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RAILWAY MASTER MECHANIC

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Illustrated Articles Indicated by Asterisk

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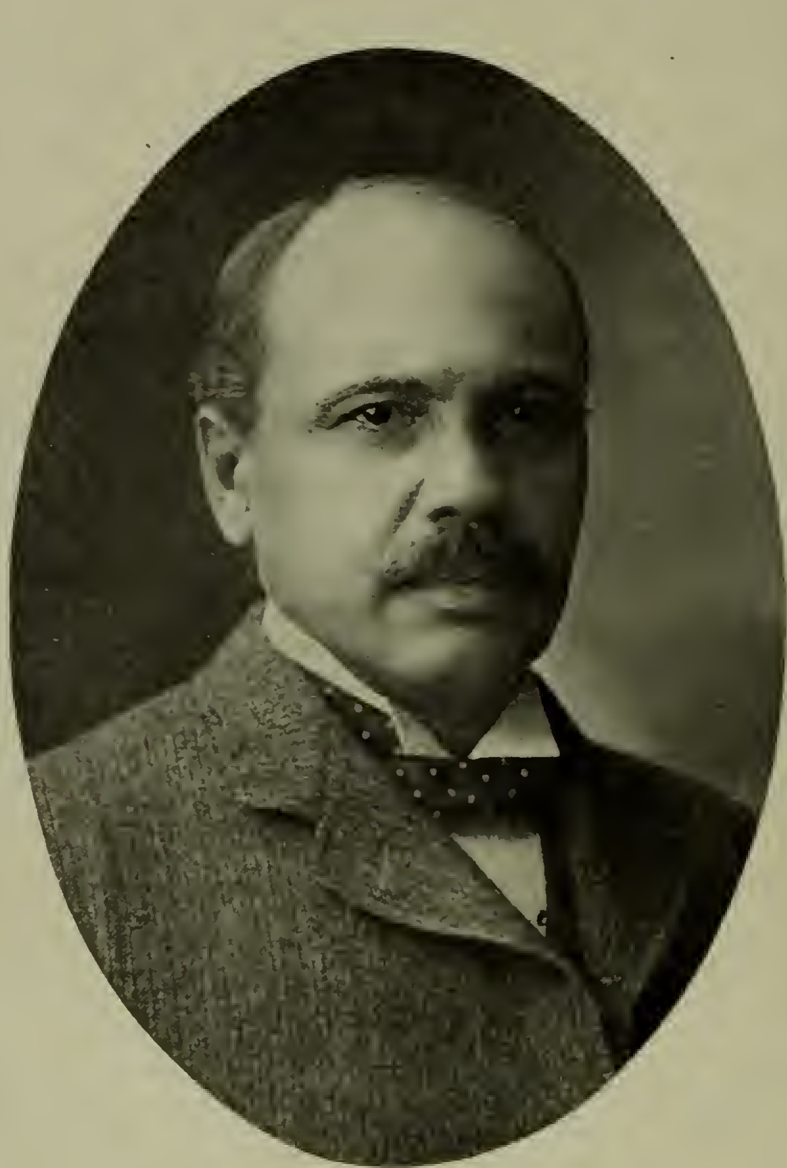
fully investigating the conditions of service and the troubles experienced in the operation of freight trains.

The first item considered by the committee is one of much significance and one which should attract the attention of heads of departments particularly. This refers to the design of cars to withstand the added strain imposed upon them by the ever increasing tractive effort and size of locomotives. While much attention has been given to the design and construction of locomotives of greater capacity, it appears that the same progress has not been made in the construction of cars of greater strength and stiffness.

Another point well taken is the suggestion that railroads should insist upon all couplers being designed to conform to the M. C. B. contour lines and more julgment exercised in the distribution of metal. The careful consideration of these points together with the others examined by the committee indicate the ability with which the subject was investigated. The recommendations offered are such as to be practical considerations in the manipulation of freight trains with high efficiency.



MR. MYRON J. CARPENTER.
GENERAL MANAGER PERE MARQUETTE SYSTEM.

Mr. Carpenter was born April 12, 1850 at Caledonia, Illinois He entered railway service in 1869 as an operator on the Chicago, Milwaukee & St. Paul Railway. Since that time he has held important positions with several different railway companies. He retires from the presidency of the Chicago & Eastern Illinois Railway to accept the position of vice-president and general manager of the Pere Marquette Railway System.

IT is in the reduction of the cost of repairs, the rapidity with which locomotives are overhauled, the introduction of methods whereby new parts are produced at least cost, as well as in the ability of handling men, that the shop manager proves himself efficient and successful. While a locomotive remains in the shop for repairs, it represents so much capital remaining idle. This is particularly felt at this time when traffic is heavy, when the locomotive builders are so crowded with orders as to be necessarily tardy in supplying the great demand for new equipment and when, in many instances, freight cars are waiting on sidings for the necessary motive power to move them.

In the present operation of shops, the shop constitutes a machine in itself, its success as such being represented by the work turned out each month. The manager who so controls his shop as to keep a locomotive out of service the minimum time while undergoing general or necessary repairs, at the same time reducing the cost per locomotive repaired to a minimum, is the man most productive of good results to the department which he represents.

The interdependence of the several departments, the several shops which constitute the great machine, must necessarily be considered. These several departments must be guided together harmoniously and made to work to one great end. The consideration of the supply and demand must be borne in mind. In this particular the number and output of machines, for instance, must be such as to supply the parts as they are required for the erecting floor, so that capital, represented in the wages paid to the men, will not be idle while the workmen are waiting for material to be supplied by the machines.

The detail of the work is the consideration necessitating close attention. For this reason the selection of men for subordinate positions is an important factor. It devolves upon such men to direct their individual interests in a manner conducive of best results, for only by their co-operation and the generalship of a competent leader will success of the machine as a whole be insured.

THE following abstract from the consular report of Mr. E. C. Bellows, U. S. Consul-General in Japan, will be appreciated by those interested in the progress of American Locomotives abroad:—Three standards of railway equipment were introduced into the Empire, the British having the advantage of being first in the field and of being established in the island, which both from its size and from its including nearly all the important commercial cities of the Empire, would require much the greatest mileage.

There was no marked change in the conditions thus introduced into Japanese railway affairs, the standards of each nation continuing to predominate in the island where they were introduced until 1897, when 125 locomotives were ordered from America for the imperial and Nippon railways in the main island, the Nippon being the most important of the private railway companies. Since that time, the importation of English locomotives has never greatly exceeded that of American, and now more than 50 locomotives of American manufacture are in daily use in Japan, where the entire number of all kinds is not far above 1,200. Considering the great advantage which England had at the start, this is a very good showing indeed, and it is especially creditable in view of the prejudices our manufacturers have had to overcome.

Lehigh Valley Dining Cars.

THE Lehigh Valley Railroad Company has recently placed in service two new dining cars, built by the Pullman Company at Pullman, Illinois, from designs and specifications devised by the Pullman Company. The cars are thoroughly equipped with modern conveniences, containing all the necessary appurtenances required. Fig. 2 is a side elevation indicating the symmetrical outlines of the cars and Fig. 4 is a floor plan showing the roomy floor space, arrangement of kitchen, tables, chairs, etc. Figs. 1 and 3 are illustrations of the exterior and interior, respectively, of one of the cars. Steps are applied to but one end of the car, the trap doors in the platform at the kitchen end being fixed.

FIG. 1.—LEHIGH VALLEY DINING CARS.—EXTERIOR.

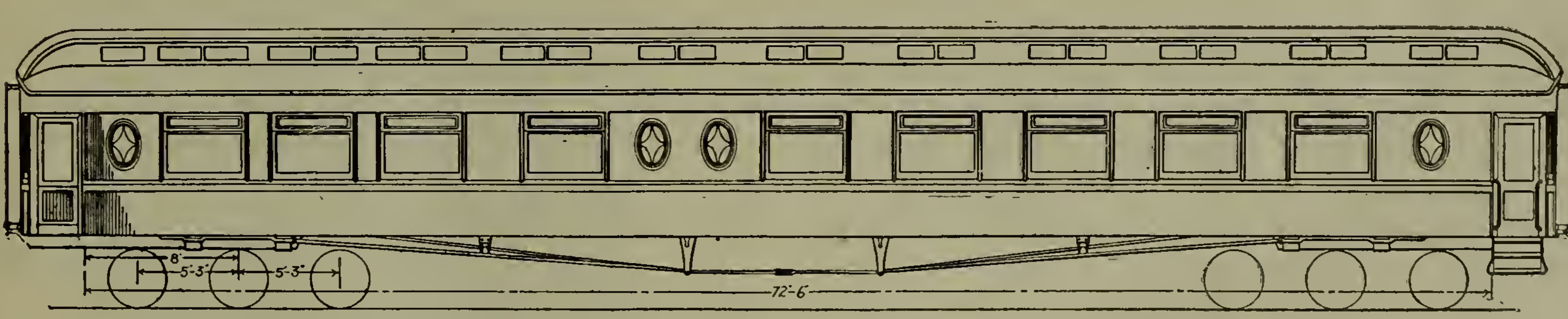


FIG. 2.—LEHIGH VALLEY DINING CARS.—SIDE ELEVATION.

There are thirteen windows on each side of the car, nine large square windows and four ovals with opalescent glass. There are twelve upper deck windows with opalescent glass set in metallic frames.

Each car is 72 ft. 6 ins. long over end sills, 9 ft. 8 ins. wide over side sills, 10 ft. ¼ in. wide over all and 6 ft. 10 ins. high between sill and plate. The framing is the Pullman standard cantilever truss type, with 1¼ ins. continuous blocking below the belt rail and ⅞ in. above, and fitted with Pullman anti-telescoping device. The flooring is double consisting of ¾ in. yellow pine laid diagonally, and the outside sheathing of the car is in narrow strips. The car is carried on Pullman standard trucks, with the standard centre plate of the Lehigh Valley Railroad. The trucks have M. C. B. fittings and automatic side bearings with frictionless rollers outside. The wheels are 36 ins. in diameter, the width of tire being 5⅜ ins., and the journal dimensions are 5x9 ins. The truck wheel base is 10 ft. 6 ins. and the total wheel base of car is 67 ft. 4 ins. The platforms are of the standard steel type and the draw bars are of the Tower long shank form, having 6¼ x 8 in. two-coil crucible draft springs. The height from top of rail to center of coupler is 35 ins., Westinghouse high-speed brake equipment, with McKee slack adjuster, is applied, including the Hodge brake lever system, with triple brake arrangement, the braking power being 90 per cent of the weight of the car.

The car has a seating capacity of thirty persons, there being ten tables in all, five at which there are four chairs and five at which there are two chairs each. The interior is finished in Cuban mahogany with figured veneer panels and three-ply painted ceiling in the Empire style. The kitchen is finished in oak with sheathed ceilings. The windows are fitted with mahogany sashes. The window curtains are green silk-faced Pantasote, with Acme shade fixtures. The kitchen and pantry floors are covered with copper, having wooden mats, and rubber tiling is used in the passageways, the rest of the floor being covered with Whittal Wilton carpet, including the aisle strip from bulkhead to bulkhead. The dining chairs are of mahogany with upholstered seats and backs, and with leather pads to prevent marring the woodwork. The car is fitted with electric fans and is supplied with both Pintsch gas lamps and electric lights. The car is heated by the consolidated system of steam heat in connection with four rows of straight pipe similar to the pipe layout where the Baker heater is used, the heater pipe grills being of brass, except in the kitchen compartment. The Davis and Roesch thermostat is applied to the heating system.

FIG. 3.—LEHIGH VALLEY DINING CARS.—INTERIOR.

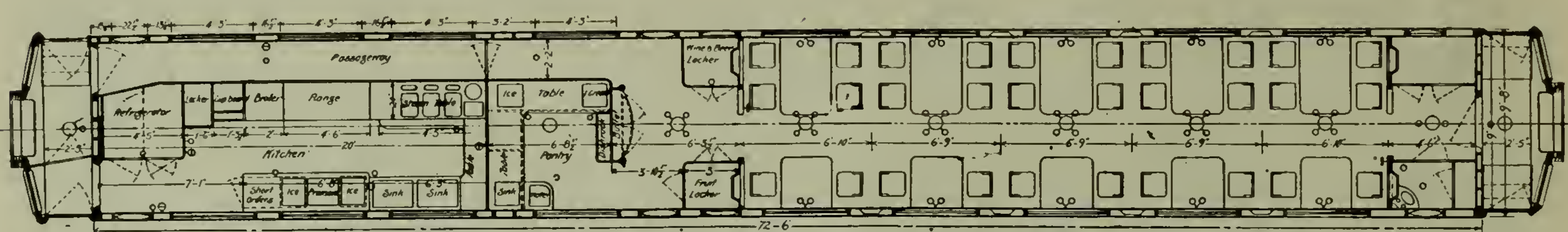


FIG. 4.—LEHIGH VALLEY DINING CARS.—FLOOR PLAN.

Convention of American Society of Mechanical Engineers.

THE forty-sixth meeting of the American Society of Mechanical Engineers was held in New York City from December 2nd to 5th, inclusive. The meeting opened at 8:30 in the evening at the house of the society, 12 West 31st; the business of the meeting being opened the following morning at the Sturtevant House. The meeting was called to order by Vice-President A. M. Waitt, who presided throughout. Owing to the illness of President Edwin H. Reynolds he was unable to attend and the usual presidential address was omitted. The temporary quarters selected for the principal sessions of the meeting were adequate in every particular, meeting every condition desired. That the principal meetings of the society will ever be held in the limited quarters owned by the society is hardly probable and with a large attendance of members at such gatherings it will be impossible to convene in cramped quarters.

The subjects presented for discussion were of great interest, both in the cases of those pertaining to the welfare of the society and the engineering problems considered in the several valuable papers prepared for discussion. The consideration of the future of the junior members was given no little attention, it being shown that the dues of the juniors were insufficient to defray the expense of keeping them on the roll. The consensus of opinion finally reached was to the effect that a rule should be adopted providing for the advance dues or for the transfer by the regular methods from junior membership to associate or full at the age of thirty.

The subject provoking the greatest discussion was the report of the committee appointed to gather material which might be used as data at such time as it may be necessary to demonstrate the advantage or disadvantage of the metric system, should there be an attempt to force its adoption. This is an item of interest to all branches of engineering and the discussion consequent to the committee's report will be read with much interest.

The following is a list of the papers presented, given in the order of their discussion, together with the names of the members preparing them:

A Rational Solution of the Problem of Weights and Measures, by Sidney A. Reeve; the Metric System, by F. A. Halsey; Entropy Analaysis of the Otto Cycle, by Sidney A. Reeve; Fly-wheel Capacity for Engine-Driven Alternators, by Walter I. Slichter; Heat Resistance, the Reciprocal of Heat Conductivity, by William Kent; A Forty-foot Pit Lathe, by John M. Barney; Finer Screw Threads, by Charles T. Porter; The Use of a Surveying Instrument in Machine Shop, by C. C. Tyler; Gift Propositions for Paying Workmen, by Frank Richards; Rotary Pumps, by John T. Wilkin; A Filing System for Office Use, by Henry M. Lane; An Analysis of the Commercial Value of Water Power per Horse Power per Annum, by A. F. Nagle; Centrifugal Machines and Their Uses, by Bartholomew Viola; A New Oil Testing Machine and Some of Its Results, by Albert Kingsbury.

Mr. James M. Dodge was elected the next president of the society. In his selection, the society has chosen an experienced engineer, an active business man and a qualified leader. Mr. Dodge is president of the Link-Belt Engineering Company, of the Dodge Coal Storage Company and the Stair Lift Company.

The Railway Club of Pittsburg.

By Mr. J. D. Conway, Secretary.

THE Railway Club of Pittsburg, composed of men employed in railway work and kindred interests, was organized at Pittsburgh, Pa., October 18, 1901, at the Hotel Lincoln upon a call issued by the following gentlemen: J. H. McConnell, manager of the American Locomotive Co., Pittsburg Works; D. F. Crawford, Supt. Motive Power, Penna Lines West of Pittsburg; L. H. Turner, Supt. Motive Power, Pitsburg & Lake Erie R. R. Co., J. D. McIlwain, sales agent.

MR J. H. MCCONNELL, PRESIDENT OF THE RAILWAY CLUB OF PITTSBURG.

There were 49 names enrolled as members at this meeting and the following officers were chosen to serve one year: President, J. H. McConnell, Vice-President, L. H. Turner; Secretary, J. D. Conway; Treasurer, J. D. McIlwain; Executive Committee, Messrs. D. F. Crawford, J. E. Simons and F. T. Hyndman.

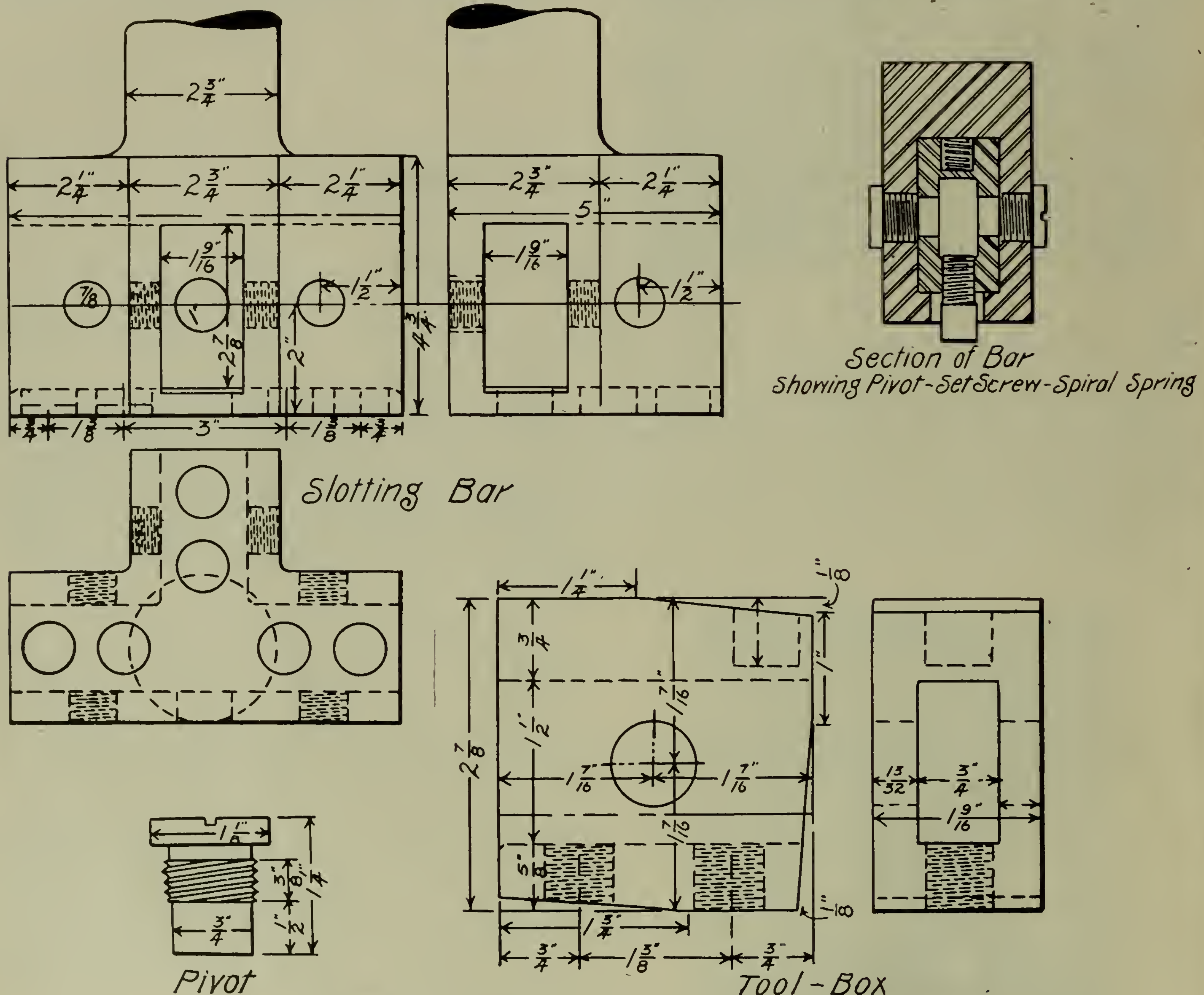
It was decided to hold meetings at the Hotel Lincoln each month except June, July and August at 2:00 o'clock p. m. The following committee was named to draft By-laws and a Constitution for the government of the Club: Messrs. J. D. Conway, H. W. Watts and J. H. McConnell. The charter list of members was left open until the following meeting in November, there being enrolled at this meeting 201 charter members. Col. David P. Jones, a retired naval officer, entertained the Club at this meeting with an eloquent address on "Some of the underlying causes for the total destruction of the Spanish Fleet at Santiago." A very able and appropriate paper was presented at this meeting by Mr. J. E. Simons upon the "Relation of the Young Man to our Club."

The annual meeting of the Club was held at the Hotel Henry, Pittsburg, Friday evening, October 24th, 1902, a smoker being one of the features of the meeting, and addresses by Col. J. M. Schoonmaker, Vice-President and General Manager of the Pittsburg & Lake Erie R. R. Co., and the Hon. Geo. A. Post, President of the Standard Coupler Co. of New York City. All the former officers were unanimously re-elected for another term. At present the meetings are held at the Hotel Henry at 2:00 o'clock p. m. each month except June, July and August. The total membership reported at the annual meeting was 313, showing the popularity enjoyed by this comparatively new organization. The conditions are most favorable for this Club to become one of the strongest of its kind, owing to the vast industrial center where located.

An Improved Slotting Bar

Chicago, Burlington & Quincy Railway

THE economy in machining locomotive driving box crown brass and cellar fits on a planer is in the advantage of planing a large number at one time. Under circumstances where a large number of boxes may be supplied to the planer as desired the saving of time is illustrated in the accompanying line drawing. This bar is designed with a head having three tool-holders. By operating this bar in slotting driving box crown brass and cellar fits, the same work is accomplished in fifty minutes which previously required two hours. One



SLOTTING BAR, CHICAGO, BURLINGTON & QUINCY RAILWAY.

very appreciable. However, it often happens that but a small number of boxes may be obtained from the foundry at one time or it may be desired to machine but a small number together. In the latter event the slotting machine may be operated to more advantage than the planer.

An improvement on the old form of slotting bar and a design of tool head used in connection therewith is large box or two small boxes are set up on the machine at one time.

The bar is made of steel throughout. Its general form and detail of construction are clearly shown in the line drawing. The head of the bar is so constructed with three tool-holders that two tools may be operated at once both in machining cellar fits and in machining crown brass fits. When slotting cellar fits the tools are placed in the two opposite holders and are then parallel to each other. In these positions the tools cut on both sides of the cellar fit at the same time. When machining the crown brass fits the tools are placed in the holders at right angles to each other. In making the first rough cut, each tool cuts one-half of the fit, one tool beginning its cut at the center of the fit, the second tool beginning its cut at the end. It is thus seen that in making the first or rough cut but one quarter of a revolution is made. The second, or finishing cut, is made with one tool.

An interesting feature of this design is the tool box. It is shown in section within the bar and also in detail in the accompanying line drawing. It is supported in position within the bar by two pivots, about which it is free to turn for 1/8 inch. This movement is to allow for the clearance of the tool during the return stroke. To insure the return of the tool to its proper position before beginning its forward (or down) stroke, a spiral spring is applied above the box and near its rear end. Two set screws are inserted in the under part of the box to hold the tool rigidly in position. To allow for the movement of the set screws when the head swings, the holes in the head of the bar through which the screws pass are drilled large enough for them to clear. The same form of tool box is used in bars with single heads.

This slotting bar is in successful operation in the West Burlington shop of the Chicago, Burlington & Quincy railroad.

Passenger Locomotives of the Canadian Pacific Railway.

IN our December, 1902, issue of volume 26, it was announced that the Canadian Pacific Railway Company had ordered twelve 10-wheel locomotives from a locomotive manufacturing establishment in Scotland. They are to be built according to plans and specifications devised in the office of the superintendent of rolling stock and the accompanying drawings demonstrate the American lines along which they are to be built. These engines are to be similar in construction to six of the latest type designed by the Canadian Pacific Railway which were built at the Delorimier Avenue, Montreal, shops and which are now in service. Six more are now under construction at the company's shops. These engines were designed with the idea of having them modern and up-to-date in every respect and it may be added that the engines already built present a very handsome appearance and are giving excellent results in service.

The design includes piston valves with inside steam admission and outside exhaust, giving incoming and outgoing steam courses as direct as possible. The valve gearing has been given particular attention to get the motion as straight as possible and do away with the transmission bar, thus using a minimum number of pieces. This has been achieved by placing the piston valves in line with the centre of the frames and using a rocker which swings about a pin attached within the frame, bringing the valve rods directly above the frames and giving a very direct motion in forward gear.

The boiler is of liberal size, being radial stayed with extended taper course, having a sloping face sheet so arranged that the weight per pair of wheels will not exceed 46,000 pounds, and the resultant cab room will be as great as possible. The cab is of steel, its lines conforming to the company's standard. The spring gear is under hung and central with the driving wheel journals. The engine truck is of the 4-wheel swing bolster type.

The form of the company's standard turtle back hopper tank is followed in the design of tender. The tender frame is constructed of 10-in. steel channels, and is very strong. The trucks are made of steel and iron having outside carrying springs.

Assuming the mean effective pressure to be 85 per cent of the boiler pressure and determining the tractive effort from the given dimensions of cylinder and driving wheel, the engine is capable of exerting a starting power of 26,900 pounds. The weight on drivers being 126,750, the ratio of adhesive weight to tractive effort is 4.7; the ratio of tractive effort to total heating surface is 11.11, and the ratio of total heating surface to grate area is 72.92.

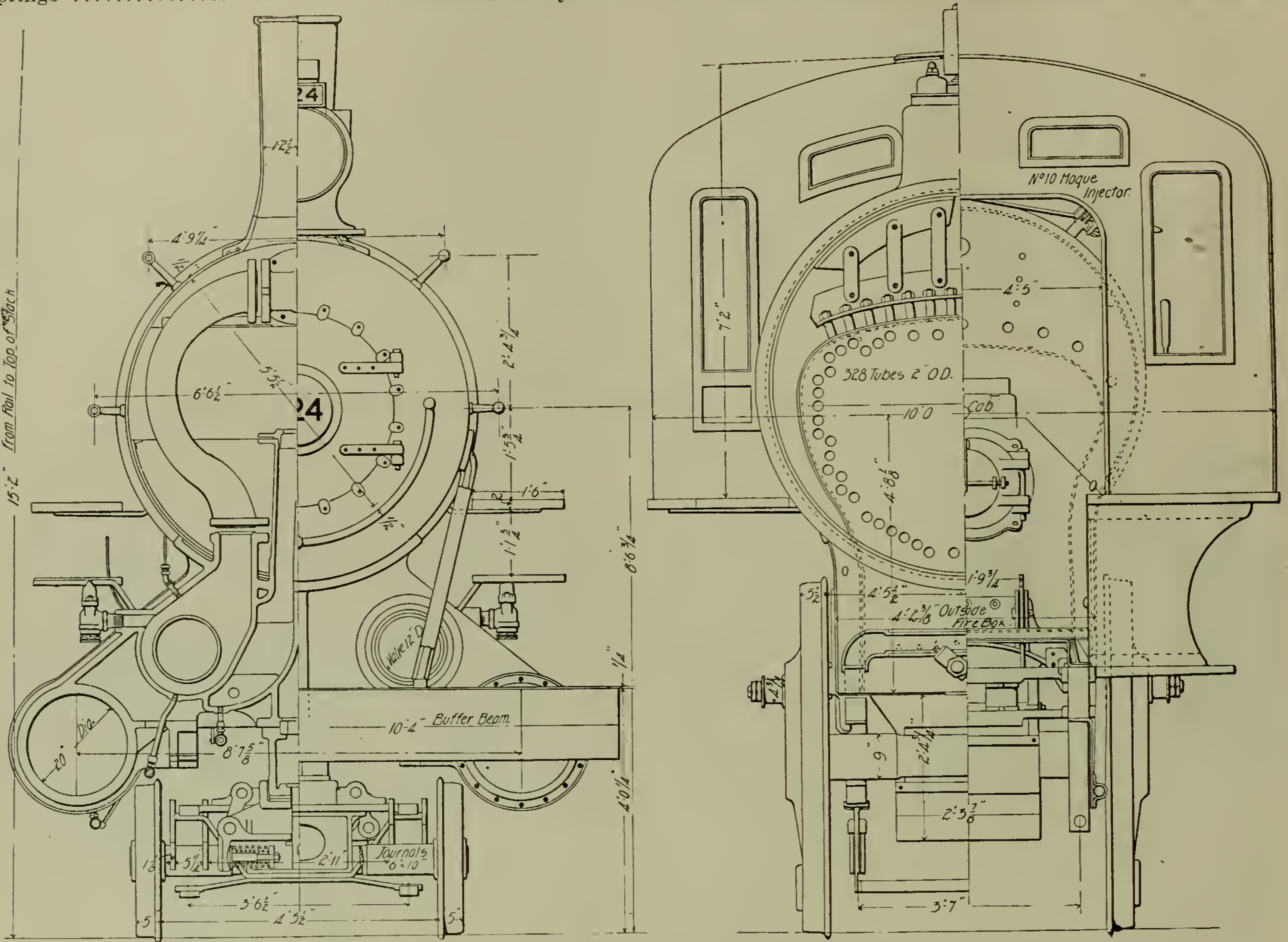
The following table presents the general dimensions and further details of construction:

Gage	4 ft. 8½ in.
Type	Ten-wheel, passenger.
Weight on drivers	126,750 lbs.
Total weight	164,550 lbs.
Diameter of cylinders	20 ins.
Stroke of pistons	26 ins.
Diameter of drivers	69 ins.
Type of boiler	Radial stayed extended wagon top.
Working steam pressure	210
Tubes, number	328
Tubes, material	National Charcoal Iron.
Tubes, outside dimen.	2 ins.
Tubes, length	13 ft. 2⅛ ins. between sheets.
Firebox, length	9 ft. 6 ins. inside.
Firebox, width	3 ft. 5⅞ ins. inside.
Firebox, material and maker	Steel, Otis.
Tank capacity for water	5,000 im. gals.
Coal capacity	10 tons.
Total heating surface	2,421 sq. ft.
Tube heating surface	2,262 sq. ft.
Firebox heating surface	159 sq. ft.
Grate Area	33.2 sq. ft.

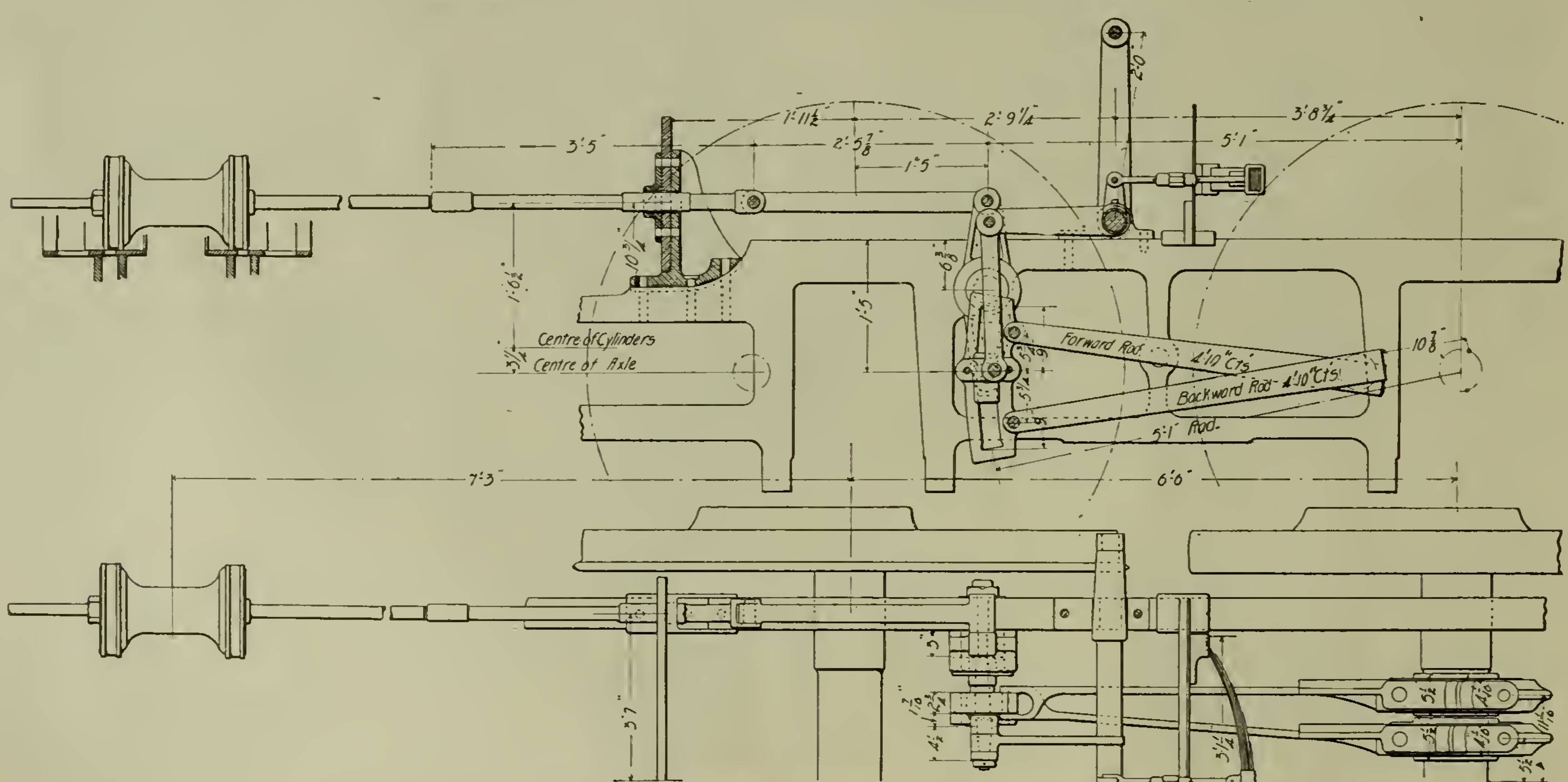
Kinds of Special Equipment and Names of Makers.

Air brakes	Westinghouse American.
Axles	Krupp (steel).
Bell ringer	Little Giant.
Brake beams	Sterlingworth reinforced.
Brake shoes	W. A. B. & M. C. B. standard.
Couplers	Washburn flexible pilot coupler and Tower long shank freight coupler on tender.
Headlights	Pyle-National Electric.

Injectors ....2, No. 10 Hogue.
Piston rod packing ....U. S. Metallic.
Valve rod packing ....U. S. Metallic.
Safety valve ....Two 3-in. Crosby.
Sanding devices ....Leach.
Sight feed lubricators ....2 Michigan.
Springs ....Canadian Pac. Ry. Co.
Steam Gages ....Star Brass Co.
Steam Heat Equipment ....Gold.
Tires, driving wheel........................Krupp crucible.
Tires, truck wheel........................Krupp crucible.
Tires, tender wheel........................Krupp crucible.
Wheel centres—
....Cast steel from Can. Switch & Spring Co., Montreal.

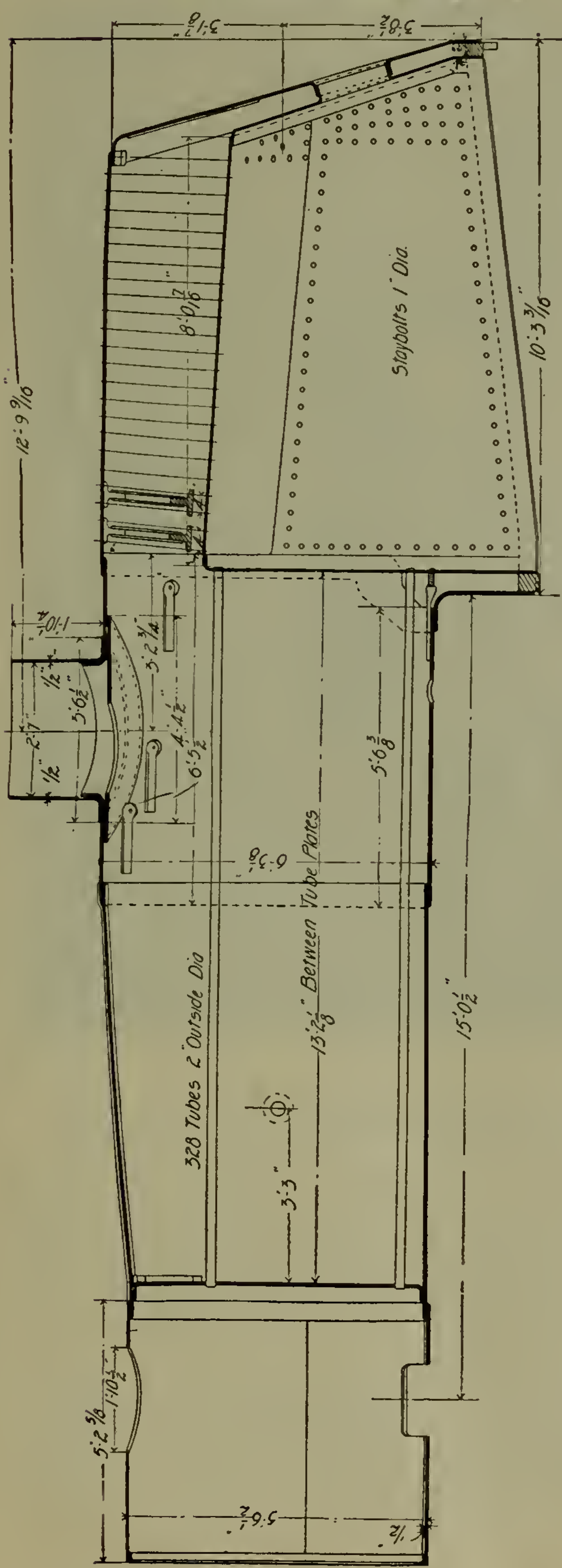


Passenger Locomotives of Canadian Pacific Railway.—Section and Elevation.

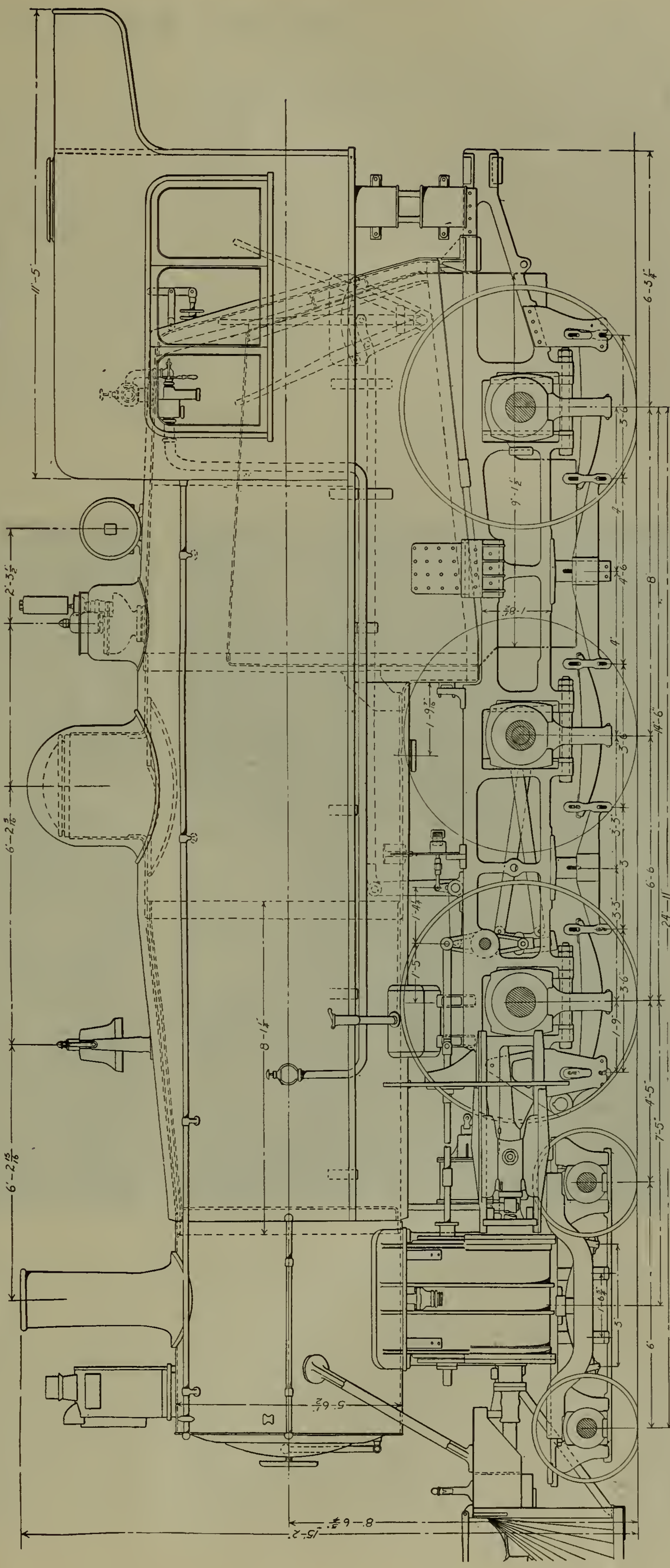


Passenger Locomotives of the Canadian Pacific Railway.—Detail of Valve Motion.

Horizontal Section of Cab.



Section of Boiler.



Passenger Locomotives of the Canadian Pacific Railway.

Air Pump Repair Table.

DUE to the inconvenience in handling locomotive air pumps it is necessary to have a table of some kind to which the pump may be attached and on which it may be easily adjusted while being repaired. To facilitate this work, the pump should be rigidly attached to the table and the table so designed as to turn in any practical direction and be held rigidly in any desired position.

Figure 3 is the line drawing of a table of this kind constructed under the supervision of Mr. E. Belknap, general foreman of the Hicks Locomotive Works, Chicago Heights, Illinois. Figs. 1 and 2 illustrate the table in two positions for operation.

The table is constructed of 2½ in. by ¾ in. flat bar of the supporting castings of the pump and are arranged to accommodate any size pump on the market.

The construction of the table is very simple, all adjustments are made by hand and whatever lifting is necessary is accomplished by an air hoist conveniently located. The table is situated in that section of the shop set apart for air brake repairs. In this section there are located all six connections, gauges, etc., for testing and all apparatus for repairing. The air connections are so arranged that the pump may be thoroughly tested and prepared for service before removal from the table.

The table has been erected very near the lye tanks used in cleaning and removing grease and dirt from the castings. Above the tanks and table is a track bearing an

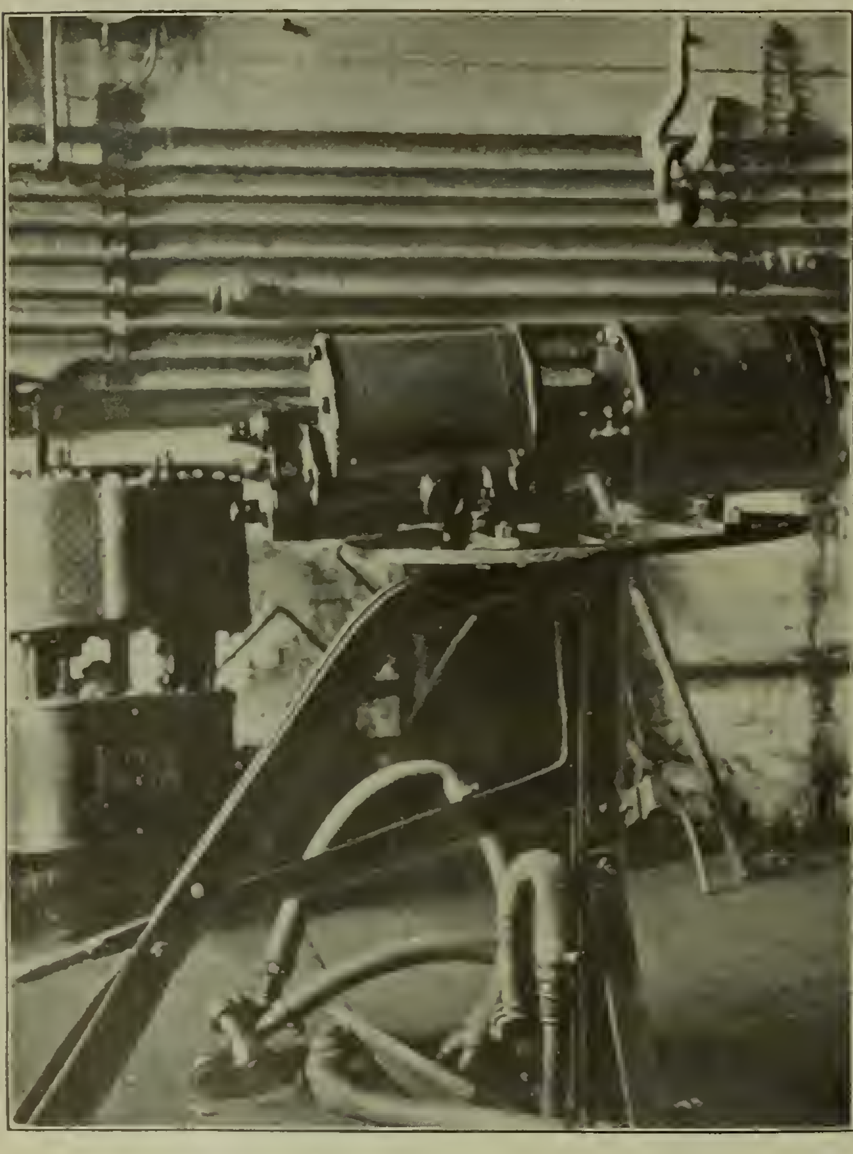


Fig. 1.—Air Pump Repair Table—Hicks Locomotive and Car Works.

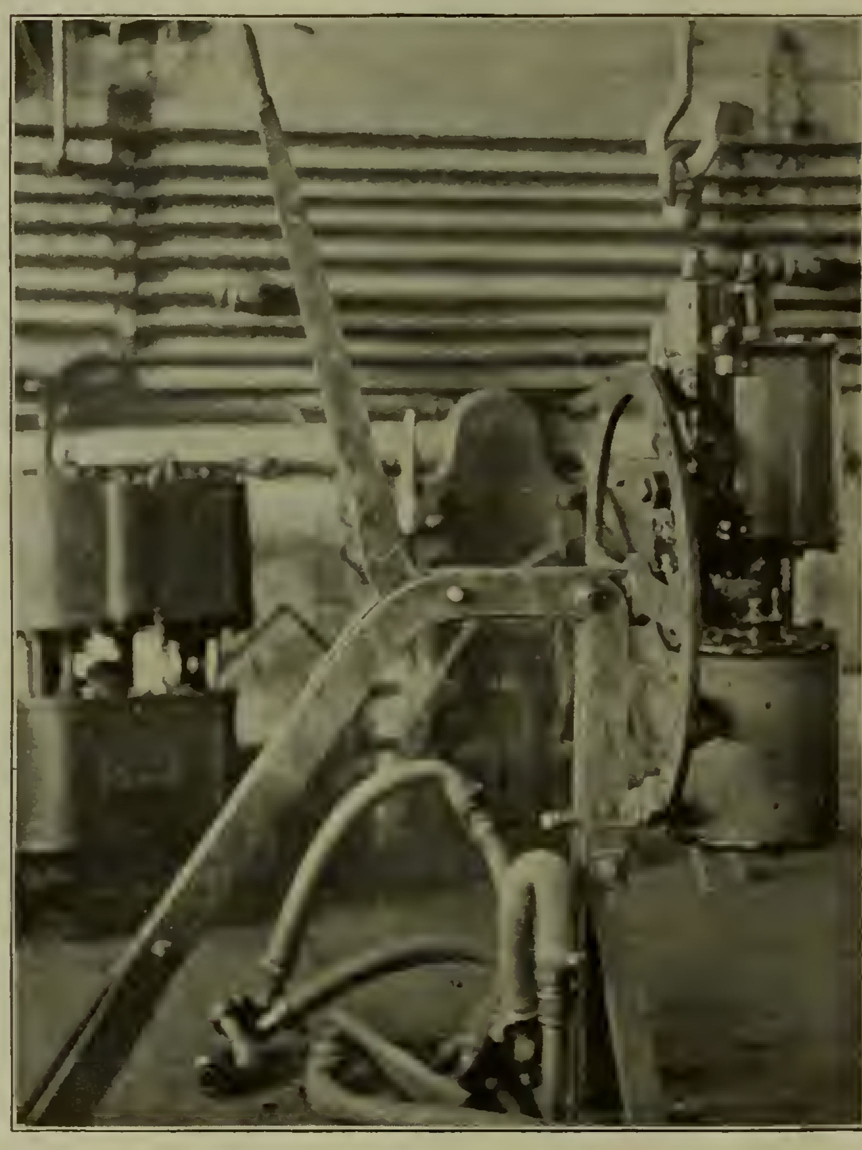


Fig. 2.—Air Pump Repair Table—Hicks Locomotive and Car Works

iron. The supporting base is bolted rigidly to the floor of the shop. The table is attached to the lever shown, which is pivoted to move about a single point; the table in turn being pivoted at the end of this lever is free to turn in any direction. By adjusting the lever and turning the table, the pump may be placed in any position desired. Suitable plugs are supplied, by means of which the table is held in place when adjusted. Holes are drilled in the table frame to conform with the bolt holes air hoist. The pump is handled entirely by this hoist, being lowered into and removed from the lye tanks by the same. A lug bearing an eyebolt is screwed into the cap of the pump, the hook of the hoist being made to engage this lug when lifting.

When brought in for repairs, the pump is lifted into position and attached to the table where it is stripped. All parts having been removed, the castings are transferred to the lye tanks where they are thoroughly cleaned and then returned to the table. All parts having been repaired and returned to the castings, the pump is thoroughly tested, and, having stood the test satisfactorily, is painted while still on the table.

arranging the apparatus as to be under the control of one man and to be manipulated quickly and readily, the device is being operated economically, proving itself a time as well as a labor saver.

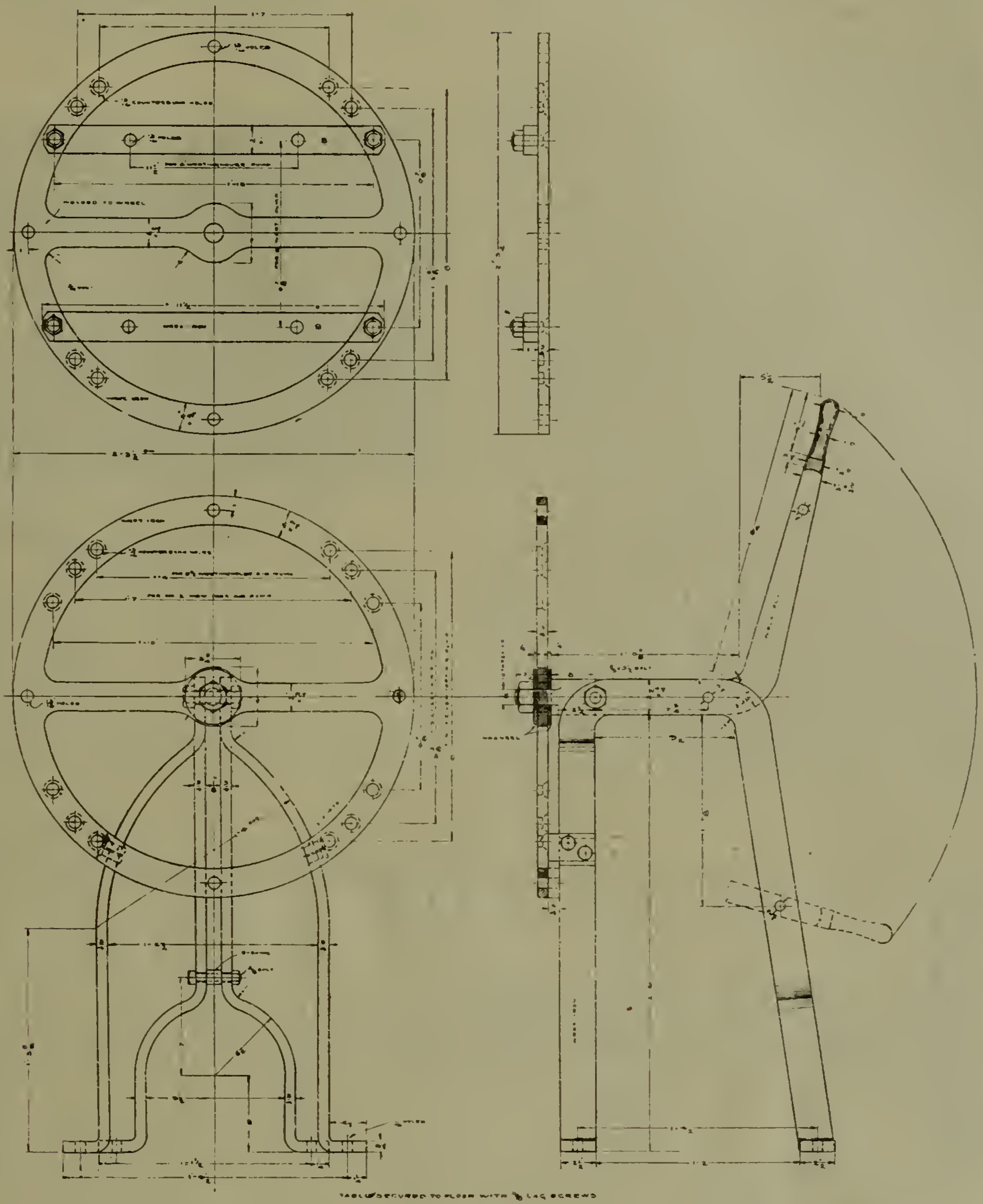


FIG. 3.—AIR PUMP REPAIR TABLE—HICKS LOCOMOTIVE AND CAR WORKS.

By the use of this table and the other conveniences arranged in connection therewith, one man is enabled to handle a pump easily and without exertion. By so

The wrought iron strips marked B and B', Fig. 1 are bolted to wheel only when 8-in. Westinghouse air pump is being repaired.

Pennsylvania Railroad 100,000 Pounds Capacity Gondola Cars

THE accompanying line drawings illustrate an interesting design of low side gondola car, prepared by the motive power department of the Pennsylvania Railroad. The body is of wood with steel underframing. The underframing is of an unusually interesting form, the center and side sills being of channel section, and having the extreme depth of 24 ins. at the center. In Fig. 1 a sectional plan view and side elevation is presented, and in Fig. 2 some cross-sectional and detailed views are shown.

These cars have a capacity of 100,000 lbs. and are designated by the railroad company as Class Gr. They are 40 ft. long over end sills and 30 ft. between truck centers. The inside dimensions are 37 ft. 10 ins. long by 8 ft. 9 ins. wide, with sides 30¼ ins. high, made up of three timbers 10 ins wide by 3½ ins. thick, faced with a strip ¼ by 3 ins. on the top. In the design of the car sufficient strength was provided to permit of a concentrated load of two-thirds of the marked capacity being carried at the center, and the weight of the car, which is 44,000 lbs., gives a ratio of dead weight to paying load of .44. In the cross-sectional details, Fig. 2, the transverse construction providing for the concentrated load is shown. The side sills connect with the center sills through the body bolsters and through transverse diaphragms, the latter being of extra depth and having a cover strip 10 7-16 ins. wide by 7 ft. 7 ins. long, secured by angles. The center sills also have a cover strip running their entire length and are reinforced at the bottom by 5 by 5 by ⅝-in. angles secured on the opposite side from the flanges and extending the distance between the body bolsters. The latter comprise two diaphragms of ⅝-in. metal between the center sills and two diaphragms of 5-16-in. metal between the center and side sills on each side of the car, secured by top and bottom cover plates and the body center plates.

Diagonal braces of the construction and dimensions shown extend from the outer ends of the body bolster to the end sills, being secured to the latter next to the ends of the center sills. The end sills are made up of 10-in. channel sections weighing 15 lbs. to the foot, and are attached to the side sills by a push pocket casting riveted to both sills. The floor stringers consist of two

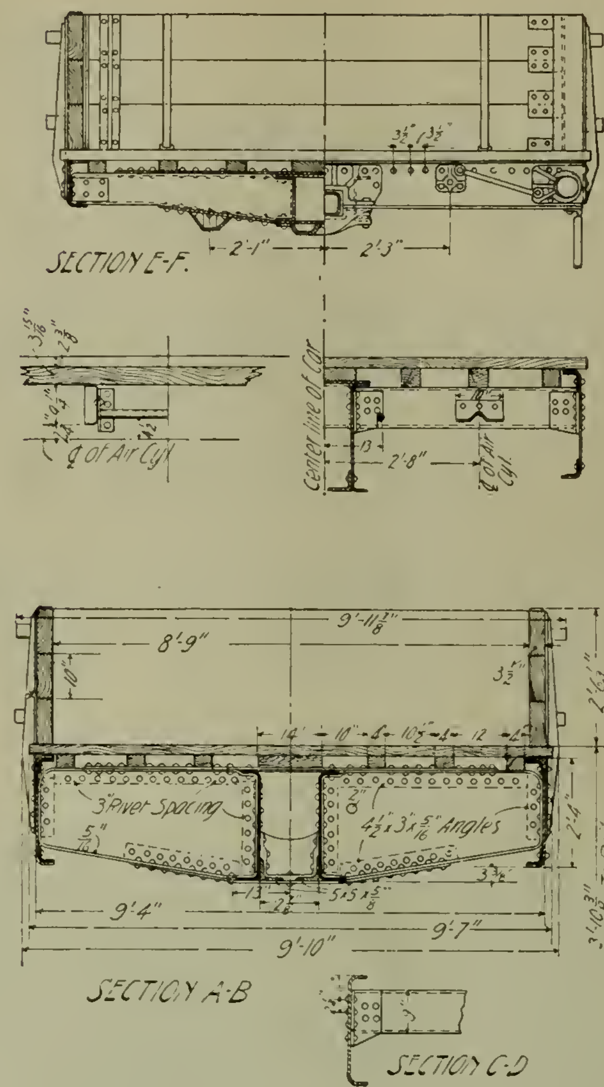


Fig. 2.—Cross Sectional Views and Details.

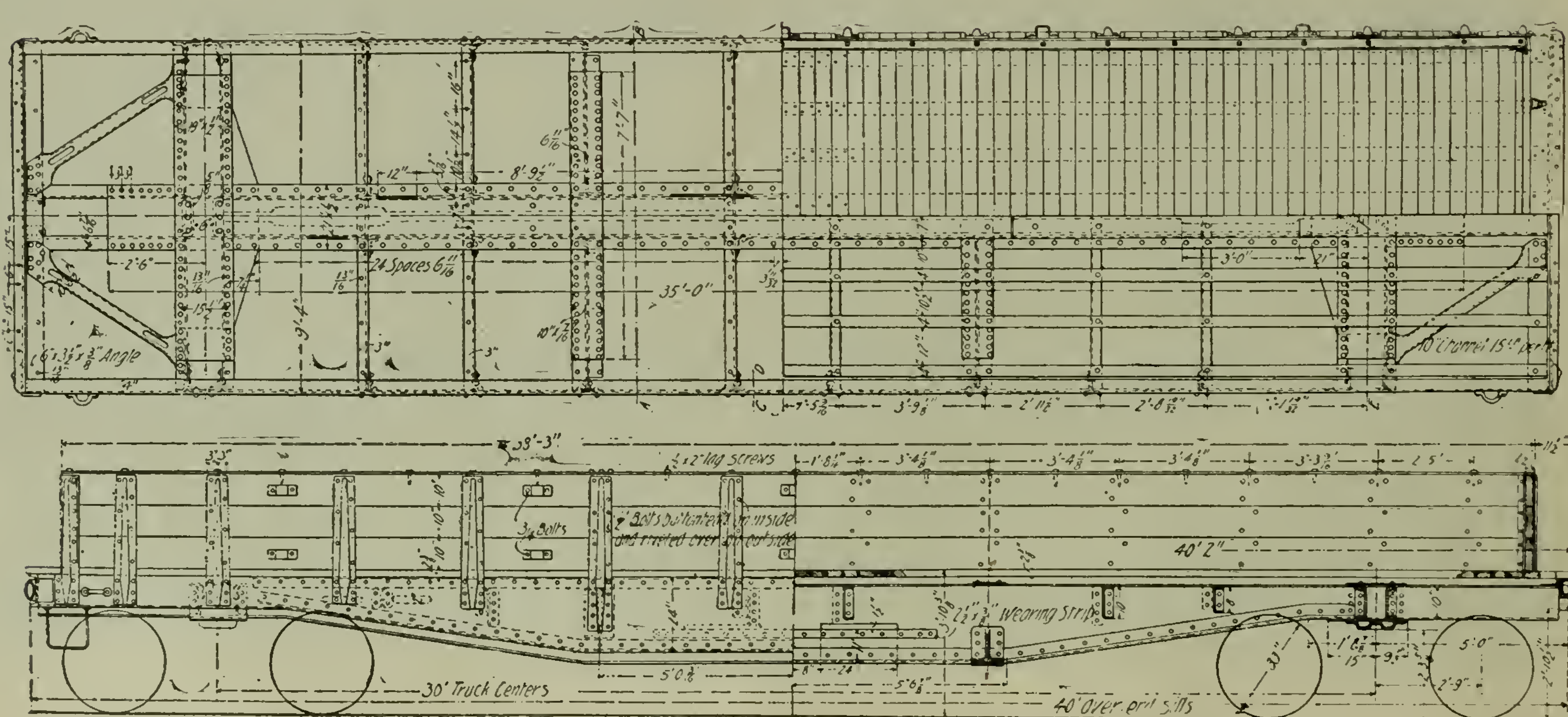
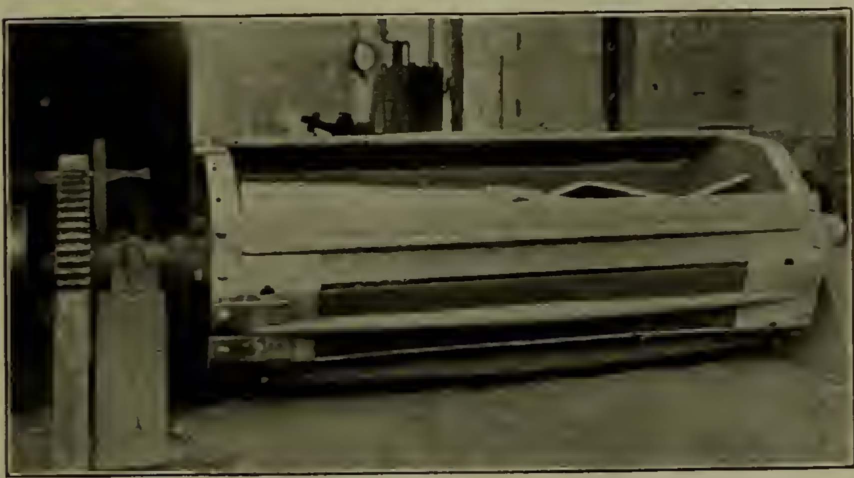


Fig. 1.—Pennsylvania Railroad 100,000 Pounds Capacity Gondola Cars.—Sectional Plan View and Side Elevation.

side, four intermediate, and one center timber, the latter being 3 ins. thick and 14 ins. wide, and the remaining stringers 3x4 ins. The flooring is 2⅜ ins. thick and the side planks are bolted to steel stakes, 14 of the latter being placed on each side. The ends do not drop. The cars are equipped with Westinghouse friction draft gear, the draft rigging being supported at the end sills by a casting in the form of a yoke, which is bolted to a larger and heavier casting above, the latter being riveted to, and reinforcing, the end sills against buffing stresses. The follower stop lugs are of ⅝-in. steel riveted to the webs of center sills. The trucks are of the Pennsylvania standard diamond type with 33-in. wheels, 5½x10-in. journals, metal spring planks, and inside hung brakes.

A Scrap Rattler

IN the repair yards of the Armour Car Lines, Chicago, the large scrap or tumbling barrel illustrated in the accompanying half-tone engraving is found to be quite an advantage. The rattler is placed at the scrap bins and cleans perfectly all usable scrap which is put therein.



Scrap Rattler Armour Car Lines.

The barrel is built large enough to take in metal bolsters, and the practice is, wherever a truck is being torn down for renewal of spring plank or arch bars, that all castings of the truck are thrown aside and taken to this rattler where they are perfectly cleaned. When they are taken from the barrel they are carefully inspected and those that are found to be in good condition are dipped in graphite paint and put back in stock.

It is found, especially in the case of arch bars and metal spring planks, that defects are discovered after they have been put through this rattler that could not be discovered before.

This rattler is capable of handling a large amount of scrap and is found very satisfactory in cleaning those parts which are to be repainted before being replaced in service. Springs and any other material taken from a scrap bin and which have been exposed for any length of time are always more or less covered with rust and scale. After passing through the rattler, this material is found to have been thoroughly cleaned and freed from all scale, giving a good surface over which to paint.

By painting the usable material at the rattler, all parts to be replaced in service are handled directly from the scrap bin to the material shed. By so doing, second-hand material is handled more economically than would be the case in taking it to the shop.

When filling the rattler, care is taken to put in a large number of small pieces of material together with large parts so that in tumbling the small pieces will have, by their freer movement, the effect of thoroughly cleaning each other and the larger pieces against which they rub, taking the place of tumbling jacks.

This practice originated under the supervision of Mr. W. E. Sharp, superintendent of the Armour Car Lines, through whose courtesy we are permitted to present this description.

Trains Parting

Report of a Committee Appointed by the Car Foremen's Association of Scranton

WHILE investigating the parting of freight trains, the causes, and remedies for same, the following are worthy of consideration:

First: To the introduction of the heavy type engines, and the hauling of an increased number of cars without any material change in the construction of the majority of same.

Second: To the giving away of draft rigging and the pulling out of the ends of same on the older types on account of the excessive drawbar pull.

Third: On account of the design of the older types of automatic couplers, they not conforming to the contour lines as adopted as standard by the Master Car Builders' Association; also to the faulty distribution of metal.

Fourth: Due to wear and failure of coupler parts, common among which are knuckle lugs, knuckle pins, coupler body and guard arm, knuckles and locking pins, creeping locks and short uncoupling chains. (Record of one road shows 65 per cent of trains parting due to the failure of knuckle pins, which break about the middle, the lower half dropping out, and putting all the strain on the top lug which fails, and is the second highest of coupler failures).

Fifth: The old design of draft rigging under cars built a number of years ago being too weak, the single spring attachment having only 19,000 lbs. capacity, and the double spring 40,000 lbs. These springs will not stand this service. This part of the car should be reinforced to compare with the design on the modern cars of today. The conditions under which we are operating today demonstrate that the only design of draft rigging we have in service capable of standing this strain is the friction draft rigging, of which you will find a very small percentage of the cars equipped; in fact, a large majority of the cars have the single draft rigging.

Sixth: Due to the slipping of engines, caused by overload or the conditions of the rail.

Seventh: To the release of brakes at slow speed without the proper resistance on the engine, or head end cars.

Eighth: To defective triple valves, known as "kickers" or sticky triples, when the same are located on the rear end of train.

Ninth: To insufficient main reservoir capacity in not bringing about a more uniform release of brakes.

Tenth: To the negligence of engineers in not manipulating the brake valve properly.

Eleventh: To the rough handling in starting of trains, the switching of cars in yards and the taking on and leaving off of same on long trains where done on the rear end of train.

REMEDIES FOR SAME.

First: As the heavy type of engines have come to stay, it is essential for the car department to meet this emergency by bringing the condition of the cars to a point to be able to withstand the shocks and strains of these heavy engines. When we consider that cars built twelve years ago to withstand shocks from 50 to 60-ton engines in trains not exceeding 30 cars (loads) are today being handled with engines weighing from 90 to 100 tons in trains consisting of from 75 to 85 loads, we do not wonder at the number of breaks-in-two, and as previously stated, the strengthening of cars and the introduction of greater capacity cars (the older types being 40,000 and 50,000 lbs.), which will necessarily shorten the train, with modern appliances will overcome the first cause.

Second: The large majority of failures in draft riggings we have discovered has been in the older type with the single spring draft gear. We would recommend that this part of the car be reinforced in line with the present friction draft gear.

Third: We would recommend that the railroad companies insist that all couplers purchased shall conform to the Master Car Builders' contour lines, and that the manufacturers re-design their coupler so that the distribution of metal shall be such that there will be no excessive strains. Also that the link pin hole in knuckle should be made smaller so that the wall between hole and wearing face of knuckle will not crush in, thereby increasing the distance from the face of knuckle to the face of coupler. Also that the manufacturers should agree on one size knuckle pin, thereby saving the railway companies from carrying a large stock of the different sizes on hand.

Fourth: These conditions can best be overcome by a little more care in handling cars while switching in yards, and insisting on great care while inspecting these cars to replace them before they fail.

This will necessitate either more time for inspection or the addition of more inspectors on the trains, so that no cars shall leave a terminal without proper inspection. At present it is almost impossible to hold trains long enough for proper inspection causing a congestion in yard terminals, and we think it necessary to increase the number of inspectors; this to be governed by the time allowed on inspection of trains.

Fifth: This is covered by the conditions given above in No. 1.

Sixth: This is a question for the superintendents to consider in their tonnage rating of engines, in which we think they should take into consideration the conditions of weather and the physical conditions of their respective divisions. It has also come to our notice that the quality of sand that is being used is such that it turns into loom and the engine will slip on it. A better quality of sand will greatly reduce the engines slipping, and the proper clamping of sand pipes so that the sand will be spread on the rail. In a number of instances you will find that sand pipes are too short or where coupled with a union connection are loose and swing inside or outside the rail; in either instance the sand is not deposited on the rail and eventually the engine slips, causing the train to bunch and when the drivers catch the rail again break a knuckle.

Seventh: We would recommend that all engines in road service be equipped with straight air, or if this does not meet with the approval of officials, it will be necessary for the superintendents to issue bulletins to trainmen requiring that where slow-downs are made, due to reconstruction of bridges or any other designated slow-down points where the speed is not to exceed eight miles per hour, that the train be brought to a full stop or have the trainmen set up about six retainers on the head end of train, or set at least from four to six hand brakes. The application of straight air on the locomotive is the best method of overcoming break-in-two from this cause, as your committee knows that conditions will arise when the attention of the head brakeman will be required at some other part of the train than on the head cars, when the release of train brakes will be necessary, and the engineer being permanently located in the right side of the cab while handling the engine can more readily with one movement of the hand apply the brake than the brakeman can turn up retainers or set a few hand brakes. Until this is done, either the retainers or hand brakes must be used. Trainmen will argue that if hand brakes are used that an application of the air will release them. This is not so, as not more than a 10-lb. reduction is used to slow down a train of 50 or 70 air brake cars, and only 23 pounds pressnre developed in the brake cylinder. Any brakeman will develop a greater power than this without the use of a brake stick on account of the hand brake rod being connected from five to seven inches from the push rod. The retainer will give good results if the brake cylinder packing leathers are in good condition, and do not leak, and the retainer pipe connections are tight. Any leakage in these parts weakens the resistance and bad results may come therefrom.

Eighth: This can easily be overcome if all private lines and all railroad companies will live up to the rules of the Master Car Builders' Association on cleaning triples and cylinders on cars. We note recently that this is being done more so than in the past, due to the interest manifested in this particular line of work, and by having competent men to do the repairing. Your committee has known of three instances where repaired triples just applied to cars had tight fitting triple piston packing rings, which caused this form of trouble, and it is not only essential that the triples be cleaned and repaired, but that they must be tested before being put into service, especially when a packing ring has been renewed.

Ninth: To overcome this, we would recommend that for trains of 50 or more cars not less than 1,000 cubic inches main reservoir capacity for each car handled. It has come to our notice that engines equipped with main reservoirs to meet the requirements of eight or ten years ago are in service at present handling long trains and no effort has been made to increase the main reservoir capacity, and while they were capable of taking care of the trains in years past, they are certainly inadequate for the trains of to-day. Where the lighter types of engines are in use they are invariably used in double-heading, and as only one engine can control the brakes, we find these engines equipped with reservoirs whose capacity does not exceed 20,000 cubic inches, handling trains of fifty or more cars. These engines should have not less than 40,000 to 50,000 cubic inches main reservoir capacity, or be taken out of such service and placed where they will not be required to handle more than thirty cars.

Tenth: If enginemen on releasing the brakes on long trains would not place the brake valve handle in release position unless they had the full amount of excess pressure in the main reservoir, and that after placing the handle in full release would allow it to remain there not less than 40 seconds, as the volume of air from main reservoir must pass through a restricted passage in the brake valve, this passage remaining the same regardless of the number of cars in train, it will require at least this amount of time for the trainpipe and main reservoir pressures to equalize, and also prevent the brakes on the head cars from sticking, which will occur if the brake valve handle is returned to running position too soon.

Eleventh: This can be overcome if engineers would display good judgment by first using sand to give a good rail, and by opening the throttle gradually until the slack of train is taken up and continue the use of sand to a speed of six miles per hour. In starting the train the engineman should give his whole attention to stretching the train before looking toward the rear end for signals. In many cases the engine slips while engineman is leaning out of the cab window looking for signal, and before he has time to shut off the steam the train has parted. The switching of cars in yards which actually start defects that result in serious damage after trains have left their terminals can be modified if the hand brake is applied after the kick has been made by switching engine, having the switchman ride the car to prevent any severe shock. At present in a majority of yards where considerable switching is done there are no brakes applied, the switchman simply holds the uncoupling lever, the kick is made, and the damage to coupler and draft rigging follows. Where cars are taken on or left off on long trains this should be avoided as much as possible. This work should be done by what is known as locals. One of your committee while riding long trains found that the amount of time consumed to pick up a car from a station switch on the rear end of an 85-car train was 45 minutes. This may seem unusually long, but when you consider that the train must be handled carefully, the engineman being governed by signal from the brakeman, it being impossible for him to see the cars he is to pick up on the rear end, then pulling out of the switch and backing train to get the caboose, getting the train started without causing it to part, this amount of time is easily taken up.

While we have not enumerated bursted airhose, as a cause for trains parting, there is a condition under which it would cause a train to part; where trains are descending slight grades or sags, and the slack is in, should a hose burst on the rear end of train, it would have a tendency to cause the train to part. The bursting of a hose on the rear end would naturally cause the brakes to begin to apply from that end, and as the last brake to apply would be on the engine, it would give time for the slack to run out causing the train to part. By reversing this condition, should the hose burst on the head end of train, the slack being in, no damage would result from the bursted hose; on the other hand, if while using steam a hose should burst, the slack being all out, if hose bursted on rear end of train, would cause no damage as only a service application would take place. If hose bursted on the head end of train while using steam, it would be equal to the engineer applying the brake in service application and no serious results would occur. When a hose bursts it usually starts a leak before giving out entirely, and this is supplied from the main reservoir, on account of the engineer's brake valve handle being in running position, the air escaping from the trainpipe, does not do so quickly enough to cause an emergency application.

Circular of Inquiry of the Railway Master Mechanics' Association.

THE committee appointed by the American Railway Master Mechanics' Association to report upon the operation and maintenance of the piston valve have issued a circular requesting information of interest on the subject. The committee is made up of Mr. F. F. Gaines, chairman; Mr. R. P. C. Sanderson and Mr. F. H. Clark. The circular is as follows:

1. Do you use piston valves?

2. What percentage of your power is equipped with them?

3. Which type? (a) Internal Admission—Hollow. (b) Internal Admission—Solid. (c) External Admission—Hollow. (d) External Admission—Solid.

4. Which of the three types do you believe to be the most economical? (a) For steam distribution. (b) For steam consumption. (c) For first cost. (d) For maintenance.

5. What ratio does the diameter of cylinder bear to diameter of valve? (a) Simple engines. (b) Vauclain compounds. (c) Tandem compound. (d) Cross compound. For compounds give ratio for both high and low pressure cylinders.

6. What provision do you have for relief for water and over compression?

7. Have you ever used piston valves with collapsible packing rings to provide for relief from water and back pressure? If so, state results and type of valve, sending blue print if possible.

8. What style of packing rings do you use?

9. What size packing rings do you use?

10. Have you any data on the efficiency or economy of the different styles of packing rings?

11. How many rings per end?

12. Have you ever made any tests for the piston valves for the exhaust effect or for the valve friction? If so, what were the results, and with what type of valves and packing?

13. Have you ever made any tests for the determination of steam loss due to worn packing ring, and if so, with what results?

14. Have you any of the new type American balance valve having double ports and stationary balance rings, and if so, with what results?

15. What in your estimation are the chief advantages of the piston valve?

16. What are the defects?

17. Please submit blue prints of type or types you use.

18. Is the wear, tear and breakage of parts of valve motions greater, less or about the same on engines of the same size and style of valve motion, and between slide valve and piston valve engines?

19. What is the relative loss in efficiency, due to worn rings, engine new, after making 15,000 miles, after making 30,000 miles and after making 45,000 miles?

20. Which rings (steam or exhaust) are the most responsible for decreased efficiency, due to wear?

21. What design of bushing should be used in connection with the different piston valves?

22. Do you use knuckle joint or its equivalent in your valve stem?

23. Do you use an extension valve stem through the forward steam chest head? If so, please submit blue prints showing your method of packing and guiding the extension?

All communications should be addressed to Mr. F. F. Gaines, Wilkesbarre, Pa.

Circular of Inquiry of the Traveling Engineers Association.

THE Traveling Engineers Association is sending out circulars to all members requesting results of experience in service, opinions and recommendations bearing upon the two following subjects and will appreciate any further information of interest. The subjects under consideration and the respective circulars relating thereto are herein stated.

Taken from an economical standpoint, how do you consider the use of brick arches in engines burning bituminous coal, deep, shallow and wide fire boxes?

1. Do you favor the use of the brick arch in shallow, deep and wide fire boxes; if so, how many brick are used in the different size fire boxes? Give the grate area.

2. State the distance from the grate to the center of the arch nearest the flue sheet; the distance the arch is set from the flue sheet; and whether there is a space between the brick and the side sheets.

3. Is a space between side sheets and brick an advantage? If so, how much space would you recommend, and what are the advantages?

4. Is it your experience that arches cause the side sheets to crack or leak in bad water districts?

5. Ever have trouble on account of arch falling down and causing steam failures?

6. What do you find the chief causes of arches giving out?

7. Which is the better method of supporting the arch; with studs or with tubes?

8. When trouble is experienced from leaky tubes, do you remove the arch to caulk or expand the tubes?

9. If so do you use the same brick in replacing the arch?

10. How many miles will an arch make in a fire box; state cost of material and labor to apply?

11. Does the arch prevent boilermakers, flue and fire box cleaners from doing work properly when engines have but a short time at terminals?

12. How long does it take an arch to cool sufficiently for men to work in the fire box?

13. When engine is properly drafted with arch in fire box, what are the results if allowed to run without an

arch? What changes are necessary in the adjustment of the draft appliances?

14. With any type of fire box can an engine have her draft appliances adjusted to give a more economical performance without an arch than with one?

15. Can you burn a whiter fire with an arch than without one?

16. Is the arch, in the fire box, a help in reducing black smoke?

17. When inexperienced firemen are employed, does the arch prevent them from placing the coal where required on grate surface?

18. If the fire fills up under arch, what are the results and does it affect the flues?

19. Have you any figures or results obtained on the engine or engines of same class with and without arches, showing fuel consumed per train or ton mile?

Address all communications to Mr. W. G. Wallace, Clinton, Iowa, care of C. & N. W. Railway.

Is it desirable that freight and switch engines be equipped with straight and automatic brakes on engine and tender? What are the advantages and disadvantages of such equipment?

1. Have you any engines, switch or road, fitted with the straight and automatic brake?

2. Do you find any advantage in its use?

3. Any disadvantage?

4. What is the cost of maintenance over the plain automatic brake?

5. Do its advantages equal the extra cost?

6. Does it have a tendency on road engines to heat and slip tires?

7. Does it on switch engines help to make bad order cars?

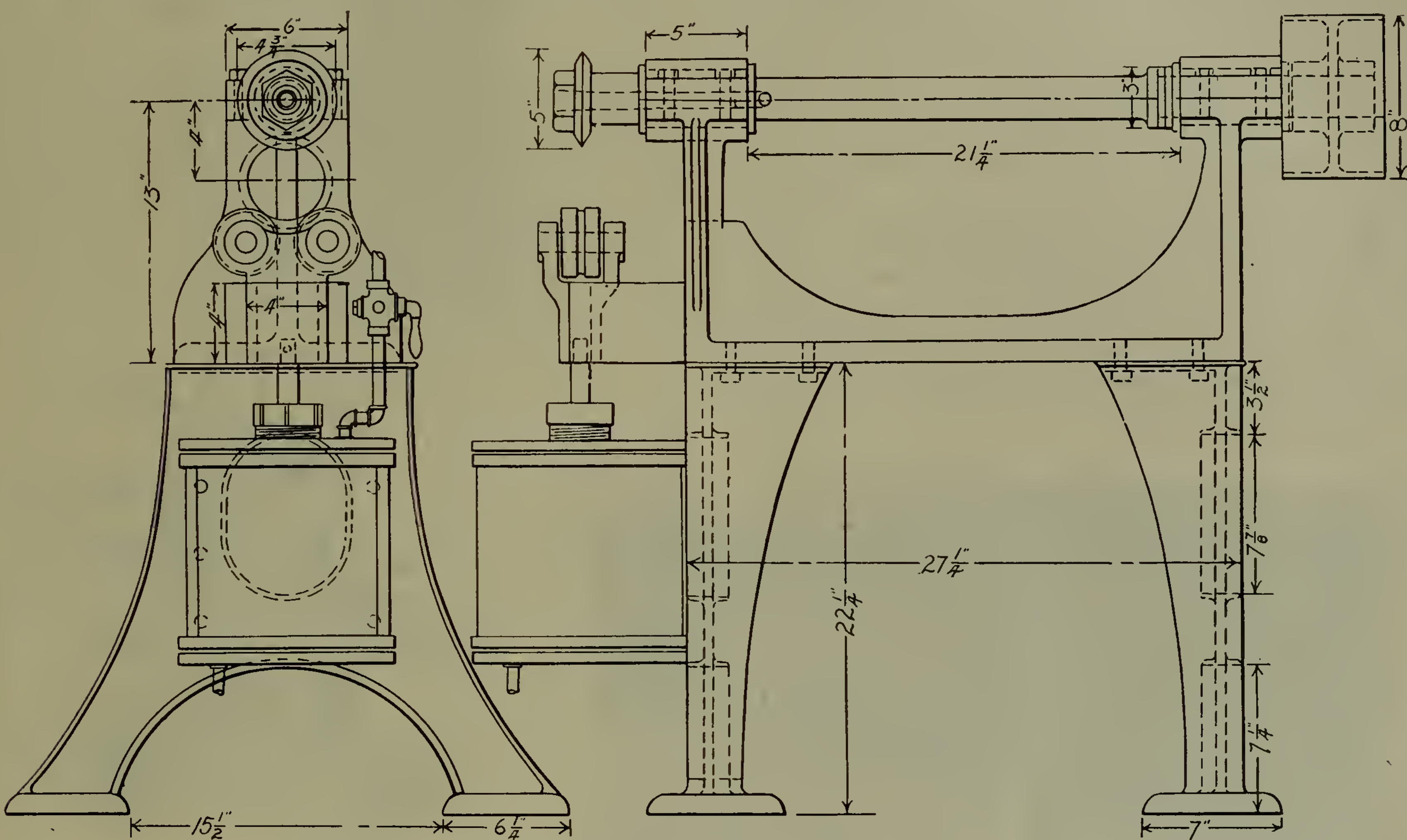
8. What is your candid opinion of it?

9. Would you honestly urge its adoption on your S. M. P.? If so, why? If not, why not?

Address all communications to Frank P. Roesch, 3774 Williams street, Denver, Colo.

Flue Cutter--Chicago, Burlington & Quincy Railway

We are permitted to illustrate herewith an interesting shop built flue cutter designed to meet local conditions in the West Burlington Shops of the Chicago, Burlington & Quincy Railroad. This machine is giving very efficient results in service, performing its work economically and satisfactorily.



Flue Cutter—Chicago, Burlington & Quincy Railway.

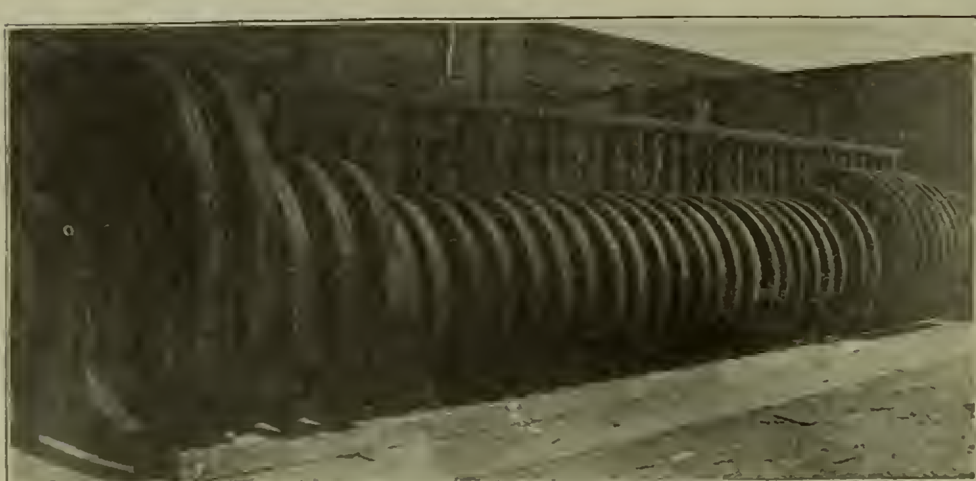
An interesting feature of its design is the method by which the rollers are raised, increasing the pressure of contact between the flue and cutter. Within the cylinder are two pistons rigidly connected to the same piston rod, the distance between them being about half the length of the stroke. The lower part of the cylinder is piped to the water main of the shop, the height of the tank, supplying the main, being such as to give a pressure within the cylinder of about 15 pounds per square inch. The upper part of the cylinder is piped to the air compressor line. A cock is so arranged with the two systems of piping that when water is admitted below the piston, the air above is exhausted into the atmosphere. The air being exhausted relieves the pressure above the pistons allowing them to be raised by the pressure of the water admitted below. The air is exhausted through a very small opening in order to reduce its pressure gradually, thereby cushioning the upward movement of the piston rod and insuring a steady motion of the rollers. A sudden reduction of air pressure would cause a sudden and unsteady upward movement which would crush the flue against the cutter rather than feed it as gradually as the cutter is capable of separating the metal.

The arrangement of two pistons mentioned above is to insure the separation of water and air. Between the two pistons, and at such a point that it will not be overlapped by either piston, is a small vent hole through the wall of the cylinder. This vent hole allows the escape of either air or water which might leak past its respective piston.

The construction of the machine is clearly shown in the accompanying line drawings. The cutter is operated by a pulley at the opposite end of the shaft on which the cutter is carried. The cylinder employed is an eight inch air brake cylinder.

Tire Rack—M. St. P. & S. S. M. Ry.

THE accompanying half-tone engraving illustrates a tire rack at the Minneapolis shops of the M. St. P. & S. S. M. Ry. This rack is very appropriate for the purpose, and permits of the workman laying his hand on the desired size of tire without going to the trouble of tearing down different stacks. The construction of the same was very cheap, as the longitudinal timbers were made of discarded car sills, and the uprights of draft timbers removed from cars in repairing the latter. The rack is built of course to operate on the principle of a bicycle rack, and is a very convenient affair. This is another interesting instance of the application of scrap car material for useful service.



Tire Rack—M., St. P. & S. Ste. M. Ry.

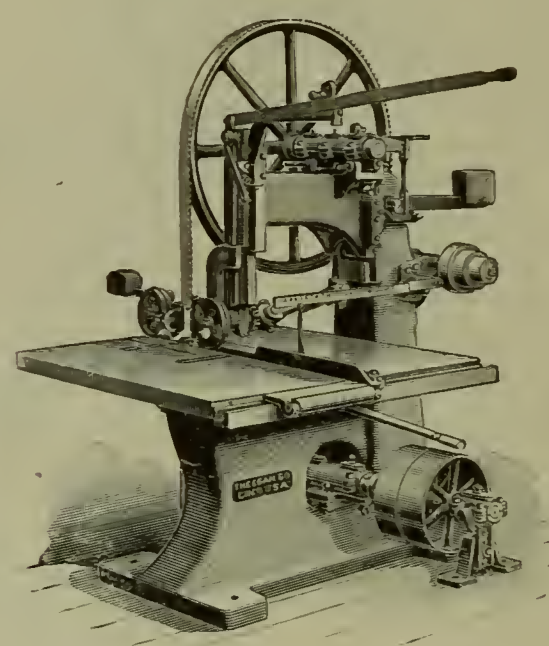
We acknowledge the courtesy of Mr. C. P. Williams, chief draftsman of the Soo Line, in presenting this illustration.

New Band Rip Saw.

The new band rip saw here represented will without doubt prove of much interest. Its makers claim it will surpass in quality and quantity anything in this line they are now using. For ripping fine lumber, it is far in advance of other models of this character, and represents an entirely original departure. There is no other like it, and it has met with unqualified success wherever used, as is attested by many letters from its users who praise its merits very highly. Copies of these letters will be sent to any desiring them, as it is the policy of the makers to prove as far as possible every claim they may make concerning any machine.

It will do either light or heavy work, and cut either soft or hard wood, with no possible danger to operator. Its many advantages that enable it to do good work and prove labor saving require detailed description, so cuts should be sent for in order to thoroughly understand what it can do. The thin saw blade will save an amount of kerf that will be readily appreciated by all users of fine lumber. The straining device, with knife edge balance, insures at all times an even tension on the saw blade, something so necessary to prolong its life, and yet so seldom found.

The lower wheel being solid, there is no vibration, increased momentum, and no possibility of its overrunning the upper. By the single movement of a lever, the machine is converted into a hand feed rip saw, and where flooring is made in large quantities, it is fitted with a long table on which are rolls for quickly returning material. The feed rolls are placed close together, so that short work can be done to advantage.



No. 1 Band Rip Saw.

The builders of this tool, J. A. Fay and Egan Company, of No. 145 to 166 W. Front St., Cincinnati, Ohio, can be addressed for further particulars.

Their new complete catalogue of wood-working machinery will be sent free to those interested who will write for it.

Oliver Wood Trimmer.

AS an improvement on the small hand trimmer used on the workman's bench, the American Machinery Co., Grand Rapids, Mich., has produced a wood trimmer which has the advantage of standing on its own base and will work on very small and delicate work equally well as upon large.

This machine, known as the Oliver No. 3, is illustrated in the accompanying engraving. It may be seen that one of the six handles on the turn-stile wheel is always within convenient reach. This device has proven to be so far superior to a lever that it is now placed on all large machines.

A long taper key or gib is fitted underneath the lower bearing to the knife carriage and by simply adjusting one single screw this taper gib will operate to tighten every joint in the knife carriage; the bevels

Oliver Wood Trimmer.

keep the carriage thrust firmly against the face of the bed.

Teeth in both gear and knife carriage are cut, which insures greater power and smoothness of operation. Rack, gear and bearings are fully protected from dirt and chips. The entire top swivels upon the column secured in any position by the lock nut. The machine is warranted to cut within two-thousandths of an inch on any angle and the angle gauges are located instantly and accurately by spring stop pins fitting into taper holes reamed in the bed.

Personals

Mr. J. H. Stubbs, general foreman of the Union Pacific shops, at Omaha, Neb., has resigned.

Mr. F. H. Paine has resigned as assistant master mechanic of the Wabash R. R., at Chicago.

Mr. F. Gleich has been appointed foreman of the car department of the Lake Erie, Alliance & Wheeling, with office at Alliance, O.

Mr. W. S. Galloway has been appointed assitsant engineer of tests of the Baltimore & Ohio, with office at Mt. Clare, Baltimore, Md.

Mr. C. S. Murray has been appointed road foreman of equipment of the St. Louis & San Francisco, with headquarters at Springfield, Mo.

Mr. J. J. La Clair of St. Louis, division foreman of the locomotive and car department of the St. Louis & San Francisco, has resigned after 27 years' service.

Mr. J. J. Waters has been appointed acting superintendent of the mechanical department of the Mexican International to succeed Mr. W. Jennings, resigned.

Mr. William Bird has been appointed foreman of car repairs of the Kansas City, St. Joseph & Council Bluffs at Saint Joseph, Mo., to succeed Mr. Thomas Aylesbury.

Mr. J. H. Milton, general foreman of the car department of the Rio Grande Western at Salt Lake City, has resigned, to accept a position with the Colorado & Southern.

Mr. Milton S. Tracey has been appointed assistant master mechanic of the Pennsylvania Company, with headquarters at Allegheny, Pa., to succeed Mr. L. S. Kinnaird, resigned.

The American Refrigerator Transit Company announces the promotion of Mr. O. F. Zoug, acting master car builder, to master car builder, effective January 1, with office at St. Louis, Mo.

Mr. W. L. Harrison, master mechanic of the eastern division of the Choctaw, Oklahoma & Gulf Railroad, has his jurisdiction extended to include the territory between Baker's Spur and Booneville, on the Ardmore branch.

Mr. E. Kennerdell, master mechanic of the Baltimore & Ohio at Lorain, O., has been transferred to Cleveland, O., as general foreman, in place of Mr. C. P. Cramer, who has been transferred to Lorain as general foreman.

Mr. C. W. Nellis has been appointed master mechanic of the Chicago, Rock Island & Pacific at Chicago, to succeed Mr. W. H. Stocks, who recently resigned to enter the service of the Gold Car Heating & Lighting Company.

Mr. George Thompson, district foreman of the Union Pacific at Omaha, Neb., has been appointed master mechanic of the same road at Omaha, to succeed Mr. M. K. Barnum, who recently resigned to accept service with the Southern Ry.

Mr. T. Booth, who has had charge of the Santa Fe shops at El Paso, Tex., for the past fifteen years as master mechanic, has been promoted to the position of mechanical engineer on the Pecos Valley system, with headquarters at Amarillo, Tex.

Mr. J. H. Tinker, master mechanic of the Pennsylvania R. R., at South Amboy, N. J., has been succeeded by Mr. D. J. Dillion, heretofore general foreman. Mr. J. R. Bowie, general foreman of the car shops at Bedford, Pa., has been appointed master mechanic at Columbia, Pa., and is succeeded as general foreman at Bedford, by Mr. J. L. Cunningham.

Mr. G. A. Miller, heretofore master mechanic of the Florida East Coast, has been appointed superintendent of motive power, and Mr. C. D. Vanaman has been appointed master mechanic, in place of Mr. Miller, both with headquarters at Saint Augustine, Fla.

Mr. J. H. Burns has been appointed division master mechanic of the Chicago Great Western at Dubuque, Ia., to succeed Mr. T. H. Yorke, who has been made division master mechanic of the same road at Fort Dodge, Ia., to succeed Mr. George Gregory, resigned.

Mr. W. B. Warren, heretofore master mechanic of the St. Louis & Gulf at Cape Girardeau, Mo., has been appointed master mechanic of the St. Louis, Memphis & Southeastern, with headquarters at Cape Girardeau, effective on December 2, vice Mr. P. L. Raymond, resigned.

Mr. Charles M. Muchnic, mechanical engineer of the Denver & Rio Grande, has resigned to become secretary to the second vice-president of the American Locomotive Company, with headquarters at Dunkirk, N. Y. Mr. F. C. Borst succeeds Mr. Muchnic with the Denver & Rio Grande.

Mr. E. W. Pratt, heretofore division master mechanic of the Chicago and North-Western Railway at Mason City, Iowa, has been appointed master mechanic of the Freemont, Elkhorn and Missouri Valley Railway to succeed Mr. S. A. Teal, resigned. Mr. Pratt's appointment places him at the head of the mechanical department of the F. E. & M. V. Ry.

Mr. William H. Hamilton, who has for some time been acting master mechanic of the Atchison, Topeka & Santa Fe at Topeka, Kas., succeeding Mr. Milton Player, has been appointed master mechanic. Mr. Irvine Wellman has been appointed road foreman of engineers, to succeed Mr. Hamilton, who has also held that office since his appointment as acting master mechanic.

Mr. L. S. Kinnaird has been appointed master mechanic and master car builder of the Cleveland, Akron & Columbus, to succeed Mr. John Dalman, who has resigned to become master mechanic of the Baltimore & Ohio at Newark, O. Mr. Kinnaird's headquarters are at Mt. Vernon, O. He was formerly assistant master mechanic of the Pennsylvania Lines at Allegheny, Pa.

Mr. Elliott Sumner, heretofore assistant master mechanic of the Pennsylvania at Renovo, Pa., has been appointed assistant engineer of motive power of the same road at Buffalo, N. Y., to succeed Mr. J. M. James. Mr. James has been appointed master mechanic of the Buffalo and Allegheny Valley divisions, with headquarters at Olean, N. Y., to succeed J. H. Magee, Jr., deceased.

Mr. James S. Pearce, master mechanic of the Norfolk & Western at Roanoke, Va., has been appointed master mechanic of the Scioto and Cincinnati divisions, with headquarters at Portsmouth, O. Mr. Herbert T. Herr, who recently resigned as master mechanic of the Atchison, Topeka & Santa Fe at Fort Madison, Ia., has been appointed master mechanic of the Eastern General division of the Norfolk & Western, with headquarters at Roanoke, Va.

Mr. L. T. Canfield has tendered his resignation as master car builder of the Delaware, Lackawanna & Western, to accept, it is stated, a position with the American Car & Foundry Company. He was formerly from 1889 to April, 1898, foreman and division master car builder of the Chicago, Rock Island & Pacific, and then for one year was connected with the Standard Railway Supply Company. He has held his present position since April 15, 1899.

Mr. J. F. Deems, who since early this year has been in charge of the Schenectady works of the American Locomotive Company, has been appointed general superintendent of motive power and rolling stock of the entire Vanderbilt system. Mr. Deems, previous to his connection with the American Locomotive Company, was superintendent of motive power of the Chicago, Burlington & Quincy, having started as a machinist and worked his way up to the head of the mechanical department of that road.

Mr. W. P. Savage, late president of the National Railway Master Blacksmiths' Association, died at his home, Palestine, Texas, on the 23rd of November, 1902. Mr. Savage became associated with the organization in 1898 at Boston, and by his superior knowledge and good judgment at once became a guiding star. At Denver, in 1901, he was elected president and by his intelligent administration of the affairs of his office, the association made greater strides during his term of office than in any like period of its history.

Mr. H. A. Lyddon has been appointed division master mechanic of the Northern Pacific, with headquarters at Gladstone, Minn., to succeed Mr. J. H. McGoff, resigned. Mr. H. M. Curry, master mechanic of the Dakota division, has been appointed master mechanic of the Minnesota division, with office at Staples, Minn., in place of Mr. Lyddon. Mr. R. Smith, heretofore master mechanic of the Yellowstone division, will succeed Mr. Curry as master mechanic of the Dakota division, with headquarters at Fargo, N. D., and Mr. A. W. Wheatly has been appointed master mechanic of the Yellowstone division, with headquarters at Glendive, Mont., in place of Mr. Smith.

Notes of the Month

The Q. and C. Company make shipment this week, from their factory at Chicago Heights of one of their largest special metal sawing machines to the United States government, to be used at the Cavite navy yard, at Manila.

The General Manifold Company, Franklin, Pa., report that the demand for their goods has grown so rapidly that an increase in machinery has been made necessary. An order has recently been placed for one 60-inch rotary press and four cylinder presses, and the plant now has a capacity of over a carload of paper a day. The General Manifold Company have issued a booklet on "Manifold Blessings," setting forth the virtues of their multiplex papers.

The Pratt and Whitney Company, Hartford, Conn., believing the time to be ripe for something better and more economical in performance than the engine lathe for the production of screws for machine tools and precision work generally, have taken up the problem of making a machine to meet such requirements. Desiring to familiarize the engineering world with the thread milling machine which they have produced, they have issued a complete and illustrated catalogue of 42 pages, giving a comprehensive description of this successful machine.

The Ashton Valve Company, Boston, Mass., is distributing an attractive looking and handsomely illustrated calendar for 1903. The company is mailing copies of this calendar to their several friends in the trade, and engineering fraternity, whose addresses are in their books and they will be pleased to mail the same to any engineer upon request, if he will state what particular plant he has in charge. To others who are not more closely identified with the company's particular line, they find it necessary to make a nominal charge of ten cents to cover cost of postage, etc.

The J. A. Fay and Egan Company, Cincinnati, Ohio, illustrate their sand papering and other wood-working machines in a new catalogue of 36 pages. The use of wood polishing machines is so palpable a factor in producing perfect surfaces on the material for doors, blinds, railway coaches, interior finish, etc., that an equipment of a wood-working plant for the manufacture of such articles is no longer considered complete without them. J. A. Fay and Egan Company are justly proud of the honor of being the first to manufacture the sand-papering machine, carrying more than one polishing cylinder, and by a series of exhaustive experiments they have determined the best method of producing a perfect surface. In the No. 4 patent triple-drum sanding machine, the essential qualities are embodied that render it the most perfect sander.

The New Jersey Central Railway operates a most complete and fast service in its Royal Blue Line between New York, Philadelphia, Baltimore and Washington.

There are five trains each way, each day, which make the run, New York to Washington, in five hours. The trains in every respect are sumptuous to the last degree. The coaches, parlor cars, buffets, observation, dining and cafe cars were specially built for these trains and no detail has been overlooked. The route of the Royal Blue is picturesque and the scenes presented are of great variety. The New Jersey Central operates a sleeping car service to Pittsburg, Cincinnati, St. Louis and Chicago.

The very popular resort, Lakewood is situated on the line of the New Jersey Central and its accessibility to New York and Philadelphia is indicated by the numbers who are daily commutors between Lakewood and these two points. Situated in the famous pine belt of New Jersey and supplied with the best hotels, it offers one of the most attractive resorts in the vicinity of New York.

"Light Railway Construction", by R. M. Parkinson, while primarily considering the conditions surrounding the construction and maintenance of roads for light equipment, is more comprehensive than its title would indicate, for the discussions set forth apply practically in many instances to railroads for heavy traffic. The treatment is confined largely to British railway management, though some of the conditions of American and British railway requirements are compared. A number of conditions are presented discussing the practicability and economy of constructing light railroads in environments where the returns are insufficient to maintain a road of usual proportions. The disadvantage of incorporating a number of miles of railroad under standard guage must be borne in mind and the difficulty consequent to extended construction of narrow gauge road should not be underrated. The book is well worth the consideration of engineers. It contains 244 pages and 85 diagrams. Published by Longmans, Green and Company, London and New York. Price, $4.00.

"Ancient and Modern Engineering and the Isthmian Canal," by William H. Burr, professor of civil engineering in Columbia University, is the title of an interesting, comprehensive and thorough treatise of the history of engineering. Beginning with engineering feats of magnitude and importance, chronicled in earliest history, the author follows the career of engineering works up to the present, illustrating the achievements of the ancients compared with more scientific and refined structures of to-day. The volume relates rather to the descriptive features of engineering progress than to a detailed treatment of purely technical matters, though a section of the book is devoted to formulae and theory of mechanics of engineering. The author, as a member of the Isthmian Canal Commission, has made personal examinations on both the Panama and Nicaraga routes, and there will be found complete engineering data for both lines on which the final conclusions of the commission were based. The book is thoroughly illustrated throughout, the half-tone illustrations, with scarcely an exception, having been prepared from photographs of the actual subjects illustrated. This work may be read with interest and advantage by the engineer, student and layman. Published by John Wiley and Sons, New York. Price, $3.50.

The Ohio Injector Company, Monadnock Block, Chicago, are distributing a comprehensive and well illustrated catalogue of 36 pages, describing the "Ohio" locomotive injector. This injector is economical in the use of steam, has unusual range of delivery, will not lime up readily, is simply in construction and easily taken apart for cleaning. It is made with either screw or lever movement for starting, has few parts, with corresponding reduction in cost of repairs, and is interchangeable with the principal injectors in use, incurring no expense in attaching it. All injectors are carefully tested, and none are permitted to leave the works that do not meet fully the exacting requirements of the standard established by the company. They also call particular attention to the "Chicago" lubricator, which is steadily making its way into use on locomotives on account of its unusual superiority. The important features of this lubricator that commend it to railways is the regularity of feed under all conditions of service or steam pressures with wide open throttle, and the positive delivery of oil to the steam chests and cylinders. It is simple in construction and operation, and the choke is transferred from the upper feed arm to the steam chest end of the tallow or oil delivery pipes.

Railroad Paint Shop

A Department Devoted to the Interest of Master Car and Locomotive Painters
Edited by CHAS. E. COPP, General Foreman Painter, Car Department, Boston & Maine Railroad, Lawrence, Mass.
Official Organ of the Master Car and Locomotive Painters Association

M. C. & L. P. A. Portrait Gallery.

FRANK F. FISK.

OUR columns are graced this month by a good picture of our associate, Frank F. Fisk, with hat on, ready to start for the next convention, in fact, looking off toward the "Windy City" in the distance.

Mr. Fisk was born Sept. 18, 1853, at Columbus, Ohio, and learned car painting under his father, Allen Z. Fisk, at the Pittsburg, Cincinnati & St. Louis shops at Logansport, Ind., and went with the Columbus & Hocking Valley in 1876 at the Columbus shops. He left that road in 1882 and the next year engaged with the Scioto Valley at Portsmouth, Ohio, and remained with them until the latter part of 1888, and the following year linked his destinies with the Toledo, St. Louis & Kansas City (now the Toledo, St. Louis & Western, or "Clover Leaf Route," so-called), with shops at Frankfort, Ind., where he now remains as master painter.

MR. FRANK F. FISK.

He joined the M. C. & L. P. A. in 1882, and has taken an active part in its deliberations.

Judging by the pen sketches by his boys that have appeared in these columns, the artistic taste "runs in the blood," and there will be other Fisks as master painters sometime and somewhere in the future. By a tasty heading, printed from a pen sketch by a son, of the letter received, we note that the father is the treasurer of the "Clover Leaf Shop Employes' Relief Association," a noble enterprise, by the way, which we are happy to note, being myself an official of a relief association on the B. & M.

The Advisory Committee Meeting.

The coming meeting of the Advisory Committee of the Master Car and Locomotive Painters' Association, which will doubtless be held next month at some central point, official notice of which we hope to receive in season at least for the February issue, is an event of much importance to the life and interest of the association. It is the most important committee and its deliberations are the most vital, for with its members rests the responsibility, in a very large measure, for the success of the annual convention to follow in September; meeting as they do to devise a program of subjects for discussion and, following out the pace set by the writer when president, of naming members to whom parts, or committee appointments, are to be assigned by the president, who formerly had the whole responsibility of assignment of members to subjects—and has it now by the constitution. When we were president we thought the committee and what local members could be gathered, together would have a knowledge of men at large that would be valuable, so we requested this committee to name at least two members on each subject, leaving the other open to us to fill, of course reserving the right to reject any or all of theirs. This worked well. No man they ever named was rejected, though some refused to serve and others had to be appointed. Now the committee has gone so far as to practically make all of these committee appointments for the approval of the president, and no one needs to find any fault, unless he does. "In the multitude of counsellors there is wisdom," the good Book says, and that is what every president of our association must feel, until he at least has served in that capacity long enough to become thoroughly acquainted with the membership and the individual ability, taste and experience of each man usually attending our annual conventions. It will be, therefore, seen that, though our constitution does not thus clothe them, the advisory committee is fast becoming an executive committee by custom and consent, like a committee so named made up of officials of the

Master Car Builders' and Master Mechanics' Associations, which committee also elects the next convention place, taking into account the nominations of the previous conventions at the last session thereof.

But what we were getting at was the importance of our committee in devising subjects, or a program, for our next convention. They should gird up their loins and give this matter much intense consideration so as to put before us live matters—not dead theories about which page upon page of words may be piled up in our annual reports at the expense of nerve to hear and read and money to pay for the same, but matters that concern us every day and over which every thoughtful master painter is often troubled and perplexed. We do not want merely to "pose to the galleries" for their applause, but to talk to instruct ourselves in the great art of successful car and locomotive painting.

Now to this end "old chestnuts" must be avoided some will say. That is true in a sense, but we must bear in mind that the same subject must occasionally be brought up and viewed in the light of this advancing age. If we did not repeat subjects, then must not only our association but every other, and all publications come to an end. Solomon said: "There is nothing new under the sun." There is not in a sense, but a thing viewed in the bright light of the twentieth century looks vastly different than it must have looked in his day (or he wouldn't have had as many wives as he is reported to have had!) The fact of the matter is, we are an advancing army, whether in piety, politics or paint, if we are on our own feet and doing our whole duty, and we can be a mighty cheerful crowd and happy by the way if we will commune with ourselves in the light of our torches as we march along; but the fellow who ignores progress, "knows it all" and falls out, or refuses to join the processions, preferring to sit by the wayside and suck his thumbs, may have a good deal of cold comfort—and much dust from the passing crowd and not a few curious glances.

Still new methods and manufactures require new consideration and treatment. For instance, here is the steel car coming by thousands—something our daddies never dreamed of, and if they had it would have been considered "a night mare"—"too much mince pie"—or something late and hard on the stomach. They are coming *not to stay* unless protective paint thoroughly and conscientiously applied makes them stay; now you mark my words. One superficial painting—with the Lord knows what—may do in the life of a wooden freight car, but it will be a short life to the steel car if it gets no more than that. Steel car building is good to-day; it always will be, unless something is done to them to bid defiance to the voracious tooth of rust. When a rap of a hammer on the side of a pressed steel truck will send to the ground scales an eighth of an inch thick and the size of one's hand that have only been in service a very few years, something is wrong and needs to be done. This subject should continue to receive the attention of our association, regardless of any fear of being "an old chestnut." It is a live question and will continue to be for some time to come. And it must be very conscientiously viewed without the fear or favor of anyone.

Speaking of subjects repeated, the subject of the flatting of varnish was considered—its cause and prevention—at the association's first meeting, Nov. 9, 1870. It has been profitably discussed many times since. And so of many other topics. What we want to get is something that is troubling a lot of us. To a man who has got a nail in his boot that is pricking him at every step there is nothing like stopping long enough to take the boot off and hammer the plaguey thing down, and then go on your way rejoicing. The same with corns; who hasn't them? Soak them, pare them down or dig them out! Why suffer needlessly when there's relief? Why, there's comfort even in comparing our miseries and talking them over!

Now, figuratively speaking, there are paint shop corns and nails that trouble us. Let us meet and talk them over and see if we cannot eradicate them. Some subjects may seem to the outside world very small for a body of men to consider, but "glory be," as Dooley says, when a man has got a cinder in his eye it is a mighty big thing —*to him*—and its consideration and expulsion is the paramount question *with him*. Now, while the whole association cannot devote itself to local issues too much and engage in "special legislation," so-called, the advisory committee invites the whole membership to send in to the chairman questions that are troubling them, that from all this mass they may select a set of subjects and queries that will be of the most general importance for discussion, while other questions can be turned over to the committee on information for answering.

If the membership will take hold and support their advisory committee with subjects and queries in this way the usefulness of our association will continue indefinitely. Doubtless also suggestions from our superior officers for discussion would be as welcome as they are valuable.

Overtaxed Alcohol

"We have formerly referred to the high tax on spirits used in manufacture, but when this tax was arbitrarily increased to the present high rate of $1.10 per proof gallon the injustice became well nigh unbearable, and has caused a bill to be offered in congress reducing the tax to 70 cents on each proof gallon.

"Considering the enormous amounts of alcohol used in this country in the arts and manufactures, the old tax has borne with excessive injustice on our manufacturers, especially as the customs drawback law under which duties paid on imported materials used in the manufacture of exported materials are refunded does not apply to internal revenue taxes paid on domestic alcohol. The American manufacturer is therefore burdened with a tax of $2.08 per gallon of commercial alcohol. How

Upper Deck Headlining, Designed by W. W. Schoettlin.

can he therefore compete with his rivals in the world's markets?

"The reduction of the tax on alcohol would place us on a better level with foreign manufacturers. The 70-cent tax rate in place of the old exorbitant one would really give higher revenues, while the largely increased use of alcohol for manufacturing purposes, etc., which would assuredly follow the reduction of the tax to 70 cents would benefit the farmers by creating an increased market for their products.

"The bill that has been introduced to effect this much-needed reform richly deserves to pass."

The above editorial from the Boston Globe Dec. 17, 1902, has an important bearing on car manufacture and railway maintenance in general, for alcohol is largely used in shellacs on interior wood finish and in the pattern shop, and in hydraulic jacks in winter to keep them from freezing, and so on. Some years ago, when the last tax was fixed by the congress on alcohol, it was understood that this tax was to be rebated to those engaged in the arts and manufactures; and a prominent distiller in Boston so informed the president of the B. & M., who wrote the general manager to this effect, who in turn took it up with the master car builder, and that official asked the writer to ascertain what the saving would be to the car department annually and report, saving the revenue stamps meanwhile on the heads of barrels as proof of our claim to the rebate. In a day or two the writer reported that he would take this tax for his salary, if they would give it to him, and they might strike his name from the payroll! However, this arrangement would never have materialized, for it was soon learned by much litigation by other parties that the law left it optional with the secretary of the treasury whether he would so rebate this tax or not; and he decided not to do it, for the reason, as we understand it, that it would give rise to much corruption and deception to obtain it by unscrupulous parties and require eternal vigilance to prevent the fraud and the depletion of the revenues of the government. As this tax was then computed to be $2.06 per gallon and our alcohol cost us $2.46 cents per gallon, it will appear that our alcohol would only have cost us 40 cents per gallon, and as there is about 50 gallons in a barrel the saving with the tax off would amount to over $100.00 per barrel! In other words, our alcohol would cost us less per gallon than our spirits of turpentine.

However, there is no tax on wood alcohol and where there is a will to save there is a way; and as a refined wood alcohol, 97 per cent, costs about 70 cents per gallon, we made a mixture of this and the taxed grain alcohol which brought our product down to the vicinity of $1.50 per gallon, using about six of the wood to four of the grain, and thus we saved upwards of $800.00 the first year we tried it!

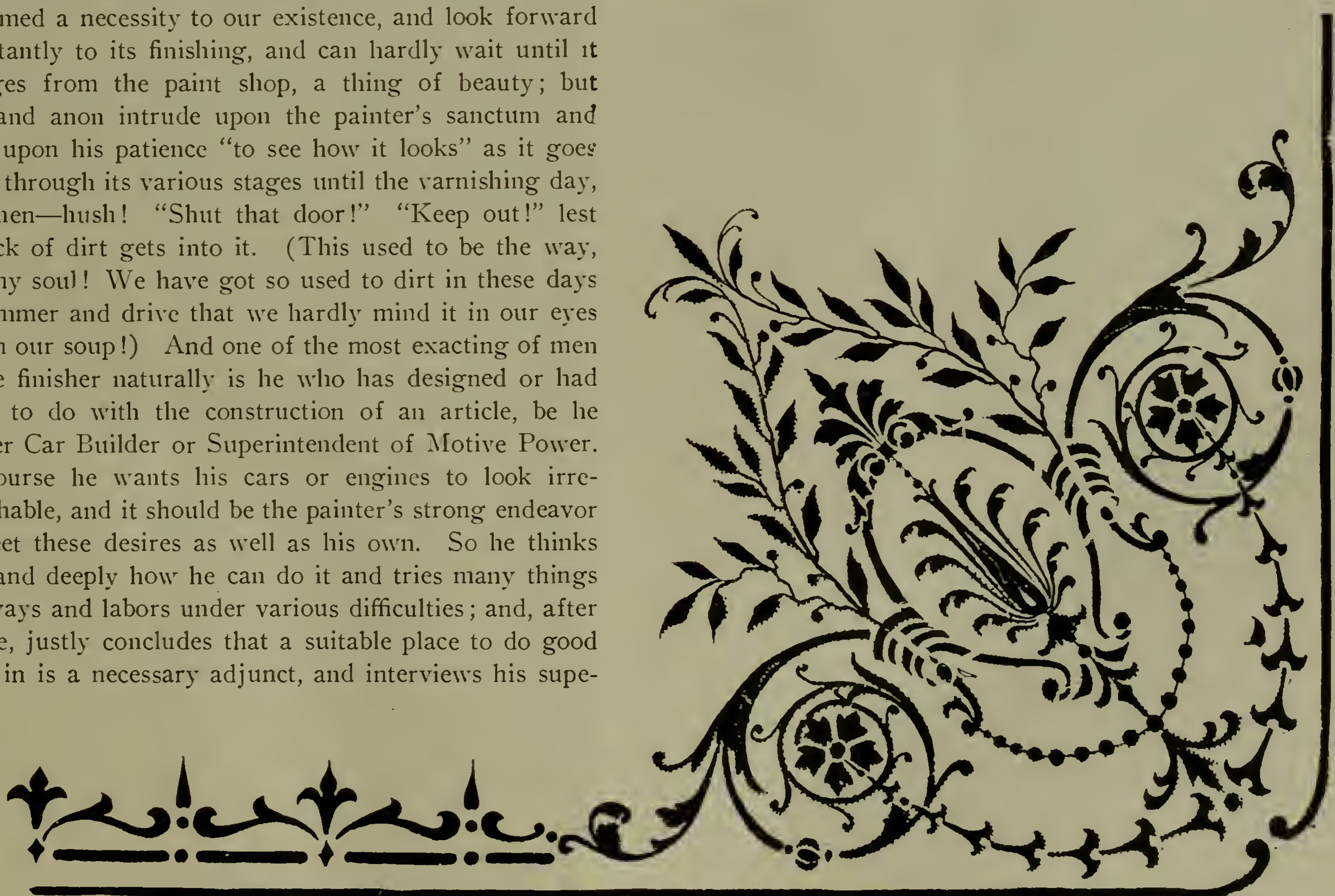
But some may say, why not use clear wood alcohol? Our reply is that it is such a rapid evaporator that it is difficult, if not impossible, to do good work on large and intricate surfaces with a brush in shellac made wholly in this alcohol on account of its rapid evaporation and consequent quick setting under the brush, resulting in "piling up" the shellac in ridges and brush marks to afterward require sandpapering down at much cost to a level surface. The addition of a third to one-half grain alcohol checks this evaporation and enables us to do good work. Our practice is to cut our shellac gum in refined 97 per cent wood alcohol, as it is a more powerful solvent than grain alcohol, and afterward add the latter in its reduction for use. But for some purposes shellac made from clear wood alcohol can be used.

There are some specially prepared spirits made from wood alcohol product that are very nice to the smell, and to use for various purposes, but as they cost around $1.50 per gallon there is no saving over our own mixture of wood and grain; and the latter is a slower evaporator, and consequently works better.

There is, however, another large use for alcohol and that is in hydraulic jacks, especially in freezing weather. We have tried in vain to get around the expense of grain alcohol, at present around $2.50 per gallon, for this purpose, but so far have failed. Wood alcohol, being such a powerful solvent, destroys the leather packings. "Jack whiskey," a refuse in whiskey distilling, full of fusel oil, costing $1.10 per gallon, ruins the interior metal parts of the jacks by rust. A "glycerine mixture," so-called, is said to be worse still. "And there ye are," as Dooley says to "Hinnissy." Presently we have got back to half grain alcohol and half water for this purpose. If anyone knows of a better way they will oblige us by writing us about it. Of course, clear water will do in warm weather.

THE FINISHER.

There are few things made, unless plated, but that the painter has a hand in their manufacture. His is the master stroke, the finishing touch, however well they have been designed and constructed. It is his part to make them presentable to the esthetic eye of a cultured community. The carpenter, the blacksmith and the machinist labor long and diligently to produce that which is deemed a necessity to our existence, and look forward expectantly to its finishing, and can hardly wait until it emerges from the paint shop, a thing of beauty; but ever and anon intrude upon the painter's sanctum and often upon his patience "to see how it looks" as it goes along through its various stages until the varnishing day, and then—hush! "Shut that door!" "Keep out!" lest a speck of dirt gets into it. (This used to be the way, but, my soul! We have got so used to dirt in these days of hammer and drive that we hardly mind it in our eyes and in our soup!) And one of the most exacting of men of the finisher naturally is he who has designed or had much to do with the construction of an article, be he Master Car Builder or Superintendent of Motive Power. Of course he wants his cars or engines to look irreproachable, and it should be the painter's strong endeavor to meet these desires as well as his own. So he thinks long and deeply how he can do it and tries many things and ways and labors under various difficulties; and, after awhile, justly concludes that a suitable place to do good work in is a necessary adjunct, and interviews his superior officer early and often on the subject and finds him very pliable. He has made an impression! That night he dreams and floats away into everlasting bliss that the paint shop so long desired has at last materialized. Is he dreaming? No, he pinches himself and finds he is awake (or at least dreams he is.) Oh! what lots of room at the sides and ends of the cars! He can now get into the shop and out after dark without a compound fracture of the shin and thigh and the skinning of his facial anatomy. Nothing under foot but a granolithic floor as smooth as a plastered wall; portable or permanent staging; no planks and horses in the way. The lightness of day pervades the place, and ventilation and warmth so perfect that faith is staggered that it is a paint shop until he sees numbers of men manipulating brushes over the mirror-like surfaces of elegant coaches. Now he knows it is no dream. At last the shop has come, after so long a time and patient waiting. He knew it would! Everything comes—at last. Now there is a place for everything—even a place to varnish a car in where no other dirt-making work is done. Suffering Moses! whoever heard of such a thing? Well, well! Everything goes along as smooth as grease. Cars are stripped and overhauled in one place; slipped into another for washing; into another for painting, sand-papering, etc.; and into another for varnishing, and then, as if by magic, they go silently back to again be reharnessed as a horse for service. A holy brush seems now to brood over everything, when, lo!—what? Is that the shop whistle?



Lower Deck Headlining, Designed by W. W. Schoettlin.

Yes, 5:30 a. m. Day dawns; senses ditto and—dreams fade. Where am I? Still "in the flesh" and in my old chamber, and, pretty soon, will be in—my old shop. Same old gag; alas! alas! And so it goes. But then the new shop will come—bye and bye. So will everything.

Meanwhile, take as much comfort as you can, my boy. Don't fret over the inevitable and the inscrutable. Life is worth living yet. You really are doing much already to make the world brighter and better with your brush. Get right down from castles in the air to things on the earth as you find them and make the best of them.

A Metal Surfacer for Car and Carriage Work.

The Koons new idea metal system of car surfacing is an entirely new product recently placed upon the market by the St. Louis Surfacing Co. Although it has been thoroughly tested and well recommended for some time by a number of the leading Master Painters of this country and Canada it has but lately been placed before the public generally.

Mr. Koons having had a number of years' experience as a Master Painter realizes the value of this material and claims it to be the par-excellence of surfacers. For durable and economical work and for reducing the time of accomplishing work this surfacer gives excellent results. It is made up of but one pigment, the priming and all the surfacer coatings being made of the same substance, giving a compact mass of but one material from the wood or iron, to which it is applied, entirely through to the last coat. This eliminates the possibility of separation of the coatings and disintegration of pigments which is responsible for the cracking of surfacers in general.

The manufacturers further claim for the new product that it is the most easily worked surfacer ever produced and one which will not be scratched under the rubbing stone. The last mentioned quality saves the extra work required in puttying and patching surfaces which have been scratched. The most valuable feature said to be characteristic of this product is the fact that it makes a secure putty which will not shrink or swell.

For booklet giving full information address the St. Louis Surfacer Company, 319 Lincoln-Building, St. Louis, Mo.

The Hardwood Finisher.

The following appeared in the Dec. 15th issue of the Boston Globe, together with a 6x7 in. picture of a hardwood finisher at work as one of the "Types of America's Toilers" that have been published in that paper daily since July 20th, this being No. 149:

"Half a century ago, when the staining of woods was confined to that of ash, walnut and mahogany, the colors of which were simplified into light and dark, it was comparatively an easy matter to handle. To-day the finisher is confronted with an endless variety of woods and color, which he is called upon to match and reproduce. Enter the homes of America's millionaires, there you will find the art of the hardwood finisher brought to bear on furniture and woodwork. In its massive oaken entrance, with its antique coloring, you are carried back to the days of the Empress Josephine. Its beams and woodwork seem to transport you beyond the seas to that old palace of Fontainbleau, with its horseshoe stairs, at the foot of which you stop to listen for the echo of Napoleon's voice saying farewell to the guard. But a few steps further and you have perhaps the rich coloring of the mahogany of the Touraine, or the somber stains characteristic of a Moorish temple or Japanese pagoda, with its furniture in harmonious coloring.

"When you begin to realize how all this beautiful work reached the finisher's hands, a mass of woods lacking color and varied in shades, you can then form some conception of the work of the hardwood finisher, who by the cunning use of acids and chemicals hastened nature itself to produce the age of centuries or the brilliant coloring of more modern times. From the fugitive oil stain used in paint shops, with its muddy results, he has progressed to the chemical stain, which alters the very nature of the wood itself, charming the eye with its depth, and making the hardwood finisher a 'Type of America's Toilers' to be proud of."

A CONVENTION CARICATURE.

Uniform Stenciling of Freight Cars.

Editor Railroad Paint Shop:

I thought perhaps some of the boys who are always up against foreign freight car stenciling were wondering whether the committee on uniform stenciling were ever going to accomplish any thing. So to ease them slightly I will just say that the committee is laboring, but you know "large bodies move slowly." Judging from the movement one would remark this committee is certainly a very large body. Well, Miller, Butts and myself finally set apart Dec. 3rd for a conference in Buffalo. Butts, much to our regret, didn't come, as he was called unexpectedly to New York. However, he wrote me that as Miller and he had talked the matter over several times he thought we could go on without him. Miller brought with him a number of blue prints showing proposed system, which can be easily adapted to a majority of all freight cars. A number of minor changes were suggested, and we hope to have another meeting in a few weeks, at which time we will be in a position to make a final report to be submitted to the Master Car Builders at their June meting.

It is an undeniable fact that a vast amount of money is annually wasted in the senseless system now in vogue. and any one who is open to conviction can be easily convinced by visiting the repair yards of any of our principal roads and just noting the many different styles and sizes of stenciling. It would seem that lack of unifomity was the consideration; for hardly any two roads in the country have freight cars stenciled identically, though many of them are nearly so, yet just far enough removed to compel one to make another stencil, or letter the car by hand, in either case causing unnecessary expense. Aside from the name, or initial, of the road, there is no reason why all the stenciling on freight cars should not be identical in style, size and location, instead of every size, style and place imaginable; and why some radical move in this direction has not been made long ere this is a puzzle to many of us.

We trust our committee will evolve some plan easy in detail and execution so that uniformity may ensue without much departure from present practice.

J. A. Gohen.

TURPENTINE.

Turpentine is an article largely and daily used in the carriage paint shop, and into it, when prices run high as they have done for some time past, the sly and shifty adulterator loves to inject an extender of subtle and invisible presence. Formerly it was the practice to adulterate turpentine with from 25 to 45 per cent of water-white kerosene oil, of 112 fire test. This latter oil shows by chemical analysis a composition practically as follows: Heavy paraffine oil, 1-3; kerosene oil, 1-3; light oil, 1-3. This adulterant has a gravity practically similar to pure turpentine, and it is therefore somewhat difficult to detect when testing from the point of gravity alone.

Fortunately, however, the painter has at command a few simple, direct, and clearly convincing tests which should enable him to keep his turpentine supply fairly above suspicion. Pure turpentine has a sweet odor, not unlike that of the pine tree aroma, scarcely pungent, and not in any wise sour, and when freshly drawn, the foam, if any, should rapidly subside.

Naval authorities in testing turpentine, still adhere to the practice of dropping the suspected sample of turpentine on a piece of white paper in comparison with a standard sample. Turpentine containing a very slight percentage of kerosene oil will leave upon evaporation a greasy stain, whereas the pure article, not too quickly distilled, will leave no stain. A turpentine that has been too rapidly distilled will leave upon the paper a gummy, yellowish white stain, and this should not be confounded with the stain of the kerosene oil turpentine.

Pure turpentine will usually evaporate from a piece of white paper in five minutes, and leave no stain. If more than seven minutes be required for the evaporation of the sample, it may be set aside as unfit to use in fine coach colors, or for mixing undercoatings of any kind. The sense of smell will sometimes expose the kerosene adulteration, but in these days of successfully deodorizing fluids, the olfactory organ cannot be depended upon as an infallible authority.—Carriage Builder and Blacksmith.

Notes and Comments

We wish all our readers "A Happy New Year"—and plenty of coal in the cellar; but at present it needs the legal tender of $12.00 per ton for the latter.

The N. E. R. R. Club is to have a "Ladies' Night" some evening the latter part of this month, January, to be decided on, which will be informal and consist of readings, songs and instrumental music, a banquet and likely some dancing. This will be an extra; the regular meeting will be held as usual. A nominal price of 50 cents per ticket will be charged to defray expenses of entertainers, the club furnishing the banquet. Come and see us!

And now the B. & O. increases wages to become effective Jan. 1st, according to a daily paper. It will not be a horizontal or uniform raise, however. Happy New Year to the lucky ones.

Our associate, Koons, formerly Master Painter, St. Louis Car Co., is going into the surfacer business, which is crowded already; but they do say "there's always room at the top," in the words of one D. Webster regarding the legal profession. Cards are out, as follows "St. Louis Surfacer Co. Chas. E. Koons, Gen'l. Mgr., F. F. Bixby, Pres., E. S. Marshall, Vice-Pres. Office suite 215 and 216 Lincoln Trust Bldg. St. Louis, Mo. His many friends will wish him all the success in the world. This rough world needs smoothing up, and the survival of the fittest must do it.

The Boston & Maine is changing its passenger equipment color to a little lighter shade—to the Pullman Co.'s standard—the old color has become rather dark by various changes in color makers. This necessarily involves no extra expense, as the old color is used on first coats and the new merely goes on all newly painted or "cut in" cars. The new shade is about midway in depth of tint between the old shade and the body color of the New York Central.

Future orders of floor paint will also show a change to more of a mahogany tint than that heretofore in use.

If one has a compressed air and gas burning-off apparatus in his shop he does not need to live in ignorance as to whether or not his white lead is pure or impure. If he will take a lump of hard charcoal and scoop out a hollow in it with a pocket-knife and put into it a lump of his Keg white lead the size of a filbert, it is but the work of a few minutes, with his burner adjusted to the blue flame of a blow-pipe, to turn it back to a molten lead button, if pure. If containing zinc, a coal the color of brimstone will be the result, etc., according to the nature of the adulteration.

The only error that we note in our December issue was in our "Notes and Comments" on page 470. The quotation from The Globe, referred to in note near the top of first column, got transferred to the bottom.

We were in error in stating in our last issue under the heading "One of the Veterans" that Messrs. Getchell and Bailey, with the possible exception of M. W. Stines, are the only living members of the M. C. & L. P. A. who were at the first convention at Preble Hall, Boston, Nov. 9, 1890. We have since learned that W. H. Jewett, now working under Geo. W. Lord, Fitchburg shop of the B. & M., was there. He is 70 years old, hale, hearty and bright as a button. There may still be others. To freshen the memories of the few survivors, and for the information of the younger members, we herewith give the list of the 17 in attendance, as above, with the road represented and where they were then located, and we will be pleased to receive any further information of more survivors.

Joseph Hill, Portland & Kennebec R. R., Augusta, Me.
Warner Bailey, Boston & Maine R. R., Lawrence, Mass.
A. L. Scott, Boston & Lowell R. R., E. Cambridge, Mo.
John B. Cox, Eastern R. R., Salem, Mass.
Samuel Lunt, Fitchburg R. R., Somerville, Mass.
James Platt, Old Colony & Newport R. R. So. Boston, Mass.
Geo. Prescott, Concord, Manchester & Lawrence R. R., Concord, N. H.
R. T. Beazley, Maine Central R. R., Waterville, Me.
S. E. Kirkpatrick, Vermont Central R. R., St. Albans, Vt.
A. H. Dean, Providence D. Worcester R. R., Providence, R. I.
Chas. W. Haseltine, Northern R. R., Concord, N. H.
W. H. Jewett, Vermont & Mass. R. R., Fitchburg, Mass.
Chas. W. Hinkley, Cape Cod R. R., Hyannis, Mass.
W. B. Getchell, Eastern R. R., E. Boston, Mass.
C. E Paige, Allen Judd, Taunton Car Co., Taunton, Mass.
P. Rudrauff, Lehigh & Susquehanna R. R., Wilkesbarre, Pa.
M. W. Stines, Boston & Albany, Springfield, Mass.

The latter was the first secretary-treasurer and Mr. Hill the first president.

At the regular monthly dinner of the Executive Committee of the New England R. R. Club at the Westminster Hotel, Boston, Dec. 9, W. S. McGowan, Jr., of the Finance Committee, having just come from the West, spoke in glowing terms of what the Lake Shore & Mich. Southern was doing at Collinwood, a suburb of Cleveland, in the way of new shops, etc. We trust some one of our readers there will write us a descriptive article with views. We were pleased to hear the son of our old colleague, Fred. Ball, well spoken of as the Supt. Motive Power—H. F. Ball. We understand that this means that all car and engine work is ultimately to be done there instead of in Cleveland.

The writer recently knocked off flakes of rust from pressed steel trucks under a coal car on his own road fully one-eighth of an inch thick and as large as his hand with fingers extended, which contained the stamped letters of the brand, which letters came off in the open form of a stencil. As the truck frame itself is but about five-sixteenths of an inch in thickness, how long will it last at this rate? But "misery loves company." He notices those of other roads on near-by side tracks in a similar condition.

In recent tests at the Fitchburg shops of the B. & M. where 300 box cars, 36 ft. long and 30 tons capacity, are being built, the writer witnessed to the fact that it took on one occasion 11¼ gals. and at another test 11¾ gals. paint for two coats on roof (of wood) and body, and one coat inside and out of Fox trucks, the latter being sprayed while body and roof were brush-work. The tongues of sheathing were dipped one at a time into a V-shaped zinc-lined trough. For sheathing enough for a car this consumed 2¾ gals. paint. The outsides and tops of sills and tops of stringers were painted and took 1½ gals. The paint was semi-paste reduced with its own measurement—gal. for gal.—with oil, half raw linseed and half Sipe's.

"Primelac" is a name for an interior car varnish by the D. B. Crockett Co., Bridgeport, Conn., that works fairly well for the purpose. We give this as an item of information for those who might think as did we at first, that it was to prime a car with. In the immortal words of Davy Crockett of old, "Be sure you are right, and then go ahead." The veteran varnish and paint salesman, John B. Hicks, sells the above.

It is our opinion that a coat of suitable enamel—or varnish-color—of the color of the car body is as proper for the deck, or outside of cleve story, as it is for the steps and trucks of passenger equipment, where no striping exists, and is all that it usually needs as it comes in to shop for the annual varnishing, instead of two or three operations of a coat of color or of two coats of varnish as heretofore. It saves some labor in cleaning it of grime suitable for varnish, and withal the color-and-varnish combined brings all out clear. Why is not this feasible also for baggage, mail and milk cars on which there is no striping having non-tarnishable metal letters to take off before and screw on after its application, touching up the letters meanwhile on a buff-wheel? Why not also for all passenger equipment, abandoning striping?

Now this may look like an unpardonable sin for a painter to think of such a thing, who is supposed to take some pride in his trade and work, much more to publish his thoughts to the world; but he is not so sure but that if he owned a railroad all by himself he would give the scheme a fair trial. For practicability he believes it would knock the coppering business silly. Of course cars would be brought up from the wood with primers and surfacers in the usual way and possibly varnished on new paint, the enamelling being reserved for the annual repair work. "There's millions in it." Business is business.

Shellac cuts much less figure in the interior finishing of passenger cars than it did a score or more of years ago. Then two or three coats were thought to be necessary by some, sandpapering each coat away down to get out all the brush marks and leveling the surface to insure the filling of the pores. Now one light coat, lightly sandpapered is all that's needful upon which to lay two coats of rubbing varnish to be rubbed to a dead surface. Indeed, oak linings may be satisfactorily finished before put up—in horizontal position. With good paste filler and two coats of varnish without any shellac at all.

Ten to eighteen degrees below zero in various localities within the city limits of Lawrence, Mass., Dec. 9th where "these few lines" are being written. How's that, you tender denizens of the sunny South-land? With the temperature in the paint shop at 58 or 60 where varnishing is being done you do not know how to sympathize with us in our troubles. And yet we have it as hot and dog-dayish in summer as you do—86 to 100. New England weather is "always doing something," in the words of Mark Twain.

"Passenger Car Cleaning" was the subject of an exhaustive report by a special committee of the North-West Railway Club and discussed at length at their November meeting in Minneapolis in which our associate Mr. A. J. Bishop of the Northern Pacific took an active part. We recommend that all our members and readers provide themselves with the November proceedings of the above club, as it is difficult to cull out and report here. The committee submitted a list of questions to twenty-three railroads, three union depot companies and one sleeping car company and received eleven replies to their queries, which answers are published in numerical order without mentioning the names of the roads or parties to whom inquiries were sent; and these answers are followed by the recommendations of the committee and discussion follows each question and the answers, section by section.

There has been mailed from the office of the Painter's Magazine a 5x9½ mailing card to members of the M. C. & L. P. A. bearing only besides the heading the following legend in large type: "The Painter's Magazine was the only paper that published a full report of the thirty-third annual convention of the Master Car and Locomotive Painter's Association. The Painter's Magazine report contained 39,653 words. The report which appeared in the official organ of the association contained 2,438 words."

Sho! That appears rather invidious from a sister publication to which many courtesies have been extended by our association and the editor of these columns, who granted them an advance copy of his convention paper gratis, with many others. All know that it was not intended to publish a full report this year in the official organ but to reserve that for the bound volume, which will soon be out. We believe such shots as that will fail of their mark. Besides, the P. M. did not contain "a full report."

What we call a full report is a verbatim report and such has heretofore been published both in the October issue of the official organ and the bound report also. This year it will occur in the bound report only, as the committee considered it inadvisable to print it twice.

Cyrus Gilbert, foreman painter in the Pullman shops at Cincinnati, O., who has been transferred to the company's shops at Flagstaff, Ariz., was surprised by his old shop men, Oct. 25. They called at his home in the evening and presented him a handsome diamond ring.

Very acceptable; but its equivalent in "dusky diamonds" would be more so down this way.

The traveling representatives, managers of branch houses, and heads of different departments of the Glidden Varnish Company have just completed a four days' business session discussing various subjects in connection with the operation of the business of the concern. Representatives from the East, West, North, and South were all in attendance, to the number of about forty. The manufacturing division of the company was also represented by the heads of the different manufacturing departments. Great interest has been manifested by all who have attended this meeting, it bringing all departments of the business into closer community, which is necessary in all large organizations.

On Monday the entire delegation was entertained at luncheon at the Union Club. On Tuesday evening all attended, in a body, the Empire Theater, and last night the meeting came to a formal close and was followed by an elaborate dinner at the Colonial Hotel.

Numerous toasts and expressions of good will were responded to with eloquence and much enthusiasm—general good fellowship was the feature of the evening, all expressing themselves that they should look forward to the next annual recurrence of this affair with the utmost interest and pleasure.

The Car Foremen's Association of Chicago

A Department Devoted to the Interests of the Car Department

Official Organ of the Association

November Meeting

The regular meeting of the Car Foreman's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, Dec. 10th.

Owing to the absence of President Parish, Vice-President Evans presided.

Among those present were the following:

Bossert, Chas.	Harvey, H. H.	Ryding, A.
Chandler, E. G.	Jones, R. R.	Senger, J. W.
Cooper, Thos.	Julian, J. B.	Stewart, H.
Callahan, Thos.	Kroff, F. C.	Stimson, O. M.
Cardwell, J. R.	Kline, Aaron	Shoemaker, C. A.
Dunley, W. T.	Lau, W. C.	Treptow, A.
Depue, Jas.	Lindseth, A.	Templeton, W. B.
Evans, W. H.	Nordquist, Chas.	Thomson, Geo.
Fildes, R. D.	Pettis, C. D.	Willcoxson, W. G.
Griffin, H. G.	Powell, C. R.	Wirtchoreck, E. H.
Haig, M. H.	Plummer, A. K.	

Vice-Pres. Evans: I regret to state that Mr. Parish could not be present tonight, consequently it devolves upon the Vice-President to act as your Chairman. I would appoint for the ushers this evening to see that the members are welcomed and brought forward, Mr. Senger and Mr. Cardwell. The sooner the front seats are filled up the sooner that committee will have their duty performed.

If there are no objections or corrections to be made, the minutes of the last meeting as published in the Railway Master Mechanic will stand approved.

Secretary Kline: The following have made application for membership:

P. M. Dahlgren, Yard Foreman, L. S. & M. S. Ry., Chicago.
A. E. Henderson, Mill Foreman, W. P. Rend Co., Chicago.
Jas. E. Jones, Inspector, Interstate Commerce Commission.
E. A. Kern, Car Inspector, L. S. & M. S. Ry., Englewood.
C. W. Montgomery, Car Inspector, L. S. & M . S. Ry., Englewood.
Geo. Miner, Foreman Car Inspectors, L. S. & M. S. Ry., Englewood.
S. D. Rodifer, Foreman Car Dept., I. S. Ry., Sparta, Ill.
R. C. Salyer, Inspector, L. S. & M. S. Ry., Wauseon, O.
P. W. White, Car Foreman, C. & N. W. Ry., Chicago.

Vice-Pres. Evans: The applications of the names that you have heard read have been approved and will be enrolled as members if there are no objections.

This brings us to the regular program of the evening, the first subject of which is,—"Defective railroad crossings and injury they cause to car equipment." This is a subject which our President was considerably interested in and I will be glad to have the members take hold of it and get out of it all there is in it

Mr. Pettis (I. C.): I do not know just exactly what may be referred to in this, but I assume it relates to the question of railroad track crossings; that is, the crossing of one track over another at grade, wherein the tracks, splice bars, joints, ties, etc., are defective. We can easily understand that such conditions would not be good practice for either tracks or cars. The opening in the crossing occasions a perceptible drop when the wheels pass over, but just what effect this will produce, increased by the parts mentioned being defective, I am unable to state; nor have I had any cases in my experience which would enable me to say. There is considerable flexibility to our trucks of different types, as to whether the defective crossing would do more injury to the pedestal truck compared with the arch bar type, seems a debatable question. I cannot say I have ever seen much printed matter on the service and conditions of crossings, as it is one which relates more specifically to the road department.

Starting as the subject does with a defective railroad crossing, we will question the effect of a car having pedestal trucks, side frames rigid and the springs located directly over the oil boxes. Will this condition compensate for the rigidity of the frame compared with the arch bar frame which has no springs over the oil boxes but with springs under a bolster? Apparently rendering the condition more trying for the shock to be transmitted through a greater number of parts before finding any spring resistance. Another question which occurs to me is the increase in capacity of cars to 40 and 50 tons, using pedestal trucks and naturally causing a harder blow in passing the intervening space, will this affect the wheels and other parts? I am free to confess I have no data nor information to offer, nor have I made any observations which would enable me to throw any light on the subject. I bring up these points, however, as it may bring some suggestions to the minds of the other members for the benefit of the discussion.

Vice-Pres. Evans: I might state for the benefit of the members that from what I learned from Mr Parish, he had collected considerable data on the subject and it had been brought to his personal attention by some defects which were noticeable, particularly in the vicinity of crossings. Since this subject was brought up I have paid some little attention to it but have not been able to get any definite information on the subject except in a general way. I find that we have experienced trouble with broken brasses; for instance, a number of broken brasses were largely in the vicinity of crossings. Frequently heavily loaded refrigerator cars, for instance, would run hot and we would find that the trouble originated very near, or after crossing over a crossing that was more or less defective. The subject, I do not think, states it exactly as we are intended to consider it. A defective crossing we would expect to be removed as soon as it became defective, but rather a crossing that had become worn to let the trucks deflect into the parts where the rails had become worn. We all know how the crossings are, particularly when the angle is 90 degrees. It is like going over a corduroy road in some places and there is no question in my mind but what that does cause considerable damage to the freight car truck. As Mr. Pettis says, I think it would cause more trouble to an arch bar truck than to a pedestal truck where the springs are placed directly over the oil box. It might be that some of the members have had experience in regard to broken journal bearings or something of that character,—broken arch bars, column bolts, truck box bolts, or something of that kind. We do not care to enter into a technical version of the question as to what amount of blows it will stand, but rather to the practical results that have been noticed.

Mr. Cardwell (A. C. C. O. Co.): I think there is no question but what a great many of our broken springs, arch bars, brasses and a number of other parts of trucks are due principally to this cause. This we can see by watching a train of loaded cars pass over a crossing, whether defective or not, especially if it is going at any speed. A railroad crossing is something I know nothing about, but I understand they last but a very short time where they are used a great deal. One railroad man told me that a crossing, where it is used right along, had to be replaced every six months. I would like to learn something more definite about this from some members that know more about it, as to how long a crossing will last. As I understand, the center piece of rail wears off at the ends so that it gives the car a very hard bump every time the wheel passes over it. I would like to know how long they ought to last.

Mr. Treptow (L. S. & M. S.): In regard to damage done to cars by defective railroad crossings I think it is principally broken axles, arch bars, truck column bolts, brasses and bottom rods torn off. I have seen broken axles right on the crossing, under loaded cars, and arch bars and brasses, especially those filled brasses. They must be broken or fractured at the crossings. The bottom rods generally become lost. It does not take very long that there is about an inch or more deflection where the wheel drops from one rail to the other. The earth underneath works away, the car drops into these holes and the springs are compressed and that lowers the bottom rod still more, especially when the brakes are hung to the body of the car. I think that is the cause of so many bottom rods being torn off. I have noticed that they are very often torn off at the crossings, or the fulcrum gets broken and when the brakes are set the rods are torn off. Nearly every train has a car or so with the brake connections torn off.

Vice-Pres. Evans: Since this subject is one that Mr. Parish is particularly interested in, I would think it advisable that we carry it over to the next meeting when he can be present. We will then have the benefit of what information he has got together on the subject. I think that would agree with what Mr. Parish would like. If there are no objections we will carry this over and make it number one for the next meeting.

Mr. Cardwell: In conection with that, if you would like, there was a gentleman who was connected with one of the railroads in Chicago, submitted to me some months ago an automatic railroad crossing that he had gotten out and he had a very neat working model, and if the President has no objections I will write him a note and tell him that the subject will be up at the next meeting and ask him to have the model present.

Vice-Pres. Evans: Of course we would be very glad to have the gentleman present and have the benefit of his information, but it is against our constitution to have anything in the way of an advertisement. If the man has any information bearing on defective railroad crossings and injury they cause to car equipment we would be glad to hear from him on the subject, but we would not expect him to use our meeting for the benefit of advertising his crossing. I do not know that there would be any objection to asking him to be present.

Mr. Powell: I think the idea is a good one and I believe that the gentleman will see our position in the matter and will refrain from using the meeting as an advertising medium and I think it would aid us greatly in reaching a conclusion as to what our opinions are and would also assist us in determining whether we consider the subject of enough moment to go into deeply. It also appeals to me that there are some car inspectors here that have had some experience and have come in contact with these features and could give us information on them. From an office standpoint I cannot say that I have ever seen any statistics bearing on this subject. I do not know as we have ever had any record of damage to equipment by reason of defective or good crossings. As I understood from Pres. Parish some time ago his idea was that defects would not be caused, necessarily, by a defective crossing, but caused by moving trains over all the crossings at a rapid rate, and the inspectors who come in actual contact with these features, by devoting a little time to it can give us valuable information. That is, they can take into consideration and present an opinion as to whether the trains are moving rapidly over crossings and whether the speed should be lessened. I believe the subject should be carried over and one or two members who are qualified along that line give the matter investigation and make a report at our next meeting.

Mr. Pettis: An inventor of any device is usually supposed to have given the matter study and consideration from every standpoint so as to enable him to intelligently set forth the advantages it possesses. The gentleman Mr. Cardwell speaks of has doubtless given the matter of crossings some thought with a view to the benefits produced and any economical results that would accrue with his arrangement. As an alternative to the party himself explaining his device, could not the information be obtained from him in a friendly way? His invention must be something new and possesses qualities advantageous to either track or cars, or both, and it might be just as well to obtain his views.

Mr. Evans: I think it would be well to carry this subject over to the next meeting, and I would suggest that Mr. Cardwell see this party, as we can no doubt convince him to keep within the propriety of the association. We expect that if we carry this subject over to the next meeting every member will come prepared to jump to his feet when called upon and have something to say.

We will now take up Subject No. 2: "A's car is destroyed on B's road. Body of car is stencilled 65,000 lbs. Trucks are not stencilled for capacity, but are equipped with M. C. B. axles with journals 4¼x8 inches. (See Rule 110.) Should trucks be settled for as 60,000 or 80,000-lbs. capacity?"

Mr. Powell: Question No. 2 was submitted to the committee on subjects and the question as to whether the size of an axle will determine the capacity of the trucks and what value should be placed upon the trucks: that is to say, whether they should be billed, in case of destruction, as a 60,000 or 80,000-lbs. capacity car. By referring to the Proceedings of the Master Car Builders' Association we find that they prescribe a standard for the different capacity cars. They prescribe 3¾x7-in. journal for a 20-ton car 4¼x8-in. for a 30-ton car, etc. They make no provision in the proceedings for a 25, 65 or 70,000 capacity car or truck. By referring to Rule 23 we find that they say the minimum dimensions for a 70,000-lb. capacity axle should be not less than 4 inches. They make no mention whatever of a 65,000-lb. cpacity axle, but under Rule 110, in prescribing for the value of trucks, they state that $175 shall be the value of a 60,000-lb. truck with wood bolsters, and $260 be the value of a 60,000-lb. capacity or under, all-metal truck. The next section reads, "80,000-lb. capacity or under." You will notice it omits the capacity of axle between 60,000 and 80,000 pounds. The car has 4¼x8-in. journal and the body of car is stencilled 65,000 lbs. Will that justify the owner of the car in rendering bill for the value of truck as 80,000-lbs. capacity? We find also that a great many companies have cars with the body stencilled less than the capacity of the axle. That is, we find 4¼x8-in. journals under cars stencilled 20 and 25-ton capacity on the body, but the trucks are not stencilled. It leaves the question of value for the trucks open, so when we find that we have a car destroyed we do not know whether the stencilling on the body should govern for the trucks. Now it seems to me the principle involved here is, should the stencilling on the body govern the value of the trucks, or whether the size of the axle is to govern the value of the truck, in case they are not stencilled. The case is an actual one, I understand from the question submitted, and it appears to me, personally, that the size of the axle, irrespective of the other dimensions of the truck, should govern. Again referring to the proceedings of the M. C. B. Association, there is nothing that I can find which prescribes the size of the arch bar affecting the capacity of the truck, except for 80,000 lb. cars. I find that the M. C. B. proceedings state that 1⅜ and 1½ x 4 in. bars are suitable for 80,000 lb. capacity car. Now in this rule the size and dimensions of the various parts of the truck are not given. Whether that would make any difference in the value of the truck I am not prepared to say. However, inasmuch as the Association has adopted as a standard 4¼ x 8 in. journal as suitable for 60,000 lb. capacity car, I think it is immaterial what the stencilling on the body is, and that the size of the axle alone, irrespective of the size of arch bars, transoms, etc., should govern, and upon this ground I would like to hear from some of the other members as to their opinion. Personally I think that any truck with an axle less than 5 x 9 in. should be billed for as a 60,000 lb. car.

Mr. Cardwell: I agree with Mr. Powell inasmuch as the size of the axle should govern the capacity of the truck, irrespective of the stencilling on the body of the car, but I do not think that all trucks with axles less than 5 x 9 in. should be settled for as 60,000 lbs. capacity, because a 4½-in. journal is the minimum limit for 80,000 lb. capacity and I think he should reduce the 5 x 9 in. to 4½ x 9 in. diameter at any rate.

Mr. Powell: In explanation of my remarks, I was merely looking at that from a technical standpoint. It was simply this. As I say, the Master Car Builders' Association has adopted a standard; they have adopted a 5 x 9 -in. journal as suitable for an 80,000-lb. car. They make no provision for anything between 5 x 9 in. and 4½ x 8 in. Other sizes of axles are adopted by the different railroads at their own risk. Some use odd sized axles for different sized cars. They are not M. C. B. Standards and therefore it appeals to me that we should confine ourselves to what the Master Car Builders' Association have adopted and that the prices should range in accordance with their decisions rendered heretofore.

Mr. Pettis: Rule 23, relating particularly to axles, states "all cars to have their capacity stencilled on them." Now if a railroad company sees fit, for reasons which they think advisable or for good practice, to use axles of smaller dimensions than the recognized practice for cars of the various capacities, they can go just so far. Any further will result in trouble, for this reason. If they build a car of 80,000 lbs. capacity and use journals of any other diameter than commonly used, they may do so just so they do not get below 4½ in., for there is no railroad company which will accept a car with journals below the limits allowed by the M. C. B. Rules. Consequently their connections would be very thoughtless to accept an 80,000 capacity car, having journals 4¼ in. diameter. The same provision would apply throughout the entire list. A railroad company might desire to build a 60,000 lb. capacity car and if it figures that a 4¼-in. journal is too large and for economical reasons we will say, wanted a smaller axle, it may use such an axle provided it is not less than 3¾ in. in diameter at the journal; for a 25-ton car 3½ in. and so on. This rule states that cars are to be stencilled their capacity, which really establish the size of the journals: although the members have doubtless seen cars instead of being stencilled with the recognized capacity, are marked "Load Limit" so much: this being usually 10 per cent of the regulation capacity added; thus showing a capacity not indicated in the rules. Therefore it is my opinion that the intention of the Rules is that the dimensions of journals must not be less than the ones prescribed for the different capacities. Consequently with the case in question a 4¼-in. axle is 1¼ in. too small for the minimum prescribed by the M. C. B. Association for a forty-ton car.

Mr. Kroff (Penna. Co.): I think Rule 23 would govern that case. Rule 23 shows the limit for the different capacity cars and I do not see where they have made any provision for the odd capacity cars,—for instance, 45,000, 55,000 and 65,000 lb. capacity car. These rules are laid down so that when you find an axle below those limits they can be removed. I think the settlement should be for a 60,000 lb. capacity truck.

Mr. Powell: I call attention to the fact that Rule 23 gives us the size of centers, wheel seats, etc., which has not been taken into consideration, but you will also notice that Rule 23 prescribes that a journal with a minimum diameter of 3¾ inches is suitable for a 60,000-lb. car. It does not say how much greater that journal may be. It may be 5x9 inches. It may be any size, but the minimum shall be 3¾ inches. Now a 4x7-in. journal, under the rules, would be suitable for a 60,000-lb. capacity car, because the journal would be 4 inches, ¼ inch greater than the minimum allowed, therefore as far as the length of the journal is concerned I do not see that it is taken into consideration in Rule 23, and as to how same shall be interpreted in connection with Rule 110 I am not able to say.

Vice-Pres. Evans: Rule 110 says: "60,000-lbs. capacity or under, all metal, per pair, $260; 80-000-lbs. capacity or under, but over 60,000 lbs. all metal, per pair, $325." It looks to me as if the question hinges a little more on the trucks than on the size of the axle, and it looks to me as if it hinges on this rule, as to what consideration shall be placed on the wording of this rule as it is, "80,000-lbs. or under, but over 60,000 lbs., all metal." There is no question here about the size of the axle. Rule 23 governs, but we are wandering a little bit away from the question, which is really settling for trucks which are equipped with 4¼x8-in. journals, body of the car being stencilled 65,000-lbs. capacity. It looks to me the acknowledged practice is to allow for the ordinary freight car, 10 per cent over its marked capacity. That would in this case allow a 60,000-lb. car to be loaded to 66,000 lbs., that is as Mr. Pettis says. But the question still arises, whether you can load a 65,000-lb. capacity car 10 per cent over its marked capacity. I think the question really hinges on the trucks themselves as much as on the size of the axles.

Mr. Pettis: Have not the rules established the capacity of the trucks by establishing the size of the journals? In other words, is there anything in the rules indicating the size of journals for a 40-ton car to be 4¼ inches? On the other hand, it states that less than 4½ inches cannot be accepted for 40 tons. In fact, it is generally admitted that the capacity of trucks is determined by the size of the journals.

Vice-Pres. Evans: Of course we begin to build the truck from the axle up, but there are other parts of the truck than the axle. Of course, as Mr. Pettis says, Rule 23 is the only thing that lays down in the rules which gives the foundation work for the capacity of the car

Mr. Stimson (S. R. L.): I do not see anything in this question. In the first place, to determine the capacity of any car the length of the journal should be considered as well as the diameter shown by Rule 23. In this case it is admitted, I believe, that the dimensions of the journals when new were 4¼x8 inches; this would appear to settle the question, notwithstanding the fact that the minimum diameter allowed for journals of axles under cars of 70,000-lbs. capacity is 4 inches. The length of journal of axles under cars of 100,000-lbs. capacity should be 10 inches, 80,000-lbs. capacity 9 inches, 60,000-lbs. capacity 8 inches, and 50,000-lbs. capacity 7 inches, which lengths should, in my judgment, be considered in connection with diameters shown under Rule 23. I cannot believe that the party was serious in billing for 80,000-lbs. capacity trucks, equipped with axles having journals when new only 4¼x8 inches. It is my opinion that the Arbitration Committee would not consider the question a minute before deciding that A could not bill for trucks of greater capacity than 60,000 lbs.

Mr. Powell: I would like to ask Mr. Stimson whether he would consider the fact that the arch bars and the transoms were greater size, that the other features of the truck were greater in comparison with 70,000-lb. stencilled car than those for 60,000-lb. cars, would that make any difference in the value of the truck?

Mr. Stimson: It certainly would not. The capacity of a car is, in my opinion, determined very largely, if not wholly, by the size of the axles, and particularly the length and diameter of the journal. As it appears to me, the capacity of a car is nothing more nor less than the load it will carry with safety and without heating the journal. The mere fact that the maximum diameter of the journal of an axle for a car of 60,000-lbs capacity is greater than the minimum diameter of an alxe for a car of 70,000-lbs. capacity should not permit "A" to bill "B" for trucks greater than 60,000-lbs. capacity; something must be allowed for wear, hence the maximum or diameter of new axles being ½ inch above the minimum or condemning diameter. Would it not be just as reasonable to assume that trucks with axles having journals 3¾x7 inches were suitable for cars of 60,000-lbs. capacity as it would to assume that trucks with axles having journals 4¼x8 inches (when new) were suitable for cars of greater capacity than 60,000 lbs.? I would like to see the rules amended to show the length of the journal as well as the minimum diameter allowed for the different capacity cars, which would prevent such questions coming up.

Mr. Cardwell: I agree with Mr. Stimson there, but I would like to ask him, on the other hand, if his car was stencilled 60,000-lbs. capacity and the jurnals 5x9 inches, in case of settlement, would he bill for the truck as 80,000-lbs. capacity?

Mr. Stimson: Most assuredly. It is not an uncommon thing to apply 60,000-lbs. capacity trucks under 50,000-lbs. capacity bodies; the company with whom I am with follow this practice to some extent. In case of total destruction, the car body and trucks are always settled for as separately, as though they had no connection whatever.

Mr. Cardwell: Then on this subject it appears, following up Mr. Stimson's argument, that the marked capacity of the body of the car has nothing to do with the trucks, and I think that way myself. This Rule 110 simply gives the capacity of the trucks. We have not to take the body of the car to learn the capacity of the trucks, as Rule 23 has decided that for us. Therefore I think this question is a very simple one and that the trucks should be settled for as 60,000-lb. capacity.

Mr. Powell: I want to call attention to the fact, if I remember correctly there is one railroad which uses an odd-sized journal, namely, 4¼x7½. Now that is not an M. C. B. standard axle, but I believe that the Arbitration Committee has decided that it is suitable for a 60,000-lb. capacity car and should be settled for at that rate. I do not remember the number of the decision, but I merely call attention to it.

Mr. Callahan (C. L. S. & E.): Rule 23 refers only to safety limit of journals and responsibility of owners for same. Rule 110 is for settlement of destroyed trucks. I do not think Rule 23 enters into this question at all. While 4¼x8-in. journal trucks are generally considered a 60,000-lbs. capacity truck, there are a lot of cars running with 4¼x8-in. journal trucks that are stencilled 70,000-lbs. capacity, and there are provisions in the rules that they shall or shall not be settled for as such.

Mr. Pettis: A 4¼x8-in. journal under a car stencilled 70,000 lbs would run, according to the rules, until it wore to 4 inches, but a 4¼x8-in. journal under a car which a company desires to get settlement for as a 80,000-lbs. capacity car would not be accepted at all. In so far as the length of the journal is concerned, the necessary area for the weight of the journal is to carry can be obtained by increasing the diameter of the journal. That is, the diameter for a journal 8 inches long can be increased until exactly the same weight per square inch is obtained as if the journal was 9 inches long. But a proper weight per square inch could not be obtained with a 4¼x8-in. journal for a car of 60,000-lbs. capacity, certain weights per square inch being recognized as good practice to take care of friction and obtain lubrication. One of the largest roads entering Chicago, I understand, is using a truck calculated for 80,000-lbs. capacity having 5x8-in. journals instead of 5x9 inches, and this under passenger train cars. The reason for this, as I am informed, and which I thought a very good one, was that the 5x8-in. axles could be used in trucks having the same centers transversely as the 4¼x8-in.; but it was doubtless desired having axles of greater carrying capacity, hence the diameter was increased by ¾ inch. However, the question does not relate to what diameters any one might figure for the best practice, but whether there is anything in the rules permitting one company to bill against another for a pair of trucks having 4¼x8-in. journals as being 80,000-lbs. capacity. My opinion is against this, as the M. C. B. rules prescribe 4½ inches as the minimum for 80,000-lbs. capacity, and the axles in question were 4¼ inches.

Vice-Pres. Evans: It seems to be the opinion that in this case A would not be justified in attempting to settle for his trucks for a greater capacity than 60,000 lbs.

Mr. Cardwell: I would make that as a motion.

Motion seconded and carried.

Vice-Pres. Evans: The next number on the program is the discussion of the M. C. B. rules, beginning with Rule 83. We have been worrying along with these rules for quite a while and would like to get through with them, and I hope the members will take right hold of them and bring out the points so we can get through with them.

Rule 84.

Mr. Powell: I notice a number of railroads billing for the key bolts where the rods and connections are missing. That is to say, even though all the brake material is missing, they claim it is due to the bolts becoming loose and dropping out and they are entitled to charge for the failure of the bolts. I am rather doubtful as to whether that is a correct interpretation of the rules, and I believe that the road in whose possession the car is should stand the expense for the bolts as well as the other material. However, as I say, there are a number of roads that do not so interpret the rules, and I would like to have the opinion of the association.

Mr. Thomson (L. S. & M. S.): We would bill for the labor only. We do not charge for the key bolts.

Mr. Griffin (L. S. & M. S.): I notice the rule here includes the key bolts and I think, according to the way the rule reads, you cannot charge for the key bolts.

Mr. Kroff: I think the key bolts or brake shoes or heads are chargeable to the owner, providing they are lost separately. That is to say, if the brake beam is there. But if the brake beam and its attachments are missing, then they are not chargeable, only the labor for replacing same.

Mr. Cardwell: I would like to ask what would be the proper charge in case the levers are lost? That is, the key bolts lost with the levers. Could you charge the owner for them?

Mr. Kroff: I think I would. The brake beam is what cuts the figure. The rule says: "Bills may be rendered against car owners for the labor only of replacing couplers, brake beams (including their attachments, such as shoes, heads, key bolts, jaws and hangers), brake levers, top and bottom brake rods that have been lost on the line of the company making the repairs."

Rule 85.

Mr. Powell: In regard to the form, I would simply like to say that I would like to see the Master Car Builders' Association make that an arbitrary ruling whereby the various railroads would use the same forms for rendering bills The other day in our office we got a bill from one of our connecting lines, and I imagine the size of that bill must have been 12x14 inches. It was very hard to handle, and while a great many roads do not adopt the particular style of printing that the association has provided for, yet at the same time they usually adopt the same size stationery, and as long as the association has prescribed a size and form I believe it to be to the benefit of all concerned if they would confine themselves to that form and method of rendering bills.

Vice-Pres. Evans: That brings up the question of penalty for not adhering to the proper rules. Would a company be justified in refusing a bill, or returning it, on account of the form of the paper?

Rule 86.

Mr. Pettis: What are the sizes of the axles to get the capacity? Is a 4¼-in. journal an 80,000-lb. axle according to that rule?

Vice-Pres. Evans: My opinion is, this rule is made to cover an M. C. B. axle. It specifically specifies in regard to the sizes for what the M. C. B. Association has adopted as standard. I suppose odd sizes that come within those limits can be charged for, either new or second-hand, and credited as scrap under the same prices.

Mr. Plummer (C. B. & Q.): I think that the labor price for taking out a pair of wheels under a 80,000 or 100,000-lbs. capacity car should be changed to read $1.75 in place of $1.50.

Mr. Evans: We might consider that in making our next recommendations to the Master Car Builders' Association.

Rule 87.

Mr. Cardwell: Under the rule I think they ought to include the 60,000-lb. axle also if it is worn below the limit.

Vice-Pres. Evans: The idea is, I believe, that the 60,000-lb. axle can be used under a 50,000-lb. car and a 50,000-lb axle under a 40,000-lb. car, 40,000 lbs. being the lowest limits railroads now maintain.

Mr. Kroff: If you remove a 4x8 axle from under a 50,000-lb. car, what credit would be allowed in that case?

Vice-Pres. Evans: That would be a 60,000-lb. capacity axle and I take it credit for scrap should be allowed for it.

Mr. Kroff: The idea is, the car is marked 50,000-lb. capacity and you remove a 4x8-in. journal. What credit should be allowed for it, 50,000 or 60,000-lbs. capacity?

Vice-Pres. Evans: As I understand it, it is getting back to where we were awhile ago on the settlement for the truck. If you take out a 4¼x8-in. journal, that is a 60,000-lb. capacity axle.

Mr. Pettis: Allowance should be made for a second-hand axle. The object of the rule, as the president said, was to take care of axles which were below the limit of journals which would prevent their being used. Now the limit for a 40,000-lb. axle is 3¾ inches. A 60,000-lb. axle is not mentioned, because if you remove an axle that is not worn below 3¾ inches from a 30-ton car you can use it under a 20-ton car. In other words, allow for second-hand axle if the axle is good, as it can be used in a 50,000-lb. car, or 60,000, for that matter, because the limit dimensions do not go below 3¾ inches.

Rule 91.

Mr. Powell: It was called to my attention the other day on page 32 it says: "Door, for side of box or stock car; ventilated (wooden frame with iron rods), each, applied; no credit for scrap, \$5." Right underneath that, the next section, says: "Door, for side of stock car, with iron rods, each, applied; no credit for scrap, \$4." I would like to have the opinion as to what is the proper charge for a stock car side door with iron rods, \$4 or \$5. In explanation I might say that there is an arbitration case that decides (I believe it was an S. W. S. car) that had three-quarter side doors, and I believe it sets the value of that particular door at \$4, but in this case it appears in the rules as though there were two prices for the same door.

Mr. Plummer: I would think a ventilated door would mean a freight car door with iron rods covered with a wire mesh. That would be worth more.

Mr. Evans: I would not pretend to make a decision on that rule. It is fairly clear to me, at least. It says: "Door for side of box or stock car: ventilated (wooden frame with iron rods), each, applied, \$5. Door for side of stock car, with iron rods, each, applied, \$4." The second one, of course, applies altogether to a stock car, so you cannot in any case charge but \$4 What I mean to say is, that the \$5 charge would usually be correct for a ventilated door for a box car.

Mr. Stimson: As I understand the rules, they describe but two kinds of grated side doors: (a) ventilated doors for box cars having rods and wire screen, \$5 each; (b) ventilated doors for stock cars practically the same construction as the box cars, but without wire screen, price \$4 each. There are, however, two other kinds of doors on stocks, namely, the door with the lower part hinged for unloading stock at platform, for which we bill \$4 each, same as the ordinary stock car door; for the side doors on the double-deck stock cars we charge \$5 per side (\$2.50 per door).

Mr. Powell: As I understand the gentleman here, a door for which you could charge \$5 is one with iron rods and an iron mesh or screening over it. That makes the additional value to the door.

Vice-Pres. Evans: Is not \$5 the proper charge for a door with frame underframing where the rods do not run the entire length?

Mr. Plummer: You find in Rule 91 continued: "Door for side of box or stock car; ventilated wooden frame with iron rods, each, applied; no credit for scrap, \$5." I think this should be added to the rule with wire mesh. This would be much plainer.

Rule 94.

Mr. Harvey: What credit would you give for a steel channel; that is, how much a pound? Would you credit it the same as wrought?

Vice-Pres. Evans: The same as forgings, would it not?

Rule 99.

Vice-Pres. Evans: What is the opinion of the members in regard to the credit for second-hand material? What determines when the parts become second-hand?

Mr. Cardwell: I think it is like a wheel; after it has been put under the car it is second-hand. I will say further, that I think 75 per cent is a pretty fair average. Some of the parts, say the knuckles, may be worn sometimes until they are not worth 75 per cent. There are other cases when the parts are applied as second-hand when they are really as good as new. Their use has not affected them at all.

Vice-Pres. Evans: As Mr. Cardwell says, I think 75 per cent is a good average. Second-hand material applied is never more than three-quarters new, I guess.

Rule 102.

Vice-Pres. Evans: It is the usual practice to add percentage for all bills except M. C. B. bills, is it not?

Rule 103.

Mr. Cardwell: I notice some of the roads charge 20 cents and also for the material in the grab iron. That is, they charge 20 cents labor and charge also for the material.

Vice-Pres. Evans: Does the charge of 20 cents include the material?

Mr. Plummer: I understand it includes the material.

Meeting adjourned.

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Bruce V. Crandall, Editor. Charles S. Myers, Manager.
Maham H. Haig, Associate Editor.

The Railway Purchasing Agent

THE first number of The Railway Purchasing Agent was published in January, 1878. It was successful from the start from a business point of view. The purchasing agent of those days had much more discretion and decision in the choice of supplies, than is possessed by those of today. Specifications and requisitions did not control to the extent which they now do, and it was of the highest importance that the purchasing agent should have knowledge and judgment as well as shrewdness. It is not to be implied that purchasers of today do not need and do not have similar qualifications; but the range of supplies, which are entirely under the control of the purchasing agent, has considerably narrowed, and the manufacturer or dealer now has to win over the heads of other departments before meeting the purchasing agent whose duties on some roads are now merely clerical.

There was then in existence a Railway Purchasing Agents' Association of respectably large membership, but with rather small active participation. The annual conventions for several years were attended by only about a dozen; but the discussions were interesting and valuable. Naturally they were confined to quality of materials and methods of doing business. Prices could not be discussed and were avoided. The result was that the subjects came to be about the same as those discussed by the master mechanics and master car builders, which, of course, handled the subjects more comprehensively. For these reasons the association died an early death. Its interest and efficiency during its existence were chiefly due to the late C. M. Higginson, then purchasing agent of the Chicago, Burlington & Quincy. Mr. Higginson was also a frequent and able contributor to the columns of The Railway Purchasing Agent, and the files show that he was a pioneer in many lines of thought and investigation.

Among the most active members was Gilbert C. Breed, purchasing agent of the Louisville & Nashville; then advanced in age, but as active and genial as the youngest, Mr. Breed had occupied nearly every position in railway service from telegrapher up to chief engineer, and even president. He was full of interesting reminiscence and well posted on a great variety of subjects. Among other members still well remembered were A. C. Armstrong of the Lake Shore, Allan Bourne of the Michigan Central and A. W. Sumner of the Northern Central.

In May, 1879, the convention was held at Louisville, and the social pleasures included a trip to Mammoth Cave, made glorious by the southern hospitality of the Louisville & Nashville Railroad. In an experience of thirty years in attending conventions, the writer recalls no more pleasurable occasion. Alas, very few, either of the purchasing agents or supply men, who with their wives and friends formed that jovial excursion party of seventy, are now left to tell of it.

In the course of time it came to pass that the contents of the Railway Purchasing Agent became more and more related to the mechanical engineering of railroading. Special themes relating to the management of purchasing were "written out." But the field and the constituency called only for a change of name and the paper became THE RAILWAY MASTER MECHANIC, and now, at the completion of its quarter centennial, appears more flourishing than ever. It is interesting to note the changes of twenty-five years, not only in the contents of the reading matter pages, but of its advertising. The whirligig of time has carried out of existence most of the firms and companies who then advertised. A very few still retain the identical names. Many have gone the way of all flesh. The fashion which can be traced in railway supplies, as in other things, has changed, and carried some out "over the bar." There are fewer dealers—the manufacturers doing much more of their business now direct with the consumer. Absorption and combination have wiped out the greater number—especially the barb wire fence, car wheel and car spring makers.

We all realize the tremendous progress of the last quarter century in the science of railroading and the fact that change and improvement were never at such flood tide as now. Nothing can bring this so clearly and forcibly before one, however, as an examination of the railway press of twenty-five years ago and comparing it with that of today.

PROBABLY the history of the RAILWAY MASTER MECHANIC during the last twenty-five years is of little general interest to the general railway public, but we can hardly pass the quarter century mark without taking a glance back over our own past. The RAILWAY MASTER MECHANIC had its beginnings in 1878 when it appeared as the RAILWAY PURCHASING AGENT, and for a number of years it was the official organ of the RAILWAY PURCHASING AGENTS' ASSOCIATION, which was in existence at that time. Smith and Cowles were the first publishers and this partnership was within a few years succeeded by a corporation, which continued to publish the paper until January, 1901, since which time it has been under its present ownership.

During its earlier years the RAILWAY PURCHASING AGENT, and later the RAILWAY MASTER MECHANIC, was under the editorial management of Mr. Willard A. Smith, whose connection with our various great expositions and his position as publisher of the Railway Review has made him a prominent figure in railway affairs.

In 1883 Mr. Willard C. Tyler took the editorial and business management of the paper and several years later became the vice-president and eastern manager of the Railway Review. In 1885 Mr. Edwin N. Lewis purchased a large interest in the Railway Purchasing Agent Company and became the editorial and business manager of its publications. No one man has been so closely identified with the Master Mechanic as was Mr. Lewis up to the time of his death in February of 1900. Shortly after his coming with the paper the name was changed to the RAILWAY MASTER MECHANIC.

In 1890 Mr. Walter D. Crosman became the editor and Mr. Lewis gave his entire time to the business department. In October, 1891, Mr. Crosman accepted a position with the Railway Age, and June 1896, returned to the editorial management of the RAILWAY MASTER MECHANIC, which position he held until June, 1901, when he resigned to accept a position with the Gold Car Heating Company.

Mr. W. H. Marshall, well known in railway circles and recently appointed as general superintendent of the "Lake Shore" railroad, was in editorial charge of the Master Mechanic from January, 1892, to February, 1896.

Mr. William E. Magraw, whose name has become synonymous with the words "perfect circulation," and whose energetic and forceful methods have made the "Red List" an indispensable book for thousands in the railway field, was several years manager of the RAILWAY MASTER MECHANIC.

Perhaps this is a sketch of the men who have been connected with this publication rather than a history of the RAILWAY MASTER MECHANIC, but a paper reflects very largely the personality of those who have conducted it.

MR. GEORGE W. RISTINE.

DIRECTOR OF TRANSPORTATION, LOUISIANA PURCHASE EXPOSITION.

Mr. Ristine was born in Philadelphia March 3, 1846. He entered railway service with the Empire Transportation Company in 1881. Since that time he has held a number of positions of responsibility with several different companies. His appointment as director of transportation took effect January 1st. Mr. Ristine's extended experience in railway traffic and operation, as well as his other personal qualifications, fit him in a remarkable degree for this position.

WE often receive suggestions as regards our name, the RAILWAY MASTER MECHANIC, and are asked why it is not changed to include a wider field, or given a name which shall include the entire mechanical department. We can do no better than quote from an editorial which appeared in our own columns in January, 1886:

"Our name, THE RAILWAY MASTER MECHANIC, seems to be generally approved. The term is distinctively American, and will always be thoroughly understood, no matter how many other official designations of the principal mechanical officer may become current. We now have "superintendents of motive power and machinery" in this country, "mechanical superintendents" in Canada, and "locomotive and carriage suerintendents" in England. But all these are mechanics, and presumably masters of their art. Our name may, therefore, be assumed to cover all the craft—those who have passed up higher and those whose ambition is yet in the bud, as well as our actual namesakes."

IN the present progressive age when locomotive design has been reduced to a science and it is no longer necessary to resort to "cut and try" methods, it is gratifying to notice the generous assistance offered by railroads and locomotive building establishments, to the technical institutions of the country. A pleasing instance of this nature is the recent offer of the Baldwin Locomotive Works to present a locomotive, complete in all its appointments, to the railway mechanical department of the Sibley College of Mechanical Engineering, Cornell University. Not only is this a generous offer on the part of the Baldwin Locomotive Works, but it is further a pleasing recognition of the inestimable features of the technical training pursued at the institution which is to be the recipient of this desirable addition to its laboratory. An outline of the plans to be followed in the construction of this locomotive and a compendium of the instruction given each year in locomotive road testing, through the courtesy of the Delaware, Lackawanna & Western Railroad, are presented on another page.

Twenty-Five Years of Locomotive Development

THE most casual observer can not fail to have recognized that within the past twenty-five years ending with this year of grace, 1903, there have been remarkable changes brought about in the design and construction of the American locomotive. And by the American locomotive is meant the machine or types of machines that have been adopted and incorporated into the everyday practice of the railroads of the United States. And yet wonderful as the practical progress has been, the searcher after actual novelties that have appeared during the quarter of a century that is past will find very little to reward even the most painstaking investigations. The cry of there being nothing new under the sun, seems to echo along the whole line, for nearly everything that we have come to regard as best and most valuable in our present practice was foreshadowed in a tentative way before the opening of the period under consideration. Some of the work so done was premature and ahead of the time, some was faint-hearted and did not grasp the problem in its full significance and so failed to come into general practice, leaving it to after years to develop these earlier suggestions. The fact of a device or idea having been tried and found wanting is little reason for withholding credit from those who afterwards took it up and made it a success.

In order to appreciate what has been done in the past two and a half decades it will be well to pass in brief review the state of locomotive practice in 1878. For general road service there were three arrangements of wheel base in use. These were those known as the eight-wheeled or American type, the mogul and the consolidation, with a leaning in favor of the first for all classes of service, though the two last were rapidly making friends and were being strongly advocated for freight work. Still even for this the eight-wheeled engine had a number of supporters among officers of the largest roads.

While such an opinion may seem to smack of old-fogyism in the light of present-day accomplishments, there were conditions in existence at that time which went far to support the position. Principal among these views was the small amount of heating surface that could be obtained in the boiler. With this surface limited to twelve hundred square feet or less, a cylinder of sixteen inches in diameter and twenty-four inches stroke could use all of the steam that the boiler could generate. The engineers, too, were protesting against the imposition of excessive weights upon the wheels, and 25,000 lbs. upon a pair of drivers was considered good, sensible practice. To be sure there were a few roads that were endeavoring to increase the weight of their engines and the trains hauled by them, by increasing these figures fifty per cent; but it is safe to say that the practice was not regarded with favor by railroad master mechanics generally.

The result of these limitations were that the great bulk of the traffic of the country was hauled by these engines of, what would now be considered, very limited capacity, having cylinders sixteen inches in diameter, though there was a goodly leaven having a diameter of seventeen inches, and eighteen was not entirely unknown.

As for speeds, many of these old light engines were occasionally run at a rate that rivaled the most recent accomplishments, but, it goes without saying that such machines were incapable of long-sustained exertions with heavy trains. The situation was once well expressed by a prominent master mechanic who, after a long conference on the possibilities of building a high-speed locomotive, remarked that it was a very simple matter to build a locomotive that would run at a speed of sixty miles an hour, but that it was a very different problem to build one that would run sixty miles an hour and haul eight heavy sleeping cars at the same time.

Meanwhile the traffic department was clamoring for higher speeds and heavier trains, and the locomotive men were concocting all manner of schemes to meet these demands. It was thoroughly realized, at the time, that the boiler was the key to the situation. It was useless to increase the size of the cylinders and the weight on the drivers unless steam could be generated in proper quantities to utilize the increase. Again, of what use to add to the heating surface unless grate area could be obtained to secure a proper rate of evaporation? The length of the grate was limited to that possible with the maximum distance allowable between driving wheels. Few master mechanics cared to work side rods of a greater length than 9 feet 6 inches, and this practically limited the length of the grate to about 6 feet 6 inches. With the firebox set down between the frames and even a three-inch water space on each side, the grate area stopped at about 20 square feet.

With these dimensions for the boiler a high rate of combustion was needed to furnish steam for even such moderately sized cylinders as 18 inches in diameter. Here was the situation: Apparently the maximum dimensions of boiler, firebox and cylinder had been reached and the traffic department, like an insatiable Oliver Twist, was asking for more. The demand was met in 1880-81 by a very simple expedient, as it now seems. Mr. Theodore N. Ely, then at Altoona, designed and built the Class K locomotive for the Pennsylvania R. R. The engine embodied many novel features, some of which have survived and some that have been quietly dropped. Among the survivals was the placing of the bottom of the firebox on top of the frames. This at one stroke added eight inches to the width of the firebox and warranted the future designer in raising the heating surface to 1,800 square feet, though in the engine under consideration it still remained between 1,100 and 1,200. This little thing, however, required a man with the courage of his convictions. With the elevation of the bottom of the firebox to the top of the frames, there was a corresponding elevation of the shell of the boiler and the center of gravity of the whole machine. Well, to eyes accustomed to seeing the center of the boiler shell about 6 feet 6 inches above the rails, this new height of 7 feet and 4 inches did look pretty well up in the air. So the croakers at once began to croak and many were the predictions as to the instability of the new locomotive, and of its speedy upset. In fact, these croakings were so loud and persistent that, though careful calculations showed the machine to be perfectly stable, it was deemed advisable to limit the speed on its first outward trip to forty miles an hour. The running was so steady on this trial that the return was made at a speed of sixty miles an hour, even around the sharpest curves of the Middle Division of the road. The safety of the firebox placed upon the top of the frames was thus assured, and this engine became an epoch-maker in the annals of American railroads.

This demonstration having been made, it is hardly necessary to say that the railroads were quick to appreciate the advantages offered by the new construction, and it was rapidly adopted in all new work until it came to be universal. The length of the firebox was no longer limited by the safe lengths of the side rods, but by the ability of the firemen to throw coal. So the box grew until even thirteen feet was touched, but this proved too much for average human muscles, and the standard of length settled down to between eleven and twelve feet for the maximum, giving a grate area of about twice the amount available before the advent of the Class K.

This improvement gave a wonderful impetus to the introduction of the mogul and consolidation types of freight locomotives as well as to an increase in the general dimensions of the passenger engine. The result of this was that in 1890, not quite ten years after the introduction of the high boiler, we find engines with cylinders of 19 inches in diameter, a piston stroke of 26 inches and between 1,700 and 1,800 square feet of heating surface in their boilers.

Coincident with this growth was an increase in the steam pressures carried. In 1878, with the 16-inch cylinders, the steam pressure was limited to 125 lbs. per square inch in a shell ⅜ inch thick and about 50 inches in diameter. Naturally one of the first attempts to obtain an increase of power was to imitate the reckless engineers who screwed down the safety valve, and thus secure an increase of pressure. This was done a little at a time, rising from 125 to 130, to 140, then to 150, and finally in 1890 we find pressures of 160 lbs. per square inch in vogue. Each of these points added to the power of the locomotive, and the 19 in. by 26 in. mogul of 1890 had 105,000 lbs. on the driving wheels and was rated to haul more than 3,200 tons on a level.

In this same year a locomotive was built for the St. Clair tunnel with cylinders 22 inches in diameter and a piston stroke of 28 inches, weighing in working order 180,000 lbs. and carried on five pairs of driving wheels. This must, however, be regarded as beyond the pale of regular practice and as an example of a special piece of work designed to fulfill exceptional conditions and not as a regular part of the locomotive development of the last quarter of the century.

The mogul and the consolidation locomotive, while highly approved for freight work, have never been popular for passenger service, probably on account of the pony truck that every man seems to fear and which, nevertheless, has no derailments to its discredit. Hence there grew up with the mogul another six-coupled engine known as the ten-wheeler, having a four-wheeled truck in front, and thus adding to the tractive power available with the ordinary eight-wheeler of the American type. All sorts of experiences were obtained with these engines, but they were mostly to the good, and the type bids fair to survive, though its importance has been greatly curtailed by later improvements.

The state of the art as resulting from the development of the first twelve years of the twenty-five that are under review was that, in 1890, the steam pressures used had been increased from 125 lbs. per square inch up to 160 lbs., though perhaps it would be more accurate to put the average at 150 lbs. Cylinders and boilers had been greatly increased and there was every prospect that the growth would continue, provided the heating surface could be extended or a more economical utilization of the steam generated be obtained.

This latter point was at the time attracting some attention, though not as much as it deserved in the development of the compound locomotive. For a number of years previous to 1890 foreign engineers had been engaged in experimenting with various types of compound locomotives. The total results obtained, at the time, were not very brilliant, but they were, upon the whole, encouraging rather than otherwise. It cannot be said to the credit of American engineers as a whole that they took any very great amount of interest in this work, and, indeed, with a very few notable exceptions, it may be stated that the officers of the motive power department of American railroads were decidedly indifferent to the success or failure of the compound locomotive; and that whatever success has been since attained in the exploitation and development of the several systems has been due to the persistency of the builders rather than to any encouragement received from the railroads.

During the eighties there were a few compound locomotives built in the United States, but lack of experience resulted in faulty designs, so that the savings effected in fuel consumption were neutralized by an increased cost for repairs or general operative troubles, and the system was not in good repute save in the eyes of those who could look beneath surface indications and see that, while the working out of the details was faulty, the underlying principles were sound. It was this clearsightedness on the part of a few builders, coupled to a persistence worthy of the cause, that has proven to be the salvation of the compound locomotive.

Immediately after the opening of the last decade of the century there was an increased demand for more powerful locomotives in order to meet the expected requirements of the World's Fair traffic to be held at Chicago in 1893, and many of the railroads were putting forth extra efforts to secure machines to do this work. For the most part the work consisted of merely an increase in size, and by the time of the opening of the fair there were a number of engines in service having from 1,800 to 1,900 square feet of heating surface and cylinders 19 inches in diameter.

These dimensions seem to have been the sticking point for again the grate area had become the limiting element in locomotive work, by the restrictions that were imposed on the width of the firebox by its position between the driving wheels. There was, however, a locomotive exhibited at Chicago, which opened the door to a further widening of the grates, though in its own construction this width was limited to a little more than 42 inches. This engine was the Columbia, exhibited by the Baldwin Locomotive Works. The special features of the design were the location of two pairs of driving wheels in front of the firebox, as in the ten-wheeled locomotives, the carrying of the overhang of the firebox on a pair of trailing wheels, and the compounding of the cylinders. In this instance the only advantage gained was the lowering of the top rail of the frame and adding to the depth of the firebox without raising the boiler. The trailing wheels were, in this instance, 54¼ inches in diameter and rose above the top of the frame, thus limiting the width of the firebox in exactly the same way that the driving wheels had done in ordinary construction. The front end of the engine was carried by a two-wheeled truck, after the manner of the mogul and consolidation type. Only the exhibition engine was built along these lines and it was followed by the Atlantic type in which the two-wheeled truck was replaced by one having four wheels; the other features remaining unchanged. It is this type that has since been extensively adopted for heavy high-speed passenger traffic.

While the width of the firebox in the Columbia was no greater than that which had obtained for several years and had become standard practice the suggestiveness of the design is at once apparent. By reducing the diameter of the trailing wheel it is evident that the width of the firebox could be increased to the full width of the engine, by carrying it out over these wheels just as the Wootten type of firebox is carried out over the tops of the driving wheels. This was soon done and the term "wide firebox" was applied to the new design just as it had been to the firebox on top of the frames that came in after the advent of the Class K locomotive upon the Pennsylvania R. R. This, now narrow, firebox had, however, rendered a yeoman's service in all classes of locomotive design and even in 1894 we find cylinders 22 inches in diameter in use upon consolidation engines having nearly 2,300 square feet of heating surface. This was steadily increased, however, by comparatively long jumps during the next five years, until in 1899 engines were in freight service having the firebox on top of the frames, with 3,500 square feet of heating surface; with a total weight of 232,000 lbs.; with cylinders 24 inches in diameter by 30 inches stroke and carrying the enormous steam pressure of 210 lbs. per square inch.

Reverting to the new wide firebox we find a steady increase in weights, cylinder capacities, grate areas and heating surfaces until 3,000 square feet of the latter has been touched and passed and 21 inch cylinders are in use for passenger service.

It was quite natural that at first the rear axle should run in inside boxes like those of the driving wheels and the front truck. But as there were no obstructions in the way and the use of outside bearings had many evident advantages, the frames have been so modified as to make such a construction practicable and a large number of engines have been built in this manner.

We have seen that in the usual type of firebox with the mud ring on top of the frames, the grate area was practically limited to 40 square feet, and this holds even in regard to the largest and heaviest locomotives. This answers for comparatively slow running, but the advantages of the larger grate area for fast freight work is readily apparent and a new type of freight engine was brought out to utilize these possibilities. This is known as the Prairie type and bears the same relation to the mogul engine that the Atlantic type does to the old eight-wheelers; it is formed by merely adding a pair of trailing wheels to the original and using them to carry the firebox. These engines are used for both freight and passenger service and have been built with nearly 3,400 square feet of heating surface; 48 square feet of grate area; with cylinders 20½ inches in diameter and 28 inches stroke; weighing 174,500 lbs. and working with a steam pressure of 200 lbs. per square inch.

This, then, may be considered the gross evidences of the progress made in locomotive construction during the past twenty-five years. The steam pressures have been increased from 125 to 210 lbs. per square inch; cylinders have grown from 16 inches in diameter and 24 inches stroke to 24 inches in diameter and 30 inches stroke, an increase in cylinder volume of 2.81 times; the heating surface has risen from 1,200 square feet to nearly 5,000 square feet and weights have come up from about 100,000 lbs. to 230,000 lbs., and it would be a rash statement to say that the limit has now been reached.

This review of the most striking feature of locomotive development has been given by itself in order to carry the reader through to the end along lines that appeal most strongly to the imagination and which represent the important features, when regarded from the commercial standpoint of the reduction of the cost of transportation.

It must not be considered, however, that this mere agglomeration and accumulation of weights and sizes and steam pressures tell the whole story. Even a cursory investigation would show a very different state of affairs. This heaping up of bulk and tonnage has only been made possible by improvements along the whole line. The larger cylinders called for larger valves and these would have been impossible to operate unless they had been relieved of the steam pressure upon the back by careful balancing. This naturally suggested a self balanced or piston valve and now, after many trials and much experimenting such valves have been so designed that their service is eminently satisfactory. The link motion, to be sure, has experienced no change, but it was found that with large cylinders running at high speeds the old practice of proportioning the laps and leads needed revision. It was found far easier to get this high pressure steam into the cylinder than it was to get it out again, so that negative inside lap, unknown in locomotive practice of a quarter century ago, became a regular portion of the designs of to-day.

High steam pressure also brought with it the problem of cylinder lubrication, and it was no mean problem to produce an oil that would not only work at the greatly increased temperatures but take care of the increased pressures due to the heavier parts.

As already intimated the boiler was early recognized to be the most important factor in the combination. High speeds and heavy trains called for the evaporation of large quantities of water, rising to 5,000 gallons and more per hour. It was, therefore, desirable that the boiler should be made as large as possible and this has been the end and aim of all builders for years. But size means weight, and the load on the drivers is limited by the strength of rails and bridges. So, while there has been the constant urgency to increase the size of the boiler, there has been an equally strenuous attempt to cut down the weights of the other parts in order that as much as possible should be available for the boiler.

Unfortunately locomotives are not made in such quantities as to make drop forgings available to any great extent in the place of castings, and the substitution of ordinary forgings for cast iron is entirely out of the question on the score of expense. Cast iron parts could not be lightened without an undue sacrifice of strength, so, if there was to be any great reduction of weight a different material must be resorted to. The only material that offered any inducement in this direction was the steel casting, and this has been most successfully utilized. In 1890 at the beginning of the rapid advance in locomotive construction, steel castings were only used to a slight extent in this work, and superintendents of motive power were rather chary of the dependence which they placed upon them. But if the material could be made sound and free from blow-holes it offered very evident advantages and the market was ready to the hand of those who could meet the requirements.

At first the application was limited to a few parts where a weakness or blow-holes would not be serious. Successfully used here, and with the manufacturers constantly improving the quality of the output, the number of parts was rapidly increased, and now include the major portion of the castings formerly made of iron, besides being substituted for many forgings. We find them used for pistons, crossheads, rockers and boxes, driving boxes, lifting shafts, driving wheels, foot plates and frames and with a growing confidence in their ability to do the work imposed upon them.

It has not been child's play to raise the power of the locomotive to its present standard, but has been a labor that involved a multitude of details dependent upon widely different industries, and has been brought about by the progress that has been made along the whole line of our industrial system.

The development of the locomotive as thus considered has been that of the simple machine, which forms by far the great majority of locomotives in service to-day. The compound locomotive, however, is far from being the negligible quantity that it was twelve or thirteen years ago. At that time only a few examples were in service in this country and those few were not in high favor with the railroad authorities. Contrary to the practice abroad the experimenting was all done at the expense of the builders and not by the railroads. To be sure the subject was one that was constantly before the Master Mechanics' Association, but the discussions in the convention were mere laudations, while those unrecorded ones between sessions were far from complimentary to the system. The builders were claiming a saving in coal and were effecting it, and as early as 1894 claims of savings of from 25 to 30 per cent over an equal powered simple engine were maintained.

During this period of introduction two types of compound locomotives were exploited in the United States. One was the four cylinder engine of the Baldwin Locomotive Works and the other was the two-cylinder of which a number of classes were put out by as many builders, and which differed from each other mainly in the construction of the intercepting or starting valve. Many difficulties in the details of construction were encountered and overcome, with a result that has put the compound locomotive in a position of a guaranteed success. The saving in fuel by one of these engines should be from twenty to twenty-five per cent of that burned by a simple engine of the same capacity in the same service, and they can be purchased under a guaranteed saving by the makers of fifteen per cent.

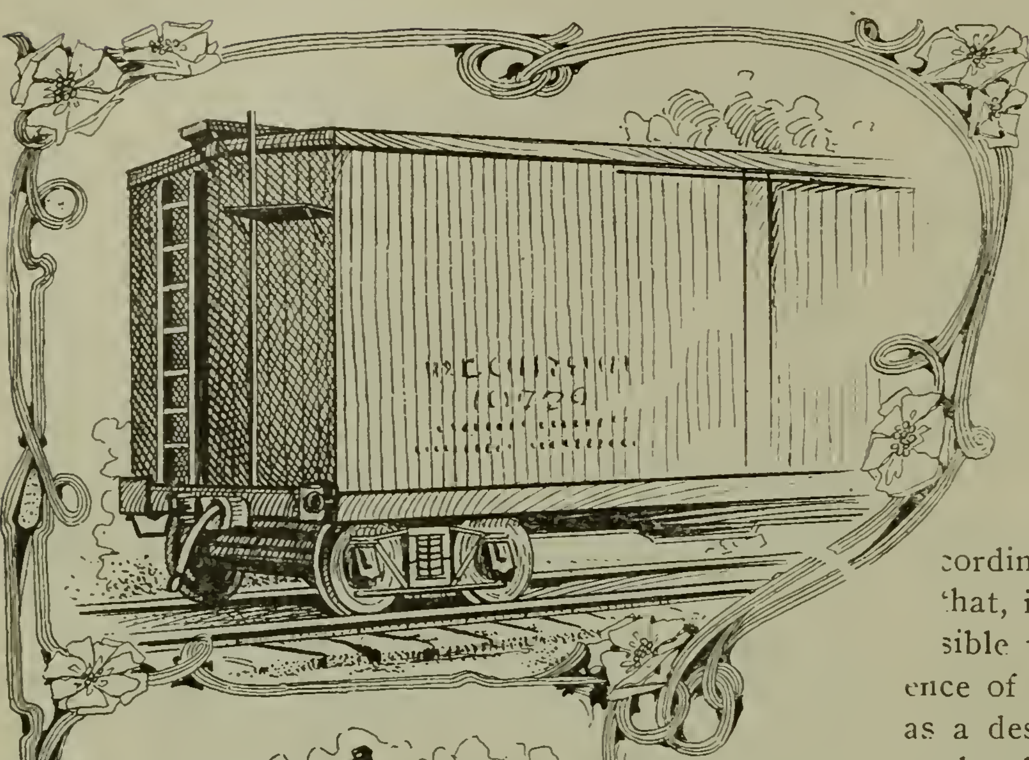
It is of course quite impossible to enter into a discussion of the details of the construction of these locomotives within the limits of this article, but it may be said that after a struggle to perfect the two types alluded to and which were the first in the field, much good work has been done in the development of the four-cylinder tandem and the four-cylinder cross compound, the latter having one set of two cylinders between the frames. The development has been gradual and due to the persistency of the builders who have at last succeeded in placing the machine in a position of assured efficiency.

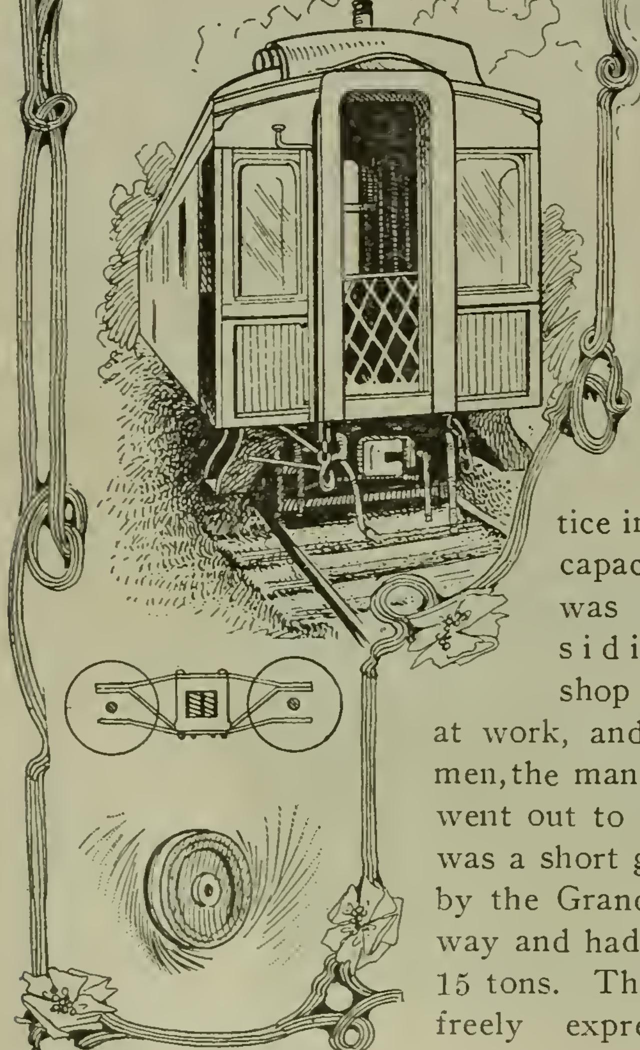
With this review of the wonderful growth that has taken place in the past quarter of a century, what are the prospects for the future? Has the limit of weight, strength and efficiency been reached? Can the locomotive be made to do better service than it is doing to-day? Judging by experience where those who believed the final goal had been reached and were ready to call a halt, were invariably in the wrong, it behooves the cautious man to be careful of expressing corresponding opinions. On the other hand, we know that apparently insuperable obstacles to advancement have "vanished like the breath into the wind," when attacked intelligently and persistently. We know, too, that the evaporative efficiency of the boiler, and the steam utilization in even the best of compounds is far from the best theoretical or practical efficiency as measured by the standards of stationary practice. There is, therefore, a field for improvement still open, and may we not expect to see the locomotive derive the benefits of the use of superheated steam and of water tube boilers and a heated feed-water in the not remote future? Surely these should not appear as impossible to the engineer of to-day as the development of the compound locomotive or the construction of a hundred-ton machine would have seemed to his predecessor of a quarter of a century ago.

C. Klackner, New York City.

BEFORE THE DAYS OF THE RAILWAY MASTER MECHANIC.

A Quarter of a Century of Car Building





An engineer who is well known in railroad circles is very fond of telling the story, how, when he was an apprentice in 1878, a high-capacity box car was set off on a siding near the shop where he was at work, and how all the men, the manager included, went out to look at it. It was a short grain car built by the Grand Trunk Railway and had a capacity of 15 tons. The opinion was freely expressed among this inspecting junto that the top limit in car capacities had been reached and grave doubts were expressed as to the advisability of building even such a car as the one before them. This opinion may have been a little conservative, but it was warranted by that set forth in the Master Car Builders' Association of 1877, where the inadvisability of increasing car capacities was urged. Ten tons was, at that time, the standard capacity for all freight cars; and, while deprecating the excessive dead weight involved in cars of that class, the car builders did not see their way clear to remedy it.

Matters have changed so in these twenty-five years that it is difficult even for those who were engaged in car work at that time to realize what a chaotic condition existed. The ten-ton car was, as already stated, the standard of capacity, but there the standardization abruptly ended. Although the association had adopted a pedestal journal box and axle, they had received but scant recognition in freight service even in 1878. Each car builder was constructing cars according to his own ideas and it is quite safe to say that, in most instances, it would have been impossible for him to have given a reason for the existence of those ideas. There was really no such thing as a design for a freight car. No calculations were made of loads and stresses; cars were built in large quantities without drawings, and when one of them failed the next lot was merely strengthened at the point which had developed the weakness. What are now considered as essentials were wholly neglected and the result was that each car builder was a law unto himself and it frequently happened that cars built at different shops on the same road, for the same service were very far from being alike.

The car coupler was in a state of confusion worse confounded. Many patents had been issued for both automatic and non-automatic couplers, and railroad men had been so pestered by the representatives of devices which were absolutely unsuited to the work which they were intended to perform that less than scant courtesy was afforded the promoters. The only thing that had been done towards the standardization of this portion of the car was in regard to the height of the draw-bar. This had been placed at 2 ft. 9 ins. above the rail, but it was disregarded to so great an extent that bent links were everywhere in evidence. That this was so is shown by the recommendation made at the convention of 1879 to the effect "that special pains be taken to have the draw-bars in all freight equipment made 2 ft. 9 ins. from the top of the rail to the center of mouth of the draw-bar." A resolution that certainly would not have been passed had there been no necessity of urging the railroads to conform their work to the standard.

What was true of the draw-bar went into every other detail. The standard axle was regarded by many, if not the majority of railroad officials, as too heavy, and so these parties simply did not use it. There was no more uniformity in truck construction than there is today; but, at that time, the diamond truck, which afterwards became a virtual standard, was not used very extensively. It had been known for many years but it was still felt that there should be an end-cross piece to hold the trucks square and so the full frame of wood or metal, usually the former, was in use.

The air brake was still too new and too expensive, it was thought, to permit of its application to freight cars, and all brakes were applied by hand.

So it would be possible to go on through every detail. Each road was a law unto itself, and each was governed by the whim and prejudice of its car builder, who was usually relying entirely upon his own practical experience to carry on his work, and who operated solely by the rule of thumb.

With the railroads divided into separate units to a far greater extent than they are now; with car builders jealous of their own originality, and with no good reason why each should not follow the lead of his own ideas, it will be readily understood that car building was far from being established upon scientific principles and that the whole subject seemed involved in inextricable confusion.

In the passenger department matters were somewhat better. The truck had been developed until it was practically of the same form that we find it in to-day. The automatic coupler of the Miller type was in general use and the air brake was receiving a rapid and extensive adoption. The cars, to be sure, were lighter and shorter than those of to-day, but to all intents and purposes they were the same. The couplers had checked the sway that was characteristic of the work of the late sixties, and the sleeping car had become a feature of American railroading. Many of these cars were light, some not weighing more than twenty-six or twenty-eight tons, but they were looked upon as being very luxurious and the public may be said to have been content. So, while the passenger car has grown in strength and size and ease of motion and luxury of finish during the twenty-five years that are past, it is in the freight equipment that we will find the most radical changes and improvements.

These improvements have been the result of a development due for the most part, to the new demands that have been made. Surely it would have taken greater wisdom than that usually possessed by mortal man to have taken the problem, as it was presented in 1878 and have marked out the lines of the solution in a way that would have been at all satisfactory, or which would have reconciled the many opposing opinions that existed in regard to each and every detail entering into the construction of the vehicle.

The influence tending towards a change was from outside the car department while the influences towards uniformity were at work within.

It had been felt for a number of years that the ten-ton car was not all that it should be. Its dead weight was about equal to its capacity and this was known to be a much worse showing than that made by the English four-wheeled cars. The same arguments were then used that have since been so potent in the development of the large car; that an increase of capacity would result in a decrease of the proportion of dead weight and therefore an increase in the proportion of the paying load that the locomotive was to haul.

If we are to believe the reports of the discussions of the Master Car Builders' Association conventions there has never been a time when the demands upon the car department for economy of operation have been so great as they are at "present." The word "present" being taken to refer to each and every succeeding year in the history of the association from its birth to that of its most recent meeting. So we may naturally infer, even though our recollection did not bear us out, that, in the later years of the seventies, considerable pressure was brought to bear upon the car department to produce a car that would carry a heavier load and weigh no more than the old ten-ton capacity car.

One of the first fruits of this pressure was the production of the fifteen-ton car by the Grand Trunk Ry. It was not, however, an acceptable car, even to its builders, for its increase of strength was gained by shortening the distance between the body bolsters, with the result that it was an exceedingly awkward car to handle at elevator chutes and before warehouse doors that had been spaced to take cars of ordinary dimensions. The order was never duplicated but experience had taught the valuable lesson of the advisability of meddling with the average longitudinal dimensions of the car.

Increase of capacity was in the air and before the close of the eighth decade of the century cars of fifteen tons capacity were very much in evidence. At first these cars were built anew on the guesswork basis, but the changes made in the ten-ton car to produce that of fifteen, were so slight and the actual increase of strength was so insignificant that it became a common method to increase a car's capacity with a paint pot; a short and cheap method but one that once bid fair to be carried to such extremes that the old cars seemed to be carried away on the wings of the wind and a new lot substituted, but bearing a marked resemblance to those that had gone before.

There is no means of substantiating the assertion, but appearances go far to establish the belief that the majority of fifteen-ton cars were metamorphosed from the ten-ton by the magic touch of the paint brush.

The entering wedge had, however, been driven and the operating department would no longer be content with the old car or even the new, but clamored for still higher capacities, in order that the theoretical cost of the transportation of a ton of freight might be further reduced.

The jump from ten to fifteen tons capacity was an easy one, especially if a paint pot was convenient, but the next five tons called for a greater strengthening in the body of the car. This was done and there was a marked difference in the appearance of the new 40,000 lb. capacity cars and those of the old regime that had gone before. They were more substantial in every way, and seem to have been very satisfactory. This weight seems to have touched the last notch of the possibilities of the old M. C. B. axle, for we find, in a committee report at the convention of 1883, it was agreed "that 40,000 pounds of load, not including the car, is all that can safely be put upon the present master car builders' standard axles and our present construction of freight equipment."

Such a report was all very well as far as it went, but with the temper of the railway world as it then existed, the mere fact that the standard axle was not strong enough to carry heavier loads was no reason why heavier loads should not be carried on a stronger axle, and we find cars of 50,000 and 60,000 lbs. capacity following close upon the heels of those of 40,000 lbs. and with such rapidity that they seem to have put in an appearance at one and the same time. Still, with this three-fold increase of capacity that had taken place in the years between 1878 and 1882, the methods of construction had not changed and did not change for a number of years.

The explanation may be inserted here that, while cars of 60,000 lbs. capacity were not in common use in 1882 some experimental cars of that kind had been built, and their use was positively recommended but with the reservation that they should be built cautiously.

Reverting to the method of design and construction, it continued to be that of the rule-of-thumb for many years, and as an example of the widely varying results that are apt to follow from a close adherence to this system, an analysis of the strength of certain body bolsters made in 1892 may be cited.

These bolsters were all under cars of 60,000 lbs. capacity of, at that time, recent construction. Their safe carrying load based upon the same factor of safety varied from 36,000 lbs. to 84,000 lbs. each. At the time some car builders were calculating the strength of their parts and it was considered good practice to use a bolster whose working strength was equal to the total capacity of the cars. The analysis, however, shows the wide variance of practice.

The result of this was what might have been expected. Some cars were made abnormally and unnecessarily strong while others were weak and sagged at the bolsters and in the center, especially at the former, until the bulk of the load was carried on the side bearings to the detriment of the flange wear of the wheels and the coal consumption of the locomotive.

As soon as the movement of increased car capacity was started, wood began to disappear from truck construction. The wooden framing was the first to go, and the diamond frame was put in its place, where it remained practically the only thing used for many years. Steel channels for transoms came in with the frame, but the wooden bolster was slow to yield. At first it was a plain oak beam, then it was trussed, then split and fitted with flitch plates. But sooner or later it sagged and brought the side bearings into contact, until it was finally discarded and the steel bolster put definitely in its place, thus finally evolving an all-metal truck. These changes were not made all along the line at one and the same time, but with the straggling effect of an army of vagrants which may be seen to move in one direction when viewed from afar, but which seems to have no aim or purpose to the man in its midst. In fact, the wooden bolster has not yet been entirely eliminated from new construction.

As in all matters of development, it is impossible to give dates that are absolutely beyond dispute because no one improvement was introduced universally at one and the same time. In a way the diamond truck may be said to have come into general use by 1881, and the wood to have disappeared or, rather, the metal bolster to have appeared in 1894, but the evolution is not yet complete though it bids fair to be before long.

As soon as the trend to increase car capacity was fairly appreciated, there were some progressive men who began the advocacy of a steel car frame, but it was a number of years before this form of structure became a feature of American rolling stock. When it did come it was the result of a development and did not spring full panoplied into existence.

We have seen how steel was gradually made to supplant wood in all portions of the truck; so the same metal has been slowly introduced into the several parts of the car body until now certain types are built entirely of steel while others are still in the transient condition and will probably be a long time in developing into a full fledged steel car.

At the opening of the period which we have under consideration, the body bolster as well as those of the truck were of wood. Some were trussed and some were merely oak beams. This statement, however, like all others involving dates of practice, must be taken with an allowance, for as early as 1877 we find the car builders discussing the best method of making a metal body bolster, and in 1875 they were objecting to the metal bolster on account of its cost and maintaining the reliability of the wooden one. But confidence in this latter construction was short lived after the commencement of the movement in the direction of increasing car capacities, and from that time on the introduction of the iron body bolster took place all along the line. Yet the progress was slow, for in 1883, after really ten years of experience with the metal body bolster, a committee in reporting on the substitution of iron and steel for wood in car construction wrote that: "Judging from present appearances the change from wood to steel and iron will be a gradual one, piece by piece. Iron trucks seem to be working their way into favor more and more. The same may be said of iron body bolsters." Never was a prophecy more literally fulfilled. Steel has come into use in car construction "piece by piece," and the end is not yet.

It is difficult to analyze the reasons that blocked the immediate substitution of steel for wood in the body bolster. Car builders and all connected with railroad work have been complaining from time out of mind of the weakness of bolsters and the trouble that has been experienced on account of the sagging of the same and yet these same men have persisted in designing cars that were weak and have resorted to all sorts of makeshift expedients, instead of taking the dilemma boldly by the horns and putting in a bolster that would and could do the work. It is impossible to enter into the details of the constructions of bolsters that have been used in this development, other than that they have passed through the successive stages of the simple wooden beam, the trussed wooden beam, the flitch plate, the bolster built up of two flat plates, the pressed steel and the steel casting, each increasing in weight and strength and cost, until, at the present time, it is generally conceded that strength is of the first importance; that sufficient weight must be put into the structure to insure that strength, while the cost must not be cut down to the detriment of the first.

This somewhat extensive discussion of this matter has been introduced in order to show the tardiness with which innovations on established practice have been adopted. What is true of the steel bolster is equally true of the other metallic parts that have entered into car construction.

It was not, however, until 1888 that a serious attempt was made to substitute steel for wooden parts in the work. Of course center plates and certain other wearing pieces had necessarily been made of metal for many years, but wood had been the prevailing material. In the year named the entering wedge for the introduction of steel and the development of the composite and metal car was driven. It was a little thing, nothing more than a pressed steel stake picket. It was well received because it was both light and cheap, and rapidly led to the making of other parts until in 1896, about everything that had formerly been made of cast iron could be obtained of pressed steel.

Meantime there had been a rapid and extensive development of the steel car abroad, and in 1890 metal underframes were very common on foreign roads. A year later some ore cars were built entirely of iron for a Spanish road, and in 1892 the International Sleeping Car Co. had some cars built with metal underframing.

While this work abroad could not fail to attract attention, it does not seem to have had much, if any, influence upon American practice previous to the Chicago Exposition in 1893. A steel car had, however, been introduced into this country in 1890. It was the one known as the Harvey, a car that after a service of two years was reported to be "satisfactory" but which was possessed of such defects that it was never extensively introduced. The car did, however, attract widespread attention and served to prepare the railroad world to accept the steel car; a frame of mind that was undoubtedly promoted by the World's Fair, where the master car builders of the United States were made to realize that the steel underframing was the recognized method of construction everywhere except in this country.

Immediately thereafter there was a decided impetus given to metal car construction, and in 1896 a number of examples were exhibited at the Master Car Builders' convention at Saratoga. Some of these were built entirely of structural shapes, while pressed steel was used for others. Everyone looked and admired, thought they were good things, but when urged to buy, "all with one accord began to make excuse." The cars were not adapted to easy repairs; they would rust, they were heavy, they were expensive, in short the railroad officials either did not have the courage of their convictions or the authority to carry them into execution.

The time was ripe for some progressive man to step into a new field and show that the mountains of objections were merely molehills seen through the magnifying glass of indecision. Such a man appeared in 1897 in the person of Mr. J. T. Odell, at that time vice-president and general manager of the Pittsburg, Bessemer & Lake Erie R. R. He placed an order for a number of steel gondola cars of 100,000-lbs. capacity. Everyone was on the qui vive to learn how they would work, and profit by the experience of this first man. Of course everybody's hopes and expectations were realized and orders followed thick and fast from those who had not dared to take the lead. In fact, during the next two years, orders were entered for more than nineteen thousand of these cars.

The steel gondola having shown that it was admirably adapted for the carrying of coal and ore, the use of the steel underframe for box cars naturally followed. To this was shortly added the steel upper framing, and we now have a complete steel box car, made of metal throughout with the exception of the sheathing, lining, roof and flooring. Owing to the exigencies of our climatic conditions, wood is the only housing material that has thus far been found to fulfill the demands of the service and, from present indications, it bids fair to hold its own for a number of years to come.

Turning back to the early days of the Master Car Builders' Association for a brief review of another matter, we find that, for more than thirty years, there has been a constant effort to introduce a uniformity into car construction for the purpose of facilitating repairs, interchange and first cost. For this purpose a large number of standards have been adopted and where these have not been considered advisable a recommended practice has been established. These have accomplished much in the direction intended, but for the whole thirty years it has been the dream of the car builder to have a standard size of box car, a dream that appeared never likely to be fulfilled. There seemed to be every possible obstacle in the way.

The ideas of the individual car builders may have been and probably was a formidable obstacle to uniformity, but the principal one was to be found in the traffic department which insisted upon a competition in rates that involved the construction of cars of all sorts and descriptions and of every imaginable dimension. At first they existed at the time of the opening of this period as furniture cars; larger than the ordinary box car, but not excessively bulky. But, under the demands of shippers and the competition between the railroads they grew until, in 1890, they had a length of 50 feet and a width of ten. The troubles and abuses arising from the great variety and capacity of such cars, made the need of a standard more imperative than ever and really resulted in the adoption of such dimensions by the American Railway Association in November, 1901. The details of these cars have not yet been worked out, but the prospect is that the long-devised standard box car will soon lose its character of an illusive will-o'-the-wisp and become a tangible reality.

In this discussion of the development of the freight car, two points marking an era in the practice of the country have been neglected. One is the introduction of the power brake and the other that of the automatic coupler. They occurred at about the same time and as a result of practically the same influence.

In 1878 the situation was that while the air brake was being rapidly introduced in passenger service and had practically been adopted as a standard, the whole railroad community looked upon it as being far too expensive and dependent upon direct locomotive connections to have the slightest chance of ever receiving a general introduction in freight work. In fact such a contingency was not even considered.

The position regarding the car coupler was simply chaotic. Thousands of patents had been issued to men who had not the faintest conception of the requirements of the service, and no railroad man had the slightest confidence in the ability to solve the problem, though all were eager for such a solution.

In the early eighties, however, there came an urgent demand for power brakes and automatic couplers. As a result of this a number of buffer, momentum, steam, air, electric and vacuum brakes were brought out, and their promoters were clamoring for the recognition and adoption of these devices. No one knew how they would act, and few had much, if any, idea as to what the requirements of a train brake really were. As a result of this agitation, the Chicago, Burlington & Quincy R. R., under the direction of Mr. Godfrey W. Rhodes, instituted a series of tests in 1887. In spite of protests from all concerned Mr. Rhodes insisted that these tests should be made with trains of fifty cars, and he had the satisfaction of having the whole railroad world reverse its first attitude and endorse his position. To say that these tests constituted a series of surprises to all concerned is to state the matter mildly. The shocks in the rear cars were terrific and life itself was in danger as the result of the stops.

It was shown that speed in the application of the brake throughout the whole length of the train was of the first importance, and that this application should be made upon each and every car at practically the same instant. It was also found that coupler slack between the cars should be eliminated to as great an extent as possible.

This ruled out all momentum and buffer brakes, as well as those working with a vacuum, and increased the demand for a close coupler. In their first report the committee, of which Mr. Rhodes was chairman, having the matter in charge, came to the conclusion: "That the best type of brake for long freight trains is one operated by air and in which the valves are actuated by electricity." In short, the air brake, as made at that time, was too slow.

As there were evident objections to the use of electricity as an auxiliary in the operation of the air brake, work was started at once on improving the apparatus as it then existed. The celerity with which experiments were made and a new apparatus designed was very remarkable, for almost before the ink of the report was dry upon the paper the necessity for an electric operation of the valves had been done away with and the quick action automatic air brake brought into being. So that one year later the sky was cleared and it was a mere matter of time when the air brake should be that adopted and used upon all freight cars. From that time on the introduction and application has been rapid and constant until today it is a standard portion of the equipment of all new cars.

It so happened that the demand for a standard automatic coupler culminated in the adoption of one at the time when active preparations were in progress for the Burlington brake tests. At the Minneapolis convention in 1887 of the Master Car Builders' Association it was agreed to submit the Janney type of car coupler to letter ballot as a standard. This was done and, as all the world knows, it was adopted.

So in 1888 the country started out with two great problems solved, or at least with the means of solution indicated: the train brake and the automatic coupler. The introduction of the two has gone on side by side for many years; urged and insisted upon, to be sure, by state legislatures and the National government, but, for the most part, willingly by the railroads themselves.

In this brief review only the salient features in the development of the modern car have been touched upon, and many most interesting details have been necessarily omitted, but enough has been said to show the general course that has been followed in the development of the ten ton car of 1878 with its multitudinous variety of tails, built by the rule-of-thumb and to a great extent incongruous in the proportioning of its parts, into the car of today built upon scientific principles, larger, heavier, stronger than its predecessor and more economical of operation. That this car as it stands is the final type in the evolution, no one believes, but that it is an efficient vehicle of modern transportation even the most captious critic must concede.

The development of the cars used in passenger service has been almost if not quite as radical as that which has been noted for freight work. It has, however, been more in the elaboration of detail than in fundamental principles of construction. The framing has been strengthened and lengthened. Steel has been introduced, but not to the extent that it has in the box and gondola car. The wooden bolster has been supplanted by steel; the channel steel plate truss has been introduced to strengthen the side framing; steel carlines have been put into the roof to stiffen it and a multitude of other changes have been made. In the interior the methods of ornamentation have been wonderfully improved; the old stove has entirely disappeared and steam heating with the locomotive as its source of supply has taken its place; the oil lamp has been improved or supplanted by gas or electricity, although the latter must still be considered to be in an experimental condition.

In the trucks the most noticeable feature is perhaps the extensive introduction of the six-wheeled type due to the use of the long and heavy car bodies that were unknown a quarter of a century ago.

To the public these changes have come so slowly and gradually that it is impossible for it to realize what has taken place. It is merely conscious in a dim and hazy way that the speeds of trains are greater, the comfort more, and that is all. It does not realize what this means and how much careful and thoughtful study has been put into the modification of every detail entering into the modern construction; of the work involved in the change from the stove to steam heat, the introduction of gas lighting, the lengthening of the car body, the adjustment of springs, the adaptation of couplers and buffers to the heavier loads; the application of the vestibule and the development of the high speed brake. All of these things have taken time and patience that has extended over the whole period under review.

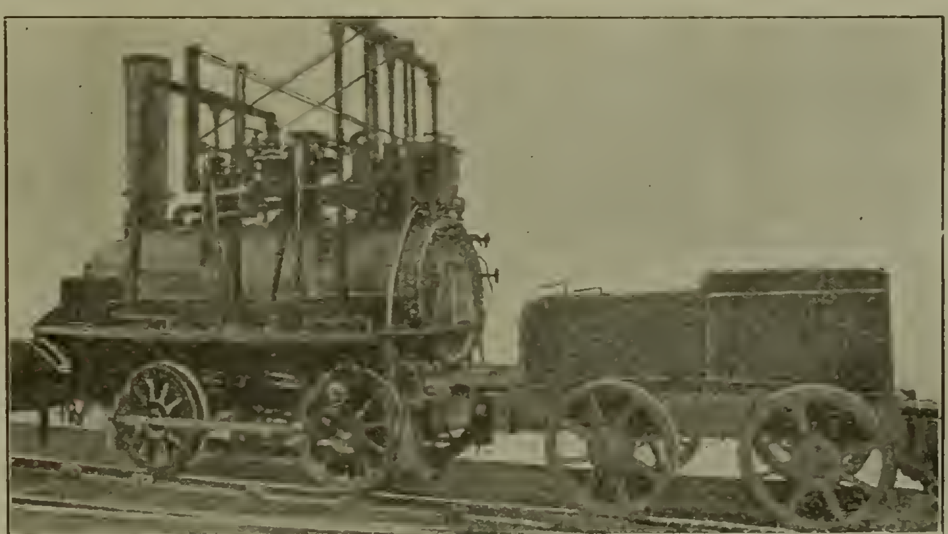
It is manifestly impossible to discuss the development of the passenger car within the limits of this article with even the scanty elaborateness that has been devoted to the freight car. Important as it is, it occupies but an insignificant place in point of numbers compared to the freight car, but as a vehicle in which no expense is spared to make it the embodiment of modern luxury it stands pre-eminent.

It would be rash to attempt to predict what the future has in store for the car builder, but it is safe to say that whatever may come, that however luxurious the passenger car may be and however great may be the capacity of the freight car, the last quarter of the nineteenth century will always be able to hold its own as an era of remarkable advance in every department of railroading and especially in the development of what is now considered the modern car.

The Oldest Locomotive in Service

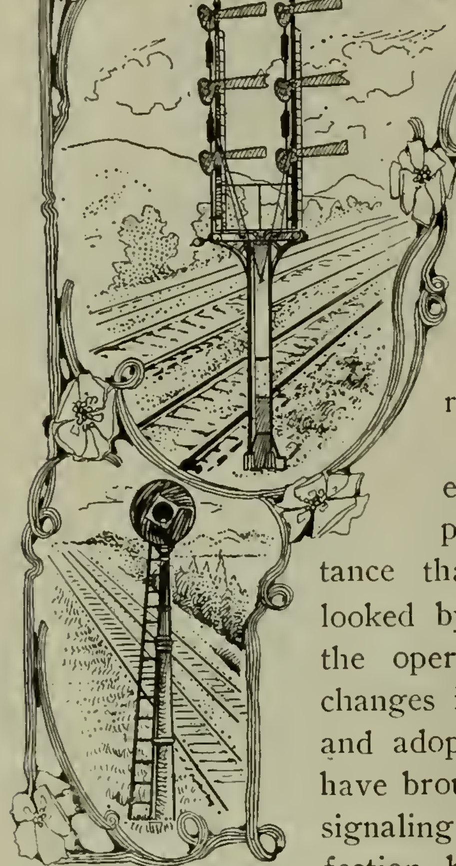
THE Locomotive Firemen's Magazine republishes from the Railway News, of London, the following description of an old locomotive which was the oldest locomotive in service until it was retired very recently, together with the accompanying illustration of the same:

One of the original locomotives, built by Stephenson in 1822 for the opening of the line, is still employed hauling the trucks at Hetton, and is now, after nearly eighty years, continuous service, claimed to be the "oldest working locomotive in the world." The principal dimensions of this "old timer" are: Diameter of the cylinders, 10¾ in.; piston stroke, 24 in.; diameter of the wheels, 3 ft. The weight of the engine is 15 tons, and it has a haulage capacity of about 129 tons at a speed of 10 miles an hour on a fairly level track. Its general design (excepting the cab) remains as originally constructed, whilst some parts, notably the steam dome, are actually portions of the engine as constructed in 1822. After this long and faithful service it is not surprising to learn that the engine is at last becoming unequal to the ever-increasing demands made upon it, and the directors of the Hetton Colliery therefore, and with commendable appropriateness, shortly intend to withdraw the relic from Hetton, and it will in the course of a few weeks find a permanent "resting place" at the Durham College of Science, Newcastle-on Tyne, where it will be preserved to this and future generations as a worthy example of the earliest period of locomotive engineering. It may be here noted that Stephenson's "No. 1 Locomotion," built for the opening of the Stockton and Darlington Railway in 1825, continued in working on "the first public railway" until 1850, when it passed into the hands of Messrs. Pease and Partners, by whom it was used for colliery purposes until 1857, at which time it was placed on a pedestal for exhibition at Darlington Station, where it is to be seen today, so that not only in point of date of construction but also as regards years of "active service," must the engine used at the opening of the first public railway give place to that constructed for the Hetton line by George Stephenson four score years ago.



THE OLDEST WORKING LOCOMOTIVE IN THE WORLD.

Development of Railway Signaling in the Last Twenty-Five Years



THE quarter century just completed has witnessed the practical development of a branch of engineering which has, until the last few years, attracted but little notice outside of railroad circles.

Signal engineering, however, has recently been productive of such importance that it can not be overlooked by any official engaged in the operation of railways. The changes in design, new inventions and adoptions of standards which have brought signal apparatus and signaling to its present state of perfection, have nearly all taken place within this period and present indications seem to say that we have only gone a step forward.

Signals may be divided into two general classes; block and interlocking; the former having to do with the maintenance of space interval between trains and the latter including all methods of interlocking derails, switches and signals for the protection of trains at drawbridges, crossings, junctions and other fouling points where there is possibiity of accident. Under the latter may very properly be classed switch signals for government of trains approaching outlying switches and crossovers. I shall first discuss block signals, which are perhaps the older of the two, as certain principles regarding their use were agreed upon as far back as 1841 at which time the semaphore arm was adopted at a meeting of the English railway officials.

BLOCK SIGNALING AND SIGNALS.

There are three general methods of operation into which block signaling may be divided, viz: Telegraphic, controlled manual and automatic. Each of these three methods of operation may be subdivided a number of times according to the actual construction and operation of the signals themselves.

The first method of operation is much the oldest, having been in use in some form for the past fifty or sixty years Previous to 1870 fixed signals were in use only at certain points on American railroads and were of the nature of block signals. Up to that time there had been no attempt to locate fixed signals at regular intervals to govern traffic over certain divisions, however, when signals were located for this purpose the first could be classed under the head of telegraph block. The communication from one block station to another was not always carried on by telegraph as bells were used to some extent at first. In later years telegraph instruments succeeded bells, as information could be transmitted more fully by them. While the construction and mechanical operation of signals used in telegraphic block systems vary indefinitely, the fundamental principle of operation of all is the same, that is, the operator must obtain information to the effect that a block section is clear before he can clear the signal for a train to enter it.

There are a vast number of shapes and colors of telegraph block signals in use on the different railroads in the United States but it is a feature of nearly all of them that they will gravitate to the stop position in case of disconnection of the apparatus at the signal and this principle is carried out in the design and construction of all signals of any consequence.

By making blocks of the sections of track between stations the telegraphic block can be comparatively cheaply installed on any railroad and this fact, coupled with the increased safety of operation over train order systems, has led to a general adoption of the telegraphic system and at the present time it is in use on most of the prominent railroads of the United States.

On some roads it is a rule to have two men work in conjunction to give a train permission to enter a block section but even with this precaution there is a chance for a mistake at any time as there is wherever the human agent is the controlling factor. To overcome this difficulty, the Sykes controlled manual system was devised.

The Sykes was the first of the controlled manual system to be used in the United States and except for a few changes in the design to remove certain defects, is the one that is in use today on some of the eastern railroads. The principle upon which the Sykes system works is as follows:

A block operator "A" wishing to let a train into a block notifies the block operator "B" in advance who, by closing a switch, releases A's signal which can then be cleared for the train. The train passing the signal automatically changes it to the stop position by means of electric slot controlled by a track circuit. Clearing A's signal, breaks the electric releasing or unlocking circuit which can only be restored by a train running over track circuit just in advance of B's signal. There were some features of the original machine which were not satisfactory. One was that it would fail in such manner that signalmen could clear his signal. Another, though not so important, after signal had once been unlocked, it would be locked up upon being returned to the stop position.

To overcome these and other minor disadvantages, the Patenall instrument was introduced and later the Union lock and block system. In the best installations of both of these systems it is usual to extend the track circuit throughout the block to prevent a portion of a train leaving block from releasing the signal governing the same.

All of the above manual controlled systems are applicable to double track only. There are two, however, which can be used for single track, viz: the Staff system and the Fry & Basford system. The latter works equally well on single and double track, but the Staff system can only be used on single track. The Fry & Basford system is much the same in operation as the Sykes except that the instruments are of more simple construction and the unlocking is effected by means of polarity of line current and polarized relays. The release to allow of operation on single track consists of making two electric contacts in pre-determined order. None of the manual controlled systems, except the Staff system, seem to be gaining in popularity and but few, if any, machines are being installed.

The Staff system was first put in operation in this country on the C. M. & St. P. Ry. in the year 1894 at which time it was in general use in England. The authority for a train to run through a block under this system is a staff in the possession of the engineer. A staff machine is located at each end of block and it requires combined efforts of both operators to remove a staff. When staff has been removed, no more staffs can be withdrawn until the first has been returned to either machine. While this system has not come into general use, it is very effective as a means of safely blocking a piece of crowded single track. It is usually operated as an absolute block system but can be operated as permissive. The C. N. O. & T. P. Ry. and the Santa Fe railroads are using the staff system on some particularly dangerous sections of their mountain divisions and a number of machines are in use on the C. M. & St. P. Ry.

The automatic block signal systems may be divided into a number of different classes according to method of operation, power used for operation and the construction of signals.

The oldest form of automatic signal used was the now familiar Hall electric disc and the first application was made on the Easton R. R., now the Boston & Maine Ry., in 1871. This installation was operated on open circuit plan with track instruments for opening and closing the circuits. Home signals were normal clear, the circuits of these signals only being closed. To guard against possibility of accidents, a second signal, called the safety signal standing normally in caution position was placed 500 feet in advance of each home signal. This signal cleared when home signal went to stop position, showing the engineer that everything was in working order.

Within a few years installations of these signals working on same principle were made on the Boston & Albany, Boston & Lowell and Old Colony. The performance of these signals proved that the safety signal could be safely dispensed with by making all controlling signal circuits closed circuits. This was shortly afterwards done thus establishing a fundamental principle of all electrically controlled automatic signals.

The next development of importance in automatic signaling was the invention of the banner signal, a signal of both form and color. The day indications were given by two discs, one oval and one round, set at an angle of 90 degrees on a vertical revolving axis, the motive power for which was furnished by a heavy weight in the body of pole. These discs made one-quarter of a revolution at each opening or closing of signal circuit and being of different forms and colors and having the same back ground the signal was discernible at a considerable distance. On account of the more or less complicated mechanism and the consequent liability of failure, this type of signal has never been extensively used.

A number of automatic time signals were tried and all were sooner or later discarded. The Fontaine Electric Time signal was the best of these and operated as follows: The signal consisted of a large dial divided off by numbers from 1 to 15 supporting a hand or pointer which normally pointed to the figure 15. A train passing, set the hand to 0 and it immediately began to travel back across face of dial to the figure 15 at the rate of 1 point per minute. Thus for any time up to 15 minutes, the hand indicated the number of minutes since a train passed. None of the time signals were used to any extent as they gave but very meager information concerning the condition of the track ahead and afforded little if any protection.

Between the years of 1885 and 1890 the number of accidents occuring on roads where electric signals governed by track instruments were in operation, drew the attention of railway officials and signal manufacturers to the insufficient protection such systems afforded and track instruments for operation of signal circuits were relegated to the past. They served a purpose nevertheless as without them the cost of installing the first automatic block systems might have dismayed conservative railway officers and the progress of signaling suffered as a result.

After the disc and banner signals had been in use a few years there was a demand for an automatic semaphore signal which could be economically operated and relied upon as a signal. The electro pneumatic signal satisfied this demand to a certain extent but could hardly be called an economical signal to operate. A considerable number of these signals were installed, however, and are giving satisfactory service to the present day.

A short time after the introduction of the electro pneumatic block, Mr. Lattig of the Lehigh Valley Ry. designed and patented an electrically operated semaphore. This signal consisted of a motor fastened to the pole a short distance above a balance lever which was connected by a short up and down rod, to the signal arm casting. A drum geared to the armature shaft carried a phosphor bronze rope, one end of which was fastened to the weight end of balance lever. Rotation of the motor in one direction wound up this rope and lifted the up and down rod clearing the signal. The motor with its gearing mechanism was enclosed in an iron case

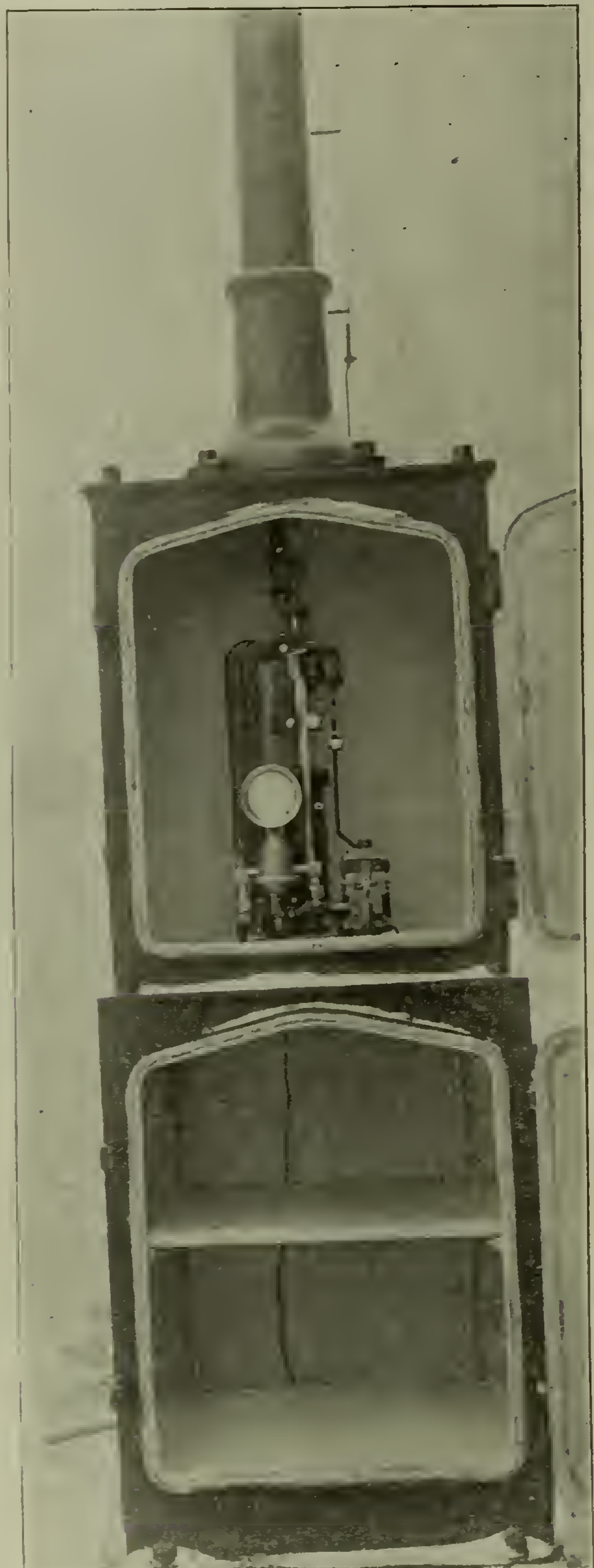


Fig. 1.—Hall Electric Gas Seamaphore.

making its operation comparatively free from failures, but there were so many other working parts exposed that this type of signal could only be operated with safety on the normal danger plan.

The placing upon the market of inside connected electric semaphore signals by both the Hall and the Union Signal Companies served to make automatic signals much more popular with signal engineers and railway officials in general, as it made possible the installation and operation of automatic semaphore signals at a figure which was not out of reach of all but the larger railroads. The only working parts exposed in either of these signals are the arm and arm casting and a small piece of shaft supporting them. This feature makes them equally applicable to normal clear and normal danger.

The Gray and Herman electric signals have been introduced in the last few years and are very much the same as the signals referred to above with the exception of a few changes in the method of transmitting power from the motor to the arm and in the slot for holding clear. The three position electric semaphore was first worked out by Mr. Gray in his signal and a large number of signals of this type were installed on the P. F. W. & C. Ry. near Pittsburg.

The latest automatic semaphore signal to be placed on the market is the Hall Signal Co.'s electric gas signal, the first of which was put in service on the Illinois Central R. R. in Chicago less than a year ago. The results from the first signals installed have been satisfactory to most signal engineers and at the present time there are some 200 or 300 in operation or being installed. A section of about 40 miles of double track on the Illinois Central Ry. in Kentucky is now being equipped with these signals. This signal is a considerable departure from other semaphores in that the power for its operation is obtained from carbonic gas under high pressure. The pressure is reduced by a diaphragm reducing valve to a pressure of 30 or 40 pounds per square inch. An electrically operated pin valve admits the low pressure gas to a sliding cylinder attached to the up and down rod of the signal which operation causes cylinder to rise and clear the signal. At a certain point in the travel of the cylinder, a trip allows an arm, also attached to the pin valve, to drop, closing the cylinder to the gas and opening it to the air. At this point the gas in cylinder exhausts to the air and the signal is held in the clear position by a dog attached to cylinder engaging with a step on a swinging arm at the lower end which is attached to the armature of an electro magnet. The deenergizing of this magnet allows the arm carrying armature to swing out and disengage the dog and signal arm gravitates to stop position. While this type has not been as long in service as the other types of semaphore signals, the results so far obtained seem to indicate a bright future for it. The mechanism of this signal is shown in Figure No. 1.

The Kinsman block system was tried experimentally on the C. M. & St. P. Ry. in 1894 and taken out after six months' service on account of failure to operate as desired. The principal reason that this system was not a practical success, was that the main electric circuit was an open circuit and a failure to operate gave the engineer a clear signal.

A system of automatic signals was installed on the C. M. & St. P. Ry. early in 1902 by the Rowell Potter Safety Stop Co. and operated experimentally for about six months. This system differed from all other automatic systems in that a safety stop at each signal and one 180 feet in advance of each was added as an additional precaution. The method of obtaining power for the operation of signals and stops was a departure from all other methods and a very ingenious one. A track treadle or lever operated by passing trains wound up a set of springs in a machine which stored the energy thus obtained and converted it into motion of a pipe line to which were attachd the signal and the two safety stops. The normal position of this signal was clear and with the first stop lowered and the second stop raised. When signal changed to stop position, the first stop was raised and the one in advance lowered thus protecting against a failure of the signal to assume the stop position. When passed in raised position either stop would operate an air valve placed on tender making an emergency application of the brakes. The principle objection to this system was the small amount of storage capacity in the springs.

Another new system of automatic block signaling which has within the last two years been brought to the attention of signal engineers is the Miller electric cab signal. This system was exploited some years ago and was given up on account of several inherent defects but now the system has been redesigned throughout and arranged so that a failure of the apparatus gives the engineer a danger signal. An installation has just been completed through the Park avenue tunnel on the N. Y. C. in New York City where it is used as an adjunct to the manual controlled block system. About 30 miles of double track are equipped with the Miller system on the C. & E. I., but it is not in use as a block system to govern trains, five engines only being equipped. The feature of this system is the absence of fixed signals of all kinds which materially reduced the cost of installation.

Several mechanical block systems have been devised, the two principle ones being the Rowell-Potter and the Black, both of which are at present in operation on elevated roads. The pressure of wheels of a train on an inclined bar furnishes power for operation in both of these systems. On account of the number of working parts exposed probably none of the mechanical systems will ever be used on surface roads.

INTERLOCKINGS.

The question of properly protecting trains using tracks at crossings, junctions, etc., began to force itself upon those concerned in railway operation almost as soon as the crossings themselves came into existence. All of the earlier devices were more or less crude and afforded only partial protection to trains using crossings as at any time there was a possibility of enginemen not obeying indications of gates, targets or other devices in use and also that the train would get beyond control of engineer. In either case, such train would sweep away all light obstructions and foul train on crossing.

To provide against such contingency, the English interlocking system was imported to this country in about 1873 or 1874, the first plant being installed at East Newark on the New York division of the Pennsylvania R. R. under the supervision of English mechanics. Shortly after this in 1874 a plant was installed by Messrs. Tony & Buchanan at Spuyten Duyvil Junction on the New York Central.

To show the relative progress of interlocking construction in the United States and England at this time, the following statement may be of interest. In 1875 there were on the London & Northwestern alone 1,400 interlocked levers while in the United States there probably were not more than 150 or 200.

In the year of 1875 some interlocking machines were built in this country and installed on the New York Central and the following year the Pennsylvania R. R. built a few in their own shops for use on their road. Only the first few were built by the railroad company as they found it cheaper to buy of the signal companies who were then entering the field. In 1876 a model of the Saxby & Farmer machine was exhibited at the Centennial.

In the early days of interlocking in the United States, there were but three machines in the field. The Saxby & Farmer, manufactured by the Union Switch and Signal Company and the Stevens as made by the National and as made by the Johnson Signal Companies. They were all alike in regard to the principle of latch locking, the essential difference being in the position of the locking on the machine. In the Saxby & Farmer machine the locking was horizontal and placed above the floor of interlocking tower back of the levers. In the two latter the locking was placed in a vertical plane under the floor of tower. The Johnson Signal Company also placed on the market a machine in which the power for moving the different functions of the interlocking was transmitted by means of large wheels fitted with hand spokes. These machines did not find much favor on account of mechanical defects and slowness of operation.

The three machines, National, Johnson and Saxby and Farmer, are practically the same today as when first placed on the market. Nothing has been done in the mean time to change the general design of the machine but on the other hand much has been done towards standardizing of the parts. This work has been carried out with such completeness that now all parts of either machine are interchangeable with like parts of any machine of the same type.

In regard to outside connections the same process of standardizing has been carried out which has accomplished much towards simplifying and decreasing the cost of interlocking construction. Pipes, cranks, jaws, pins, crank bases, compensators, pipe carriers, wire pulleys, signal wire and chain wheels have approached a standard but pipe joints, arm plate castings and pole fittings seem to be as far from the goal as ever. The two latter may probably never reach a standard but there is no reason why pipe joints can not be made standard for all roads.

The first foundations for cranks and compensators were made of oak but as the average life of these was not more than about five years, their use has been almost wholly abandoned in favor of concrete and iron construction.

The standard practice of today is to use two kinds of home signals, high and dwarf and, if necessary, high distant signals. High home signals are used for tracks in their usual direction and low or dwarf signals are used for tracks in their reverse direction or for routes over which slow speed movements are made. One of the principles of interlocking signaling developed soon after interlockings came into use was that tracks, not trains, are signaled. In England the practice is opposite as different kinds of trains are governed by different signals.

Fig. 3.—Union Electric Semaphore.

For entrance to yards or terminals, the early practice was to put up one arm for each track signaled making the arm for high speed route a little longer than the others. This proved to be unnecessary, expensive and led to accidents and so a change was made to two arms for two or more routes. The higher arm being for the high speed and the lower for all diverging routes. The Pennsylvania lines west of Pittsburg were first to make this change.

Mechanical indicators were used extensively up to about 1890 when practical operation showed little need for them and now they are seldom used.

At first it was common practice to connect up signals with one down pull wire, but this practice proved unsafe and at present all wire connected signals have down and back pull wires. The difficult problem of making a wire compensator that will compensate and become a fixed point when the wire line is being used has not been solved yet, at least no wire compensator fulfiling these conditions has ever been put on the market and become a practical success. A wire compensator fulfilling the first condition and used in connection with a disengaging lever, has given very good results on the C. M. & St. P. Ry.

It is common practice in the eastern states to put in an interlocking without derails but in the west they are considered an essential part of every plant.

In England the practice has been to use a separate lever for each function which makes installation expensive. In the United States the tendency has been to combine functions to operate them from one lever. The switch and lock movement was designed to further this scheme and if used in connection with a bolt lock at distances up to 400 or 450 feet from the tower, is a safe arrangement.

The facing point lock has not changed to speak of since first introduced. A check other than a bolt lock is still needed for the facing point lock to prevent the possibility of switch connection failing and plunger entering the same hole.

Selectors for signals were used to a considerable extent but more than two way selectors are not advisable and at the present time very few are being installed.

A thorough system of bolt locking is necessary to good construction and practically all prominent railroads specify bolt locking as complete as possible.

Boxing of pipe and wire lines is being gradually abandoned as unnecessary except where crossing the track. Pipe and wire lines laid in streets and crossings where there is liability of freezing up in winter are now being laid in oil pipe closed with packed glands. Oil pipe was first used in 1885 and since then it has been widely adopted.

A considerable change is at present being brought about in the use of the distant signal. The standard distance from the home signal has been about 1,200 feet as that was about as far as a wire line could be worked satisfactorily. The tendency now is to put in power operated distant signals and to place them far enough away from the home signal to allow the engineer to work steam right up to them and be able to stop before reaching the home signal.

Annunciators, while not generally specified, are being installed at a large percentage of new interlocking plants.

As with every other kind of manual labor an attempt was made to apply power to the working of interlocking switches and signals and the first power plant, a pneumatic, was put in service at the Centennial tracks in Philadelphia in 1876. In the year 1880 another kind of power plant, the hydraulic, was put in service at Wellington, Ohio. Still another, the Hydro Pneumatic, was put in service at Bound Brook, N. J., in 1884. From this time to 1890 there were no new developments in power plants to speak of.

In 1891 a new kind of power plant was introduced and put in service on the B. & O. S. W. at East Norwood, Ohio. This was the Taylor electric system which has since become one of the most important power systems. In 1893 some improvement was made in this system and in the seven years to 1900 a few small plants were installed. Since 1900 the Taylor system has been applied to some of the largest and most complicated crossings in the country.

In 1891 the electro pneumatic, which has proved to be the best of the power systems from that time up to the present, was installed at the Jersey City terminal of the Pennsylvania R. R. This system has since been put in service at most of the large interlocked terminals. The operating pressure is 60 pounds per square inch.

The last few years has brought out still another power system, the low pressure pneumatic. This is the same ones that have proved a practical success. On account of the large first cost of maintenance of pneumatic plants, the Taylor seems to be the one that will be used most extensively in the future. What the Union semaphore has done for block signaling, the Taylor system is now doing for the installation of power interlockings and we may look for a number of power installations in the near future.

Figure 2 shows a Wharton derail as connected in the Taylor system.

Fig. 2.—Application of Taylor System to Wharton Derail.

as the electro pneumatic except that the controlling force is air and release indication is given by air pressure. The operation pressure is 20 pounds per square inch.

In the electro pneumatic, as well as in the low pressure, the power for operating switches and signals is compressed air, but electricity is usd to control the valves and to give the release indication.

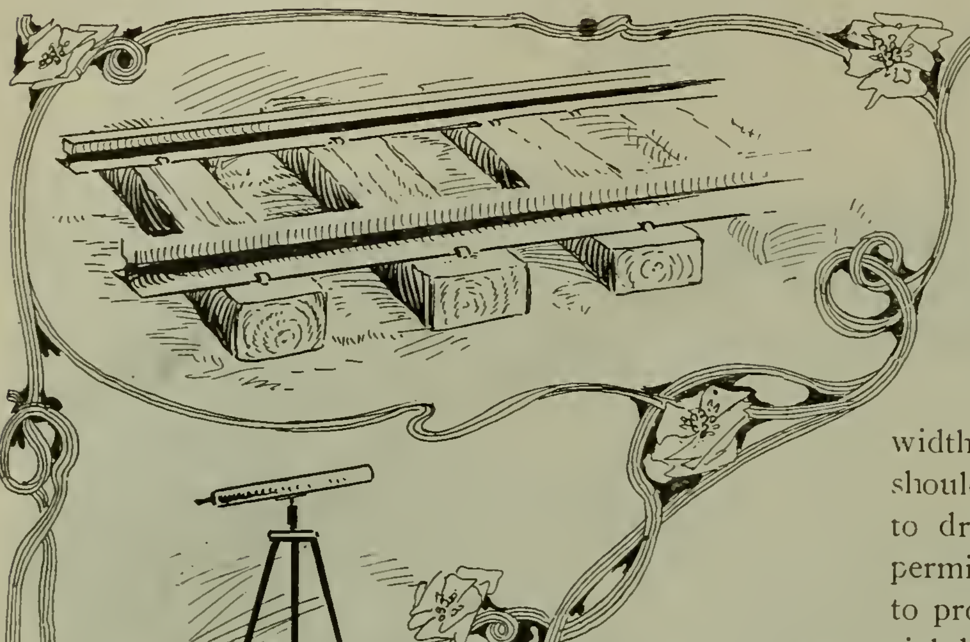
In the Taylor system, electric motors are used to operate switches and signals and are controlled by switches in the tower. The release indication is given by motor running as dynamo under its own momentum after having completed a movement.

The three power systems last mentioned are the only

Figure 3 shows general appearance of a Union electric semaphore which is a representative of this type of automatic signal.

That signaling in this country will advance we may infer from the following figures. There are at present in England on the London & Northwestern, a road now operating 1,800 miles, some 36,000 or 37,000 interlocked levers. There are in the United States altogether 42,000, of which more than half are at interlocked crossings. Of the 36,000 on the L. & N-W. nearly all are at yard and terminal stations. If we hope ever to have our roads as well equipped as the average English railroad, there is surely a task ahead of us.

Progress in Track Construction During the Past Quarter of a Century



If one was to investigate the progress in track construction during the past quarter of a century with a view to discovering radical departures from original design or methods, he would have but a short story to write, for it would only be necessary to explain that there have been none. The same type of rail, fastened to ties of the same kind, and in the same manner, and ballasted with the same kind of material, and in the same manner, that are now in service, were in existence 25 years ago. It is true that there have been important improvements in many details of track construction, but, for the most part, these have been developed along ideas which had already been introduced 25 years ago. The information to be had on this subject is, therefore, of more interest to the student of railway engineering than to the general reader.

Taking the question up in detail, we will consider first the roadbed construction, which is synonymous with earthwork. The machinery used in roadbed construction, such as steam shovels, is now generally of larger capacity than was the case 25 years ago. At that time excavators with one-yard or 1½-yard dippers were about the limit. Now 3 to 3½-yard dippers are common, and steam shovels with 5-yard dippers are being used on a number of railroads, as on the Wisconsin Central and the Southern Pacific. So far as the roadbed itself is concerned, about the only improvement is in the specification of larger dimensions. Years of experience have shown that roadbed of a width which will merely permit the track to be ballasted will not stand up under service for many years, in the case of embankments, or afford sufficient drainage where track is constructed through cuts. A large mileage of track was formerly constructed on roadbed 12 feet wide, on embankments, and but little wider in cuts. Sixteen feet is now considered about the minimum allowable limit for roadbed on embankments, and 18 feet is none too much, when we consider the washing effect of rains. In order to properly support the ties there must be a good width of shoulder to hold the ballast. In cuts the ditches should be well removed from the ends of the ties, so as to drain the water well from their under support and permit the use of a good depth of ballast; and in order to provide for this there must be room for ballast material between the ditch and the ends of the ties. On such lines as these there has been a very noticeable improvement in track construction, and this improvement is still in progress.

So far as ballast is concerned, gravel is still the universal material, as it probably always will be, for this purpose. Broken stóne is used in larger quantities than formerly, but probably not in greater proportion to that of gravel. Wherever gravel of desirable quality is convenient to a railroad it is undoubtedly the most economical material for supporting and maintaining track. If one was to consider improvements in track maintenance, he would have to include some mention of the improved cars for handling ballast, but so far as the work of ballasting is concerned, there have been no improvements within the period considered, or within the past half century, for that matter. The shovel and the tamping bar are still the implements for this work.

We are still using the same kind of ties that were in service 25 years ago. Metal ties and combination ties of concrete and steel construction have been experimented with, but as yet, in this country, there is no considerable mileage of track built with either of these kinds. So far as the future is concerned, the use of concrete and steel combined seems more promising than the use of iron or steel alone. Notwithstanding that forestry experts have for the past 15 years been warning railroad companies of the vanishing supply of timber, the wooden tie is still the universal standard in this country. So far as the quality of the timber is concerned, there has been a retrogression rather than an impovement. All things considered, oak is the most desirable timber available in this country for railway cross ties, but the proportion of oak ties to the whole number used is much smaller than it was 25 years ago—probably not more than a quarter or one-third as large as it then was. Use is now being made of many kinds of timber that 25 years ago were considered out of the market for railroad ties. Among these, pine—both yellow pine in the South and mountain pine in the West and Southwest—are now very generally used, and late years this material has been finding its way into the Mississippi valley north of the Ohio river. White cedar, also, is now being very largely used. This is a desirable material so far as failure by decay is concerned, but so soft that when used without special means of protection is soon cut out under heavy traffic. Mention might be made of several other kinds of inferior timber used rather miscellaneously.

The gradual decrease of what was formerly considered the standard timbers has compelled railroad managements to accept ties of several kinds of inferior wood in order to maintain an available supply. The enforced use of soft-wood ties called for some means of protection against rail cutting, and tie plates, which are now very commonly used, are a distinct improvement which the changed conditions of timber supply and weight of rolling stock have brought about. Although the tie plate is useful in more ways than that of protecting the timber from cutting, still the conditions which make its use imperative, or at least expedient, is the wearing effect of the rails on the ties under heavy traffic.

For the past fifteen or eighteen years there has been slow but gradual progress in the treating of ties to resist decay. The first plant to be erected for this purpose, in this country, for the treatment of any considerable number of ties, was that of the Atchison, Topeka & Santa Fe Ry., at Las Vegas, N. M., in 1885. This was followed by another plant erected in Chicago a few years later. Both of these plants are still in operation, the latter by the Chicago Tie-Preserving Co.; and in addition to these there are some eight or ten others erected within the past five years. All of these plants are located west of the Allegheny mountains, and all except three west of the Mississippi river.

There is now no question as to the economy of the chemical treatment of ties, and the zinc chloride or zinc tannin (Wellhouse) process is the only one thus far to be adopted on any considerable scale. So far as the present outlook is concerned the preservation of ties by chemical treatment is destined to delay the general use of metal ties, if the results possible from the use of the same do not so reduce the demand on the forests that a sufficient supply of timber will be available indefinitely.

The railway rail has been much discussed and written about, but the type has not changed since the early days of railroading. In the quality of the material, in progress and rapidity of manufacture, and in minute details of design there has been important progress during the past quarter century. It might also be said that this period has been coincident with the life of the steel rail, for before the beginning of this period iron rails were very largely in service, and it was only about ten years before then (or in 1867) that the first steel rail was rolled in the United States; and only a few years before that when they began to be used extensively.

The quality of the metal and the method of heat treatment in rolling the same into rails have been very carefully studied; but for all this there are many railway engineers of long and studious practice who claim that the wearing qualities of rails rolled twenty years ago were much superior to those of the present time. Of course, the conditions now are different, for both car-wheel loads and locomotive-driver loads have been doubled within the time referred to. In the early days of steel rails hand labor was largely employed at the mills, but now all this has been supplanted by modern machinery, and the increased output of the mills has enabled a very large reduction in the price of steel rails. Of course, it is only trite to say that the steel rail has gradually increased in weight within the period considered. Twenty-five years ago 50-pound rails were in service all over the country, but with the increase in weight of locomotives and cars there has been a necessary increase in the size of rail section, so that 100-pound rails are now very commonly in service.

Aside from the use of Bessemer steel in rail manufacture, what was perhaps the most distinct advance was the recommendation by the American Society of Civil Engineers of a standard shape of rail section for rails of different weight per yard. This recommendation came in the form of the adoption of a committee report of that society ten years ago, and at the present time at least seventy-five per cent, and probably more, of the rails that are being rolled are patterned after these sections. While, to an ordinary observer, the standard section of the present day would not appear greatly different from those of the former time, the maintenance of way engineer nevertheless understands that an enormous amount of energy has been expended on the finer points of the design of rail sections. To enumerate briefly, these points cover the proportion of metal in the base, web and head of rail; the radius of the top of the rail section, and particularly the radius of the top corners of the section; and rails with side-sloping heads have gone pretty nearly out of use, in deference to the head with vertical sides.

The twenty-five years considered will cover the extensive use of angle bars for splicing rails at joints. The angle bar was a great improvement over the fish-plate and the chair connection at the joints, and it is still the universal standard joint device. There are, however, a few patented joint splices brought out within the last ten or a dozen years, which are making good progress, and are clearly conceded to be superior to the angle bar under modern traffic conditions. The spike fastening between the rail and the tie is still the universal standard in this country, as it was sixty years ago. There has hardly been any attempt at improvement in this detail. Steel is used to some extent in place of wrought iron for spikes, but the shape has remained practically unchanged, except perhaps for some patented improvement in the design of the point, of which there are several; but still the plain wedge-pointed, hook-headed spike is the typical fastening of this class.

In switches, frogs, switchstands and other devices used in and about turnouts the progress has been more striking than it has in plain track construction. Less than twenty-five years ago there was some doubt in the minds of some maintenance of way officials as to whether a point switch was superior to a stub switch, but the gradual increase of wheel loads has settled this. It is not too much to say that the heavy traffic handled these days over some of our railroads would require a fair-sized crew on each section a good share of the time to keep the head blocks to surface, if stub switches were still being used. In order to make the point switch safe it has been necessary to reinforce the split rails with bars of wrought material; and the adjustment of the connection between the switch and the stand is either designed on finer lines or else more carefully inspected and looked after than was necessarily the case when stub switches were in general use.

The development in the design of frogs has been hardly less important. The spring-rail frog, with reinforcing bars, hold-downs, anti-creeping devices and other improvements to make it safe, has taken the place of the rigid frog on nearly all the heavy-traffic lines, and is fast superseding it elsewhere. If one will take the pains to read the proceedings of the Roadmasters' Association of America some fifteen years ago he will not fail to find discussion divided as to the merits of spring-rail frogs, but the changing conditions have enforced upon track engineers such improvements in the lines indicated as now make the spring-rail frog decidedly more economical than the rigid frog.

The extensive installation of interlocking plants at grade crossings, at junction points and for operating a numerous layout of switches on main line, has worked decided improvements in the design of switches and crossovers. The adjustment of the parts of these devices is now necessarily finer, and the fastenings more secure, than was thought to be required before interlocking became so commonly applied. To go into the details of the connection of switches with hand-operated interlocking plants, commonly known as "mechanical plants," or into machinery for operating switches at power interlocking plants, would necessarily transgress the ground of another department of maintenance of way. Improvement in this line has gone so far that machines for operating switches at terminals and other points where numerous switches are located in the same vicinity are now being worked by compressed air, by electricity, and by a combination of the two.

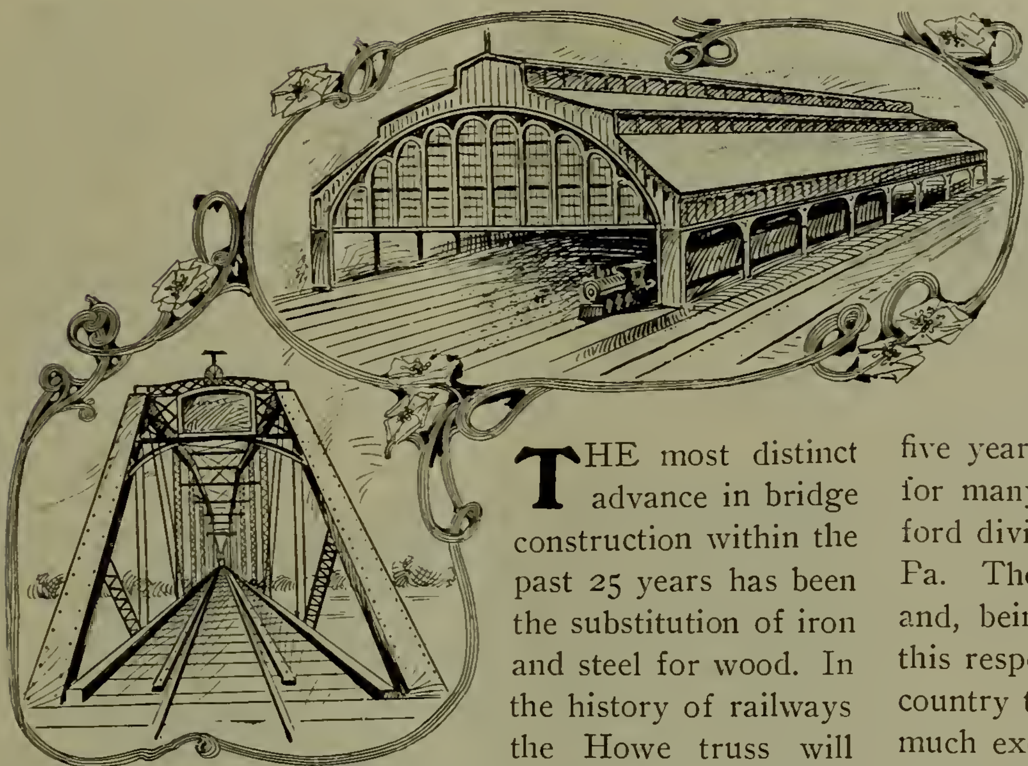
Comparative Mileage Per Locomotive

DURING the last few years the motive power equipment necessary to handle the heavy freight and passenger traffic of the country has been necessarily increased. This increase has been at such a rate that in a number of instances the number of locomotives employed in the service of a railway company has nearly equaled the track mileage of the system and cases have been observed in which the number of locomotives has been claimed to be quite equal to the number of miles of track. This fact has led a number of railway companies to publish a comparison of the number of locomotives and track mileage, each one claiming a distinction in its own particular case.

In order to obtain a correct estimate of the number of locomotives per mile of track we have compiled a table of the principal roads of the country operating two hundred miles of track, or over, and having in service at least one locomotive to every four miles of track. The figures herewith presented have been verified by the officials of the railways represented:

Railroad.	Miles Operated	No. of Locomotives in Service	No. of Cars in Service	Mileage per Locomotive	Mileage Per Car
D., L. & W.	952	649	28,698	1.46	.033
Balt. & Ohio	4,339.54	1,686	87.054	2.57	.049
Bessemer & L. E.	219 8	86	7,967	2.55	.025
Boston & Albany	393.95	263	4.851	1.49	.081
Boston & Maine	2,265.5	956	19,299	2.36	.117
Buff., Roch. & Pitts.	475	177	10,082	2.67	.047
Central of N. J.	685	450	20,180	1 52	.033
Chesapeake & Ohio	1,636	446	22,579	3.66	.071
Cin., N. O. & T. P.	338	136	6,861	2.50	.049
Del. & Hudson	747	358	18,647	2.08	.040
Erie	2,154	1,157	54,145	1.86	.039
Hocking Valley	347	112	15,045	3.09	.023
Lake Shore & M. S.	1,411	587	24.610	2.40	.058
Lehigh Valley	1,399.6	763	36,107	1.83	.038
N. Y. C. & Hud. R.	2,926.58	1,459	61,779	2.00	.047
N. Y., N. H. & H.	2,038	982	16,211	2.07	.126
N. Y., O. & Western	426	147	6,785	2.90	.063
Northern Central	382	191	9,980	2.00	.038
Pennsylvania	5,062	2,901	129,533	1.74	.039
Phil. & Reading	2,397	906	39,837	2.64	.060

Progress with Railway Bridges



THE most distinct advance in bridge construction within the past 25 years has been the substitution of iron and steel for wood. In the history of railways the Howe truss will have to be conceded to be the typical pioneer structure for truss bridges. The materials for this were readily got together when the country was still undeveloped. The timber could be cut in the forests, in advance of the track-layers, the bolts could be readily supplied from any railway blacksmith shop, and the castings for the panel connections could be made at any foundry. This type of bridge was almost a necessity in the early days of railway engineering. At remote points it would have been impracticable to have completed railway construction within reasonable time had the engineers been compelled to await the arrival of material for iron or steel structures.

There was also another type of wooden bridge largely employed in railway construction, which consisted of a combination of a wooden truss and arch. This was known as the Burr truss bridge, and, considering bridges in general, including highway bridges, it was formerly more used than any other type of bridge in the United States. But wooden truss bridges in railway service in this country are rapidly passing away. The limitations on length of span, the danger from fire, and the uncertainties of the strength of connections and of the timber when it begins to decay, have put the wooden truss bridge out of the railway field.

For trestle construction of moderate hight, wood is a material that is still very largely used, out of consideration of the plan now very generally followed by all important railroads of filling in trestle structures to form earth embankments. As a general proposition, earthwork is now more generally employed for carrying railways over depressions than is permanent trestle construction. The filling in of trestles 50 ft. high is now nothing unusual, and in the improvement of heavy-traffic lines the building of earth embankments more than 100 ft. high is not uncommon practice. Where earthwork is not in contemplation steel is preferred to wood for high trestles, say trestles more than two decks high; and if it is not employed at the time of construction of the road the steel trestle is usually built when the first renewal is made.

In high steel trestles, commonly known as viaduct construction, there are now many fine examples in this country, and practically all of these have been built within twenty-five years. The most notable structure of this kind, for many years, was the Kinzua viaduct, on the Bradford division of the Erie R. R., 16 miles from Bradford, Pa. The first structure at this point was built in 1882 and, being 301 feet high, at the highest point, was, in this respect, indeed a very remarkable structure. In this country this height for viaduct construction has not been much exceeded. The Pecos river viaduct on the Southern Pacific road, in Texas, a few feet higher, is a combination trestle and cantilever structure. The Boone viaduct for the Chicago & Northwestern Ry., near Boone, Ia., although not so high as this (185 feet) is a double-track structurer of very substantial construction, and one of the notable structures of this class in this country. It is generally understood to be the longest double-track structure of its height and the heaviest metal structure of its class in the United States.

Another advance in steel bridge construction is the more general use of arch and cantilever designs. Like the cantilever, the braced-arch bridge is usually erected without falsework, and but for this principle of construction the only means of crossing some depressions, as, for instance, the Niagara gorge, could not be done without suspension bridges. Long-span cantilever bridges and braced arches have put suspension bridges out of the field of railway service and well nigh out of the field of bridge construction for any purpose.

In masonry construction for railway bridges the change has been almost revolutionary. Within the past ten years concrete has been very largely substituted for stone masonry in bridge piers and abutments, and at the rate of present progress in this direction this material bids fair to accomplish still greater changes. The fact that it can be handled by ordinary laborers makes it cheaper than stone, in most parts of the country, and it is even expected that it will prove to be more durable. Concrete construction is more generally used in the West than in the East, due to the fact that throughout the Mississippi Valley a durable quality of building stone is scarce and expensive. Concrete can also be handled without derricks, which is a saving of a great deal of expense and delay in railway work. The flexibility of its application makes it a very desirable material for railway culverts, of both the arched and rail-top designs. It is only some ten or a dozen years since this material began to be used extensively for railway bridge masonry above the surface. The Illinois Central was one of the first roads to make use of it.

Owing to the ancient history of masonry arch bridges this class of structure cannot be said to be new; but the more general use of arch bridges on railways is new in this country. There are but few masonry arch railway bridges in this country as old as twenty-five years; but it is important to understand that within the past ten years this class of structure has been adopted as the standard with a few of the larger railroad systems. The Pennsylvania Railroad is building cut-stone arch bridges at all points where these structures are feasible. After the Johnstown flood the stone arch bridge of the Pennsylvania Railroad, which figured so prominently in that catastrophe, was the synonym for stability; but structures fully as fine as this are now to be found at many points on this road. Crossing the Susquehanna river at Rockville, Pa., near Harrisburg, this company completed, only a few years ago, a stone bridge of forty-nine spans of seventy feet each.

The use of concrete, and of concrete and steel combined, in arch structures will very likely be very largely employed in railway bridges. Concrete arches are now being built for railway service in spans up to fifty feet and more, notwithstanding that the use of this material is still regarded as a new industry.

Stone and concrete arch bridges are fast coming to be considered the standard construction wherever the alignment has been permanently established. The history of iron and steel bridges is that it has been necessary to re-design these structures about every ten years, to provide for increase of train loads. Renewals at such frequent periods has thrown a great many metal structures out of service long before the strength of the members had deteriorated from corrosion or in any other respect.

An Experimental Locomotive to be Installed

Gift of the Baldwin Locomotive Works to Cornell University

THE Baldwin Locomotive Works has offered to present a complete locomotive to the mechanical engineering department of Cornell University, to be especially adapted to experimental work. The locomotive will be of the Vauclain de Gehn type, especially constructed according to plans and specifications to be agreed upon by the Baldwin Works and Professor H. Wade Hibbard, principal of the railway mechanical department. It will be a 4-cylinder balanced compound, similar to the engine recently built by the Baldwin Works for the Plant System, with the difference, however, that it will have four driving wheels and four truck wheels. Designated by the F. M. Whyte system of classification it will be of the 4-4-0 type. The boiler will be designed to carry 300 pounds gauge pressure. When run at this pressure, the entire weight of the locomotive will be arranged to be thrown upon the driving wheels by means of a pneumatic cylinder at the rear, connected to an anchor in the foundations. When the traction increaser is not in use the locomotive will be operated under 200 pounds pressure. It is intended that the locomotive shall be easily convertible into a perfectly balanced 2-cylinder simple engine by the removal of the two high pressure cylinder bushings and a change in the valves.

This engine is to be mounted on a testing machine in the laboratory of the university and is to be installed for the purpose of instructing students in laboratory testing of locomotives, to familiarize them with the operating mechanism, and for original investigation in order to lead to the further improvement in locomotive operation and design.

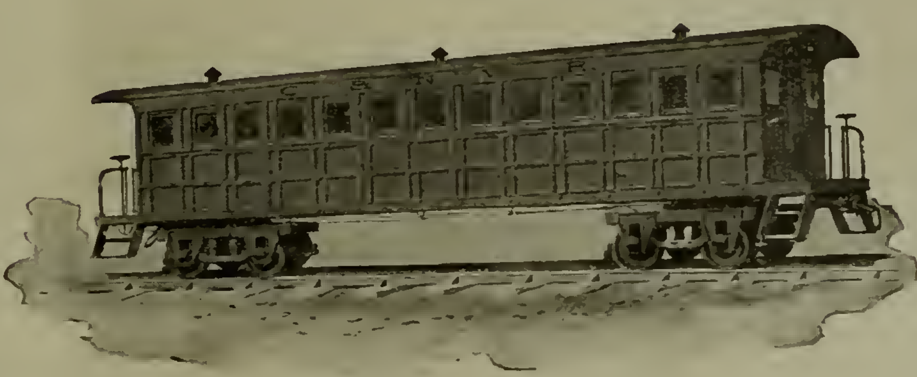
Experimenting with this locomotive in the laboratory will in no way supplant the instruction tests on the road, primarily intended to instruct students in locomotive testing under the actual conditions encountered in road service. Through the courtesy of the Delaware, Lackawana and Western Railroad this instruction is made possible and each year the road supplies a locomotive which is thoroughly equipped for road testing. The students themselves do the work of rigging up the locomotive for the test and strip it ready for replacement in regular service.

These instruction tests have been very thoroughly developed at Cornell. An indicator reducing rigging, geometrically perfect, practically rigid and entirely satisfactory, of the pendulum or similar triangle type, has been constructed for use in these tests. The coal is carefully weighed in bags and delivered to the fireman as it is required to be fed into the firebox, feed water is metered, each cylinder is supplied with two indicators connected by short straight pipes, steam chest diagrams are taken, calorimeters are used in steam dome and steam chest, a vacuum gauge is applied to the smoke-box, the smoke-box temperature is observed, a Boyer speed recorder is connected with the axle of the truck, revolutions of the driving wheels are counted by a stroke counter and recorder, the strokes of the air pump are recorded by a counter and recorder, and the various calibrations are made of the dynamometer, water meter, tank, boiler, air pump, blower, safety-valve, steam distribution, cylinder clearances, etc.

After receiving instructions as herein described, a number of the seniors who pursue the course in railway mechanical engineering, often make tests for roads in the east, using the data so obtained as a basis for the preparation of their graduating theses. The results so obtained are of value to the roads as an indication of the performance of the class of locomotive represented by the one tested. Such tests are conducted by the students without assistance from the faculty or members of the instructing staff.

Twenty-Five Years of Traffic

ALL railroad progress is dependent upon, as well as measured by, the volume of traffic. That is what a railroad is for. It is not, primarily, to promote improved construction methods, better bridges, finer cars or scientific operation, but to move



PIONEER COACH, 1848.

MODERN VESTIBULE COACH, 1903.

passengers and freight. All of these other characteristics are merely means to an end, and it may be profitable, therefore, to briefly review the motive of the wonderful progress that has taken place in connection with railroading during the past twenty-five years.

During this period the railroad mileage of the country has increased nearly 150 per cent, while the business of the country has more than kept pace with it. The subjoined figures will serve to indicate the lines of progress in this regard:

	1878	1902
Capitalization	$4,589,948,793	$12,014,265,990
Freight earnings	365,466,061	1,126,267,652
Passenger earnings	124,637,290	360,702,686
Net earnings	187,575,167	520,294,727
Operating expenses	302,528,184	1,092,154,099
Frt. earnings per mile of road	4,630	5,792
Pass. earnings per mile of road	1,580	1,861
Net earnings per mile of road	2,380	2,668
Oper. expenses per mile of road	3,830	4,895
Capitalization per mile of road	58,130	61,330

The figures covering traffic density and earnings per ton-mile were not compiled with sufficient accuracy to permit of a comparison prior to 1882, but the showing since that date will afford an indication of the relative growth in this respect:

	1882	1902
Average tons freight per mile of road	3,764	5,575
Average number passengers per mile of road	3,018	3,098
Average rate per ton-per mile	c1.23	c0.756
Average rate per passenger per mile	c2.51	c2.028

It will be observed from these figures that the freight traffic of the country has developed very much faster than the passenger traffic, and that the freight rates have declined in very much greater proportion. There are two theories in connection with traffic which are opposed to each other. One is that rates should be reduced in advance for the purpose of promoting traffic, and the other that rates should be reduced only as the volume of traffic will warrant it. In the above figures the advocates of both of these theories affect to find the proof of their claims. Those who hold to the first idea say that the very slight increase in the number of passengers per mile of road is because the average rate for transportation has not been reduced, and that the immense increase in freight movement is because of the large decrease in rates. The others point to the same figures and claim that the slight increase in travel does not warrant a reduction in the passenger rates, but that the railroads will reduce their tariffs as fast as warrantable, is fully proven by the statistics of freight traffic. The truth probably lies between these two statements. Statistics show that in the thickly settled communities the increase in passenger traffic has been proportionately larger than the decrease in passenger rates, but that the extension of new roads throughout sparsely settled districts, where business was necessarily limited, has had the effect of keeping the averages on about the same scale. Freight traffic, on the other hand, does not observe this rule. These extensions into new communities constitute feeders to the older lines, and serve to swell the average of traffic movement much beyond the actual new tonnage.

Although averages are useful in measuring traffic in general, specific instances will better illustrate the decline in rates during the past twenty-five years. In 1878 the grain rate to New York from Chicago was 30 cents per hundred pounds; the tariff is now 20 cents, and it has not infrequently been as low as 12 cents. In 1878 the rate on cattle from Kansas City to Chicago was $67.50 per car; it is now $40 for a car of the same weight. Then the rate on first-class goods from New York to San Francisco was $5 per hundred; it is now $3.25, and in many cases much lower on special articles embraced in that class. Nails and other iron articles are now carried to the Pacific Coast for 70 cents per hundred, and oranges are hauled from the Eastern seaboard at $1.25 per hundred. On every hand and in every direction rates have decreased from 50 to 150 per cent, until now the railways of the United States furnish transportation at a much lower cost than any country in the world.

This constant decline in revenue has necessitated the adoption of many improved methods in the conduct of business, in order that a correspondingly declining scale of operation might be maintained. Chief among these is that of cars of larger proportional carrying capacity. In 1878 cars weighing 20,000 to 22,000 pounds and carrying 30,000 to 36,000 pounds were common, although it was even then beginning to be appreciated that larger capacities were both feasible and economical, and some were venturesome enough to assert that 60,000 pounds was a possible attainment. Now cars of 100,000 and even greater capacity are in daily use. So that instead of a combined weight of 50,000 to 60,000 pounds, of which not more than sixty per cent was freight, we have now a vehicle that when loaded weighs 140,000 to 150,000 pounds, of which seventy-five per cent is revenue tonnage. The length of haul has also contributed to the economical movement of freight, the system of interchange which prevails allowing cars to go from one end of the country to the other without transfer.

Another marked difference in the conduct of freight traffic is the speeds at which freight trains, and particularly through freights, are now run. On many roads regular express freight schedules are made, and while the time of transit expressed thereon is not guaranteed it can be usually depended upon for service. Twelve days from New York to the Pacific coast is not unusual, and fourteen days is very common—a rate of speed that twenty-five years ago would have been deemed impracticable. A corresponding increased rapidity of movement marks the passenger service. This has been principally effected through the medium of additional trains making fewer stops, a result to which the modern system of interlocked crossings has greatly contributed. In 1878 thirty-six hours was the ordinary, and thirty hours the fast time of trains between Chicago and New York. This is now reduced to twenty-six hours for the ordinary, and twenty hours for the limited trains. An equally radical improvement has been made in the character of the cars used in this service. The equipment which was then thought to be even luxurious is now replaced with cars that are elegantly appointed and supplied with conveniences then undreamed of. So that while in freight transportation the people get the same service for less money, in the passenger service they are furnished vastly better facilities for the same money.

Another noticeable improvement in the conduct of freight service, which has only recently been adopted, is the substitution of the per diem system for the use of cars in the place of the mileage plan which has heretofore prevailed. Under the old rule a mileage rate, which was finally determined at six mills per mile, cars were paid for only as they were run, and hence there was no incentive to return them to their owners, but rather the contrary; for an empty of another road standing on the track cost the holding road nothing; whereas, when it was started home mileage must be paid. The present plan reverses all this, and now it is to the interest of each road to get rid of other than their own cars as soon as possible, and so relieve themselves of the charge of twenty cents per day while in their possession. This rule has not been applied to refrigerator cars, as being employed in a special service they require different treatment. Through the medium of these last-named cars a new traffic has been developed. Not only has it been possible through their use to entirely eliminate the local butcher, and put Chicago beef on the table of New York and even London, but all kinds of perishable commodities are transported throughout the country. It is now possible to supply one's table anywhere in the United States with the delicacies of the different latitudes at any time of the year. Strawberries and green peas in Chicago in December are of ordinary occurrence, while the whitefish of Lake Superior is daily served fresh in the hotels of the Gulf cities.

There is one feature, however, in connection with the progression of traffic that is not to be commended. The private cars owned by heavy shippers and used by them for the transportation of their freight, constitute the most serious menace to the uniform progress of traffic affairs. Because of the large influence wielded by the ownership of such equipment they have thus far apparently been able to dictate terms to the railroads, and fix not only the price at which their freight shall be transported, but the mileage rate which shall be paid them for the use of their cars. Fortunately there has been recently no little objection raised to the continuance of this condition, and it is possible that some way of relieving the railroads from this incubus may be discovered. If the next twenty-five years shall prove to have been as fruitful in results contributing to the welfare and comfort of the people of the United States as has the period which has just passed, those who are responsible therefor will be entitled to a high place among those who have succeded in making this country occupy the first place among the commercial nations of the world.

The Brake Shoe

THE brake shoe is the business end of the brake mechanism, being the medium through which the air from the main reservoir or the muscular effort of the brakeman reaches the wheel to control its motion. It is apparently a very humble part of the car equipment, and yet it is the shoe pressing against the wheel that controls train and makes possible the rapid and safe operation of the railroad.

In the early days of the art—when cars were of light weight and moved at low speeds, a wooden block made an excellent shoe. (It is used to this day on some of the lighter European equipment.) In this country, however, a metal shoe has become the recognized standard for all service and much ingenuity has been exercised, not only in the design of the shoe, but in the selection and arrangement of the materials in its construction, that it may successfully meet the requirements of modern service.

The brake shoe when forced against the wheel generates friction by reason of the interlocking of the projections on the shoe face with those of the wheel tread, and this friction is more or less, in proportion to the extent of the interlocking and the strength of the points in contact to resist distortion or fracture.

Heat is the natural result of the retarding action of the brake shoe—and the rise in temperature plays an important part in the determination of the value of the shoe.

As the primary object of the brake shoe is the retardation of the wheels motion it is important that the material used will be such as will give a high degree of friction, and as rolling friction is more effective than sliding friction, the shoe should wear by grinding away rather than by flowing. Soft cast iron possesses the property of generating friction by reason of the grinding away of angular particles, which reluctantly roll between the shoe face and the wheel. So long as the grinding continues the friction keeps up. If, however, the shoe face is hardened by chilling the retarding effect falls because of the diminished interlocking of projections in the polished face. Cast-iron shoes are for this reason never wholly chilled, but where extra durability is desired it is secured by partially chilling, leaving areas of soft metal to grind away, providing the grit to roll between the surfaces and produce friction. Therefore a good brake shoe should be comparatively soft to hold the wheel, mere hardness is a disadvantage, as hardness is, in most cases, directly opposed to friction.

A good brake shoe must not injure the wheel, but must be such as to act on the wheel tread with a uniform action, to wear itself away in doing useful work, rather than wear the wheel, and must be strong and tough to give reasonable service.

In the selection of a brake shoe, the service for which it is intended should be considered. Because the same shoe may not act the same way on both the cast iron and steel tired coach wheels or the more heavily loaded power-driven wheel of the locomotive.

The points to be considered in the brake shoe are:
First.—Frictional properties.
Second.—Strength to stand up to the work required.
Third.—Action upon the wheel tread.

The Master Car Builders' Association after exhaustive examination of the principal types of brake shoes in common use, to determine their frictional qualifications have recommended certain minimum qualifications, which should be followed in the selection of a brake shoe.

Their specifications may be briefly noted as follows:

For the cast iron wheel the brake shoe acting under a load of 2,808 lbs. should give an average retarding force of 618 lbs. throughout the whole stop from a speed of 40 miles per hour.

For the steel tired coach wheel, the brake shoe acting under a load of 6,840 lbs., should give an average retarding force of 821 lbs. throughout the whole stop from a speed of 65 miles per hour. These figures are practically those obtained by the use of a brake shoe of strong fine-grained unchilled cast iron, practically the common shoe of every-day use.

With this data at hand the brake shoe makers design their shoes with a view of obtaining the maximum durability consistent with the required friction and a shoe which will not injure the wheel. Durability in a brake shoe may be secured in several ways. It means not only a low rate of wear in the shoe, but also the capacity of giving the greatest possible amount of useful wear before removal.

Hardness delays rapid wear and is usually obtained in the brake shoe by the use of a grade of cast iron, which takes a strong chill when cast against a chill block. The face of the shoe being made with alternate chilled and unchilled sections. These are known as integral chilled shoes.

Durability may be obtained by the use of hard inserts in the shoe face surrounded by the softer cast iron body, or by the use of a soft insert surrounded by a hard iron body which chills against the insert. These are known as cast insert shoes.

Again, durability may be secured by the use of inserts of a tough or ductile nature such as wrought iron or expanded sheet steel, which by their resistance to abrasion retard the rapid grinding sway of the surrounding cast iron. These are known as tough insert shoes. Hard cast iron, though unchilled, is not strong and such shoes are liable to crack in service and must be removed when but little worn. The danger of fracture is increased by chilling, or inserts which reduce the transverse section.

To such shoes it becomes necessary to apply reinforcement at the back to hold the parts together when cracks occur.

The really durable and efficient shoes of today are those which have composite wearing faces and steel backs to which the body metal is securely anchored, permitting the shoe to remain in service, even though cracked, until the cast iron body is completely used up. An ordinary cast iron shoe is usually scrapped when but half its weight is worn away—whereas with a steel back there should result 85 per cent of useful wear before removal.

A study of the M. C. B. brake shoe report develops some interesting features which are valuable in the selection of a brake shoe for any particular service. For instance—Unchilled cast iron gives the maximum retarding effect at the lower speeds on both the cast iron and steel tired wheel, although at the higher speeds the retarding effect falls very rapidly, tending towards the effect of the harder and more durable shoes, which may be accounted for in the increased temperature in the shoe at the higher speeds which reduces the abrasive resistance.

Shoes with the tough, ductile inserts show higher retardation on the cast iron wheel than on the steel tire, although they show a high degree of efficiency in both cases. Shoes with hard inserts which afford transverse cutting edges, take a higher stand on the steel tire than on the cast iron wheel, due to their wearing action on the tire; they survive at the expense of the wheel, and lastly, shoes with a large percentage of very hard chilled areas, such as the integral chilled shoes, occupy practically the same position on both wheels, showing the minimum friction and no dressing action; but their rate of decrease in retarding power by increase in speed is much less than with unchilled iron, indicating a softening effect by reason of rise in temperature.

And from these results we may conclude—For slow trains when the rate of heating is low, as in freight service, the unchilled iron and the wrought iron insert shoe are to be preferred if provided with a steel back to guard against rupture, as they give the maximum efficiency.

For steel tired coach wheels in passenger service where high speed and rapid rate of heating are common, the unchilled cast iron shoe and the shoe with tough clutch insert (so long as this insert does not flow and burn) are to be recommended, especially when protected by reinforcement against fracture, as being the most efficient.

Shoes with chilled areas, when reinforced with the steel back, are suitable either for the freight or passenger service when the speeds are high and the loads excessive, as under these conditions the harder shoes tend to approach the unchilled cast iron in efficiency while being much more durable.

The foregoing applies to car and coach service only. For locomotive use there is a condition which must be met not to be found with the cast iron wheel, and but little noticed with the steel-tired coach wheel, that is the wear of the wheel by the shoe, during action.

The driving wheel of the locomotive carries an excessive load, and is forced against the rail by the steam pressure in the cylinders, which causes the wheel to be rapidly worn into by the rail. Sooner or later the engine must go out of service to have the tires turned.

The driver shoe should be so designed as to bear on the tire where the rail does not, and be of such a nature as to wear down the tire.

The shoes having hard cutting edge inserts have been described as occpuying a higher position on the steel tire than on the cast iron wheel under similar conditions of load and speed, because of the cutting or dressing action of the inserts upon the tire. Such a shoe should be confined to the engine use, as it will delay the time when the tires must be restored to their original shape, at the same time giving high friction on account of its action in wearing down the wheel. The durability of these tire dressing locomotive brake shoes depends largely upon the nature of the inserts, since the heat produced by friction tends to rouse their efficiency by softening the inserts. Such shoes should be supported by the steel back to secure the maximum efficiency.

The cast steel brake shoe has proved to be a valuable tire dresser on account of the tearing action of the soft steel. This shoe, however, should be used with caution since there exists the possibility of scoring the tire by reason of flowed and burned steel forming hard spots.

Joint Subjects for the Railway Clubs

WE publish herewith a communication from the secretary of the Railway Club of Pittsburg. This letter suggests the formation of a general subject committee, to be composed of one member appointed by each club. The duty of this committee, as suggested, is to be the selection of a list of subjects to be presented and discussed during the year; the subjects to be so arranged that all the railway clubs have a paper and discussion on the same subject in the same month.

While there is some argument in favor of such an arrangement, the advantage derived from a consideration of the same subject by all the clubs at the same time appears very questionable. In cases where the subjects under consideration have a direct bearing upon the work of a committee which is preparing to report to the Master Mechanics' or Master Car Builders' Association, such general discussion would be of great assistance to the committees and would add materially to the data supplied from which they might gather information. Further than this, a general discussion of the same subject would bring out but little additional information to that which would be suggested at the meeting of one club, with the exception of rare insances. If therefore appears that an arrangement such as that suggested would tend to curtail the advantages rendered by having a number of clubs situated at various points throughout the country rather than promote the benefits now accomplished by the clubs.

To the Editor of the Railway Master Mechanic:

At the regular meeting of the Railway Club of Pittsburg, held Friday evening, January 23rd, a suggestion was made that correspondence be opened with all mechanical Railroad Clubs in the country with a view of forming a General Subject Committee, to be composed of one member appointed by each club, whose duties would be to meet at some given point and arrange a list of subjects for the year; all clubs to have a paper and discussions on the same subject in the same month, it being believed by this means that a better and more thorough understanding would be had of the subject, due to a larger number of opinions being given and coming from various parts of the country, and oftentimes under varying conditions.

The papers prepared under this ararngement would be largely competitive and would result in bringing out the best efforts of the writer. The same would be true of the discussions. The competition of work of all clubs would be a valuable reference to one seeking information upon any subjects that had been considered in the manner described.

The proposition met with general approval from those present, and as a result, the following resolution was passed:

Resolved, That the Secretary correspond with the various club secretaries, advising them of the action taken, and requesting that they lay the matter before their respective clubs at their next regular meeting for consideration.

J. D. Conway,
Secretary Railway Club of Pittsburg.

A Quarter of a Century's Progress in Locomotive Building at the Baldwin Works

SOME conception of the type of locomotive built by the Baldwin Locomotive Works a quarter of a century ago may be had from an abstract from the New York Times of May 27, 1876. A comparison of the types constructed at that time with those built for present day service may be made by the accompanying half-tone illustrations of two locomotives characteristic of the past and present. Fig. 1 represents the mogul freight locomotive "Principe de Grao Para," built by the Baldwin Locomotive Works for the Dom Pedro Segundo Railway of Brazil in 1876, and Fig. 2 represents the decapod tandem compound freight locomotive, No. 940, which is the largest and most powerful locomotive in the world, built by the Baldwin Locomotive Works for the Atchison, Topeka & Santa Fe Railway in 1902. The Times article above referred to is a description of the Baldwin exhibit at the Centennial Exposition at Philadelphia, from which we quote the following:

"The Works can, and in busy times do, turn out over five hundred locomotives a year, and as it takes some months to build a locomotive, it is easy to imagine the large number the Baldwin people must always have upon the stocks in different stages of construction—often nearly a hundred.

"First on the Baldwin list, and the finest and most powerful locomotive in their exhibit, is a freight locomotive, constructed on what they call their 'Consolidation' pattern. It is built for the Lehigh Valley Railroad Company, for the ordinary 4 ft. 8½ in. gauge, and is to burn anthracite coal. The diameter of her cylinders is 20 ins.; stroke of piston, 24 ins. She has four pairs of driving wheels, 50⅜ ins. diameter, and a two-wheeled "pony" truck, as against three pairs of driving wheels and four-wheeled truck of what is known as the old "ten-wheeled" locomotive. The advantage of a pony truck is that it deprives the forward driving wheels of any tendency to cut the flanges and stops all plunging motion, which is so often seen in locomotives of the old ten-wheeled pattern. It is tolerably certain that this particular pattern of locomotive engine is to be the locomotive of the future. These locomotives have been built by the Baldwin people almost exclusively for the past ten years; but during the last year or two other builders and railroad companies have begun to appreciate their merits and are sailing in the Baldwin wake. To show how great is the improvement of the "Consolidation" over the "ten-wheeled" locomotive, it will be better to show relatively what each can do. Over maximum grades of 126 ft. per mile, the maximum load for a "Consolidation" engine is thirty-five loaded four-wheeled coal cars (329 gross tons of cars and lading), and the usual load is twenty-five loaded four-wheeled coal cars (235 gross tons of cars and lading). Over a grade of 76 ft. per mile one of these engines draws a maximum train of 140 empty four-wheeled cars (476 gross tons), at a speed of eight miles per hour. Its usual train is 100 empty cars (340 gross tons). The weight of these engines on driving wheels is 88,000 pounds. The cylinders are, as I have said, 20-in. by 24-in., and the driving wheels 50 3-8 ins. in diameter. The old ten-wheeled locomotive has cylinders 18 by 24, driving wheels 48 and 54 ins. in diameter, and weighs on driving wheels about 60,000 pounds. Now for the comparison of their respective performances:

	Gross tons of train. Grade 126 feet per mile.	Grade 76 feet per mile.
Maximum load of "consolidation" locomotive	329	476
Maximum load of "ten-wheeled" locomotive	235	340
Usual load of "consolidation" locomotive	235	340
Usual load of "ten-wheeled" locomotive	169 to 200	221

"The daily consumption of fuel by the 'Consolidation' locomotive is three and three-quarters tons; that of the 'Ten-wheeled' is three and one-quarter tons. See how easy it is to draw a line through the respective merits. It comes right in the middle. The usual load of the 'Consolidation' locomotive is just precisely the same in gross tons as the maximum load of the 'Ten-wheeled,' and this with only the increased cost in the consumption of fuel of one-half of a ton of anthracite coal a day. Surely this tells its own tale, and bars all further discussion of the matter.

"Second on the Baldwin list is a magnificent engine of the 'Consolidation' pattern, constructed for the Pennsylvania Railroad Company from the company's own drawings, to run on a 4 ft. 9 in. gauge and to burn bituminous coal. * * * There is this marked difference, which seems to be somewhat of a hobby of the Pennsylvania Railroad folks—that instead of having what is technically called the common 'wagon-top' firebox, this locomotive has a sloping firebox of what is known as the Winans pattern, the object being to equalize as much as possible the weight on each pair of driving wheels. The weight of this engine in working order is 91,640 pounds; the weight on driving wheels is 79,400 pounds. * * * *

"The next locomotive in the Baldwin exhibit is a magnificent passenger locomotive constructed for the Pennsylvania Railroad Company on what is known as the 'American' pattern, from drawings furnished by the company. * * * She is specially built for high speed, and has a conduit for taking up water from a track tank attached to her tender. This conduit, when let down, forms a sort of scoop somewhat in the shape of a capital S. The high rate of speed makes the water run up this to a height level with the top of the ordinary tender tank, into which the water falls and from which it is, of course, pumped into the boiler in the customary way. From a track tank 1,500 ft. long, 20 ins. wide, and 6 ins. deep, this engine would take up about 2,000 gallons of water, only 400 gallons short of filling her tender tank. The conduit is lowered by means of a lever, which has a constant tendency to push back against the operator. Thus there is little chance of the conduit not being properly replaced so soon as the tank has been replenished. This locomotive and tender are also provided with the Westinghouse air brakes, the handle of which is close by the throttle lever, so that the engineer can apply it instantaneously. There is also an attachment for applying the brake to the driving wheels. These splendid locomotives will carry trains over the Allegheny mountains at a rate of speed exceeding thirty miles an hour."

The following table indicates the production at the Baldwin Works during the years from 1872 to 1902 inclusive:

Locomotives.	Locomotives.	Locomotives.	Locomotives.
1872....422	1880....517	1888....737	1896.... 547
1873....437	1881....554	1889....827	1897.... 501
1874....205	1882....563	1890....946	1898.... 755
1875....130	1883....557	1891....899	1899.... 901
1876....232	1884....429	1892....731	1900....1217
1877....185	1885....242	1893....772	1901....1375
1878....292	1886....550	1894....313	1902....1531
1879....298	1887....653	1895....401	

Over twenty-one thousand locomotives have been constructed since the "Old Ironsides," in 1831. That engine was nearly a year in building. The output in 1902 was at the rate of one locomotive every four hours.

The following figures indicate the growth of the Works:

Works established	1831	11,000th locomotive built,	1890
1,000th locomotive built,	1861	12,000th " "	1891
2,000th " "	1869	13,000th " "	1892
3,000th " "	1872	14,000th " "	1894
4,000th " "	1876	15,000th " "	1896
5,000th " "	1880	16,000th " "	1898
6,000th " "	1882	17,000th " "	1899
7,000th " "	1883	18,000th " "	1900
8,000th " "	1886	19,000th " "	1901
9,000th " "	1888	20,000th " "	1902
10,000th " "	1889	21,000th " "	1902

Locomotives built in 1902: Compound, 443; electric, 77; compressed air, 10; for export, 100. Total 1,531.

It will be seen from the foregoing that, while thirty years were occupied in building the first thousand engines, almost as many were built in the single year of 1890.

FIG. 1—MOGUL FREIGHT LOCOMOTIVE BUILT BY THE BALDWIN LOCOMOTIVE WORKS IN 1876.

The present organization, based upon an annual capacity of fifteen hundred locomotives, equal to five locomotives per working day, is as follows:

Number of men employed................	13,000
Hours of labor per man per day...........	10
Principal departments running continually, hours per day	23
Horse power employed	7,500
Number of buildings comprised in the Works	33
Acreage comprised in the Works...........	16
Acreage of floor and yard space comprised in the Works	30
Number of dynamos for furnishing light, arc	11
Number of dynamos for furnishing light, incandescent	5
Number of electric lamps in service, incandescent	4,000
Number of electric lamps in service, arc....	400
Horse power of electric motors employed for power transmission, aggregate	5,300
Consumption of coal, in net tons, per week, approximately	2,150
Consumption of iron, in net tons, per week, approximately	3,500

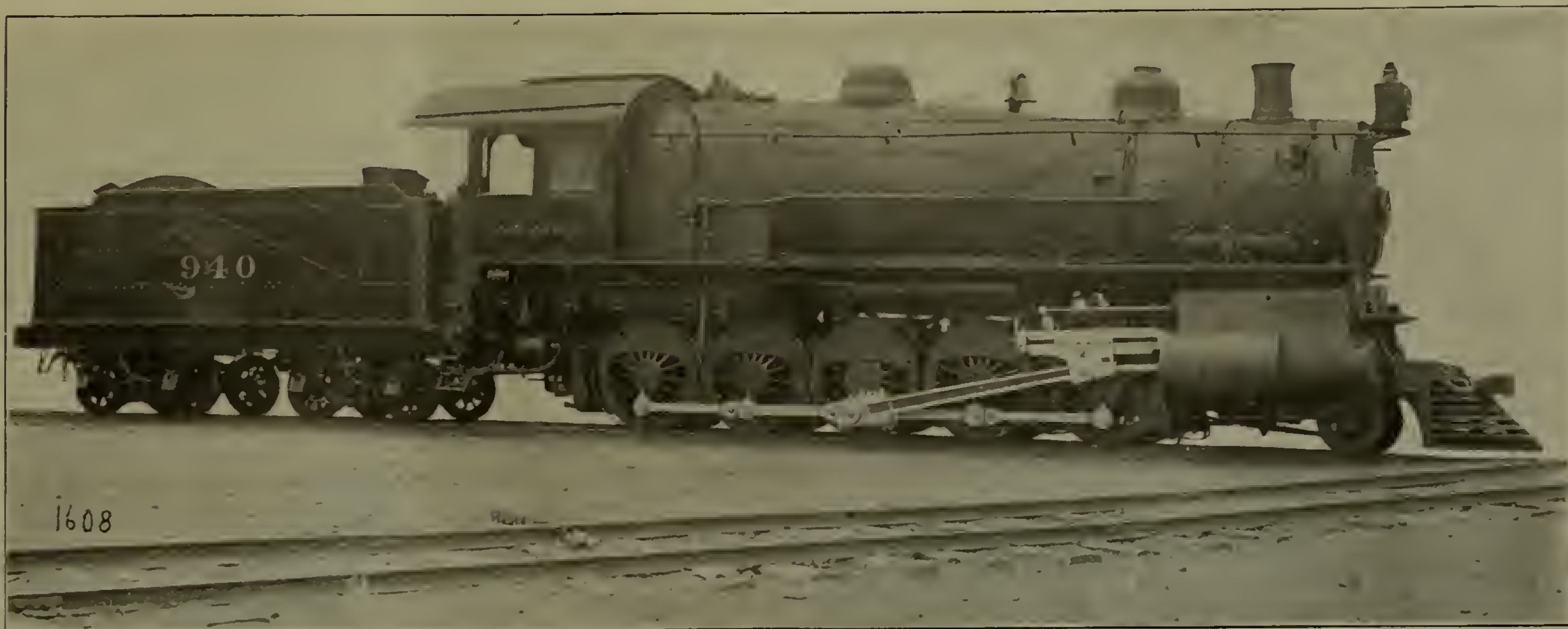


FIG. 2—DECAPOD TANDEM COMPOUND FREIGHT LOCOMOTIVE BUILT BY THE BALDWIN LOCOMOTIVE WORKS, 1902—THE HEAVIEST LOCOMOTIVE IN EXISTENCE.

Consumption of other materials, in net tons, per week, approximately 1,000

The location in one of the largest manufacturing cities in America, gives especial facilities and advantages. Proximity to the principal coal and iron regions of the country renders all required materials promptly available. A large permanent population of skilled mechanics, employed in similar branches in other Philadelphia workshops, gives an abundant force of expert workmen from which to draw, when necessary. All parts of locomotives and tenders, except the boiler and tank plates, chilled wheels, boiler tubes and special patented appliances, are made in the main or adjunct Works from the raw materials.

Quarter-Century of Locomotive Progress--American Locomotive Co.

THE history of the American locomotive comprises practically the entire development of the machine, and that on lines distinctively their own, which is as apparent today as at any time since the locomotive was scarcely more than a toy. The great demand for transportation to keep pace with the rapid growth of this country, furnished the hint to capitalists to provide the motive power, and numerous works for locomotive manufacture sprang into existence in consequence. Many of these after a few years of success dropped out of sight, leaving in some cases a memory only, in others a name indelibly fixed among the improvers of the locomotive.

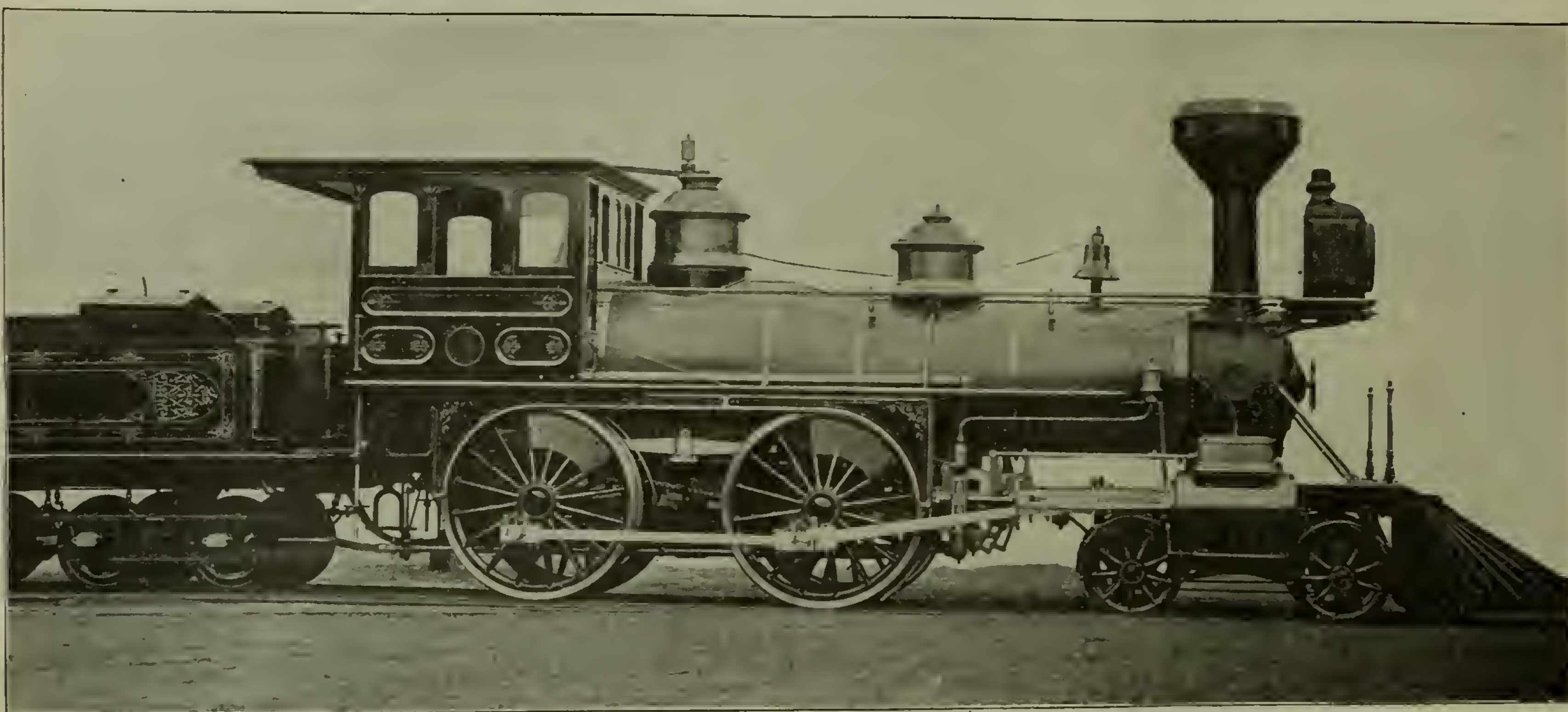
In the year 1901 the American Locomotive Company was organized, taking in eight important locomotive building plants, among which are the Schenectady Works of Schenectady, New York, which has a record dating from 1848; the Brooks Works of Dunkirk, New York, which was established in 1869; the Pittsburg Works of Allegheny, Pa., which started in 1865; the Richmond Works of Richmond, Va., whose business life began in 1887; the Cooke Works of Paterson, N. J., the organization of which took place in 1852; the Rhode Island Works of Providence, R. I., dating from 1866; the Dickson Works of Scranton, Pa., dating from 1856, and the Manchester Works of Manchester, N. H., which had its beginning in 1854. It is seen by these figures that this company comprises some of the oldest locomotive building concerns in the United States, and all of which, it is hardly necessary to say, have been important factors in placing the locomotive on the high plane it occupies today.

Among the reasons for the remarkable success of the American locomotive builder stands pre-eminent the intelligence of the rank and file, and this coupled with the fact that the work is largely done by the piece or contract in these establishments—which assures the maximum output in a given time—makes it possible to guarantee deliveries that could not be thought of by the strictly day-work method that prevailed a few years ago. Another potent factor which exerts a great influence on the amount of work turned out, is the character of the machine tools; this is being recognized to the fullest by the installation of the best modern tools obtainable to cheapen the cost of work, and neglecting no facilities to enable these tools to be handled to the best advantage in putting out a product which includes every possible type of motive power operated by steam or compressed air.

In twenty-five years a marked change has taken place in the design of locomotives, and this change is one that concerns not only the details in general, but the type of the machine as a whole. At that period the popular engine for all classes of service was the eight-wheel or American type. Ornamentation in paint and brass was a hobby then running wild with railway officials, and was no mean item of expense; today the contrary is the rule, no scroll-work being seen, and but little striping, and whatever brass is visible has some reason for its existence, other than to be polished by an over-worked fireman. Wrought iron was then practically the only material used in boiler construction; today steel is the rule. This change is of course due to the increase in boiler pressure from 140 pounds to pressures as high as 225 pounds. Then, cast steel was all unknown material, all castings being of iron or brass, now cast iron for locomotive details has been largely supplanted by steel and malleable iron. The pump of long ago has been retired as a boiler feeder to make room for the injector. Then balanced valves or piston valves were practically unknown; now there are few engines without one or the other of these types. Then the compound principle for locomotives was looked upon as the figment of a disordered brain; now there are thousands of these fuel savers in commission, two cylinder compounds having long been a specialty with this company, which has also recently built many of the tandem type.

A representative eight-wheeler, or 4-4-0 type, built in 1876 at the Dickson Works, and sent to the Centennial Exposition at Philadelphia in that year, as typifying the best development of the time for that plant, is given herewith, Fig. 1. This engine was a 17x24 inch passenger engine with 68 inch wheels, weighing 50,800 pounds on drivers and 72,800 pounds total. With 140 pounds boiler pressure, the engine would exert a maximum tractive effort of 12,100 pounds, and had a tractive coefficient of 4.2;. the latter value giving evidence that the designer had torn away from precedent in giving the engine correct adhesive weight. The halftone shows the engine to be fully abreast of all the foibles and frills of the time in respect of brass finish and paint. As a foil to the above relic is given a modern passenger engine built at the Schenectady Works, Fig. 2, having a four-wheeled engine truck, four drivers and a two-wheeled trailing truck, or what is known as the 4-4-2 type. This engine has cylinders 21x26 inches with 79-inch driving wheels; weighing 95,000 pounds on drivers, which is the normal adhesive weight, and has a total weight of 176,000 pounds. The engine is equipped with a traction increaser, a device operated by air, by which 12,000 pounds of the weight carried on the trailing wheels may be transferred to the drivers, thus making the adhesive weight equal to 107,000 pounds when necessary to utilize full cylinder power in starting a train. The boiler pressure is 200 pounds, while the maximum drawbar pull is 24,700 pounds and the tractive coefficient 4.33. This machine is a plain business-like affair, designed to haul heavy passenger trains, which service demands the development of an unfailing boiler power; this essential being of first importance, the engine has an enormous heating surface, there being 180 square feet in the fire box, 3341.85 square feet in the tubes, and a total of 3521.84 square feet, with a grate area of 50.3 square feet.

In attaining the desired heating surface the wide firebox has become a recognized factor for all classes of service, and to this fact is due the changed appearance of the modern passenger engine owing to the different wheel arrangement, since the wide fire box is back of the driving wheels and the overhang must be supported;



4-4-0 Type of Passenger Locomotive Built by Dixon Locomotive Works in 1876, Now the American Locomotive Company.

4-4-2 Type of Passenger Locomotive of the Present, Built by the American Locomotive Company.

to sustain this weight is the province of the trailing wheels. The wisdom of reducing the rate of combustion by means of the large grate area was perhaps never better exemplified than recently, when engine 483, an exact duplicate of that shown herewith, hauled a tonnage on the Michigan Central that borders on the phenomenal. The engine and tender weighed, with half tank of fuel and water, 125.62 tons; the weight of passenger train cars was 605.57 tons, making total load of engine and train 731.19 tons. This train was taken a distance of 118.22 miles in 127 minutes, which is at an average speed of 55.8 miles an hour. Basing the work done on Wellington's formula v÷4+2 there would be 15.95 pounds per ton resistance, and therefore about 1900 horse-power developed. It is unnecessary to say that the large heating surface of this engine made this performance a possibility. These two locomotives embrace the extremes of passenger engine practice for the past twenty-five years and do not represent more radical changes than are also seen in freight types as put out by the American Locomotive Company.

Record of Run of 4-4-2 Type Passenger Locomotive, Built by the American Locomotive Co. for Michigan Central R. R. Recently.

Station.	Time.	Mins.	Miles.	Miles Per Hour	
Bridgeburg ....A	8.13 A. M.	2	0.81	24.30	
Bridgeburg ....D	8.19 A. M.				
Victoria	8.21	2	0.81	24.30	Yard Limits
Niagara Junc..	8.24	3	1.27	25.40	Yard Limits
Stevensville ...	8.30	6	5.06	50.60	
Brookfield	8.25	5	5.44	65.28	
Welland	8.40	5	4.71	56.52	Slow Down
Perry	8.50	10	9.34	56.04	Slow Down
Attercliff	8.59	9	8.22	54.80	
Canfield	9.07	8	7.33	54.98	Slow Down
Edward	9.12	5	4.82	57.84	
Hagersville	9.24	12	11.57	57.85	Slow Down
Townsend	9 30	6	5.57	55.70	
Villa Nova	9.32	2	2.25	67.50	
Waterford	9.37	5	4.93	59.16	Slow Down
Windham	9.44	7	6.57	56 31	
Pt. Dover Junc.	9.48	4	4.13	61.59	Slow Down
Hawtrey	4.49½	1½	1.23	49.20	
Cornell	9 54½	5	5.08	60.96	
Tilsonburg	10.00	5½	5.44	59.35	
Brownsville ...	10.06	6	5.79	57.90	
Springfield	10.11½	5½	5.47	50.67	Slow Down
Aylmer	10.14	2½	2.46	59.04	
Kingsmill	10.17	3	2.74	54.80	
Yarmouth Cros'g					Slow Down
St. Thomas....A	10.26	9	7.99	53.27	Yard Limits
		127	118.22		

Light Locomotives—H. K. Porter Company

The light locomotive business has been carried on in Pittsburg, Pa., for some thirty-five years. The first machine built by the firm of Smith & Porter (which was one of the predecessors of the present H. K. Porter Company, builders of light locomotives), was constructed about the year 1867, an illustration of which is here presented, Fig. 1. This machine was an odd gauge of track for one of the old coal mines on Coal Hill, Pittsburg, which has long since been worked out, and was interesting because embodying quite a number of features of construction along English lines. The frames were made of plate iron, and at that time there were no mills, except in Pittsburg, capable of rolling plates as wide and as heavy as needed. The boiler was altogether built of iron, as no steel boiler plate was made at that time. Chilled tires were used, since steel tire had not then been manufactured, at least in this country. Quite a number of machines of this type were made, requiring six or eight months to construct each machine.

The photograph of engine "Birch Rod," Fig. 2, shows

Fig. 1—First Light Locomotive Built by the Porter Company, 1867.

a machine built in 1870, which is a little more modern in type, although still retaining the old style plate frames, and pump worked from a half crank on the rear driving wheels. This machine was standard gauge, and quite a number of engines of this type were shipped to the Northern Pacific Railroad for construction work. Only a few years ago a number of these machines were reported to be still at work every day. This photograph is of interest as it shows, just over the sand box of the engine, the old shops, a three-story, wooden, barn-like

Fig. 2—Early Type of Standard Gauge Light Locomotive, Built in 1878 by the Porter Company.

structure, which burnt to the ground in 1871. Locomotives were shipped from this old shop by running them out the front shop door on to a turn-table in the street, and then hauling ahead sections of portable track until a street was reached running to the Monongahela River, where the engines were loaded on a flat boat and towed to the railroad station and hauled up the bank on to the railroad tracks. One of these early machines was run by its own steam all the way from the shops on the South Side, across the old Monongahela suspension bridge (one of the first that Roebling ever built), and thence along the wharf to the old station of the Pennsylvania Railroad at the Point. The gauge of track of the engine happened to be just about right for the space between the two tracks of the Street Horse Railway which led over the bridge. The toll-keeper was unable to find locomotives in his classification of tolls, and is said to have charged the tariff due on elephants. Another of these little machines was shipped down the Ohio on a flat boat, the engine being jacked up on the flat boat with the side rods uncoupled and turned backwards, and attached by long beams to a stern paddle wheel. In this way this amphibious locomotive worked its own passage down the river. The inhabitants of the river towns turned out en masse with inquiries as to how much water was found on various riffles and shoals; but the

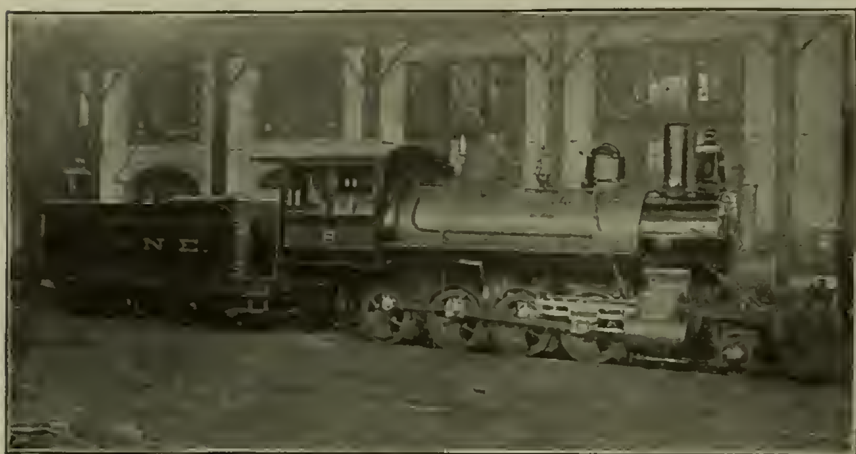


FIG. 3—MODERN 36-IN. GAUGE CONSOLIDATION LOCOMOTIVE BUILT BY THE PORTER COMPANY.

navigating crew had passed the various dangerous shoals and riffles without being conscious of their existence, as the boat only drew 3 or four inches of water.

In 1871, after the burning up of the old shop, the firm name was changed, and new shops begun at the present location at 50th street on the Allegheny Valley Railway, and before the roof was on the shop a locomotive had been shipped. The original shop was a very small affair, but has since grown to the present dimensions, occupying some three squares, and the growth still continues. At the present time very large extensions are under way. The present capacity of the shops is 250 to 300 locomotives per year, and machines varying in gauge of track from 18 inches up to standard gauge, and weighing from about four tons to about 55 tons, are turned out.

We present an illustration "J. & N. E." (Fig. 3), showing a modern 36-inch gauge, 16x20 cylinders, Consolidated locomotive, weighing upwards of 45 tons.

The H. K. Porter Company make a specialty of contractors' locomotives, and have turned out during the past year 100 contractors' locomotives, 9x14-inch cylinders, weighing about 12½ tons, all 36-inch gauge. Some large contracting companies have forty to sixty of these machines in constant operation. The Porter design of contractors' locomotive is a favorite, and has preference over all other builds because better balanced and more efficient, and also because in case of accident the Contractor has the advantage of the Porter Company's unique system of keeping duplicate parts of locomotives on hand in stock, ready to ship at a moment's notice.

We also present an illustration (Fig. 4) of a little compressed air, narrow gauge locomotive, one of a number the Porter Company have shipped to Japan. These air locomotives are used mostly for underground work, but also for surface work where a steam or electric locomotive is impracticable on account of danger from fire. There have been greater developments in the last six or eight years in compressed air than there have been in electricity, and comprssed air has proved in practice to be superior to electric locomotives for a large

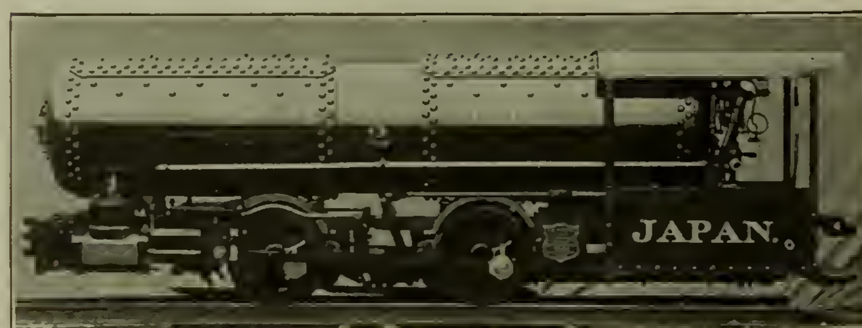


FIG. 4—COMPRESSED AIR NARROW GAUGE LOCOMOTIVE BUILT BY THE PORTER COMPANY.

range of requirements, and is in fact a more up to date power, being absolutely safe against fire, and the locomotive having its energy self-contained is not dependent upon any overhead, or track, arrangements such as trolley wires, but can run wherever it it desired to lay a track.

Hicks' Locomotive and Car Works, Chicago

IN 1897 Mr. F. M. Hicks with rare foresight perceived the need for an extensive and well equipped locomotive repair shop, and with his characteristic energy set about the development of his plans. A small frame building suited to his immediate needs, and with ample ground for expansion was found at Chicago Heights, and the building equipped with such tools as were necessary to the immediate requirements.

Chicago Heights is a suburb of Chicago, admirably located and with excellent shipping facilities over the Chicago & Eastern Illinois, the Michigan Central, the E., J. & E., which is the outer belt line, and the Chicago Terminal Transfer Railroad Company, an inner belt line connecting with all roads entering Chicago.

The growth of the Hicks Locomotive & Car Works has been phenomenal. A full description of this plant will be found on page 140 of the November issue of the Railway Master Mechanic. The extensive new power plant just completed comprises 72-inch boilers with the Hawley down-draft system, two compound stationary engines of large capacity, each operating two large dynamos; air compressor of large capacity, etc.

The entire plant is operated by electricity with individual motors for the machines, singly or in groups as best suited to the requirements. The air compressor furnishes air for a large number of pneumatic drills, hammers, stay-bolt clippers and special tools, also pneumatic flanges, clamps, pneumatic jacks and hoists. The 75-foot transfer table which is now operated by air will very soon be controlled by electricity, as will also the overhead cranes which serve the erecting shop. The machinery of the entire plant is modern, selected with a view to future growth as well as immediate needs. It includes a full line of heavy and light tools for machine shop, boiler and blacksmith shop, and for wood working in the various freight and passenger car departments.

In another column we illustrate two locomotives recently rebuilt at the Hicks works, which are samples of types furnished by Mr. Hicks in from thirty to sixty days. We also reproduce photos of a private car built for the president of the Brunswick & Birmingham Railroad, as characteristic of the passenger equipment turned out at this plant.

Private and official cars are delivered in from sixty to ninety days. Straight passenger coaches, combination and baggage cars in from thirty to sixty days. Heavy locomotive repair work is also being done for outside

Type of Freight Locomotive from the Hicks Locomotive and Car Works.

Type of Passenger Locomotive from the Hicks Locomotive and Car Works.

parties, including a number of the large railroad systems whose facilities are inadequate for their present demands.

The machinery of the entire plant is modern, selected with a view to future growth, as well as immediate needs. The treatment of locomotives in the machine and erecting shop is most thorough, every part being handled by specialists. The energy and careful attention to detail on the part of the management bespeaks a bright future.

Twenty-Five Years' Progress in Railway Equipment Painting

By Charles E. Copp, General Foreman Painter, B. & M. R. R., Lawrence, Mass.

What progress, if any, has a quarter century marked in the painting of cars and engines? The nature of some arts or trades is such that seemingly there is no chance for advancement, and painting is looked upon as one of them. The work of the mason appears to be done now as then; likewise that of the upholsterer, and others; but if we were to canvass even these and other trades more closely we would find many labor-saving devices brought into requisition. The stone-cutter and marble-worker have brought compressed air to their aid in chiselling the name of the hero upon the tablet of honor, and polishing it to a mirror-like surface.

What has machinery and power done to give speed to the work of the painter and lessen its cost? Well, at first thought but little; and yet if we stop and think we shall see that it has done much, and promises more. Take, for instance, the item of burning off the paint from a passenger coach: the crudest implements and methods were in use in those days; hot irons from the blacksmith's shop; charcoal hand-furnaces with an open grate on one side, were held up to the car, with aching arms, until the paint was blistered, and then it was scraped off. Other hand-methods were in use, to be sure, such as various torches filled with benzine, etc.; but it was an expensive job either way to remove the long-accumulated and thick coating of cracked paint and varnish—well nigh half as much as it now costs to repaint a passenger coach. Compressed air and gas now have been harnessed to the painter's aid, and not only has the cost of this item been reduced at least by two-thirds, but the comfort in doing the work has been increased in the same ratio. The sand-blast has also been devised to remove paint from locomotive tanks and prepare these and other iron and steel surfaces for the protecting paint to follow, removing all rust and cleaning it of fire-scale. A similar device has come into use for etching glass into ornamental designs for coach decks and saloons, in connection with a plant fitted up in most large paint shops for the general work of etching, silvering and embossing glass, which work formerly had to be sent away at greater expense of time and money.

Compressed air and the painting machine have also been ushered, with considerable flare of trumpets, into freight car and other rough painting to greatly expedite this work and reduce the cost, though this is often done at the expense of the operator's and other's health and comfort, from lack of suitable facilities.

The renewal of the interior brass and bronze fixtures of the passenger coach—dipping into suitable acids to remove tarnish and bring out their original beauty, buffing, lacquering, etc., is a matter that has been developed in the paint shop, greatly to the improved appearance of rolling stock, though this work is now largely turned over to the tinsmith's department.

In decorative work articles have been devised to lend speed and ease to the car painter's work. There is the gilding wheel and ribbon gold, which are such a help in comparison to the old way of gilding from the book, especially at the present time when plain gold stripes constitute the principal if not the only decoration upon the exterior of passenger equipment. Great improvements in stenciling have also been made, so that interior decoration of a high order in first-class coach, parlor and sleeping car ceilings is now done in this way with speed and accuracy.

There are other labor-saving devices and methods that might be mentioned that have been or are being brought out to give progress to the painter's craft in one way and another, but his most notable achievements lie along the lines of quicker and cheaper methods generally in the execution of his work so that a coach is kept out of service for complete repainting less than half the time formerly. To be sure, the times and the demands of his superior officers have in many instances led him to do this; but the manufacturer, quick to discern the needs of the painter, has come to his aid with materials, not only all prepared by machinery, but better prepared than he could do it by hand formerly, and better suited for rapid and durable work thus quickly done. He would have been afraid to paint a car in those days with the rapidity that he now does it, with the crude materials then at hand, for fear his work would go to pieces before it got away from the premises. Now he gives it no concern. Like the artist on the daily paper to whom, well into the night, comes news to be illustrated in the morning paper and does not fret but takes it coolly, so the car painter of to-day does not get frightened as he formerly would at the shortness of time to paint a car which is left to his disposal but easily accomplishes it on time and in a workmanlike manner.

Railway work is not now so ornate in the painter's line as then; and in this regard many of artistic tastes will say that there has been retrogression instead of progression in the tasteful painting of railway equipment. They were rolling chromos, resembling the chariots and cages of the circus and menagerie, commanding the awe and admiration of the beholder. But we have ceased to regard railway equipment as red and gilded toys for our amusement, but rather as useful and comfortable appliances for the rapid and safe transportation of the public and their effects from place to place, thus to earn dividends on the necessary funds invested in their construction and maintenance, as well as that of the permanent way. We have come to rightly look upon railway operation as a business beset with possible serious mishaps and encompassed with sharp competition, instead of a diversion enshrouded in leisure; and so our painting has taken on this spirit and tone and made the same progress with it until a rather severe plainness, but no less a richness, characterizes the art of painting passenger equipment today, and withal it is in better taste in general. The gaudy equipages of former days would shock the sense of the cultured traveler now-a-days. What is suitable for the family coach in exterior finish is appropriate for the passenger car, so far as is consistent with its size and shape, while the interior of the latter should be made most comfortable and luxurious for long journeys.

Dark body colors have superceded the old yellow coach colors of former times as more appropriate for cars and withal more economical to maintain. They can be freshened in color annually, if need be, before the varnish is applied, by a single "cut in" coat of any of these dark shades between the stripes and around letters, etc., and thus keep them bright and clean in appearance. But not so with the old yellow cars. They had to run several years until they got to be dingy and grimy, for a coat of color on those meant several and a complete repainting.

Painted, striped and varnished steps and trucks have given way to the enamelled variety with good sense and much economy. Indeed this may be carried out still farther on decks, and so on. At least half the time and expense is required in the annual shopping of passenger equipment for painting and varnishing compared with twenty-five years ago; and if railroads do not earn their dividends it is no fault of the paint shop.

This and much other progress that might be mentioned has been brought abou largely by the Master Car and Locomotive Painters' Association, which was organized thirty-three years ago, which especially of recent years has been so well fostered and patronized by the heads of the mechanical departments and others. This has afforded ample opportunity for interchange of ideas in discussion, together with the use of the press in an official organ where communications are published from all who will contribute. These and similar instrumentalities should continue to receive the support of not only the craft, but of the superior officers and the roads for the good they have done and will continue to do in lessening the cost and increasing the output of the car and locomotive paint-shop.

The Growth of the Grand Trunk Railway System

THE original prospectus of the Grand Trunk was issued in 1853. Its object was the construction or formation of "a Main Trunk Line of Railway throughout the province," of five feet six inches gauge, and embracing the lines then completed or under construction, which included "the Grand Trunk Railway Company, of Canada East; the Quebec & Richmond Railway Company, the St. Lawrence & Atlantic Railway Company, the Grand Junction Railway Company, and the Toronto & Guelph Railway Company," and leasing in perpetuity the Atlantic & St. Lawrence Company from its junction, near the United States boundary line, to the city of Portland, Me., a total distance of 1,112 miles, of which 250 miles were at that time open for traffic.

In the year 1860, when the opening of Victoria bridge completed the undertaking, the locomotive stock numbered 206 engines, of which 165 were at work in Canada.

These were constructed as follows:

In the United States	72
In Canada	43
In England	50

The earliest of these was built by the Portland Company, in 1848, and weighed 52,640 lbs., having cylinders 15 by 22 ins., and driving wheels 5 ft. in diameter. The tubes were 144 in number, and 2 ins. in diameter, while the steam in the boiler was compressed to 11 lbs. per square inch.

Fifty engines sent from England were constructed on the lines of those in use upon the London & Northwestern Railway, by Messrs. Peto, Brassey, Betts and Jackson, the contractors for the undertaking, at the Canada Works, Birkenhead, and delivery was made during the years 1854 to 1858 inclusive. The stroke of the piston in each case was 20 ins., but the bore of the cylinders was 15, 16 and 17 ins. (four only of the last) being proportioned to the work required. The smallest, or passenger engines, had single pairs of driving wheels, 6 ft. in diameter, those for freight being four coupled, 5 ft. dimension. The steam pressure was 110 lbs. per square inch of boiler, and the weight per loaded engine varied according to capacity from 56,560 lbs. to 60,000 lbs. The cylinders were set at an angle from the horizontal plane of the driving axle, and were situated outside the main plate frames, and between them subsidiary frames, which extended back to the forward driving wheels. The boilers, which were of Low Moor iron, contained 170 brass tubes each, of 1⅞ ins. outside diameter, and the fireboxes were of copper. The engines were sent from the makers with single pairs of leading wheels, but these were gradually exchanged for four-wheeled trucks after the machines arrived in Canada. Thirty of these engines were found sufficiently serviceable to be reconstructed for the change in gauge of railway in 1873. Passengers by the Ottawa River Navigation Company's line, in summer, may see an unique specimen of these so-called "Birkenheads" (the last of its line), hauling the train which makes the connection between Carillon and Grenville, in good repair and equal to years of more work at the age of half a century. The old characteristics of the engine still remain, and the railway has the orginal Grand Trunk gauge of 5 ft. 6 ins.

THE FIRST BUILT IN CANADA.

The first locomotive built in the shops of the Grand Trunk Railway Company was No. 209, designed by Mr. F. H. Trevithick, the first locomotive superintendent of the company, and nephew of the talented engineer whose name he bears. This engine was completed May, 1859, and was used for the transportation of freight between Montreal and Toronto. It weighed close upon 65,000 lbs. in working order, and had 16 by 20 in. cylinders and wheels 5 ft. diameter, the boiler being strained by the steam to 120 lbs. per square inch. Mr. Trevithick, who, the writer believes, still resides in Cornwall, near the scenes of his great ancestor's original labors, relinquished office in 1859 in favor of his assistant, Mr. W. S. Mackenzie, who was three years later succeeded by the late Mr. Richard Eaton, who came from the Great Western Railway of Canada, with Mr. C. J. Brydges, 1863. Mr. Eaton assumed the title of mechanical superintndent, and built his first Grand Trunk locomotive at the Montreal shops, March, 1865. He had, however, previously constructed others at the Great Western Works, Hamilton, and was the first to use steel in the construction of locomotive boilers, one of which, made of this material, he built as far back at 1861. The chief distinguishing features of the Eaton engine were the armor plate or slab main frames, the straight or flush firebox outer shell, as against the raised or wagon top, and the rigid plate staying of the boiler and firebox crown sheet. The passenger and freight engines varied only in the diameter of the four coupled driving wheels, which were respectively of 5 ft. 6 ins. and 5 ft., and the cylinders were uniformly of 16 ins. diameter and 26 ins. stroke. The steam pressure was 135 lbs. per square inch, and the weight of the engine in working order was about 65,000 lbs.

TWENTY YEARS' PROGRESS.

Mr. Eaton's successor was Mr. Herbert Wallis, who took charge of the mechanical department January 1st, 1873. During his continuance in office, up to May 1st, 1896, the gauge of the Grand Trunk Railway was changed from 5½ ft. to the standard 5 ft. 8½ ins., mainly during the autumns of 1873 and 1874. During this change urgency demanded the importation of some 160 locomotives from the United States, of which the Manchester (N. H.) Works contributed 61, the Baldwins (Philadelphia) 45, the Schenectady 20, the Rhode Island 15, and the Portland Company some 20, while in Canada the Kingston Works and those of the Grand Trunk Company added their quota of new ones, in addition to reconstructing 135 broad gauge engines for use under the altered conditions. The new locomotives were practically all of one type, having 17 by 24-inch cylinders, four coupled driving wheels of 5 and 5½ ft. diameter, the steam pressure carried being 140 lbs. per square inch. They were, in fact, the regular eight-wheeled "road" engines, improved to that date, that had for years done duty on the American continent, and of which they were at that time the prevailing type. These engines weighed 70,000 lbs. in working order, and hauled in average weather, at a rate of speed, without allowance for time at stations, of perhaps ten miles per hour, between Brockville and Montreal, freight trains of 500 tons, at an average expenditure in coal of about 1½ ounces per ton per mile.

TYPE OF PASSENGER LOCOMOTIVE IN SERVICE ON THE GRAND TRUNK RAILWAY SYSTEM.

It was during the year 1873 that coal began to be extensively used as locomotive fuel, no wood-burning engines having been constructed for use on the Grand Trunk Railway subsequent to 1872.

In the effort to produce results, the eight-wheeled road engines were notoriously over-cylindered for the weight upon the driving wheels, which was greatly restricted by the light nature of the track and bridges. In this category it was impossible, for obvious reasons, to keep pace with the growing requirements of the traffic, which were constantly asserting themselves in calls for heavier trains and higher speed, and to obtain which sidetracks were lengthened until nothing but the doubling of the main lines and the strengthening of the road and bridges gave the necessary relief.

THE MOGULS ARRIVE.

The introduction of the "mogul" type of engine, of which ten were imported 1874, permitted the utilization of a larger proportion of the total weight for adhesive purposes, and thus reduced the wear and tear of track. The driving weight was distributed over three, instead of two pairs of wheels, and thus it was possible by the use of larger cylinders and higher steam pressure to increase the capacity of the machines. Between the years 1874 and 1896 more than 170 of these engines were added to the stock of the Grand Trunk Company, or replaced others of less capacity, and of those some 150 were constructed at the work shops in Montreal. In these engines a single pair of wheels, pivoted beneath the smokebox, replaced the four-wheeled truck common to the "road" engine, and this pair performed the office of a leader without relieving the driving wheels of necessary adhesive weight. Engine 572, built 1891, was of this type, the advantage of which lay in the fact that at little greater expenditure of fuel per ton-mile unit, trains were increased in weight to the extent of 130 per cent. These engines weighed something over 50 tons, had 18-inch cylinders, 26-inch piston stroke, 5-foot driving wheels, and were worked at a boiler pressure of 190 lbs. per square inch.

In 1895 the Grand Trunk Company built its first compound locomotive, which was adapted to the "mogul" type. The high-pressure cylinder measured 19 and the low, or second expansion, 29 ins. in the bore. The stroke of the piston was 26 ins., the initial steam pressure was 190 lbs. per square inch, and the total weight of the engine loaded, that is, in working order, was 118,412 lbs. In very carefully conducted trials between Montreal and Brockville, as between this and the then most recent example of simple "mogul" type, the compound engine used 35 per cent less coal per ton-mile unit and its boiler evaporated 20 per cent more water for each pound of coal consumed. The average train load (eastward and westward combined), and exclusive of the engine and tender, was equal to 1,109 tons, and this work was performed at an average speed of 21 miles per hour, with a consumption of coal at the rate of little over one ounce per ton per mile.

In the early days of the locomotive the train loads were under 100 tons, and the fuel consumption per ton-mile unit was about two pounds. Wood, in his treatise on railways, 1832, gives an average of 1.6 lbs. as the best English practice, after many experiments. There seems little doubt, however, that trains hauled in loads of a thousand tons, by compound engines can be conveyed to-day, per ton, at one-twentieth of the expenditure in coal that was common in the days of Stephenson's famous "Rocket," and this notwithstanding the additional calls upon the boiler for brake power, increased speed, car warming service, and the many little contrivances for the relief of the enginemen and firemen.

The high and low pressure cylinders on the Grand Trunk engines of to-day have respective diameters of 22½ and 35 ins. The stroke of the piston and diameter of the driving wheels are the same, but the steam pressure has been increased to 200 lbs. per square inch and the total weight of engine in working order has risen to 163,704 lbs. The haulage capacity of these engines between Montreal and Brockville is a train of 1,500 tons going westward and of 2,000 tons going eastward.

The Morse passenger engine remains of the single expansion design, but, as in the case of the freight, it is of greatly increased capacity, and an additional pair of driving wheels has been introduced, constituting it what is known as a "ten-wheeler." The essential differences may be seen from the tabulated statement, from which it may be calculated that the increase in power amounts to something over 50 per cent in the case of the Grand Trunk passenger engines of to-day, and, what is of very great importance, the steaming power of the boilers has been more than proportionately improved by a very liberal increase of heating surface and grate area.

	No. 93. 1881.	No. 989 1902.
Diameter of cylinders, in	18	20
Length of stroke, in	26	26
Number of wheels	8	10
Number of driving wheels	4	6
Diameter of driving wheels, ft	6½	6
Total weight of engines, lbs	96,000	177,772
Initial steam pressure, lbs. per sq. in.	160	200
Fire grate area, sq. ft.	17¾	33½
Total heating surface, sq. ft	1,304	2,460

Twenty-five years ago the Grand Trunk Railway Company of Canada owned 434 locomotives, of which 67 were passenger, 359 freight and 8 shunting. Of these the largest had 18 by 26-inch cylinders and weighed 160,000 lbs.

At the present time the Grand Trunk Railway System (which comprises the Grand Trunk Railway of Canada, Grand Trunk Western, Detroit, Grand Haven & Milwaukee, Cincinnati, Saginaw & Mackinaw, St. Clair Tunnel, Toledo, Saginaw & Muskegon) possesses 983 engines—243 passenger, 652 freight and 88 switching, the heaviest engine and tender being a 20 by 26-inch ten-wheeler, weighing 308,628 lbs. These engines are fitted with all modern appliances, such as high-speed air brake, air signalling, steam heat, and carry a pressure of 200 lbs. per square inch. The engines are of various type, compound consolidation, ten-wheel simple, cross-over compound and piston valve engines.

The company has availed itself of all known methods to increase the efficiency of its stock, and the progress made has been most marked during the past six years, during which time 146 locomotives have been purchased and built to meet the growing demand for power to accommodate the increased business. Improvements have taken place in the track and roadbed which permits of taking trains of 1,500 to 2,000 tons. Better facilities have been introduced for the handling of power at the terminal points, such as turning of engines by compressed air, cinder hoists, standpipes, etc.

The shops have all been greatly enlarged and improved with the introduction of labor saving machinery, which enabled them to build fifty large locomotives each year, whereas twenty-five years ago twelve was the extent of the output.

Twenty-five years ago saw the introduction of better class power, although the company owned at that time a considerable number of small engines and some of the wood-burning type. It is almost amusing at the present time to think of the loads hauled twenty-five years ago and the time occupied on the journey, the methods of heating the cars and the machinery for battling the snow in winter.

The Early Development and Progress of the C. & N.-W. R'y.

THE first railroad chartered from Chicago to the west was the Galena & Chicago Union R. R. This road, destined to become the nucleus of the present Northwestern system, was incorporated by the state of Illinois, January 16, 1836, with authority to construct a railroad from Chicago to Galena. Galena was the leading city of the west, and for that reason its name took precedence over that of Chicago in the title of the road. A provision of its charter, which now reads strangely, provided that the road "might, if desired, be made a good turnpike" instead of a railroad; and the incorporators were allowed three years in which to begin work.

The survey was begun in February, 1837, from the foot of North Dearborn street, Chicago, and ran due west ten miles to the Desplaines river. Work on the road ceased in June, 1837, was resumed in 1838, and

Type of Passenger Locomotive in Service on the Chicago & North-Western Railway in 1848.

again, in the same year, was discontinued for a period of ten years. The directors of the company at this time seriously considered the policy of turning their attention backward from the wilds of Illinois and building eastward from Chicago.

Upon the suspension of operations on the Galena line, the people of the Rock River country made several attempts to participate in Chicago's increasing commercial importance. First a plank road was favored. Next, in 1843, a survey was made for a canal to connect the Fox river with the Illinois and Michigan Canal. But these schemes were abandoned, and, in 1846, the original Galena & Chicago Union railroad plan was revived at a convention held at Rockford in January of that year. Delegates attended from all the counties on the proposed line between Galena and Chicago. A resolution was adopted showing the necessity of a general subscription to the stock of the company by the people along the proposed route. Interested communities subscribed as liberally as their limited means would permit, and succeeded in raising a fair amount; payments on subscriptions beyond the first installment had to depend upon future crops. In many places the women vied with the men in their zeal to further the building of the railroad.

Finally, the contract for the first thirty-two miles of the road was let March 31, 1848, the first sixteen miles to be completed by August 1st, and the balance by October 1, 1848.

In June, 1848, the first grade-peg was driven near the corner of Kinzie and Halsted streets, then a point outside the city limits of Chicago. The council had refused the entrance of the road into the city, but granted consent to build a temporary track east to the river, so that one of the two engines bought by the company could be brought to the tracks of the road.

On October 10, 1848, the brig "Buffalo" arrived at Chicago with the first locomotive— the "Pioneer"—a machine that now appears very crude and small beside the great engines that pull the Northwestern's trains.

The significance of the advent of this locomotive, bearing a name peculiarly suggestive, grows as one considers the important part to be played by it and its successors in the development of the Northwestern line, the city of Chicago and the entire Great West. At this time the old locomotive holds an honored place among the exhibits of the Field Columbian Museum at Chicago.

On November 20, 1848, upon invitation of the board of directors, a party of stockholders and newspaper men from Chicago took a trip over the road, then extending ten miles west. It was a gala event and brought out a great crowd of enthusiastic citizens.

On the return trip a load of wheat was transferred from a farmer's wagon to the train, the first grain shipment by rail Chicago ever received.

At this time the road's rolling stock consisted of six freight cars, one passenger coach, and the "Pioneer."

Galena was now busy showing figures to prove the

Type of Passenger Locomotive in Service on the Chicago & North-Western Railway in 1903.

benefits that would accrue when the line should reach that flourishing city.

Before the completion of the road to the Fox river, the chief engineer placed on the records of the company a prophetic "estimate," to the effect that when completed to that point, the resources of the country might furnish business sufficient for "two trains each way for two-thirds of the year, and one train each way for one-third of the year."

By January 22, 1850, the road had been extended to Elgin, forty-two miles west of Chicago.

The line from Elgin to Rockford was built during 1852, and from Rockford to Freeport in 1853.

When the line to Freeport, Ill., had been in operation about a year, the company decided to seek a more direct line to the Mississippi river, and acting upon this decision, the Dixon Air Line, from Turner Junction (now West Chicago), thirty miles west of Chicago, to the Mississippi river at Fulton, was completed December 10, 1855.

Traffic to and from points west of the Mississippi river, from 1855 until the completion of the bridge across the Mississippi river in 1865, was ferried between Fulton and Clinton.

The road from Clinton to Cedar Rapids was completed in 1858, from Cedar Rapids to Marshalltown in 1862, from Marshalltown to Boone in 1865, and from Boone to the Missouri river, at Council Bluffs, March 15, 1867, at which time it was the first railroad from the east connecting with the Union Pacific R. R. at the Missouri river.

The completion of the Pacific railroads marked an achievement of exceeding importance to our country. The demonstration on this occasion took place at Promontory, Utah, where the Union and Central Pacific railroads met, on the 10th day of May, 1869, and where, in the presence of many dignitaries and amid much ceremony, a golden spike was driven.

In 1867 one passenger train each way daily between Chicago and Council Bluffs furnished ample accommodation for all transcontinental passenger traffic. Twenty-eight hours were required for the journey of 489 miles between Chicago and Council Bluffs; and in May, 1869, after the completion of the Pacific railroads, 109 hours for the journey of 2,336 miles between Chicago and San Francisco. At present the trip from Chicago to San Francisco, one the Overland Limited, is made in 71½ hours.

The traveler of the great To-day, passing between Chicago and the Great Lakes, the Far West and the Golden Gate, is not the traveler of Yesterday. He who witnessed the opening of the transcontinental through line of the Chicago & Northwestern, Union Pacific and Southern Pacific railways met with such conditions of travel as it now seems impossible ever existed. Double tracks were unknown; single tracks were laid wherever engineers determined that water courses had been or were; little or no ballast was used, and grades were laboriously climbed. In many places so rapidly was construction work pushed that tracks were laid without turning the prairie sod. The entire west was crying for rapid transportation, and mountain and range were ready for the development work of the pioneer. The ox train was too slow, the steam horse was needed. Builders could not wait for, or did not know of, those niceties of comfort that make twentieth century traveling a constant pleasure.

Coaches were somewhat improved in style over those of De Witt Clinton's time, which took their shape and space accommodation from the stage coach, but the windows were small, the doors and aisles cramped, the cars short and narrow, with low ceilings, the seats hard, awkward and uncomfortable. Smoking oil lamps or candles afforded some light at night, or being extinguished, saturated the cars with their offensive odors. House stoves, supposed to heat car interiors in winter, either roasted or froze the unfortunate tourists. Engines were small-cylindered, possessed small hauling capacity, wheezed and leaked, spread the earth with cinders—and did their best as pioneers to perform their duty.

Fast time, as speed is now calculated, was unknown. Passenger trains averaged from eighteen to twenty-two miles an hour; freight trains of fifteen cars were content with ten and twelve miles an hour. The air brake had not come, nor the mogul engine, nor modern buffers and couplings. The hand brake and the muscle of the train employes checked speed. Bridges were of wood; rails of iron; ballast, plain earth; fuel, wood from the forests. Signal towers, semaphores, bell switches, automatic warnings and electric safety devices were unheard of. Even the telegraph service was yet undeveloped, and the utmost caution was necessary to prevent disasters.

Passengers dined at way stations; the smoker of the train was a rude affair. Buffets, sleeping cars, parlor cars, compartments for privacy, were not even discussed in the press of the day. The then long journey across Illinois and Iowa, over the ranges of Nebraska and Wyoming, the mountain plunge to the Great Salt Lake, and the crossing of Nevada and entrance to California was an undertaking that actually required considerable physical endurance. The railroad had annihilated distances, but the comforts and joys of travel were still unknown.

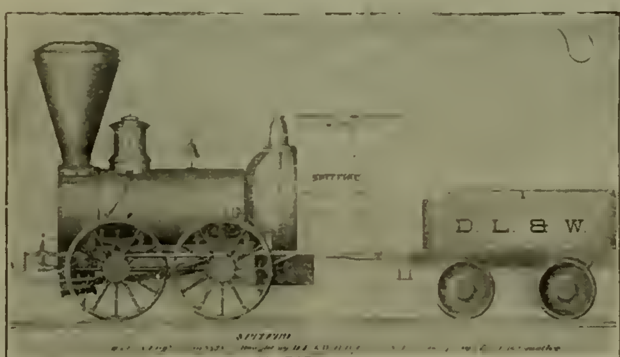
To-day the traveler over the same route of the Chicago & Northwestern, Union Pacific and Southern Pacific railways finds his train lighted by electricity; Pullman cars with electric fans, electric reading lamps, a library and buffet at his command, a telephone at his elbow, whether he is in the Chicago or San Francisco station. He has his bathroom and tub, a barber shop, a complete dining car, a compartment observation room, observation parlors, vestibuled platforms with plate-glass doors, absolute privacy if he desires, companionship if he prefers.

Double steel tracks, perfect ballast, steel bridges, every safety appliance known to railway experts, magnificent engines, greyhounds of steel, are all at his service. Surrounded by every comfort of a home, with speed, cleanliness and the highest degree of comfort, he may leave his train at the Golden Gate or the Great Lakes refreshed and instructed, as a result of the carefully perfected service modern railway management has placed at his disposal during his journey.

That the cereal and mineral granary of the world was to be created along this route in the brief space of thirty years, the dust-covered, body-worn traveler of 1869 may have dreamed, but not believed to ever be a possibility. The Indian, the buffalo, the unbroken wastes, absence of comfort and the test of his physical endurance so engrossed his mind that he was not likely to look beyond to the horizon of the twentieth century and see emblazoned there the approaching triumph of the men of To-day, the builders of the West and Pacific Coast, the creators of a new land and a new era.

The Delaware, Lackawanna & Western Railroad, Past and Present

WITH the passing of January the Lackawanna Railroad will have rounded out its seventy-fifth year. It was in January, 1828, that the original portion of the system, the Ithaca & Owego Railroad, received its charter. The length of that road was twenty-nine miles. Today the Lackawanna Railroad operates almost one thousand miles of track and its through Pullman trains between New York, Chicago and St. Louis cover seventeen hundred miles between these great terminals. The first locomotive took four hours to make the twenty-nine mile run and it was no uncommon thing for a yoke of oxen to be fastened to the train to help the engine over grades. A type of these early engines is shown in the accompanying illustration of the "Spitfire" which was brought to this country from England and was run on the Morris & Essex Railroad, now a part of the Lackawanna system, between Newark and Madison, in 1850.



Locomotive "Spitfire" in Service on the Delaware, Lackawanna and Western Railroad in 1850.

It was a machine of exceedingly light horse power, weighing about five tons, and capable of hauling two or three cars at the most. The fuel used was wood and the boiler and fire-box being small it was a difficult matter to generate steam. It cost $3,067.50.

The leading dimensions of the "Spitfire" were: Cylinders 9½ inches in diameter by 16-inch stroke, driving-wheel 51 inches in diameter, boiler 35 inches in diameter by 7 feet 6 inches long containing 86 copper tubes 2 inches in diameter, wheel base 5 feet, total heating surface 40 square feet. The first engine built exclusively for passenger service on the Lackawanna Railroad was delivered in 1851 and was known as the "Wyoming". The first train from Great Bend to Scranton was drawn by this engine. It was well proportioned and weighed about twenty-nine tons. It had the Stevenson link motion and calls for no special description. The introduction of hard coal-burning locomotives on the Lackawanna Railroad was in 1854, when the "Anthracite" was placed

At this time the equipment of the road consisted of

in service.

13 locomotives, 10 passenger and baggage cars, 60 platform freight cars and 854 coal cars. The item of wood for locomotives was a considerable one but the supply was irregular, the contractors being a shiftless class of men and the wood was often delivered in a green or unseasoned condition with the inevitable result of lack of steam and train delays. As the company worked its own mines it became evident that anthracite coal would have to receive considerable more attention. The policy of buying wood for fuel while good coal was waiting in the company's mines began to be apparent and it was ultimately decided to try an anthracite coal-burning freight locomotive. Consequently the "Pocono", the first of this class, was delivered about the year 1854. These early engines were poor steamers, the fire-boxes being too small and the water spaces too narrow, causing the water to leave the sheets when the engine was working hard. The stack had a grating of iron bars laid across the top and as the blast had to be very sharp to get the engine to pull anything of a load, these bars were quickly cut out and much fire thrown, to the damage of property along the line. This sharp blast also pulled coal out of

ITHACA AND OWEGO

RAIL ROAD.

NEW ARRANGEMENT WHILE FINISHING THE ROAD.

TRANSPORTATION TRAIN.

The train of Transportation Cars will leave Ithaca every afternoon (Sundays excepted) at 4, and arrive at Gridley's at 8 o'clock, P. M., will leave Gridley's at 4, and arrive at Ithaca at 8 o'clock; A. M., stopping, both in going and returning, at Howe's Turnout, Whitcomb's and Wilsey's Mills, to take in and discharge loading, and receive Cars that may be in readiness to join the train.

The train of Transportation Cars on the Owego end of the Road, will leave Owego every afternoon (Sundays excepted) at 5, and arrive at Gridley's at 8 o'clock, P. M., will leave Gridley's at 4 and arrive in Owego at 7 o'clock, A. M., stopping both going and returning at ones' Cross Roads, Sacket's and Chidsey's Mills, at Candor Corners, and at Booth's Cross Roads to take in and discharge loading, and to receive such cars as may be in readiness to join the train.

No burden Cars are permitted to run upon the Road except such as are registered in the Secretary's Office in Ithaca, and have a Certificate of Fitness from the Engineer, and a way-bill of loading must accompany each car not belonging to the Company's Train, and toll paid at the Gates, at the rate of 3 cents per tun per mile.

DANIEL L. BISHOP, *Secretary.*

ITHACA, July 20, 1838.

Mack, Andrus & Woodruff, Printers.

Time Table on Original Division of the Delaware, Lackawnna and Western Railroad.

the fire-box through the first set of flues, where it would get lodged in the combustion chamber, and there remain, thus stopping up about one-third of the flues. There was a man-hole for removing the ashes from this chamber.

In 1857 the "Anthracite" was rebuilt and the cab was put forward, surrounding the steam dome. A blower was also put in, for in its absence the only way to get a draft, when standing, was to disconnect the valve stem from the rocker, and place the valve in a midway position so that steam would blow through the ports and up the chimney. The engine was entirely rebuilt in 1872, and is still running, with a new boiler and a fire-box for burning fine anthracite coal.

The second hard coal-burning engine was known as the "Carbon" and was delivered in 1854. It weighed about twenty-five tons and as this was distributed over eight driving-wheels it was easy on the track and at the same time of ample tractive power, the driving-wheels being 43 inches in diameter and the cylinders 19 inches in diameter by 22-inch stroke. The wheels were cast-iron with chilled treads, and the coupling rods had solid ends. The "Carbon" may be said to belong to the common or mogul type of engine now used extensively on the Lackawanna Railroad. Five more of these camel-back engines weighing about 70,000 pounds, each having a total heating surface of 1,000 square feet were put in service in 1856. The wide fire-box located entirely above the wheels, as in the modern type, was not put into practice until 1877. As late as the year 1865, the average speed of ordinary passenger trains was 20 miles an hour, including stops, and that of the express trains 23 miles an hour. Freight trains averaged but eight miles an hour with loads of about 160 tons. The average weight of passenger trains was 75 tons. A comparison of these speeds and weights with those of the present day will show the progress made during the last 35 years.

With the acquisition of various small railroads and the extension of the main line in 1882 from Binghamton to Buffalo, the Lackawanna entered the field as a competitor for through western traffic with service and equipment comparing favorably with any of its rivals. With the acquisition of several short branches and the recent purchase of the Bangor & Portland, and Eastern & Northern lines, the road has now a total length of 946.91 miles, with a total track mileage of 2.199.54 miles.

As an example of the road's growth, we may take the Morris & Essex division, between Hoboken and Phillipsburg, N. J., the first engine on which, it will be remembered, weighed about six tons, and the number of passengers per day, taking the conductor's book as a basis, averaged about ten. Engines of seventy-five tons now travel on the same road, and the number of passengers carried per day is about 38,000.

Compared with the primitive type of early locomotives the modern engines now in service on the Lackawanna offer a striking illustration of the advance made during the last fifty years. In the road's service there are today about 700 locomotives of various classes, of which the accompanying illustrations are prominent types. One of these, Engine 991, has a total weight of about 138,000 pounds, with cylinders 20x26 inches, the diameter of the drivers being 62 inches. The freight locomotives, of which Engine No. 880 is an example, have a total of 182,000 pounds, cylinders 21x26 inches and a 50-inch driving wheel.

As evidence of the special consideration given by the

Freight Locomotive Delaware, Lackawanna and Western Railroad—1903—2-8-0 Type.

Passenger Locomotive, Delaware, Lackawanna and Western Railroad—1903.

Lackawanna management to the matter of fast train service is the fact that this company now has under construction at the Schenectady works of the American Locomotive Company 25 fast freight mogul locomotives to be placed in service early next spring.

The tractive force of the new engines is 28,000 pounds, being 33 to 60 per cent greater capacity than engines now engaged in fast freight service on the Lackawanna. They are to be strictly modern in all appointments, and many parts of the machinery are interchangeable with like parts of the company's standard consolidation engines.

The following is a summary of the specification of the hard coal type: Cylinders 20 by 26 inches, diameter of drivers 63 inches, size of driving journals 9 by 12 inches, diameter of boiler 65 inches, boiler pressure 200 pounds, firebox 10 feet 6 inches long, 8 feet 4 inches wide, tubes 315, 13 feet long, 2 inches in diameter, firebox heating surface 200 square feet, and of tubes 2,141 square feet, total heating surface 2,341 square feet, grate area 87½ square feet, Richardson balance slide valves, weight on drivers 142,000 pounds, weight on truck 22,000 pounds total weight 164,000 pounds; capacity of tanks: water 6,000 gallons, coal 10 tons.

The soft coal engines are the same as the hard coal type, except in size of firebox and location of engineer's cab. The firebox is semi-wide, 8 feet 6 inches long, 6 feet 3 inches wide. The machinery on both types of engines is interchangeable. These engines are to have Westinghouse American driver and tender brake, air train signal, automatic couplers, Session's friction draft gear, Gollmar bell ringers and Hancock inspirators.

As the Ithaca & Owego Railroad constituted the original portion of this system the accompany time table appears of interest. Trains were operated according to this time table in 1838.

The New York Central Lines

IN 1831, the total length of the New York Central Railroad, the first of the New York Central Lines to be constructed, was seventeen miles, and the entire motive power and equipment consisted of the primitive locomotive "DeWitt Clinton" and three very small passenger carriages, which were really old Concord stage coaches made over. The maximum speed of this train was fifteen miles an hour.

On the first of January, 1900, the mileage of the New York Central Lines aggregated 11,126 miles of railway in the populous territory east of Chicago, St. Louis and Cincinnati; and the equipment consisted of 150,400 freight cars, 3,600 passenger coaches, baggage, mail and express cars, and 3,580 locomotives. This equipment carried more than fifty-two million passengers in 1899, and hauled over one hundred and three million tons of freight.

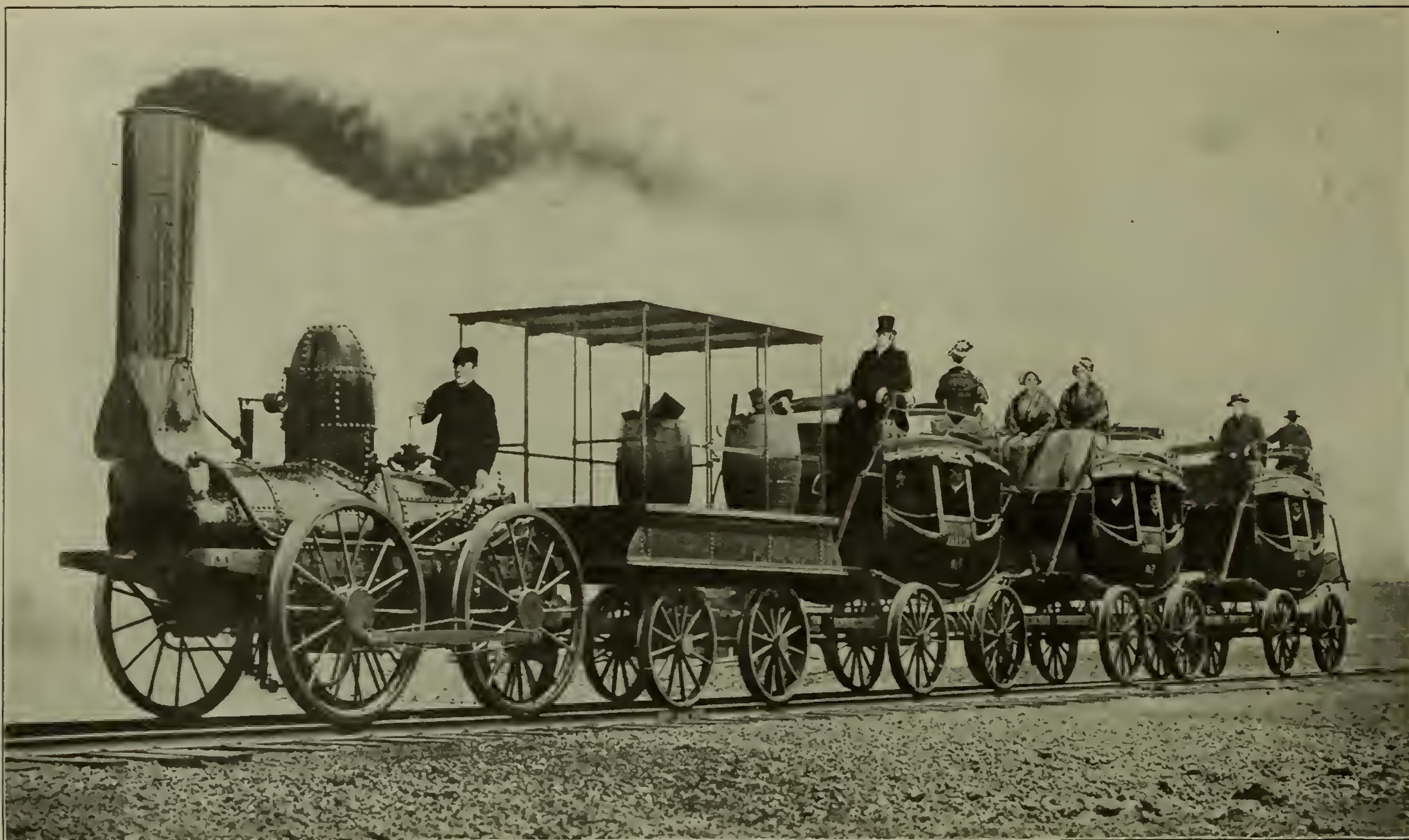
In connection with the De Witt Clinton it may be interesting to note the construction of some other early locomotives built at about the same time. In 1825 the Stockton & Darlington Railroad was opened and one of Stevenson's locomotives in which he employed a steam blast was successfully used, drawing passenger as well as coal trains. Stevenson had at this time become engineer of the road. The time required to travel the distance of twelve miles was two hours. One of the most important and interesting occasions in the history of the application of the non-condensing steam engine to railroads, as well as in the life of Stevenson, was the opening of the Liverpool & Manchester Railroad in the year 1829. When this road was built it was determined, after long and earnest discussion, to try whether locomotive engines might not be used, to the exclusion of horses, and a prize of £500 was offered for the best that could be offered at a date which was finally settled as the 6th of October, 1829. Four engines competed and the Rocket, built by Stevenson, received the prize. This engine weighed four and a quarter tons with a supply of water. Its boiler was of the fire tubular type that had grown into shape in the hands of several inventors, and was three feet in diameter and six feet long, with 25 three-inch tubes extending from end to end of the boiler. The steam blast was carefully adjusted by experiment to give the best effect. Steam pressure was carried at 50 pounds per square inch. The average speed of the Rocket on its trial was 15 miles per hour and its maximum was nearly double at 29 miles per hour, and afterwards, running alone, reached a speed of 35 miles.

In America the locomotive was set at regular work on railroads for the first time on the 8th of August, 1829. This first locomotive was built by Foster Rastrick & Co. at Strourbridge, England, and was purchased by Mr. Horatio Allen for the Delaware & Hudson Co.'s road from Carbondale to Honesdale, Pa.

It was at about this time (1831) that Mr. Horatio Allen introduced the first eight-wheel locomotive ever built and gave them a form which was the prototype of the recently built locomotives which had been brought out from Great Britain. In this year also the De Witt Clinton was built for John B. Jervis. At about the time of the opening of the early railroad the introduction of steam carriages on the common highway had become a favorite idea with engineers. In December, 1833, about twenty steam carriages and traction road engines were running or in course of construction in or near London. In our own country roughness of roads discouraged inventors and in Great Britain even the successful introduction of road locomotives, which seemed at one time almost an accomplished fact, finally met with so many obstacles that even Hancock & Gurney, the most ingenious, persistent and successful constructors, gave up in despair.

This great railway system comprises the—New York Central & Hudson Railroad and Branches, 2,975; Dunkirk, Allegheny Valley & Pittsburg Railroad, 91; Boston & Albany Railroad and Branches, 394; Michigan Central Railroad and Branches, 1,655; Lake Shore & Michigan Southern Railway and Branches, 1,413; New York, Chicago & St. Louis Railroad, 523; Lake Erie & Western Railroad, 880; Pittsburg & Lake Erie Railroad, 180; Cleveland, Cincinnati, Chicago & St. Louis Railway and Branches, 2,342; Cincincinati Northern Railroad, 245; Detroit, Toledo & Milwaukee Railroad, 133; Indiana, Illinois & Iowa Railroad, 295; making a total of 11,126 miles.

Over these lines are operated every day hundreds of splendidly equipped passenger trains. The finest character of Pullman sleeping and parlor cars and the most luxurious of modern day coaches will be found in their equipment; and the dining cars of these lines, which



LOCOMOTIVE "DE WITT CLINTON" AND TRAIN, THE ORIGINAL EQUIPMENT OF THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

are operated under the direction of the general passenger agents, are recognized as among the best in the land.

Over the perfect tracks of the highway, formed by this great system of railways, passes a large share of the enormous traffic to and from the great commercial ports of New York and Boston.

The ponderous locomotives of these lines haul over a large portion of this system from eighty to a hundred loaded cars to the train. Many of these cars will

THE "EMPIRE STATE EXPRESS," ILLUSTRATING PRESENT DAY EQUIPMENT OF THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

hold 1,000 bushels of grain, or 60,000 pounds of merchandise, or 110,000 pounds of coal each. During the busy season there are several hundred freight trains per day passing over these tracks, orming an endless chain of traffic between the great commercial, industrial and agricultural centers of the West and New York and Boston.

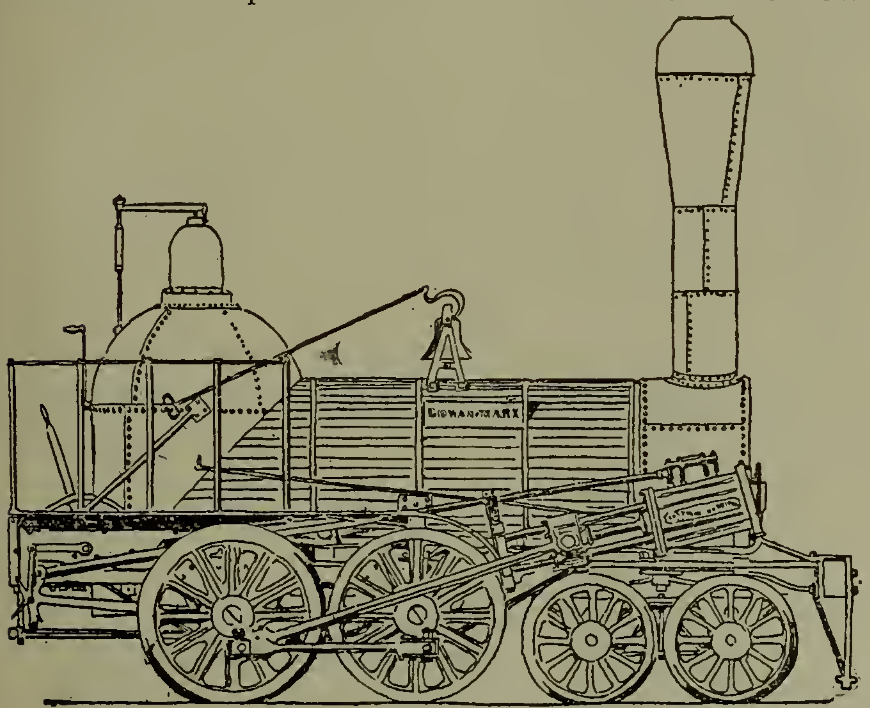
The New York Central has recently put in service twenty locomotives of the Central Atlantic type that are among the most powerful high speed passenger locomotives ever built, developing regularly 1,400 indicated horse power.

These locomotives are numbered from 2969 to 2999. The latter was exhibited at the Pan-American Exposition, and was frequently referred to as "2d 999," but number 2999 in as much in advance of number 999 as number 999 was in advance of other locomotives at the time it appeared.

The weight of the engine alone, without the tender, is 176,000 pounds, or 88 tons. The tender, loaded, weighs 110,000 pounds, making a total weight of 286,-000 pounds.

Early Railroading on the Philadelphia & Reading

An interesting description of early railroading on the Philadelphia & Reading Ry. is presented in the following article by Mr. Samuel R. Kirkpatrick, which appeared in the Philadelphia Press, December 12th, 1897: "On Wednesday last it was just fifty-eight years since the Philadelphia & Reading Railroad Company ran its first engine, named Gowen & Marx, from Reading to Philadelphia. There is no doubt that this feat was a wonderful thing at the time, and created more talk than the record-breaking run of a locomotive nowadays which covers mile after mile in remarkably quick time. The cut shows the style of locomotive which was first used on the Reading road, and when compared with the locomotives that now



Locomotive "Gowen and Marx," Type of the First Locomotive Used on the Philadelphia and Reading Railway.

roll off space at less than a mile a minute, it looks like a pigmy pitted against the giants of ancient fables.

"This engine weighed only eleven tons, which at that time was considered a big thing. When comparison is made with the locomotive of the present day, which weighs over 100 tons, it can be seen that the old ones were lightweights. In reality, they would hardly be able to pull some of the large freight cars now in use. This locomotive drew the first train on the Philadelphia & Reading R. R., and it covered the distance at the rate of about twelve miles an hour.

"There is no doubt but that the announcement that a steam engine would be run on clear days from Reading to Philadelphia created more or less excitement among those who lived near the railroad, as well as all who had heard of the event. The trip was a successful one, although the distance could be covered by a fair bicycle rider in considerably less time now than when the first attempt was made to join Philadelphia with Reading by an iron link. At that time everything pertaining to the railroad was crude. The locomotive looked like an elongated boiler placed on wheels. The connection of the driving rods were simple, but for a time the arrangement did the work satisfactorily. The advent of the steam horse was, however, the creation of a new era in this country, and at this time every city of prominence in the United States is joined together by the steel rail.

"When the road was first opened the trains carried both freight and passengers. The cars were small, compared to those now in use. For a number of years the advance in the size of freight cars was slow, but recently there has been a big jump, 60,000 lbs. capacity cars being common practice, and a number of roads having in service cars of 100,000 lbs. capacity.

"In the good old days there were not many accidents at grade crossings, due in a measure to the slow progress made by the locomotive, as well as the warning it gave. According to old engineers, the approach of the locomotive was made known by its puffing and wheezing long before it reached the crossing. The long stack with black smoke pouring from the top was a sight not easily to be forgotten, and when at night the fireman would open the furnace doors the light thrown out created an uneasiness among onlookers. The locomotive was thought by the illiterate to be of the devil's origin, and even to-day there are people in this country that have never ridden on a train, and it is said there are some that have never seen a railroad.

"In the old days the weather had considerable to do with the speed of the trains. The first train had the grade with it the whole distance from Reading, yet it took it about five hours to cover the distance between that city and Philadelphia, while from Philadelphia to Reading, which is mostly up grade, the distance now can and is covered daily in one hour and a half.

"While there is little resemblance between the old locomotive and the ones of to-day, the former fulfilled its purpose and caused our inventors to bring out the present engine that is now the standard of the world.

"Besides the change in motive power there has been a big change in looking out for the accommodations of the patrons of the road. Those who saw the first

Present Type of Locomotive Used on the Philadelphia and Reading Railway.

train that left the Reading station in Philadelphia years ago would not recognize the terminals that are now used. From the old building at Broad and Cherry streets to the palatial structure at Twelfth and Market streets is a big jump for any railroad."

A comparison between the schedules of the trains that ran on clear days and the hour trains which now run on the Philadelphia & Reading Ry. between New York and Philadelphia, gives some idea of the convenience and economy of time which have been attained through the agency of railroads in their development of transportation facilities.

The Lehigh Valley Railroad

In 1852 the Lehigh Valley Railroad was surveyed from Easton to Mauch Chunk, and the work of construction was completed and trains commenced running in 1855.

One of the oldest corporations of its class in the United States, it was intended, as originally constructed, to open the coal fields which lie within the valleys of Pennsylvania, but as the population and varied industries of the country grew, its mileage was increased and it eventually reached the position which it now holds as one of the principal trunk lines between the east and the west. Its coal traffic, which has attained enormous proportions, continues to be a leading source of the company's prosperity, but with the traveling public its interests lie in the fact that probably no railway system of equal mileage reaches such a large number of the most attractive resorts and of such varied nature as the Lehigh Valley. The property has grown from the short coal road between Easton and Mauch Chunk of 1855 to a splendidly built and magnificently equipped double track trunk line of road, extending from New York to Buffalo and Niagara Falls, with numerous branches in New Jersey, Pennsylvania and New York State, that have opened up the country through which they run, furnishing access to and developing the natural and other features of the district along the line.

Since the construction of this through line, a great many names have been added to the long list of places of rest and resort to which people flock in summer from the crowded cities, and a goodly sprinkling of these can

Fig. 2—Compound Consolidation Freight Locomotive with Wootten Firebox in Present Service on the Lehigh Valley Railroad.

be credited to the building of the road that has made them accessible. In this list we find Weygadt Mountain House, Easton, Mauch Chunk (with its famous switchback railroad), Glen Onoko, Glen Summit, Harvey's Lake, Lake Ganoga, Watkins Glen, Sheldrake, Taughannock Falls and Niagara Falls. all beautiful places, with features that make them particularly desirable for the invalid and pleasure-seeker.

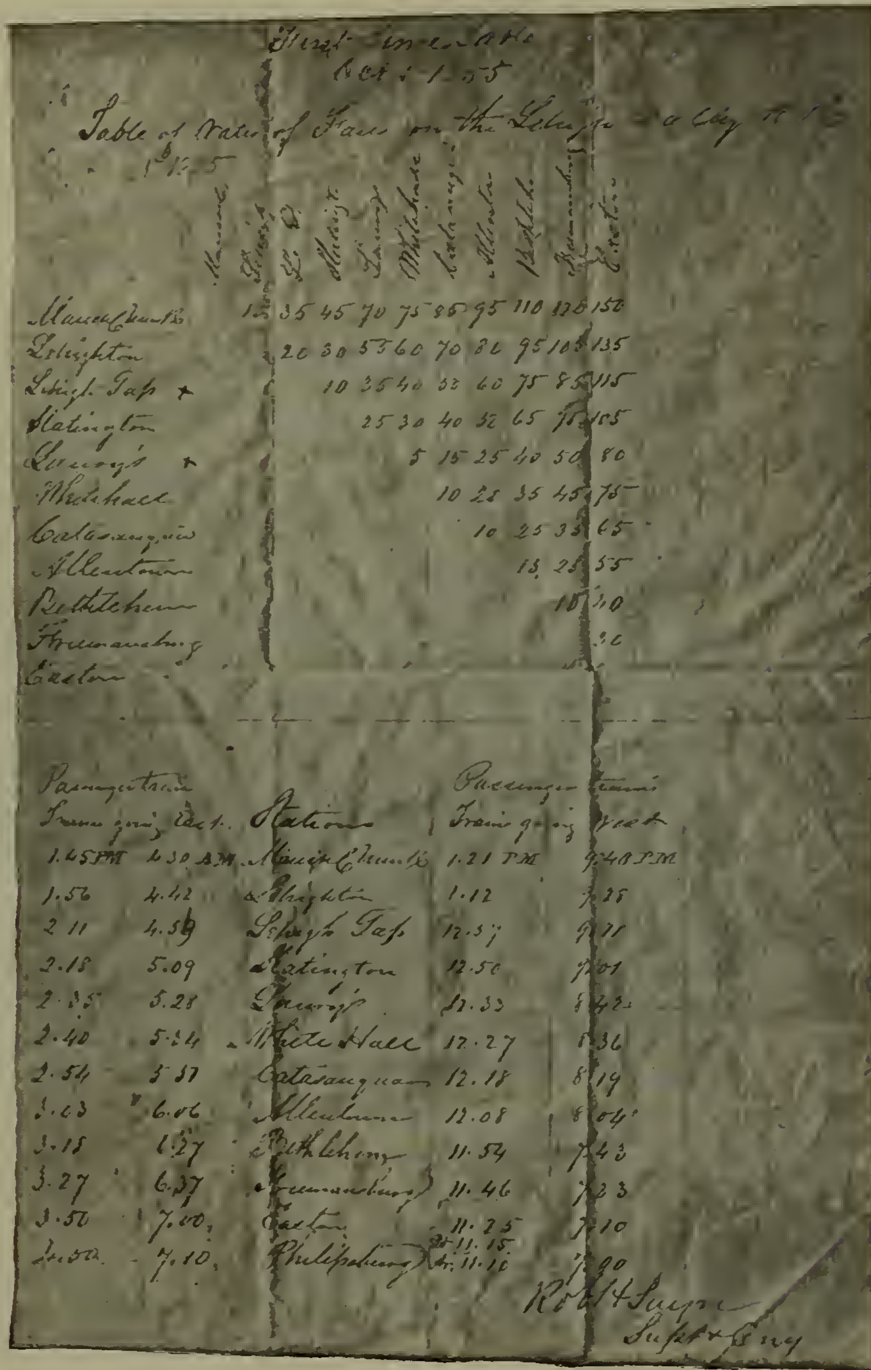
Nor must we neglect the fact that the Lehigh Valley, in construction. equipment and maintenance of its permanent way, ranks as one of the best railroads in the country, and has earned the title of a model railroad in all these important features.

The track is laid with the haviest steel rails on deep stone ballast. giving solidity with elasticity, and rendering the motion of the train smooth and devoid of jolts or oscillation. The best modern facilities for protection against accident are employed. while the refinement of service provided by the Lehigh Valley's dining cars is famed far and wide.

In connection with the Grand Trunk Railway of Canada the Lehigh Valley has inaugurated a sleeping car line between New York and Philadelphia and Chicago via Niagara Falls, and passing through the world famous tunnel under the St. Clair river. These are solid vestibuled trains, run on limited time, with dining cars and every facility and comfort which modern railroad science affords.

An old time table and table of rates of fare, issued in 1855, is shown in Fig. 3. This is a reproduction of the first table of the kind issued on the Lehigh Valley Railroad.

An interesting comparison of locomotive past and present is presented by the accompanying illustrations, Figs. 1 and 2. Fig. 1, the locomotive "United States." is a striking example of the type of engine in freight service a quarter of a century ago. This machine was exhibited by the Baldwin Locomotive Works at the Centennial Exposition held at Philadelphia in 1876. Fig. 2 illustrates a compound consolidation freight locomotive fitted with the Wootten firebox for burning anthracite coal. This illustration is typical of the class of heavy freight locomotive in service in the anthracite region.



First time table

Oct 1 1855

Table of rates of Fare on the Lehigh Valley R R

1855

Mauch Chunk 15 35 45 70 75 85 95 110 126 150

Lehighton 20 30 55 60 70 80 95 105 135

Lehigh Gap 10 35 40 52 60 75 85 115

Slatington 25 30 40 52 65 75 105

Laury's 5 15 25 40 50 80

Whitehall 10 25 35 45 75

Catasauqua 10 25 35 65

Allentown 15 25 55

Bethlehem 10 40

Freemansburg 30

Easton

Passenger train	Trains going East	Stations	Passenger trains	Trains going West
1.45 PM	4.30 AM	Mauch Chunk	1.21 PM	9.48 PM
1.56	4.42	Lehighton	1.12	9.35
2 11	4.59	Lehigh Gap	12.57	9.11
2.18	5.09	Slatington	12.50	9.01
2.35	5.28	Laury's	12.33	8.42
2.40	5.34	White Hall	12.27	8.36
2.54	5.47	Catasauqua	12.18	8.19
3.03	6.06	Allentown	12.08	8.04
3.15	6.27	Bethlehem	11.54	7.43
3.27	6.37	Freemansburg	11.46	7.23
3.50	7.00	Easton	11.25	7.10
4.00	7.10	Phillipsburg	Ar 11.15 Lv 11.10	7.00

Robt H Sayre
Supt & Eng

Fig. 3—Old Time Table of the Lehigh Valley Railroad, 1855.

Fig. 1—Consolidation Freight Locomotive "United States" in Service on the Lehigh Valley Railroad in 1876.

Maine Central Railroad

An interesting illustration of the progress of a quarter of a century is presented by a comparison of the old types of locomotives in service on the Maine Central Railroad, built in 1869 and 1871, with the locomotives of modern design now in service. The accompanying half-tone engravings serve to demonstrate the difference in the designs of past and present motive power equipment on this road. The picture of the locomotive and train, illustrated in Fig. 1, is one taken on the bridge over the Kennebec river at Augusta, Me., previous to its having been carried away by a freshet. It may be wondered that a bridge so high in the air could get carried away, but this, of course, is by reason of the ice and logs getting jammed, thus forming a dam and raising the water to such a height as to take away the bridge. The bridge in question has been twice replaced by iron structures. The first iron bridge, not being heavy enough for modern equipment, has long since been replaced by one entirely up to date in every particular.

The engine and train in question is that of the Portland & Kennebec Railroad, and was taken in 1869, the engine being the John D. Long, built by the Amoskeag Locomotive Works, of Lancaster, N. H. The Portland & Kennebec R. R. is now a part of the Maine Central system.

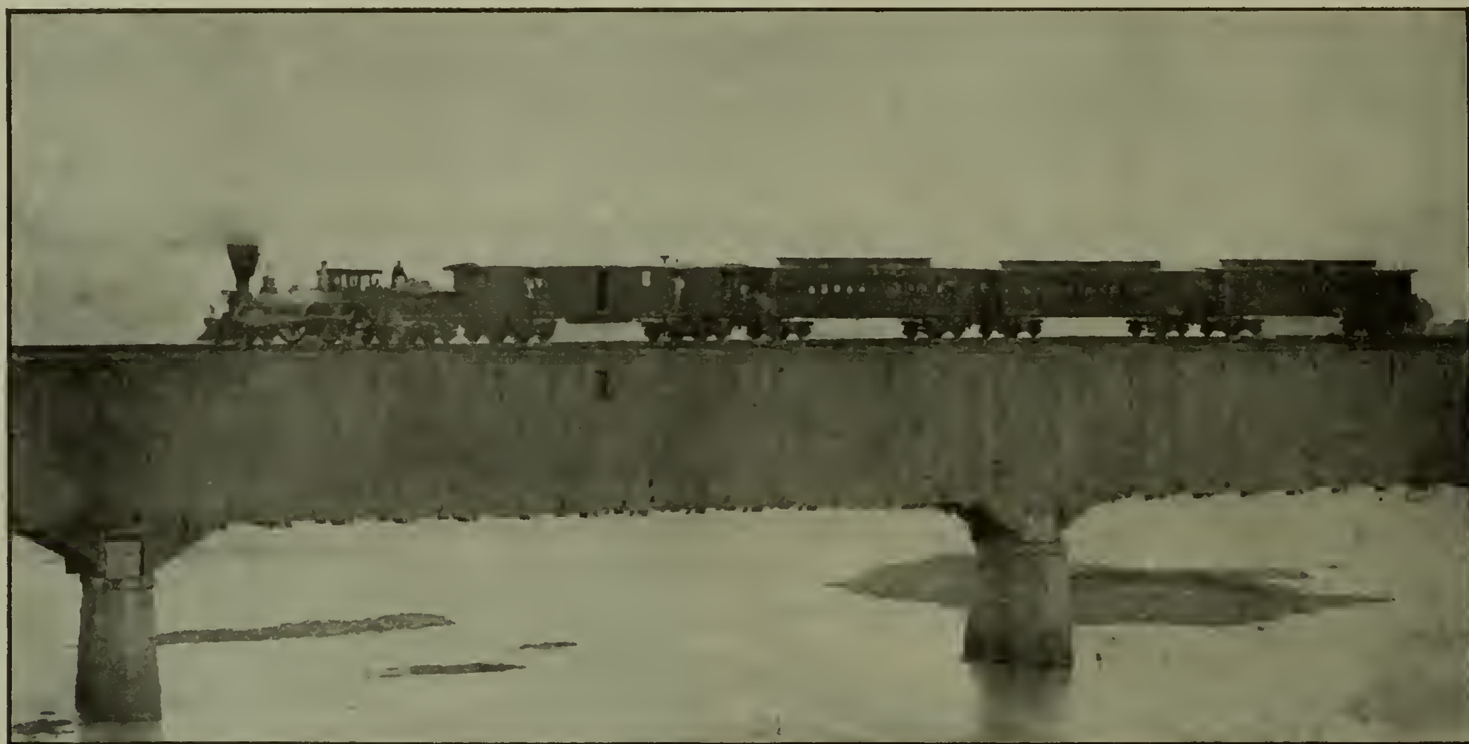


Fig. 1—Locomotive "John D. Long" of the Portsmouth and Kennebec Railroad, Now the Maine Central Railroad, 1869.

The engine of the Maine Central R. R., the A. D. Lockwood (Fig. 2), was built in 1871 by the Portland company at Portland, Me., and was considered at that time to be a first-class engine. This locomotive hauled first-class trains, and operated under 130 lbs. of steam. The cylinders were 15 by 24 ins. and the driving wheels were 5 ft. in diameter.

Fig. 2—Locomotive "A. D. Lockwood" of the Maine Central Railroad, 1871.

The A. D. Lockwood is the counterpart of a locomotive built in the shops of the Maine Central R. R. at Waterville, and when the locomotive was done the master mechanic gave an oyster supper to the employes of the shop, this being the first locomotive built in its entirety at the shops. In the course of his remarks he said that when the engine was done he supposed it would be Dunn, and sure enough when it came onto the road it was the R. B. Dunn. These engines, the R. B. Dunn and the A. D. Lockwood, were both painted a bright red—i. e., the cab and tender—and the lettering and other ornamentation were all in gold leaf, and the cylinders and domes, as was the custom of the time, covered with brass. Judging by this it may be seen what an elegant appearance these locomotives made. Both the Lockwood and Long were wood burners.

At that time there was just one passenger train each way per day over the Maine Central, and one over the Portland & Kennebec, and one freight train per day over the Maine Central and one up one day and back the next on the Portland & Kennebec—i. e., from Portland and Boston. Now, owing to the development of the state in manufacturing, and especially in summer for tourist travel, in place of the two passenger trains entering Waterville from the west there are eleven passenger trains per day, and in place of the two freight trains eight are regularly scheduled besides the specials, which, as every railroad employe knows, are more frequently run on dispatchers' orders.

FIG. 3—TEN-WHEEL PASSENGER LOCOMOTIVE OF THE MAINE CENTRAL RAILROAD—4-6-0 TYPE—1903.

The "Big Four" Railroad

THE "Big Four Route" comprises 2,500 miles of the most perfect railway in this country. The roadways, noted for smooth riding, are of such perfect construction as permits the heavy vestibuled trains with their ponderous locomotives to be run at great speed with the utmost safety.

The history of the road begins in 1847, when the first road in the state of Indiana was completed from Madison to Indianapolis. In 1852 a branch was completed with a line running from Cleveland to Cincinnati, and became known as the "Bee Line."

In 1853 a road was opened from Indianapolis to Lawrenceburg, and in '54 was extended to Cincinnati and began doing a large business. In 1856 a charter was granted for a road from Indianapolis to LaFayette, and in '66 this road was consolidated with the Indianapolis and Cincinnati road, and Mr. M. E. Ingalls was appointed president.

TYPE OF PASSENGER LOCOMOTIVE IN SERVICE ON THE BIG FOUR RAILROAD IN 1878.

from Indianapolis to Union City where it connected with another road which had been constructed to Cleveland. Within a few years the road made other connections, and rapidly grew in size and importance. In 1859 the road was consolidated with the Ohio Line, and in 1868

The beginning of his administration marks a distinct era in the history of the road. Connections were formed giving an entry into St. Louis and into Chicago; new rails and equipment were purchased, and the road soon became known as one of the great systems. In 1890 the

"Bee Line" consolidated with the Big Four, and the new combination took the latter name. Immediately afterwards the Wabash and Michigan was taken in, giving an entry into Benton Harbor and Louisville. Shortly afterwards the I. B. & W., reaching to Peoria on the west, and Sandusky on the east, was made a part of the new system. Thus, within a comparatively few years, this great system, touching all principal points in Ohio, Indiana and Illinois, has been built up.

The Big Four connects at St. Louis, Peoria and Chicago with all the great lines from the west and northwest; at Louisville and Cincinnati with lines from the south, southeast and southwest, and at Cleveland with railroads from all eastern points.

The Big Four has unequalled through service from St. Louis and Cincinnati to New York and Boston, and is known for its luxurious and comfortable equipment. The "Knickerbocker Special," "New York and Boston Limited," "Southwestern Limited," "The White City Special" and "The Exposition Flyer" are palaces on wheels, drawn by some of the most powerful locomotives in the world. These magnificent trains, consisting of standard and compartment Pullman sleeping cars, library cars, chair cars, dining cars and coaches, are all lighted by gas and heated by steam, and the inconveniences of travel are reduced to a minimum. The improvements in the roadbeds have kept even pace with those in the rolling stock. The dining cars are owned and operated by the company, and are of magnificent proportions and appointments.

Present Type of Passenger Locomotive on the Big Four Railroad.

Chicago Great Western Railway

THE Chicago Great Western Railway extending between St. Paul and Minneapolis, and Chicago, Dubuque, Des Moines, St. Joseph, Kansas City, Red Wing, Rochester, Winona, Mankato, Fort Dodge and Omaha has had a short but eventful history.

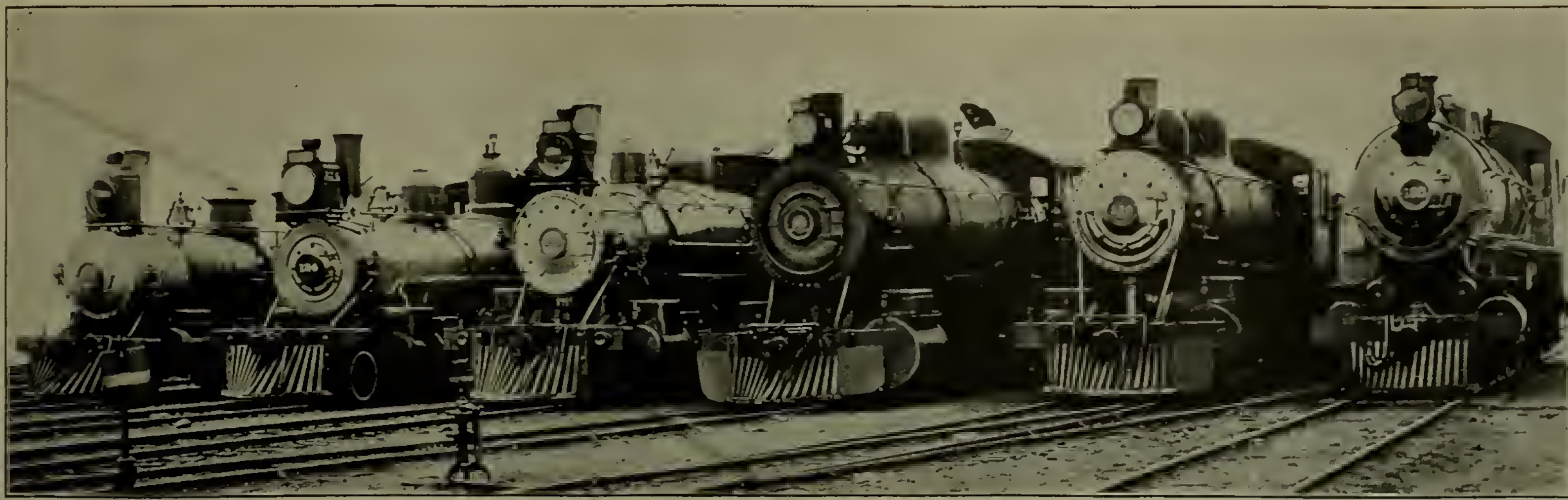
Its construction was commenced in 1884, and during that year the first section of 110 miles from St. Paul to a connection with the Illinois Central, at the town of Lyle on the northern boundary of the State of Iowa, was completed, and the following year this line was extended twenty miles to a junction with the Iowa Central at Manley Junction, Iowa.

In 1886 the line beginning at a junction with the above mentioned lines at Hayfield, eighty miles south of St. Paul, to Dubuque, and from South Freeport to Chicago, was commenced, and completed in 1887; and during the following year the missing link between Dubuque and South Freeport was constructed.

In 1886 a branch from Sumner, Ia., to Hampton, Ia., and a line from Waterloo, Ia., to Des Moines, Ia., were purchased and a connection from Oelwein to Waterloo built. In 1888 the line from Des Moines to St. Joseph, Mo., was completed. In 1890 the extension from St. Joseph to Kansas City was completed. In 1899 the line from Mankato to Red Wing was obtained by control of stock. In 1901 the lines from Red Wing to Zumbrota, Winona to Osage, and from Mason City to Fort Dodge were secured by control of stock. The various connecting links between these lines and the main lines were built during the year of 1902. The line from Fort Dodge to Omaha is now under construction and will be completed during the Summer.

The first passenger train between Minneapolis, St. Paul and Chicago, on this new line started out from the respective terminals on the evening of the first day of August, 1887, and ran through in thirteen and a half hours, thus inaugurating the fast train service in the west. In March, 1902, the running time was still further reduced to twelve hours and fifty-five minutes.

During the past year large sums of money have been



Comparison of Locomotives Past and Present on the Chicago Great Western Railway.

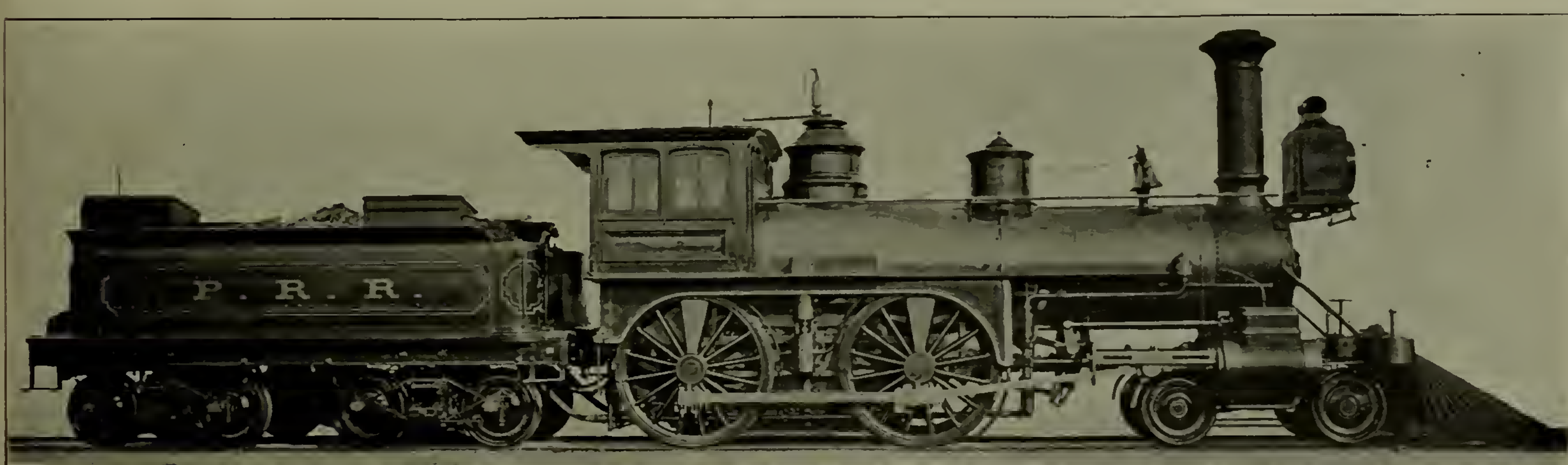
put into improvements by the company. The entire main line track has been put into first class condition with new 80-lb. steel rails, bridges rebuilt and strengthened. "The Great Western Limited," consisting of two electric lighted trains, was received from the Pullman shops in April and numerous additions to the passenger and freight equipment have been received and are ordered for future delivery.

It is now only twelve years since the Maple Leaf Route was completed, and the progress which it has made in the development of its local business, the building up of local villages and industries at its terminals and other important points, is perhaps unprecedented. There is not a point on its line which has not received a direct and noticeable impetus to its business.

The accompanying halftone illustration demonstrates the improvement in locomotive construction on this road. Some of the details of the engines here represented are given in the following table in which it is interesting to compare the relative weight, boiler pressure, etc.

Engine Number..........	69	124	151	313	210	180
Boiler Pressure..........	145	160	200	200	200	225
Total Heating Surface..	1061.25	1155.11	1838.24	02796.00	2600.00	3301.0
Size of Cylinder........	17x24	18x24	19x28	22" 35x32"	22" 35x28"	21x26
Total Weight of Engines.	85,300	105,000	125,400	179,820	162,800	193,300

Examples of Pennsylvania Railroad Motive Power, Past and Present



4-8-0 Type of Passenger Locomotive in Service on the Pennsylvania Railroad in 1878.

4-4-2 Type of Passenger Locomotive in Service on the Pennsylvania Railroad in 1903.

An Indication of the Growth of Motive Power Equipment on the Central Railroad of New Jersey During the Past Quarter of a Century

EIGHT-WHEEL PASSENGER LOCOMOTIVE IN SERVICE ON THE CENTRAL RAILROAD OF NEW JERSEY A QUARTER OF A CENTURY AGO.

ATLANTIC TYPE PASSENGER LOCOMOTIVE IN SERVICE ON THE CENTRAL RAILROAD OF NEW JERSEY AT THE PRESENT TIME.

Brunswick & Birmingham Private Car No. 100--Built by the Hicks Locomotive and Car Works

THE arrangement of the private car Brunswick consists of an observation room 12 ft. 4 in., with an extension sofa berth, the back of which forms an upper berth. Large plate glass windows in observation end of car. One small state-room with a single brass bed and upper berth, stationary dresser, with white metal wash basin and Wolff hopper. One private room with brass bed, drawers below opening into passageway, stationary dresser and wardrobe, white metal washstand and cooler. The bathroom (5ft. 8½ in. by 6 ft. 10 in.), with porcelain tub and water-heating device furnished by the J. L. Mott Iron Works. Arched ceiling in passageway. Eighteen-foot diningroom in center of car, china closet and writing desk with automatic electric light switch. Public toilet with Wolff hopper and white metal wash basin and cooler. Large linen locker. The kitchen (10 ft. 6 in. by 6 ft. 10 in.) with steel range, hot-water tank, refrigerator, dish racks, lockers and sink; also large re-

PRIVATE CAR "BRUNSWICK"—BRUNSWICK & BIRMINGHAM RAILROAD—TYPE OF PRIVATE CAR, HICKS LOCOMOTIVE AND CAR WORKS, 1902.

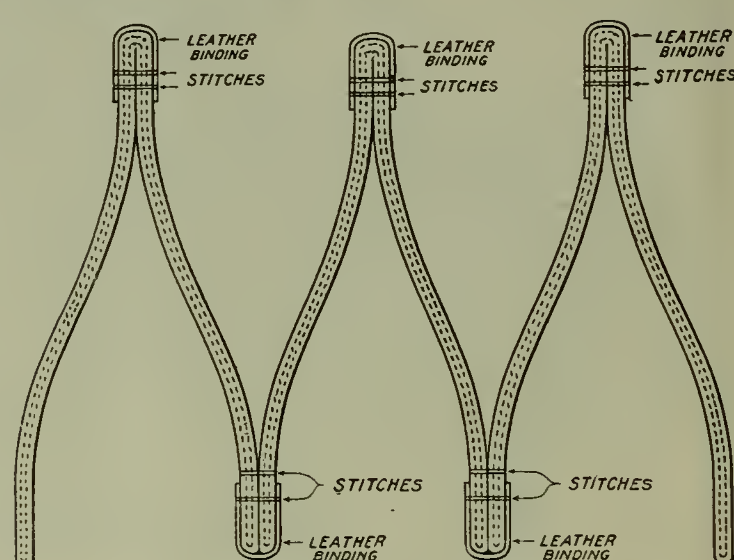
frigerator on front platform of car. The entire interior of the car is finished in quarter-sawed white oak in a modern and neat design; dark golden flat polished finish. The berths are veneered with large center panels of English oak. Floors are carpeted with Royal Wilton. The upholstering is in olive plush. Headlinings light olive green. Silk-lined Pantasote curtains. The car is lighted by the Consolidated Lighting and Heating Company. Electric apparatus with generators on trucks, and storage batteries under the car, and electric switchboard in a convenient closet off the passageway, with automatic door switch. Small round bulb electric lamps; also oil lamps for emergency use. There are also three Jandus electric fans. The car is well supplied with bronze spindle racks. The car is heated by direct steam —New York Safety Device—and also has Baker heater. Trucks are standard six-wheel Pullman type, with No. 9 Allen steel-tired wheels, and Westinghouse brakes and Boyer speed recorder. The outside of the car is painted in standard Pullman finish with lettering and ornamentation in gold leaf. The windows have opalescent glass Gothics. The observation platform is equipped with brass railings and gates and hinged step. Inlaid rubber tiling on platform and step treads. Standard platforms. Length of body is 67 feet. Such a car can be furnished from the Hicks Locomotive and Car Works in about ninety days' time.

Quarter of a Century's Progress in Railway Equipment and Supplies

Improvement in Vestibule Design

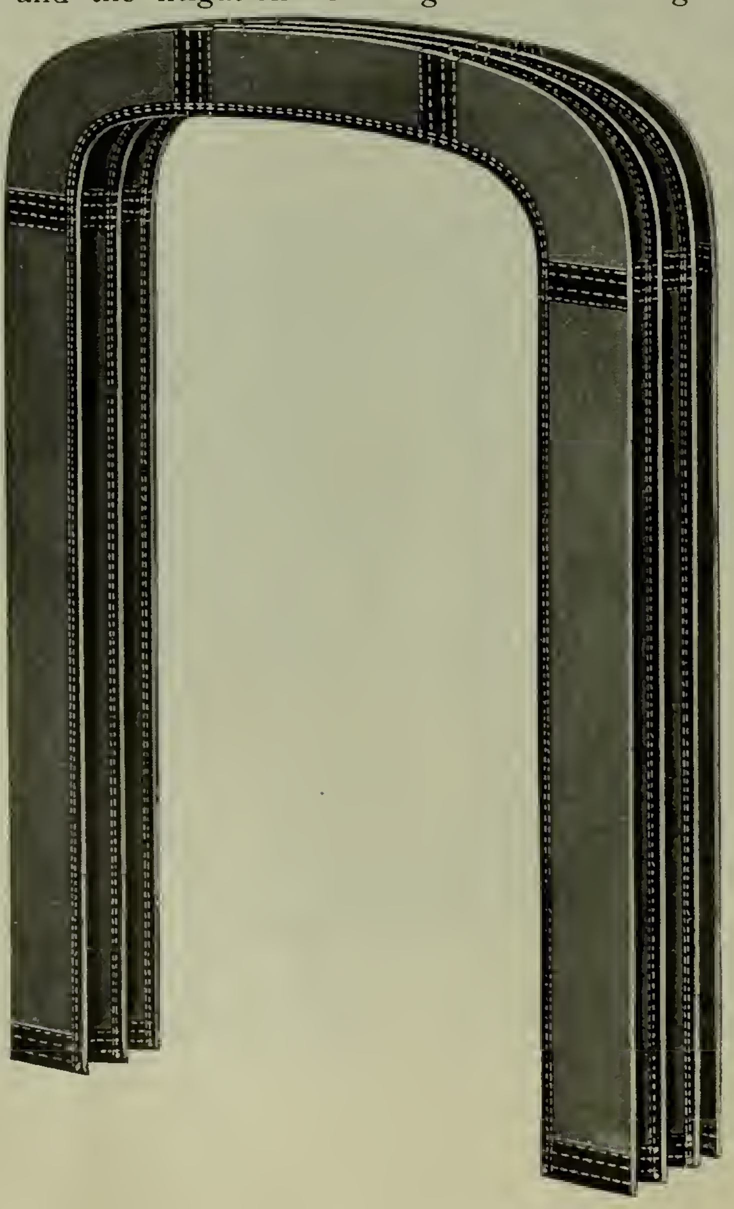
THE vestibule train is essentially the product of the last quarter of a century. The Pullman Company was the first to introduce the protection of the vestibule. This device provides additional safety to passengers when passing to and from coaches, also adds to the easy riding of trains in rounding curves. It prevents jar or shock in case of sudden blows and provides against telescoping in collision. The first patents on the vestibule were taken out by Mr. H. H. Sessions, who was then manager of the car works at Pullman, Ill. Subsequently the Wagner Company introduced a vestibule and the litigation resulting from the alleged infringement of the Pullman or Session's patents is a matter of history. It was long and bitter and only the amalgamation of the two companies finally terminated it.

The Gould Coupler Company and the American Car and Foundry Company have vestibules of their own designs which are extensively used. They differ from the Pullman vestibules in detail but their objects are identical. Before the introduction of the vestibule it was both disagreeable and dangerous to cross the platform between cars of a rapidly moving train, and it was not infrequent that passengers were blown off and more frequently suffered the loss of hats, or barely escaped injury by losing their balance in the case of striking a sharp curve or siding. The objects of the vestibule were manifold and this appliance proved to be so bene-



SECTION OF "ACME" DIAPHRAGM.

ficial that within a few years nearly all through trains were equipped with it. At first the vestibule included only that portion of the platform not occupied by the openings for the steps, but in the later form of the so-called "wide vestibule," this space is also utilized by the invention of trap doors, which raise and lower by means of levers, thus making the platform, steps and entire width of car available. In this form of vestibule windows are included. The ends of the platforms are closed by glass doors, which increases the floor area of the car considerably. The principal objects, however, are to prevent injury to a car in case of collision, and to avoid swaying of coaches on uneven or crooked track, so that one hardly realizes when rounding a sharp curve



THE "ACME" SEWED VESTIBULE DIAPHRAGM.

on a vestibule train that the curve has been encountered at all.

One very essential feature of the vestibule is the diaphragm which is an accordion shaped device surrounding the doorway and space between the face plate and the door posts of the car. This provides the necessary latitude for curvature of trains without allowing air, rain or snow to invade the vestibule. These diaphragms were originally made of rubber on the theory that this material possessed the best qualities of elasticity. It is found, however, that this material, by constant exposure to the elements, deteriorated very rapidly, as it is a well established fact that rubber in a short time after exposure to the elements, becomes lifeless and has a tendency to crack and break. These diaphragms weigh, when made of rubber, several hundred pounds, and their own weight in case of a severe shock or jar was sufficient to destroy them. For this reason it was necessary to select some light material which possessed better wearing qualities, at the same time allowing for necessary stretch or elongation.

After much experimenting, it was found that duck or canvas belting of heavy material closely woven was the article desired. As the result of this experiment and the requirements of service, there was developed by Mr. H. H. Schroyer, of Chicago what is known as The "Acme" Diaphragm, an illustration of which appears herewith. This diaphragm was found in service, to be practically indestructible and at the same time cost but one-half as much as those made of rubber. The laps or sections are sewed together securely with double seams and with seven-strand Irish linen thread, using locked stitch. The thread is thoroughly waxed before using and is waxed again in the machine during the process of sewing. These seams are calculated to be as strong as the belting itself so that there is no liability of tearing or ripping under the most severe conditions of service.

Another difficulty with other forms of diaphragm is tendency to sag at the top. This is avoided in the "Acme" by running parallel seams about one-half inch apart from the bottom of the diaphragm to the point of curvature at the top, where the seam is widened into a crescent shape to provide an arch to support the top; this it is found to do perfectly. The inner and outer edges and bottoms are neatly bound with leather, presenting a finished appearance and giving additional rigidity to the edges. The manufacturers are so confident of this diaphragm that they warrant it to wear for five years, which is estimated to be two or three times the life of a rubber diaphragm. It has been shown by experience, however, that they will wear much longer. A certain road equipped fifty cars with a cruder, though similarly constructed diaphragm, in 1890, of which only four sets have been removed from service up to the present time, a period of about 13 years. The diaphragm is made in forms suitable to the Pullman vestibule as well as the Gould and American Car and Foundry types of vestibule. It is claimed that the per cent of saving as against rubber is about four to one, the life of the canvas diaphragm being double and the cost approximately one-half that of rubber. The "Acme" is in use in upwards of fifty roads in the United States as well as the leading Canadian roads, and many large orders have been received from England, France and Germany, though in those countries the style of diaphragm differs materially from the American type. The above fifty roads include all railroads in the United States which operate a vestibule train service of any consequence, so that it may be said that the use of the "Acme" diaphragm has become almost universal, although it was not introduced in a commerical sense until the Master Car Builder's Convention, at Saratoga, last June. Previous to that time, the diaphragm had been in use on several roads for the purpose of testing its various features, which were found to be entirely satisfactory in every instance. The manufacturers of this diaphragm are Messrs. G. S. Wood & Co., 100 Lake St., Chicago, Ill.

Valves of the Past, Present and Future

SINCE the beginning of time mechanical people have devoted much time to the betterment of devices for controlling water, steam and air, and if the exact truth could be known, it is more than likely the old style plug cock was the first invention to serve the purpose, and while for hundreds of years, very little ingenuity was wasted on the plug cock, the greatest mechanical achievement of the age has been accomplished with that much despised plug cock.

The Homestead Valve Manufacturing Company of Pittsburg, with factory at the world-renowned Homestead, have since 1895 been busy inventing and placing on the market a line of plug valves and cocks which have succeeded in displacing many globe and gate valves. The firm mentioned own and control the only means for automatically sealing or locking the plug tight in the body on closing the valve and relieving pressure on opening same, insuring easy movement but at the same time never allowing the plug to rise from its seat.

One of the great advantages these patented plug valves have over globe and gate valves is the fact that while open and at work the pressure passing directly through the plug never touches the ground part of the seat, while the gate valve and globe valve are wearing out at the seat from the moment they are opened until they are closed.

The Homestead straightway valve and the Homestead Junior are made very similar in outside appearance, being closed at bottom and provided with cap and stuffing box at top to prevent leakage, and while the internal locking devices accomplish the same result, the Junior can be taken apart while closed against the pressure in case a liner should be needed under the cap, or the stuffing box needed repacking. These valves open or close on a quarter turn and always in the same direction, and can be graduated in amount of opening and regulated as to volume at will from the merest trifle to the full volume of opening, which makes them instantaneous and gives them untold advantages over globe or gate valves that require so many turns of the wheel to open or close.

While on the subject of straightways, the Homestead locking cock (patented May 13, 1902) deserves special mention. This is open top and bottom exactly like the old style of cock, but contains the Homestead principle of locking device at the bottom, which insures a tight seating of plug, both in open and closed positions, automatic release and easy movement of plug being accomplished by movement of wrench. Contrast this with the ordinary use of the usual metallic cock—when the operator first strikes the under side of the plug with hammer, wrench or any other piece of iron to release the plug and make it open easily and usually gets a shower bath at the time and then turns the plug to the open position, gives it a knock on top to tighten it in place, and when closing repeats the same series of knocks—how long is this cock serviceable?

In operating valves the Homestead three-way and four-way stand pre-eminently in the front rank of metallic valves, being used largely at steel and iron mills and blast furnaces, where they are preferred on account of absence of leather or other soft substances, which need frequent renewing in many other makes of valves. A record unprecedented was made by a Homestead four-way at Duquesne furnaces of the Carnegie Steel Co., where in four years' use nine million one hundred and twenty-five thousand (9,125,000) turns had been made, when the valve was returned in fairly good condition to the makers as a memento.

The experience of the founders of the Homestead make of valves is that where they have once been tried, orders for the same kind never fail to follow, and it seems reasonable to expect a very much extended trade for this meritorious device, according to the knowledge that valve users in this and other countries obtain of it.

The Development of Drill Grinding

TO describe the developments of the drill grinder business during the past twenty-five years is not so great a task as it would be with several other classes of tools, for twenty-five years ago drill grinders were practically unknown. With the increased use of twist drills, and the awakening to better methods throughout the craft, machines to properly sharpen these became much more of a necessity, until today, there is scarcely a shop with any pretension of up-to-dateness where not at least one of these excellent machines may be found. In some respects the progress of the drill grinder has been along radically different lines than that of other tools, as for instance, the lathe, simple as it was years ago, today some of the most modern ones have more gears, shafts, handles and levers contained in a single one of them than would be looked for in a complete small-sized machine shop twenty-five years ago. To be sure, these later machines are much more efficient, but the efficiency has been obtained by addition, rather than by subtraction.

Not long ago (and some made today) drill grinders were so constructed that before a drill could be ground, it was necessary to make several adjustments, and while, to the skilled mechanic, these were comparatively easy to make, the one great drawback remained, that whereas the machines were intended to reduce the amount of skill required to grind drills, they failed in this to a great extent, as the less skilled men would rather grind a drill on a plain emery wheel than bother with so complicated a machine. Comparatively few were therefore sold, as it was frequently found that after a machine was installed only the few best mechanics would use it.

About three years ago a machine was invented which was built on such lines that the only adjustment left to be made was the one for length, and its construction was simplicity itself. The great possibilities of this grinder were at once realized, and time has proven the utility of this invention.

The number of these machines since made runs up into the thousands, and the rate at which New Yankee Drill Grinders are now being turned out is enormous. They are made to suit all conditions that might possibly exist in machine shops, and some thirty-two styles enable the manufacturers to do this. Among these are belt and electrically driven, dry and wet machines; drill grinders with countershaft in base or overhead; small ones for drills down to Number 60 gauge size; larger ones up to drills of five inches in diameter; grinders for left, as well as right hand drills, and three to eight lipped reamers can also be ground in these; combination grinders, having a drill grinder at one end of the wheel spindle, and plain surface or special grinding attachments at the other end. These combined machines especially appear to fill a long-felt want.

A drill grinder does its work so quickly that a good sized shop would keep it busy but a small part of the time, so that if another style of grinder is combined with it, the machine may be almost constantly used, and a bigger interest realized on the investment.

The latest combined machine brought out by the Wilmarth & Morman Company, whose machines and progress we are referring to in this article, is a machine having at the opposite side of the drill grinder an oscillating grinding attachment, counterbalanced, and in other respects, similar to the arrangement used in some of the disc grinders. The table of this device is adjustable in all directions, and chasers, cutters, gibs, keys, punches, dies, lathe and planer tools, and a host of other small pieces may be ground thereon, squarely or at any angle. A V-shaped table is also provided to hold round work.

That the drill grinder business should have grown to be as extensive as that of the Wilmarth & Morman Company, few of the most sanguine advocates of machine drill grinding would have predicted, but we are convinced that it is only a sample of what specializing and directing the efforts all in one direction will accomplish.

The Dixon Crucible Company

IN the twenty-five years just gone, the Dixon Crucible Company came into the market with Dixon's American graphite lead pencils, and their quality, plus the business management behind them, has pushed them so much to the front, that they now stand with the leading makers of the world and their output of pencils for the year 1902 crowded close to fifty million pieces of lead pencils. In this same twenty-five years the company have witnessed the rise and immense growth of a system of lubrication by dry graphite, and they are the only people who have contributed to this growth. They are the originators of the system of graphite lubrication, have done all the preaching on this subject, all the introductory work, all the sampling, and have now a business that is not only national but international. And everywhere on this globe where machinery is used, the Dixon dry American Ticonderoga flake graphite goes.

In connection with the use of Dixon's silica-graphite paint it will be interesting to refer to the effect of this paint on the life of steel structures. The railroads of the United States may be said to be the greatest consumers of steel. Bridges, viaducts, buildings and cars, formerly constructed of stone and wood, are now made entirely of steel. The attention of the entire railroad world is frequently directed to the American engineer's originality in design and construction of enormous steel structures to meet the shipping and traveling requirements in the wonderful march of progress of the new world.

The complete success of steel as a building material depends almost entirely on the kind of protective paint that is used in its construction and maintenance. Realizing this fact, engineers are now giving special attention to the selection and proper use of a paint that will prolong the life of the steel structure. It has been stated that if it is renewed often enough any paint will preserve metal work forever, and it has required some years to demonstrate the paint that would make the necessity for renewal less frequent. The Joseph Dixon Crucible Company were the first to introduce graphite paint for the preservation of steel, and special attention has been given to securing information as to the protective and wearing qualities of Dixon's silica-graphite paint.

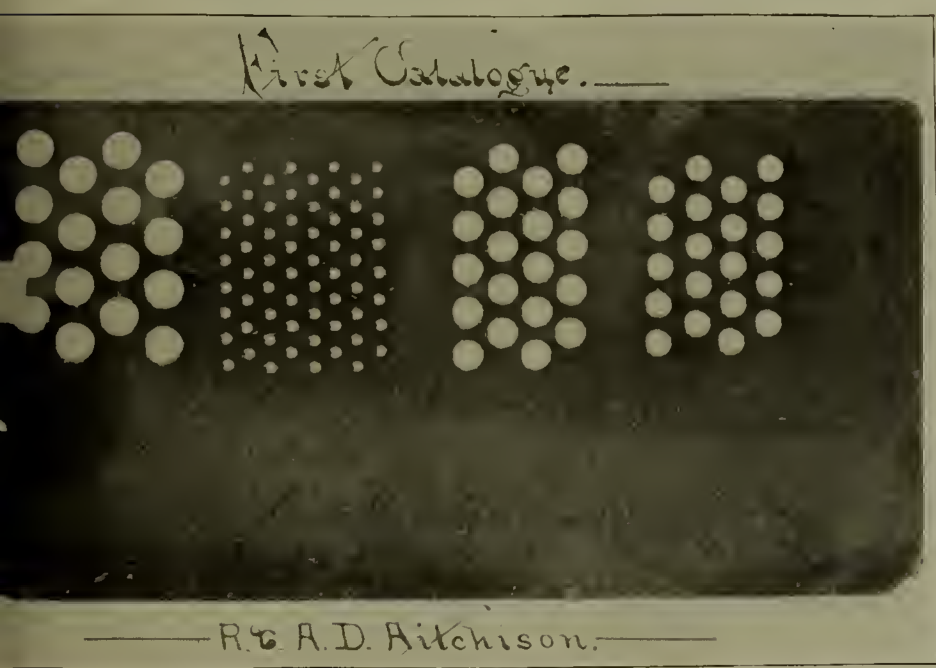
The Boston & Maine Railroad erected the Chelsea viaduct at Charleston, Mass., in 1894, and painted it with two coats of Dixon's natural color, and the structure has not required repainting. In 1890 the one-mile, four-track-wide steel elevated structure of the Pennsylvania Railroad in Jersey City was painted with two coats of Dixon's silica-graphite paint, natural, to protect against the corrosive atmosphere of New York harbor, and repainting was not required until 1901, when two coats of Dixon's silica-graphite paint were used.

One further branch of their business has been developed in less than twenty-five years, the manufacture of Dixon's silica-graphite paint. They are the originators of this material. It was their suggestion that graphite would be useful for a paint pigment; it was the Dixon company that began the preaching of this doctrine. They have advertised it in the ends of the earth and have a business now in this article all over the United States, and its growth has been very satisfactory.

The matter of Dixon crucibles is something that is older than twenty-five years. These were originated by the founder of the establishment, Joseph Dixon, some seventy odd years ago. During the last thirty-five years, however, the use of crucibles has very much increased, and they are known as altogether the leading crucible makers of the world.

In future the company proposes to take up the adaptation of graphite more largely for electrical work, such as graphite resistance rods and graphite brushes. They enjoy the distinction of being the only concern in the world where all the goods made of graphite are manufactured under one roof. The Dixon company makes everything of which graphite is an ingredient.

The Joseph Dixon Crucible Company, Jersey City, N. J., solicit correspondence on the subject of protective paint for steel work.



The above cut shows the first catalogue sent out by Messrs. R. & A. D. Aitchison who were the predecessors of the Robt. Aitchison Perforated Metal Co. of Chicago. At that time, 1868, they only had dies for four sizes. Now their complement covers nearly 600 sizes.

Tool Holders

THOUGH tool holders were not in economical use a quarter of a century ago, their development in more recent years appears of much interest to those associated with successful shop management. The progress in the manufacture of tool holders and conditions bearing upon the development of the same are hereby set forth by the Armstrong Brothers Tool Company, who have been in the business successfully during the past ten years.

Tool holders of different forms have been used in lathe and planer tool work for many years, and the economical principle involved has been recognized by mechanics for almost a century, but it was not until the introduction of Self-Hardening or Air-Hardening steel into general use, as cutting tools on lathes and planers, that the economical principle involved became of great importance. The high price of this new steel and the difficulty experienced in forging it into shape, as well as the great amount of capital tied up in the tool steel itself, made the ordinary machine shop management very reluctant to adopt it. It was this condition of affairs that gave to us the idea that a wide field existed for a strong practical holder, which would permit the use of air-hardening steel in the form of inserted cutters, such cutters to be so designed that they could be made from stock sizes and shapes of air-hardening steel, instead of being of odd shapes and special forms, as has been the case with tool holders previously put upon the market.

Our ten years' experience has proven that we were not mistaken in our opinion. For a number of years Armstrong Tool Holders had to wage a hard fight against prejudices based upon years of custom and old-fashioned conservatism, but with the knowledge that we were right and that our tools could save money for our customers, we never hesitated in making claims as to the economy and effectiveness of our tools, which while at first seeming to many exaggerated, never failed to be justified by actual experience of our customers.

From a very small beginning we have by persistency and the liberal use of the best advertising mediums among the machine shop trade journals, developed a business in our tool holders, which ten years ago would have been declared impossible by the best posted men in the machine tool business. Armstrong Tool Holders are on sale in almost every civilized country in the world. They are illustrated and listed in almost one hundred catalogs of standard machine shop supplies and are rapidly displacing the old-fashioned forged tools in even the slowest and most conservative machine shops.

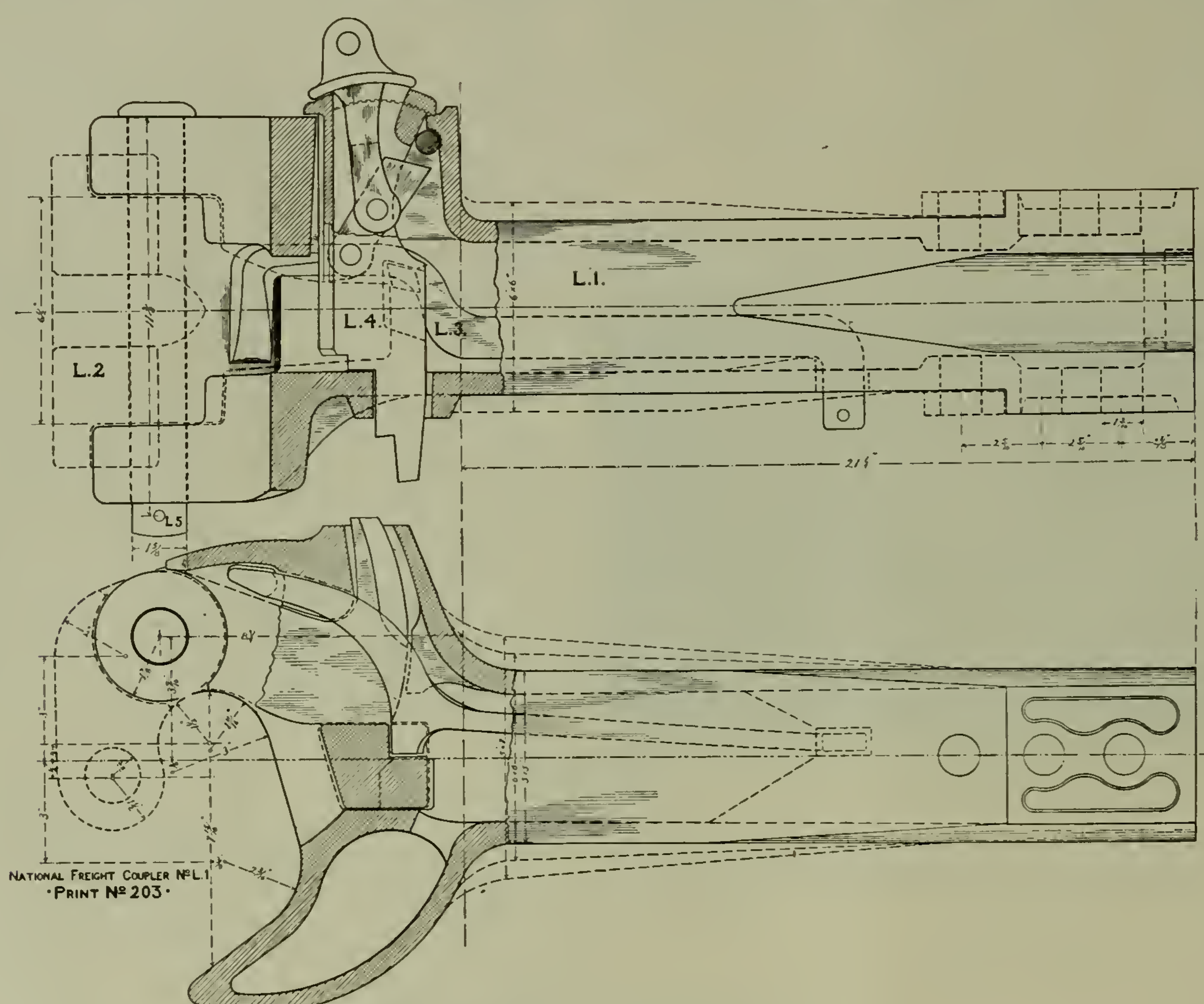
From time to time we have taken out patents covering our inventions until at the present time we hold fourteen patents, United States and foreign, fully covering our line of tools. We are pleased to say that at present we are developing a number of new ideas in the tool holder line, which we have every confidence will prove as successful as our other tools and will prove a source of profit to our customers. This in a few words gives the history of the concern, which by common consent among the trade, bears the title of the "Tool Holder People."

THE Acme Machinery Company began business in 1884, at which time they occupied a floor space sq. ft., so that the business has increased in that respect more than twentyfold in eighteen years. That hardly represents, however, the increase of the business, a very much more rapid rate of production obtains in the twentieth century than was the rule in 1884, due to better machinery and better methods. For example, in December, 1902, they made and shipped 76 machines of all kinds, ranging from 1-inch single bolt cutter weighing 1,500 lbs. to a 3-inch forging machine weighing 50,000 lbs. In 1884 their operations were confined entirely to furnishing machinery to customers in the United States, and occasionally a machine was sent to Cananda. In the year 1902 they shipped to almost every civilized country, such as Indian railways, Bombay, India; Melbourne, Australia; Aukland, N. Z.; South Africa, Japan, and the various countries of South America, and to all the countries of continental Europe in ever increasing numbers.

Changes and improvements have followed so thick and fast that the machine made 18 years ago hardly resembles the one made to-day, except in one great and important particular, and that is the type of thread cutting dies made for their machines when they began, have never been changed, so that a set of dies made to fit any particular size of machine made by them to-day will just as readily fit the machine they made when business was first begun.

National Freight Coupler No. L. 1.

IN the selection of couplers for car equipment there are a number of points worthy the consideration of motive power officials. The failure of such parts at critical times usually leads to serious results and even in cases where accidents do not follow the loss of time consequent to coupler failures is of sufficient importance to demonstrate the necessity of an appliance which will withstand the stresses imposed upon it in fair and unfair usage. While it may not be possible to design against wreckage, it is necessary to design against unfair usage, in consideration of the fact that as brakemen are no longer subjected to the danger of standing between the cars when making a coupling, the couplers are subjected to very severe tests in switching service.



National Freight Coupler, No. L. 1.

Couplers should be of the best material. They should conform to the M. C. B. contour lines and the distribution of metal should be such that there will be no excessive strains. It is very necessary that the mechanism for locking the knuckle should be simple in order to operate smoothly and with certainty when the brakeman is endeavoring to open the knuckle hurriedly. To be a good coupler it is further requisite that it should couple easily by impact, automatically set the lock, automatically trip the lock and automatically open the knuckle.

Fully realizing the requirements necessary to fulfil the conditions of present day railway service, Mr. A. J. Hinson has designed a coupler automatic in every movement and capable of meeting every demand possible. This coupler is shown in the accompanying line drawing, in which the mechanism and locking device are clearly illustrated. By reference to this figure it will be seen that the locking device L 4 is itself securely locked by an auxiliary catch which prevents upward movement by engaging the pin shown in cross section. An examination of this device will clearly demonstrate the fact that it will be impossible for any shock or jar which the car may receive to remove it from its position. However, when the lifting lug is raised by the chain (which is attached thereto in service), the auxiliary catch swings clear of the pin, and the locking device is readily raised to position in which it no longer engages the knuckle. When so raised the lock maintains the the movement of the knuckle. Raising the locking device, L 4, not only releases the knuckle, but swings it open as well. This is accomplished by the arm L 3, which is so arranged that lifting the lock will raise the lug of L 3 (shown in the plan), and by so doing swings the verticle lever (shown in elevation) against the knuckle, thereby swinging it open. The construction of the locking device is very strong, and it exposes a large surface to the locking arm of the knuckle.

The coupler herein described automatically unlocks if pulled out of a car, preventing the same from falling on the track; and an extra provision is made by the rear end of the knuckle opener passing through the bottom coupler, thereby holding the head of the coupler should the chain of the unlocking rod break in the event of the breakage or pulling out of the drawbar.

This coupler is marketed by the National Car Coupler Company, of which Mr. J. A. Hinson is president. The offices are in the Monadnock Building, Chicago; and at 150 Broadway, New York.

The Martin Metallic Flexible Conduit

THE requirements of the connections between engine and tender for the passage of steam, air, water and oil are perfect flexibility, simple construction, freedom from deterioration by corrosion, easy application, absolute freedom from leaks. These points are embodied in the Martin metallic flexible joint illustrated in the accompanying illustrations. A peculiar feature of this joint is the elimination of the abrasion of two metallic surfaces by the introduction of specially prepared gaskets to withstand the wear. Two of these gaskets are so arranged as to encase the ball, their joint being immediately around the center of the ball. To insure a good fit the gaskets are moulded to form. The gaskets in turn are included within a sleeve and held in position by a ring screwed into the end of the same. The gaskets are made of an asbestos graphite mixture and in addition to having sufficient hardness to withstand rapid wear, also lubricate the joint sufficiently to overcome all binding or strain. The conduits are made of bronze and the end sockets are attached to malleable iron supports, which are bolted respectively to the tail plate of the locomotive and the end sill of the tender frame. The area through the ball joint is greater than the area of the conduits, so that there will be no retardation to the passage through the connections. The life of the gasket is claimed to be about one year, and as the gaskets are inexpensive and readily applied it is seen that they require little attention in service. The life of the connection as a whole is practically unlimited. The parts are made of the best material and are all interchangeable.

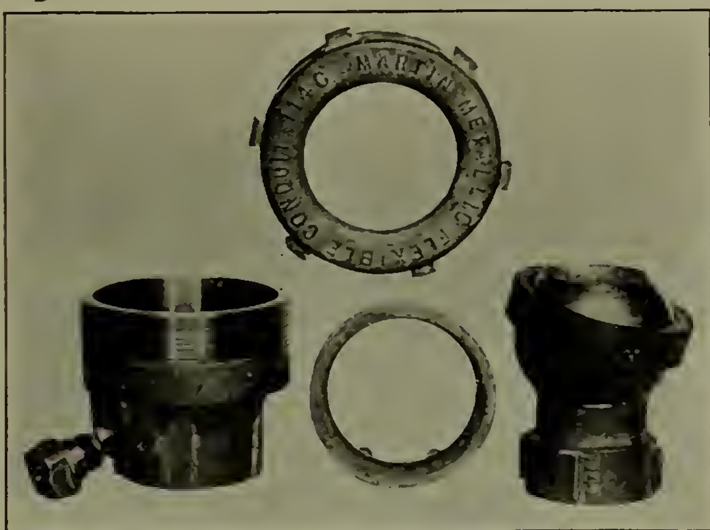


Fig. 1—Details of Flexible Joint, Martin Metallic Flexible Conduit.

Fig. 1 represents the details of construction of the ball joint, gasket, retaining ring and an automatic drip valve to prevent freezing in cold weather. Fig. 2 illustrates the connection in three didfferent positions, indicating the flexibility and the range through which the parts are at liberty to swing. In Fig. 2 may be seen the drip valve, shown in detail in Fig. 1, situated at the lowest point of the joint. This valve is seated by internal pressure, being held open by a weak spring when pressure is removed.

Experiments are now being made to include attachments to conform to the M. C. B. air couplings, so that these metallic conduits may be used between cars in a train as readily as between engine and tender. The metal conduit is a very light affair and the swivel connections are such that it may be easily swung out of the way.

This metallic conduit was originated and perfected by Mr. J. C. Martin, Jr., who is vice president of the Holland Company, a company formed to handle general railway supplies. The representatives of this company are the sole manufacturers and agents controlling the Martin patents. They also own the patents controlling the manufacture and sale of the Sharp dust-proof journal box, which was fully illustrated and described in the Railway Master Mechanic on page 368, in the October issue, 1902. The office of the Holland Company is in the Great Northern Building, 77 Jackson boulevard, Chicago, Illinois, and they are represented in New York and San Francisco.

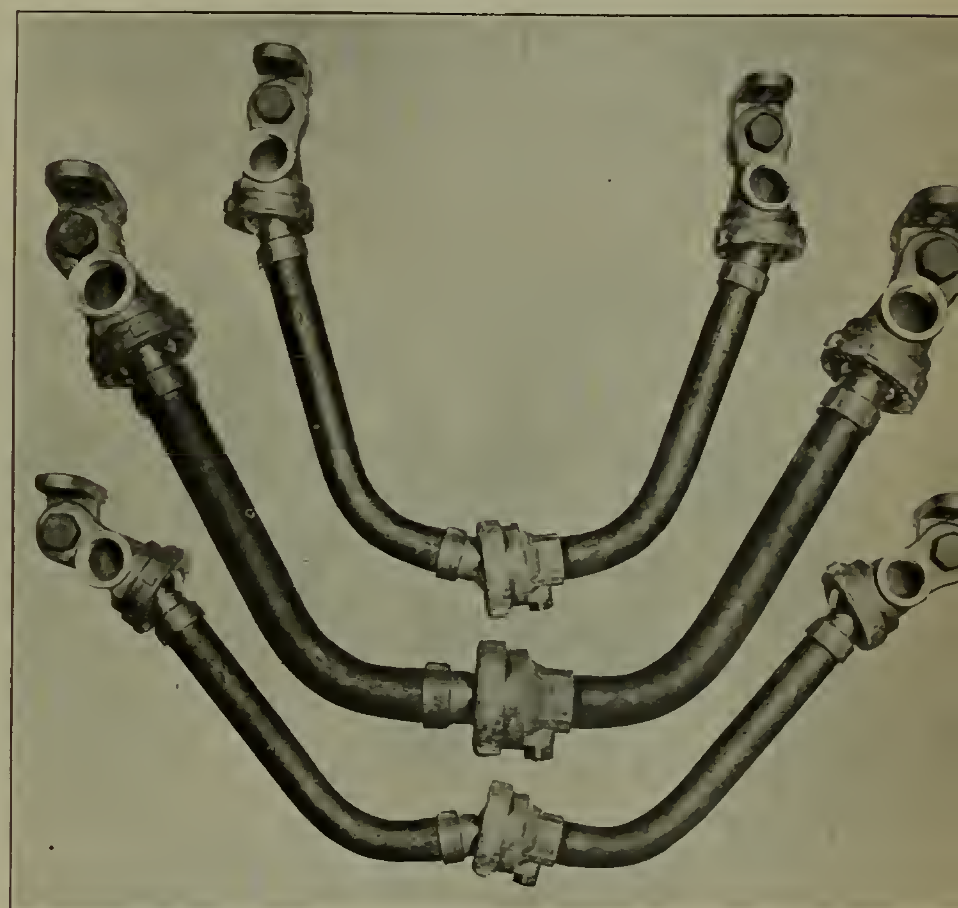


Fig. 2—Views of Flexible Conduit Complete, Showing Range of Flexibility.

J. A. FAY AND EGAN say there has never been a period since the manufacture of wood working machinery began when the saying "Improvement is the order of the age" could be better applied than at the present time. This refers not only to car shop tools but relates as well to the general line of wood working machinery.

This compnay is specially well prepared to furnish a complete line for railway car and pattern shop equipment. They take pride in calling attention to the fact that in the past years they have taken out nearly two hundred patents on new and useful improvements, which have helped in one way or another to produce the best of car shop tools. Machines which were designed twenty-five years ago are now obsolete, and have been supplanted by their machines with new inventions for the saving of labor and capital. During this period of improvement the J. A. Fay & Egan Company have increased their business at least three-fold, and now employ nearly 1,200 men.

Special Portable Tools for Railway Repair Shops

THE accompanying illustrations represent four useful portable tools designed for special work in the railway repair shop, manufactured by H. B. Underwood & Company, Philadelphia, Pa. Fig. 1 illustrates a portable boring bar for locomotive cylinders. It is also designed for general boring, being made in several sizes. All kinds of engines, steam hammers, pumps, blowing engines, air compressors, Corliss valves, etc., can be bored in place. It has fixtures for boring (with one or both cylinder heads off) in any position and in very cramped places. It can be readily operated in a space that is large enough to take the piston out of the cylinder. Many times cylinders can be rebored in place in less time than they could be removed from fixed position, leaving all steam connections, holding-down bolts, etc., intact. Enough cutter heads are furnished with each size bar to bore diameters given for each diameter of bar. These bars are powerfully geared and can be driven by power of hand. Each bar has two changes of feed; the feed screw is steel, the feed nut is also made of steel, cut in a peculiar way, insuring great wear.

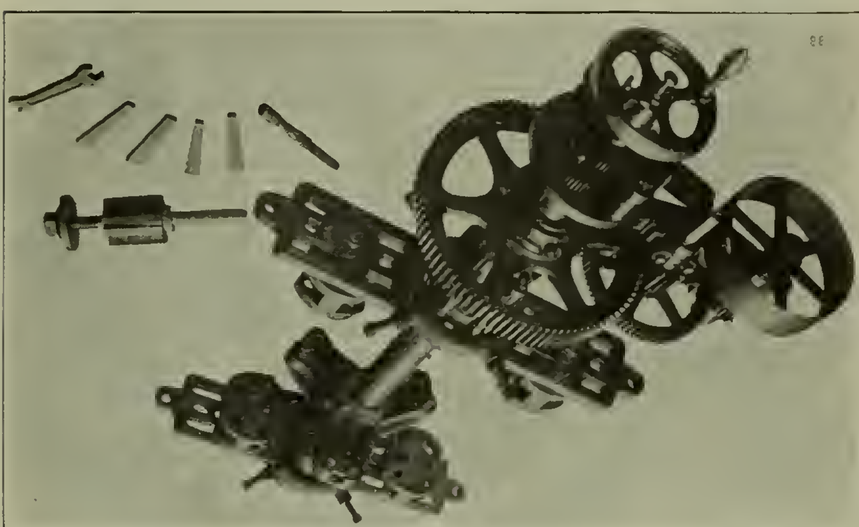


FIG. 1—PORTABLE BORING BAR FOR LOCOMOTIVE CYLINDERS.

A full complement of expanders will be sent to fit stuffing boxes. One set of sample tools and wrenches are furnished with each outfit. We are prepared to make special sizes for special work.

The machine (Fig. 2) is designed to face off worn valve seats, and valves of locomotives particularly, but the fact of it being so well adapted for attaching to the work, as well as the quick and accurate work that it will do, has made it a useful tool for various other kinds of work.

The swiveling and adjusting radial arms on the top of the machine are so made that there is scarcely any shape that they cannot be attached to. One set of studs with one end blank is furnished with each machine, the top ends are threaded quite a distance to receive the adjusting and clamping nuts and washers, one side of each nut is turned convex. The washers have a large hole in them and are turned out concave, making a ball and socket clamp that will not spring the machine, even though the studs are out of line with each other.

Each machine is furnished with a sample cutting tool, wrenches and hand flywheel, as shown in the cut. There is no breaking of portedges, and the work is perfect, requiring no filing or scraping after the machine has been used.

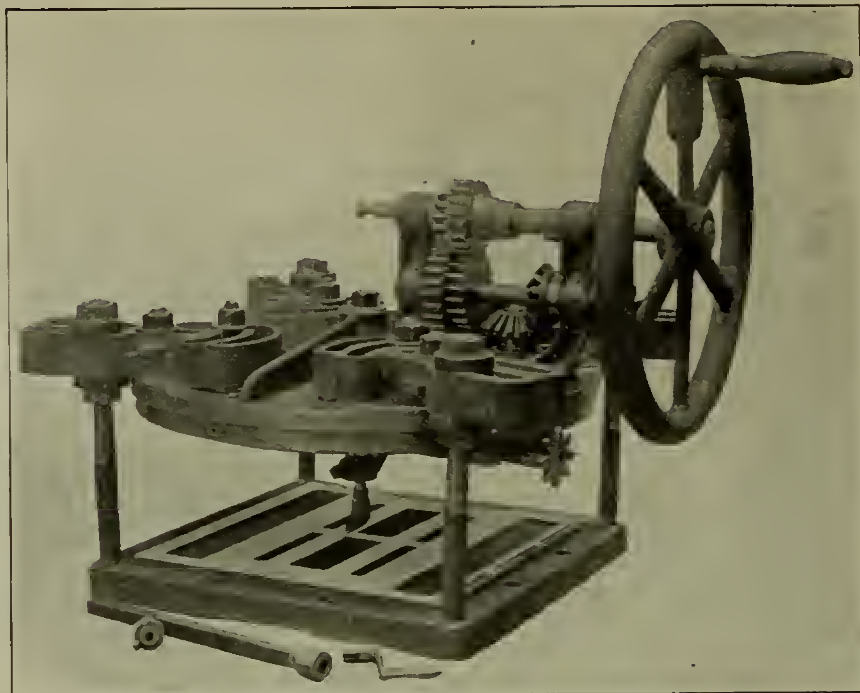


FIG. 2—VALVE SEAT FACING MACHINE.

The accompanying cut shows the machine in so clear a manner that it is not necessary to further explain the construction.

The crank-pin turning machine shown in Fig. 3 is far superior to the old style; it has a number of points of merit which make it a useful tool and one that will soon pay for itself. It is light in weight, but at the same time it is strong and durable. It will feed either way and do its work quickly and accurately.

It will go over the collar of a crank-pin, and is adjustable for small pins.

The end of the machine next to the driver contains a 4-jawed scroll chuck, with thin jaws that center that end of the machine. At the opposite end there is a center that slides into the center of the pin. The machine is then mounted by the original centers, and is clamped in position by bolts passing through the spokes of the driver. The annular cutter-head containing the tools is driven by a small pinion, hand wheel and shaft. From this shaft, by gearing, we get an automatic feed either way. The carriage contain-

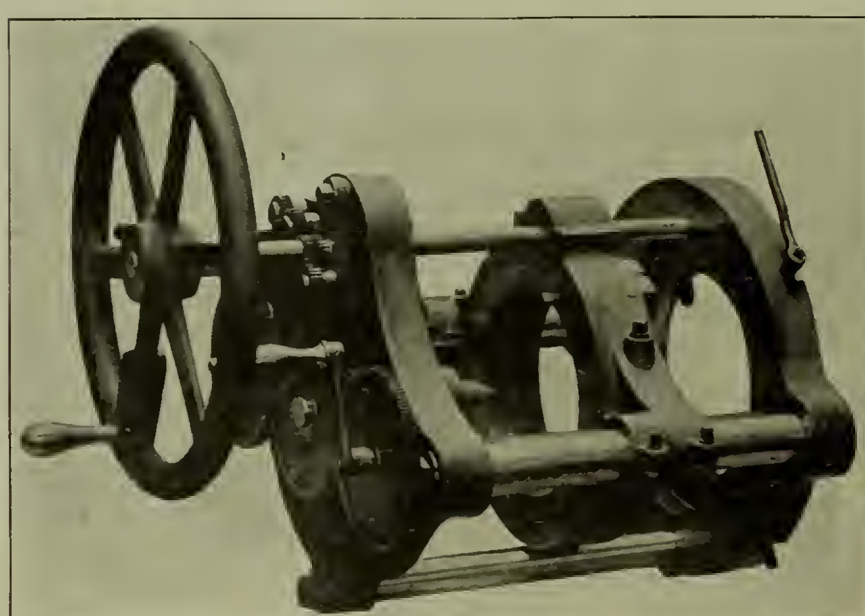


FIG. 3—CRANK PIN TURNING MACHINE.

ing the cutter head is given an even, smooth travel by two feed screws.

The cylinder head joint and dome facing machine illustrated by Fig. 4 is made for refacing cylinder head or dome joints, doing the work in place in very quick time and perfectly true. The machine is made up of two disks, the lower one sufficiently strong to resist all strains. In this lower disk there are four adjusting screws; two are shown in cut. These screws are screwed out into the counter-bore of the cylinder or inside of dome joint, centering the machine and holding it in position while doing the truing. The top disk carries a train of gearing which are shown in cut. Three other gears are in space between the upper and lower disks, gearing into an internal gear that is cut into lower disk, giving sufficient speed and power to do the cutting. In the upper disk is a steel slide, fed out automatically or by hand, as desired. The crank shown is for quickly placing the tool in position and trying it, then a clutch is thrown in, crank slipped

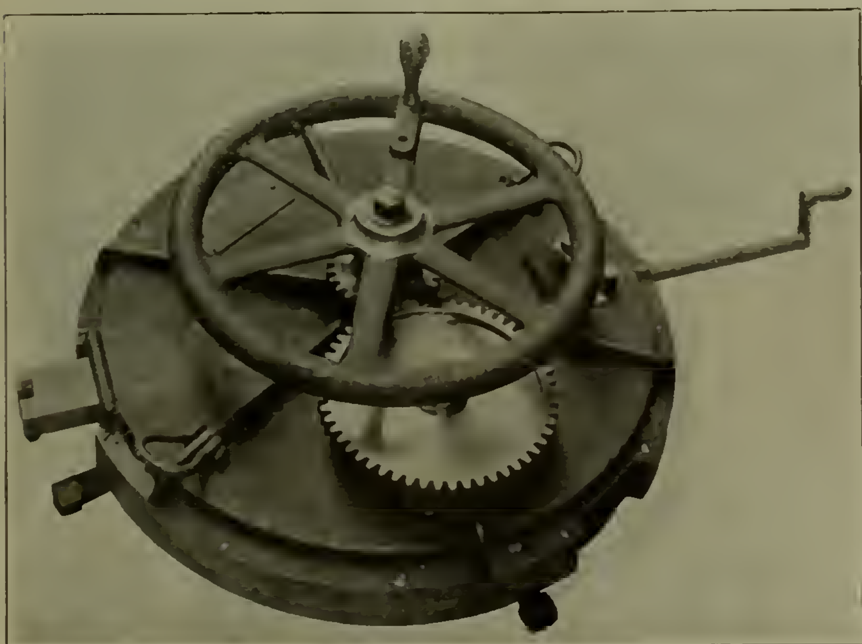


Fig. 4—Machine for Facing Cylinder Heads and Dome Joints.

off and the machine will feed out the tool automatically. When it is desired to use other than hand power, substitute a pulley clutch or coupling for the hand wheel shown. With this machine the time is so shortened that hand power is mostly used. Arrangements are made for taking up the wear (that being very little), as all working parts are in no way exposed, being contained within the two disks.

Hand Power Eye and Angle Benders

SMALL hand power tools can often be used to advantage in both small shops, where a limited amount of light work is done, and in shops of larger capacity well equipped with up-to-date machinery. The usefulness of such tools is unlimited and much time may be saved by their proper application.

Two hand machines, having a wide field of usefulness, have recently been originated for bending light bar iron and for forming eyes and hooks in the ends of bars. The hand eye bender illustrated in Fig. 1 is made in three sizes. The smallest size takes material up to and including ½ inch in diameter, the next larger size takes stock up to ¾ inch in diameter, and the largest machine takes stock up to 1 inch. Any style

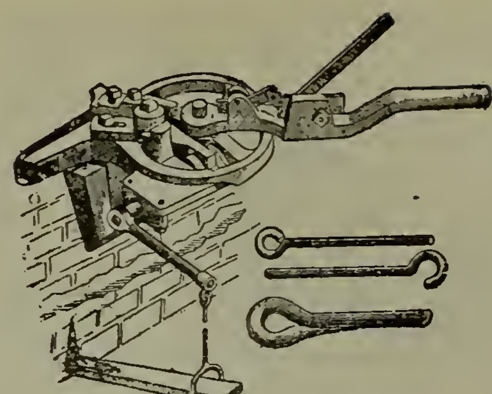


Fig. 1—Eye Bender.

of ring, hoop and loop may be bent up to 3 inches outside diameter.

Referring to Fig. 1, the principle on which this machine operates may be clearly seen. Operating upon and attached to the large handle is a small dog moved by a light lever. This dog presses the material to be bent against the pin shown in the center, so that when the large handle is turned the stock is pulled around the pin. A second dog, adjustable and held in position by bolts, guides the stock so that it may be bent to the desired form. The final adjustment of the second dog is made by the foot power lever shown, making the final bend of the form. The pin in the center extends through the table (in reduced size) and is held rigidly in position by a nut at the lower end. The pin may be turned to any size to suit the demands of the user. In using the machine it is not necessary to swing the full length of the bar, therefore a long rod may be handled conveniently. The machine is supported by a cast iron lug which fits into a socket and may therefore be easily removed and put out of the way when not in use. The socket is bolted to the side of a bench, to the wall, or anywhere that may be desired.

The hand angle bender is made in two sizes. The smaller machine has a capacity for bending iron or steel as large as two inches wide by ⅜ thick or ⅝

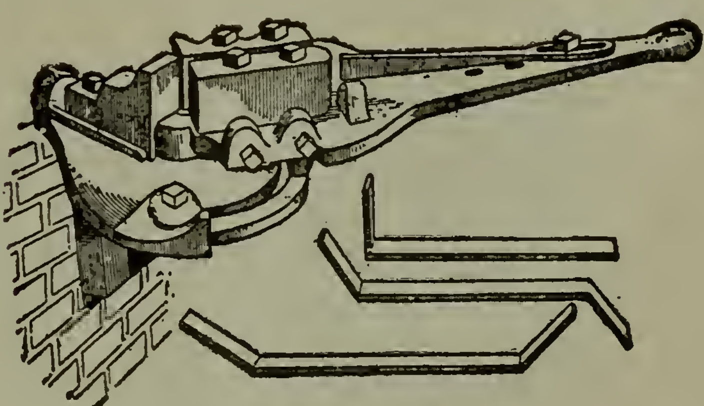


Fig. 2—Angle Bender.

round, and will form any angle from zero to 90 degrees. The large tool bends stock ½ inch thick by 4 inches wide, flat bend; or ⅜ inch thick by 1⅛ inches wide, edgewise. This machine will form any angle, as indicated for the smaller machine. The adjustment is quickly and easily effected. To set the machine for bending a right angle, place movable die back the thickness of the stock both ways from the other two dies. For angles less than ninety degrees set front die ahead or toward the center pin far enough to allow the corner to hug tight against the stationary die at corner of bend.

Referring to Fig. 2, the construction of the machine

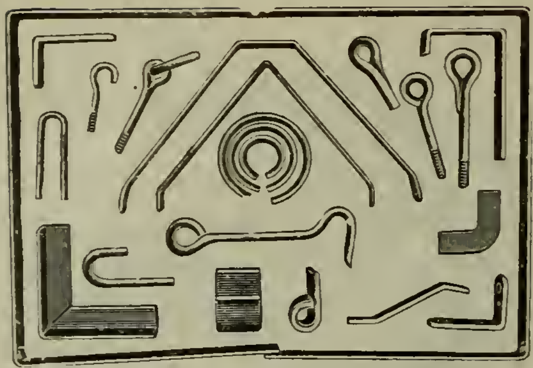


Fig. 3—Samples of Forms.

is clearly illustrated. The retaining lugs are easily adjusted to conform to the size of the material operated upon. There is an adjustable stop which regulates the distance to which the material is inserted, insuring the proper length to which it is desired to bend the arm. The angle bending machine is secured in such a manner as to be easily removed from its support, as explained in the case of the eye bender.

Fig. 3 illustrates samples of the work done by the types of machines herein described.

These machines are marketed by the Wallace Supply Company, 56 Fifth avenue, Chicago, Illinois.

Steel Rolling Doors for Railroad Structures

THE advantages of rolling sheet-steel doors and shutters, combining ease of operation, security and efficient fire protection, have come to be widely recognized, and have practically become a standard fitting of modern railway warehouses, roundhouses, shop buildings and other important structures. In the case of freight houses the fireproof features, in addition to the qualities of security possessed by the steel door, make it especially desirable, while in doors designed to cover large openings, such as those of roundhouses and shop buildings, where strength combined with lightness is an important consideration, the wind-resisting powers of the steel construction immediately commends it. That rolling steel doors possess points of superiority over the ordinary sheet-steel, hinged door is obvious, and several designs of the former type are now obtainable. One of the most recent forms of this style of door is that originated and patented by Mr. P. Ebener, which is being manufactured by the Columbus Steel Rolling Shutter Company, of Columbus, Ohio. The concern was organized in June of the present year and has completed the installation of machinery for making the door under the patents granted Mr. Ebener, the important feature of construction being the form of the steel slats used. These improved doors satisfactorily fill the requirements in modern buildings, are constructed of high grade sheet steel and consist of hinged slats so designed as to insure their being easily rolled one upon the other, efficiently shedding water and forming a thoroughly fire-proof door. The details of construction of the door are clearly shown in the accompanying illustrations, in which Fig. 1 presents a sectional view of the slats, showing the formation of the hinge, Fig. 2 shows the slats as they appear from the outside, Fig. 3, a general view of a complete door, from the inside, with the hood partly cut away, displaying the roll and hoisting mechanism. Fig. 4 shows the details of the hoisting mechanism for doors supported outside and inside the wall, and Fig. 5 shows the application of the door to a freight shed, being the equipment

Fig. 1—Sectional View of Slats.

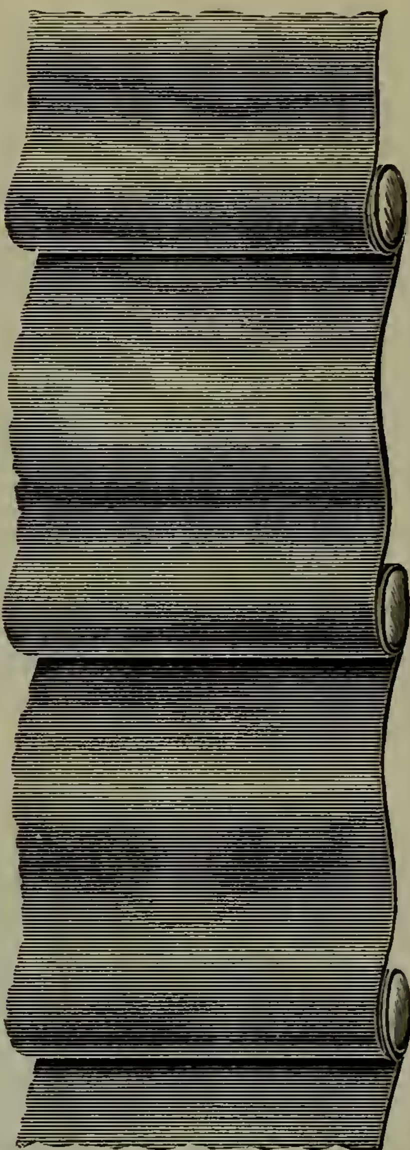


Fig. 2—View of Slats from Outside.

ordered for the new freight house of the Hocking Valley road to be constructed at Columbus.

The most important feature of a rolling shutter is the formation of the hinge or pivotal connection of the slats, and this is shown, with hinge connection enlarged, in Fig. 1, by reference to which it will be seen that in the present design each hinge has two distinct bearing points, so shaped as to produce the least friction when the shutter is being rolled, and the small bead within the large barrel of the hinge prevents the slats from being jammed apart. The rounded or cylindrical formation is very strong and not liable to spring, and the surface of the metal is not broken or weakened as is the result of

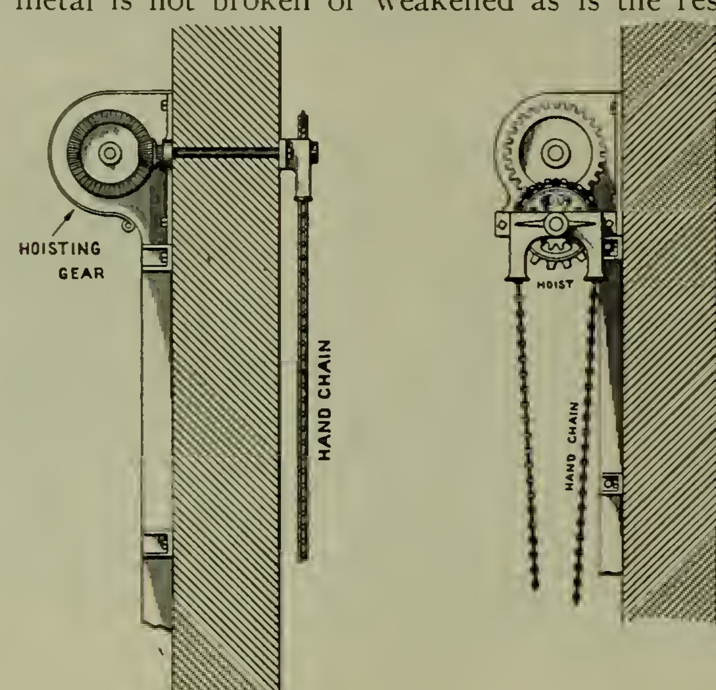


Fig. 4—Details of Hoisting Mechanism for Outside and Inside Supported Doors.

FIG. 3—VIEW OF COMPLETE DOOR, HOOD AND HOISTING MECHANISM.

short right-angled bends or folds. This endows the door with strength for resisting heavy wind pressures and general hard usage and at the same time there are no pockets or recesses left for the accumulation of water, dirt, snow or sleet, preventing rusting of the metal and premature decay. The shutter is constructed of No. 22 gage, sheet steel, the sheets being cut in strips 3⅜ ins. wide, formed in a specially built machine, the slats passing successively under seven rolls, and can be made in any length, so that a door of any desired width can be constructed. The rolls consist of tubing from 3 ins. in diameter upward, according to the size of the opening, these rolls being counterbalanced by one or more springs placed inside the same, much in the same manner as the ordinary window shade roller is made. A sufficient number of gears are furnished to insure rapid and easy operation, the sprocket-wheel and pinion being cast in one piece. In the case of the mechanism for inside hung doors and in the arrangement for doors rolling on an outside roller, the operating mechanism consists of a beveled gear and pinion, the sprocket-wheel being mounted on a shaft extending through the wall of the building, as shown in Fig. 4. In the latter, the gearing is protected by a cast iron gear case, secured to the sup-

FIG. 5—APPLICATION OF ROLLING SHUTTERS TO HOCKING VALLEY FREIGHT HOUSE.

porting bracket. The sprocket wheels are fitted with a cast iron chain guide, and the hood is formed of sheet steel secured to the supporting brackets, the latter being fastened to the wall by means of expanding bolts. Where doors are utilized especially for fire protection they can be so constructed as to stand rolled up normally and operated by the melting of a fuse, the latter releasing a spring, which starts the door, and, aided by gravity, soon closes it, shutting off the likelihood of fire being communicated from adjoining buildings.

The officers of the Columbus Steel Rolling Shutter Co. are Samuel P. Elliott, president; J. W. Cartzdafner, vice-president; S. A. Webb, secretary; H. B. Bradshaw, manager, and Peter Ebener, superintendent. The concern reports that the new form of shutter is meeting with a favorable reception on the part of engineers and architects, and that the demand is already more than equal to the output of the factory. The present quarters of the plant are limited and it is the intention to erect at an early date a larger building especially designed to carry on the manufacture of the rolling steel shutter on an increased scale.

National Passenger Coupler and Platform Buffer

SHOWN herewith is the National Passenger Coupler and Platform Buffer. This device is designed especially for elevated railroad cars, and the drawings here shown conform to the standards of the South Side Rapid Transit Railway (elevated) of Chicago. In the plan view one car is shown on the tangent while the second car is shown on a curve of 80 feet radius, indicating the respective positions of the two couplers when the cars are in such relation to each other. This view also shows the respective positions of the platforms. The buffer springs are of sufficient strength and capacity to keep the platforms in constant contact. Instead of sliding against each other each platform is supplied with a roller which withstands the wear and reduces the amount of friction between the two. One roller placed on each end of each car, as indicated, will insure their always appearing in the proper position so that they will not interfere with each other. The opening between the platforms is three-eighths of an inch.

An interesting feature of this design is the device for returning the couplers to the central position when both cars have been uncoupled. This device consists of the yokes Y 5 and Y 6 which are held apart by a spring fifteen and one-half inches in length, as shown. The position of the coupler is between the two yokes, and as the coupler swings to one side or the other so is the spring compressed, the tension of the spring being sufficient to return the yoke and coupler to their original position when the car is uncoupled. In the position shown in the drawing the center line of the coupler at the point immediately over the center line of the yokes has swung but two and three-quarters inches from its original position. The guides of the yoke permit a movement of five inches each way.

In case it should be desired to couple two cars when one or the other is on a switch there is a rod applied by which it is posible to swing the coupler to the desired position. This rod is shown in both the plan, elevation and front views. It is readily seen that with two cars in the relation in which they would stand when one or the other is on a switch, or curve, the couplers would not couple automatically until one or the other was properly adjusted.

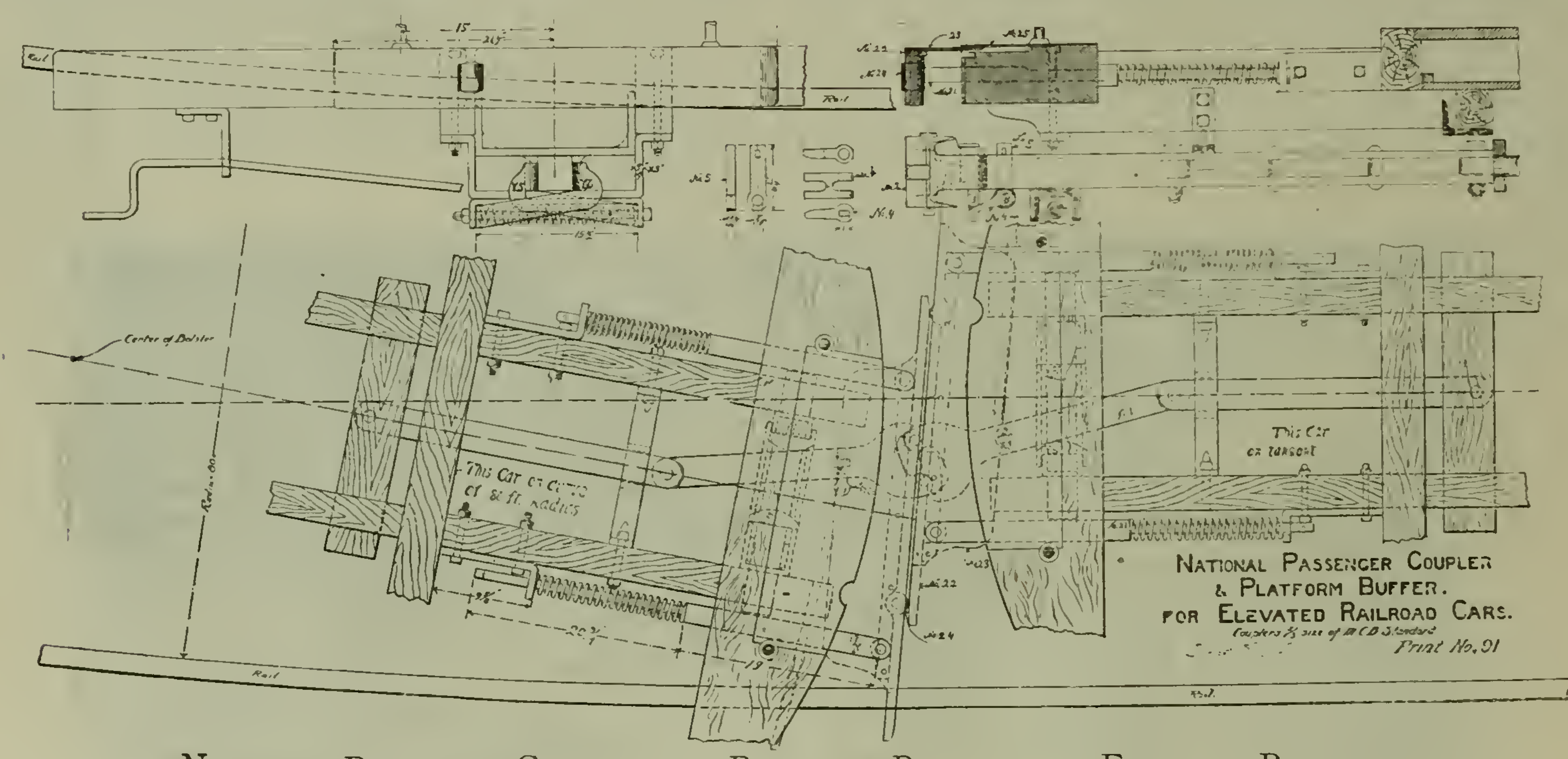
The couplers are two-thirds of the size of the M. C. B. standard.

This device is manufactured by the National Car Coupler Company, by whom it is designed. The offices of the company are in the Monadnock Building, Chicago; and at 150 Broadway, New York.

The Sterrett Pump

THE Sterrett pump shown in the accompanying illustration possesses several distinctive features of superiority. Not a drop of oil escapes outside of the pump. It can be used at any time, and under any conditions without soiling the hands or smearing the oil over everything in the neighborhood. The action is free, and the slightest movement brings it into action. So easy does it operate that a child can handle it to its full capacity. A full quart of oil is the result of a full stroke of the pump.

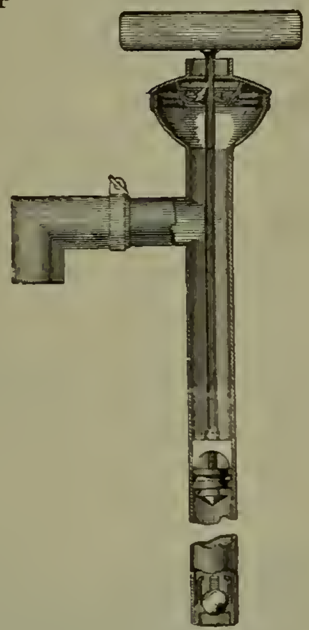
The pump is made of seamless brass tubing, all parts free from rust or breakage, and is constructed to last a lifetime. The general construction of the pump, and



National Passenger Coupler and Platform Buffer, for Elevated Railroads.

the addition of the extension spout with its ability to pump anything from water to molasses, makes it adaptable to a wide field of service.

"The pump is provided with valves of such construc-



Sterrett Oil Pump.

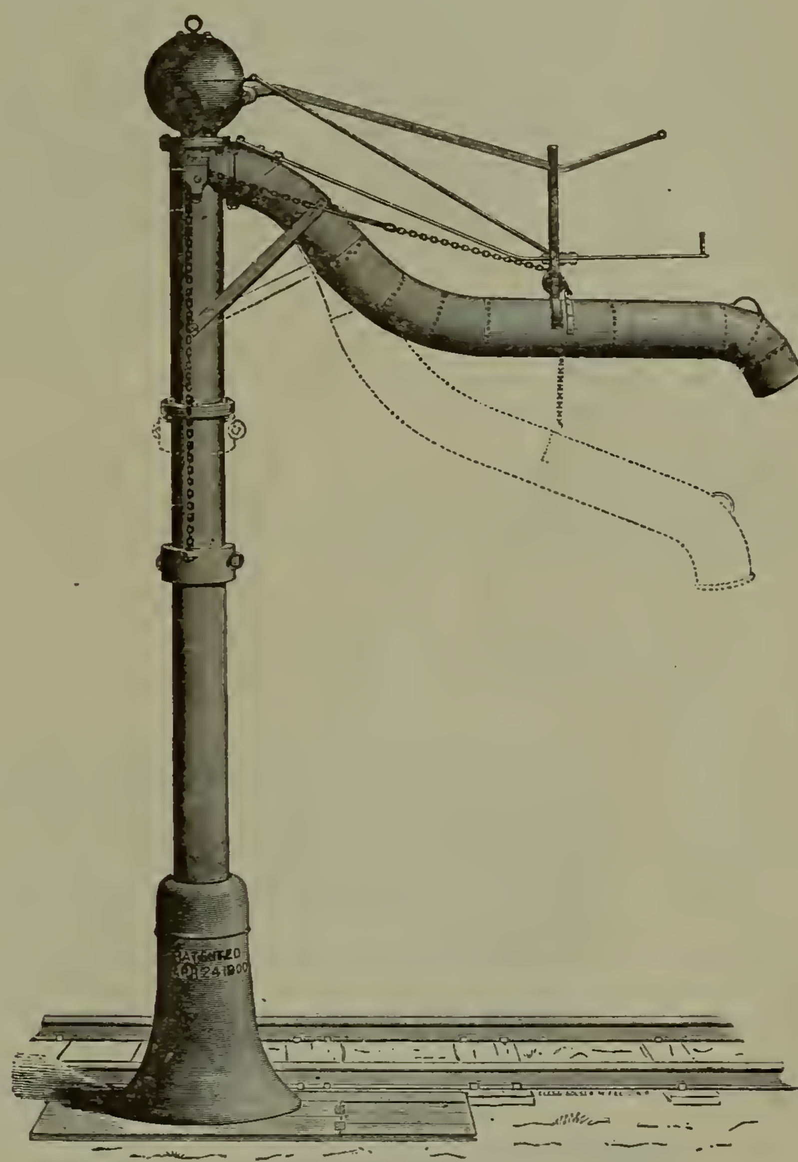
tion as to permit heavy oils to pass through them. In the bottom of the tube is a bail valve consisting of a seat screwed into the end of the tube and having an opening wherein is seated a ball. Vertical arms permit the ball to rise and fall without leaving the vicinity of the seat. The lower end of the valve stem consists of a plunger which has a cylindrical portion to snugly fit within the tube, an annular groove in the periphery of

this portion fills with oil and serves to make a tight-working joint, the vertical portion acting merely as a guide in keeping the valve in position. The stem carries at its end a tapered block, which rests within a seat of the same taper, being also tapered on the bottom so as to form less resistance to the oil as the valve descends. The top of the tube is flared to form a head, to which a cap is engaged by means of threads, and forms a guide for the stem. Within this cover and surrounding the stem is a chamber composed of an annular wall and fitted with a cap; and within this chamber is a metal washer and other suitable packing material. The pump is made entirely of brass."—American Electrician.

Water Columns

In order to maintain good locomotive service it is not only necessary that the machines themselves be kept up to date and in good repair, but the accessories which supply the locomotive throughout a run should be well designed and serviceable, to meet the demands required. Not unimportant among the equipment are the water columns at terminals and along the line. They should require but one man to operate them, should perform their duties surely, safely and quickly and when the spout has been released it should automatically swing clear of the track and be held in such position so securely that the force of the wind cannot cause it to obstruct the track.

The Poage Manufacturing Company have carefully observed the conditions required by up-to-date railway service with the result that they have produced several satisfactory water columns, one of which is illustrated herewith. This water column is made of the best material



Poage's Automatic Water Column.

throughout, the various parts being made of iron, steel and gun metal. Every part is given the closest attention in being prepared and in the final erection, the repairs required in the service being thereby reduced to a minimum, and the mechanism of the device requires but little attention. All parts are perfectly interchangeable and can be readily secured from the manufacturers. The flow of water through the mains is direct and as the capacity of chamber is increased the water passes through and encounters no retardation of its flow.

By reference to the illustration it will be seen that the spout is adjusted to both high and low tenders. By this arrangement it is possible to insert the end of the spout within the tank when taking water, thereby insuring the passage of all water into the tank rather than scattering it over the outside of the tank and the attendant. This adjustable device is made entirely of metal, there being no rubber to crack or break in cold weather or melt in hot weather, and there is nothing about it to wear out. There is an annular passage between the parts forming the telescopic joint, with no contact between them.

This column is operated by one man and it is unnecessary for the fireman to leave the tender in order to swing it into position and operate the mechanism controlling the flow of water. When released by the fireman, the spout automatically swings to a position parallel to the track and the controlling device is of such strength as to insure its retaining this position against the power of the wind. No springs are used in the operation of this apparatus, all automatic work being accomplished by the force of gravity. This is a more reliable arrangement, as springs cannot always be counted upon and are subject to rust and wear.

The spouts are made of heavy black sheet iron and are cold riveted. They are made complete with flange lever guide before being galvanized. This is done in order to provide against accumulation of rust about the rivet joints, which would be the case if made of galvanized sheets. A small vent pipe is provided below the elbow to provide against a vacuum in the spout when the pressure of water is shut off. The valve rod controlling the water supply is so fastened to the slotted casting upon which the weight ball rests as to make it absolutely sure and positive. This rod passes through a perfect stuffing box within the column and is enclosed in a pipe connected with a brass drain-box which prevents the formation of ice around the rod.

This column is known as Poage's "Style C" Automatic Water Column and is manufactured by the John N. Poage Manufacturing Co., Cincinnati, O.

Standard Accident Cabinet

IN consideration of the large number of accidents constantly occurring in establishments in which machinery is in operation, it is judicious to be well supplied with bandages and medicines to meet such emergencies. Employees often meet with accidents more or less severe and in such instances many serious cases could be avoided if proper dressing was at hand. Not only could temporary relief be given, but such a supply would also be of assistance when it is necessary for a physician's presence at a shop or factory. Realizing the necessity of such a supply, Putnam & Company, of New York city, have arranged a cabinet containing the material most apt

STANDARD ACCIDENT CABINET.

to be required. This cabinet is made of wood, 11 by 20 inches, and is neatly packed ready to be hung up. It is represented in the accompanying illustration. The articles contained therein are as follows: Six rolls linton bandages, 2 in.; 6 rolls linton bandages, 2½ in.; 3 rolls cotton bandages, 1½ in.; 3 rolls cotton bandages, 2 in.; 3 rolls cotton bandages, 2½ in.; 3 rolls cotton bandages, 3 in.; 2 packages first aid for wounds; 2 packages linton gauze; 2 packages absorbent lint; 2 packages absorbent cotton, ¼ lb.; 1 12-oz. bottle carron oil; 1 12-oz. bottle arnica; 1 roll adhesive plaster; 1 pair scissors; 1 package iodoform gauze.

The Johnson Wrecking or Replacing Frog

TOTAL immunity from derailment is hardly possible, yet it is very essential that derailed cars and locomotives should be replaced with minimum loss of time and the expenditure of as little effort as possible. A replacing frog which will rerail rolling equipment in a short space of time and which requires no preparation of the ground in the immediate vicinity of the rail should commend itself to those associated in any way with the appropriation of devices to meet emergencies.

The Johnson wrecking or replacing frog, manufactured by the Johnson Wrecking Frog Company, Cleveland, Ohio, will fit any section of "T" rail now in service and requires no removal of ice, cinders, plank or stone at crossings nor levelling of roadbed on either side of rail to support it firmly. It adapts itself to the wheel under all conditions and grips into any material that will support the wheels.

These frogs never upset nor turn the rail, and do not spread or throw the track out of line. They will replace any number of wheels at one setting and without stopping, even if both trucks are on opposite sides of the rails. They work just as well on curves as elsewhere, and may be used anywhere that a car, engine or motor becomes derailed. They are the only Replacers that will in many cases slip under the frame work of a truck, when derailed, without danger of being struck by the brake-shoe or frame and moved out of place. They depend entirely on the rail for support and will not break the rail or break the tie down from the rail.

They never endanger the lives or limbs of trainmen or workmen by slipping, breaking or flying out from under the wheels at a critical moment, nor do they require holding, bracing, or steadying, nor bolts, clamps, screws, spikes or wedges to fasten them in position while in operation. They can be placed in position quicker than any other wrecking frog made, insuring, at all times electric connection for derailed motors. They work the same in either direction; never injure the most delicate bearings of an engine or motor, as there is no drop, jar or twisting while replacing, as they raise, align and then lower the wheel by gradual descent to the rail.

It is the only two-winged Replacer, patented, to be entirely supported by the rail at its front end, on any section of rail or any condition of track, thus causing the wheels to roll gently to the face of the rail in all cases while replacing.

To use it, only requires dropping the Frog straddle of the rail at the point desired—see that the broad end is firmly supported by the tie, ice, cinders, plank, stone or whatever will hold up the wheel—then bring the derailed wheels up to the device and it will replace them as long as the tie or bearing remains strong enough to hold the Replacer. Four large cars have been replaced in 45 seconds and two loaded and four unloaded cars in 58 seconds by the watch.

Wheels yet on the rail, can be run over the Frog without fear of derailment; this is often necessary where there is only one pair of wheels off the rails and the truck is too low to slip the Frogs under. In such cases place the device ahead of the wheels yet on the rail and proceed.

The Link Metallic Car Roof

ONE of the most important elements in the construction of a freight car is the roof. Economy, effectiveness, durability, flexibility and simplicity are required, and experience has shown that a combination of these items is secured in the Link Metallic Car Roof. This claim is not unsupported. The Link Roof is in service; has seen wear and has the endorsement of master car builders in all parts of the United States, Canada and Mexico.

The accompanying illustrations represent the roofing. Fig. 1 shows a car partially covered with the inside roofing and Fig. 2 illustrates a car partially covered with the outside roofing.

Referring to Fig. 1 it will be seen that this inside roofing is proof against leakage, there being no nails driven through the metal and the application of the sheets is such that if water leaks through the outer roof of wood it will immediately run off. The metal sheets have laterally extended ears at the upper end and parting strips of wood fitting between sheets to hold same in position. The roof being practically one piece when completed, it is proof against the bad effects of straining and twisting of the car incident to operation around curves and over uneven tracks, at the same time affording sufficient flexibility. The cap is formed to slide over the ears of the metal lower sheets, completing a close-fitting yet perfectly flexible joint.

Fig. 1—Link Metallic Car Roof.

The outside metallic roof, Fig. 2, is gaining favor, a car thus covered having a more compact appearance by reason of the reduced width of the roof. The use of a cheaper and undressed lumber is also afforded. The link outside roof constitutes a complete metallic covering, the running-board being the only part of the outside top requiring the use of wood. It is an absolutely water-tight, yet perfectly flexible roof. The iron is galvanized, 26 gauge, and the roof complete weighs about 320 pounds.

The use of the wood strips is dispensed with, the sheets being brought closely together, held in position by cleats lapped over the fold and further secured by the cap or binding strip which is pressed together at the sides. The standing seam thus formed is absolutely impervious to rain, cannot become loosened in heavy service, and retains the necessary flexibility. A shoe is supplied, securing the cap to a permanent position. A running-board saddle covers the ridge at each lap, having two saw cuts to permit the introduction of a strip of metal on each side of the ridge, the strip folding under the cap, thence through the saw-cut, lapping over and nailed to the saddle, the whole forming a base for the running-board.

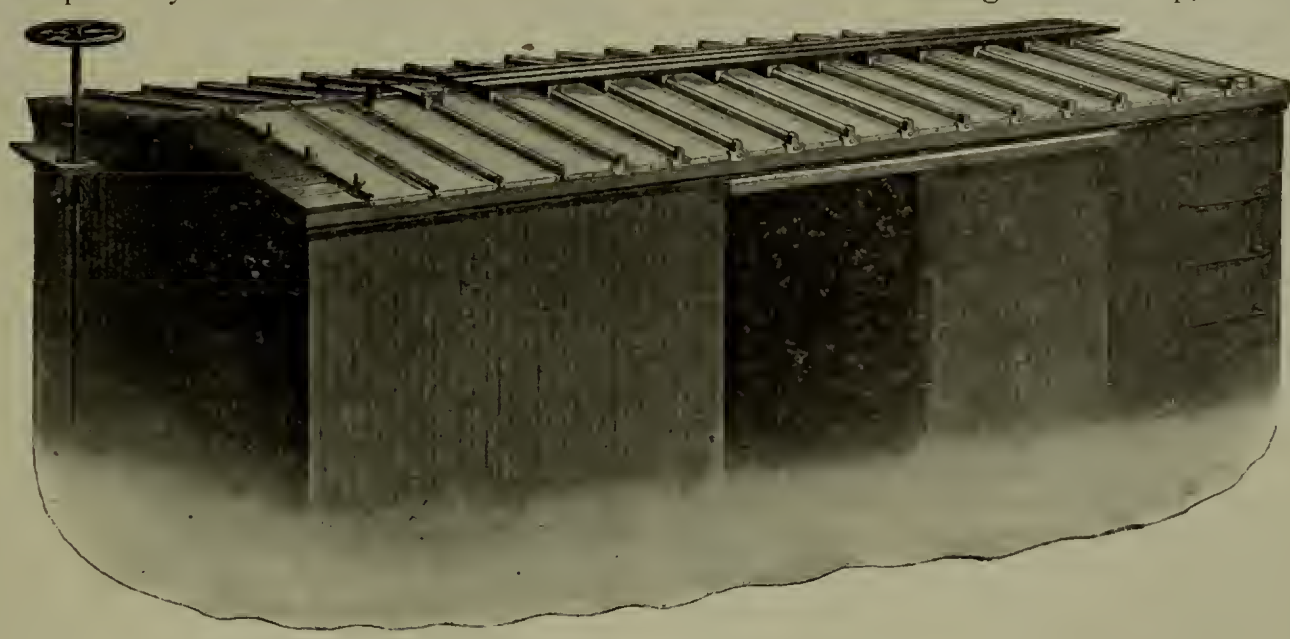


Fig. 2—Link Metallic Car Roof.

The link roof is simplicity itself in construction and may be put on in any railroad shop without special instruction except that given by blue prints which will be furnished. It is made in convenient sections and is easy to handle. Manufactured by the Inland Equipment Co., Bank of Commerce Building, St. Louis, Mo.

The St. Louis Car Company

THE manufacturing plant of the St. Louis Car Company is located at 8000 No. Broadway, in the City of St. Louis, Mo., and its extensive works cover 31 acres of ground, over 20 acres of which are under roof. T his immense factory is devoted exclusively to the manufacture of passenger cars and trucks for electric and steam service, including high-speed interurban coaches, elevated railway coaches and cars for city service.

The company enjoys the distinction of having the largest works in the world for manufacture of cars for electric service, and are sending cars to almost all parts of the globe. It has a branch establishment in Germany, in which country it has an immense business established. The St. Louis Car Company stands supreme in the art of car business. It has placed more original ideas and developments in the field than can be told in this article. The latest and up-to-date idea is that of the semi-convertible cars—constructed with solid steel sills. This type of car has become very popular throughout this country, both for city and interurban service.

Quite a number of patented specialties are also made at their factory, such as "walk-over" seats, ratchet brake wheels, fare boxes, journal bearings, automatic couplers, etc., etc.

Its lumber yard is extensive—over half million dollars' of lumber being constantly in stock. Their mahogany is imported from Africa in the log and is sawed after reaching their works.

From fifteen hundred to two thousand employees are required and the factory is at work both day and night.

A cordial invitation is extended to all for inspection of its magnificent plant, which will be one of the interesting features while visiting the St. Louis World's Fair in 1904. St. Louis has always been foremost in the manufacture of electric railway rolling stock.

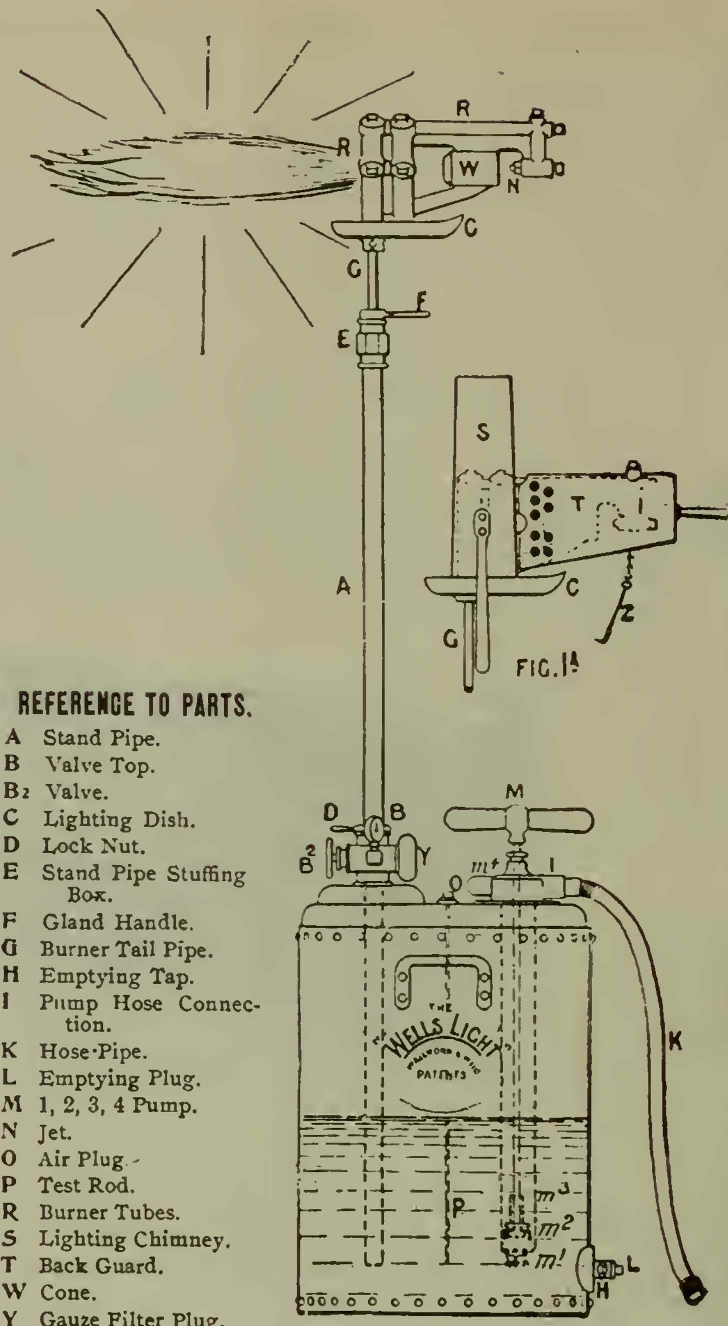


FIG. 1A

FIG. 1

REFERENCE TO PARTS.

A Stand Pipe.
B Valve Top.
B2 Valve.
C Lighting Dish.
D Lock Nut.
E Stand Pipe Stuffing Box.
F Gland Handle.
G Burner Tail Pipe.
H Emptying Tap.
I Pump Hose Connection.
K Hose-Pipe.
L Emptying Plug.
M 1, 2, 3, 4 Pump.
N Jet.
O Air Plug.
P Test Rod.
R Burner Tubes.
S Lighting Chimney.
T Back Guard.
W Cone.
Y Gauze Filter Plug.
Z. Pricker.

The Wells Light

THE light is produced by passing kerosene oil through a heated burner, where it is generated into gas; the gas burning in a large, powerful flame which needs no protection, and will stand any weather.

The oil is forced into the tank by the pump "M," through the hose pipe "K," until it is two-thirds full, compressing the air already in the tank to about 25 lbs. pressure.

The burner is heated by burning a little oil in the dish "C," the heat being concentrated around the burner tubes by the chimney "S," Fig. 1A. In about seven or eight minutes the burner will be sufficiently heated; the valve "B2" is then opened a little and the oil from the tank is forced by the air pressure into the heated burner, where it is converted into gas, which issues from the jet "N," mixing with sufficient air in the cone "W," where it may be ignited; the chimney is then removed, and the flame passing through the rings of the burner, maintains the heat and gives a clear, white light, free from smoke or spray, the burner generating the gas continuously from the ascending oil. A few strokes of the pump every few hours is all that is required to renew the pressure—and oil or air can be pumped into the tank while the light is burning. The tanks are made of best steel plate, and are very strong.

Since its adoption for tire expanding it has met with unbounded success, having already been adopted by a large number of railroads. This system of expansion allows tires to be removed or set while the wheels are under the locomotive, with from 10 to 15 minutes' heating.

For other heating purposes the "Wells Light" meets requirements almost, if not quite, as important as tire expanding. Bent locomotive frames can, in a few minutes, be heated by the direct application of the flame sufficiently hot to straighten without burning the paint off or heating adjacent parts, and the time required for such heating is less than the time required to build up an arch on a forge, as is done in many shops at the present time. For boiler-shop work in laying up laps and corners around water legs and openings, in boiler repairs for heating sagged crown sheets, shaping patches on fire boxes, the "Wells Light" supplies a long-felt want, as it is practically a large blow-pipe, and will heat a considerable section of the plate red-hot in from 10 to 15 minutes. As a combination shop-tool, for lighting shops, turn-tables, yards, tire expanding, heating bent frames and boiler making and repairing, it is one of the most useful additions that can be made to a shop equipment. The lights when not in use for tire expanding can be used as lights for wrecking purposes, etc., etc.

The Boston Artificial Leather Co.

THE Boston Artificial Leather Co. as it stands today, occupies a position that its originators hardly dared hope for and represents an industry that is little dreamed of by the great majority of its customers. This is true as regards both the enormous volume of business transacted, as well as the complicated chemical and mechanical processes involved. Those who buy a few hundred yards of goods, obtaining an article distinctive in quality and price, cannot understand the care and skill expended in every step of the operation, the exhaustive tests of raw materials, the expensive machinery required, the facilities needed for turning out thousands of yards of goods in a day, and every day, all of eually good quality.

After two years of experimental work on both a small and large scale, the enterprise was incorporated in 1890 and began business in a practical way. At about the same time, successful efforts were made to produce rubber coated goods in colors, as well as black, and these goods attracted considerable attention. Instead of following the intended lines, the demand for goods for upholstering purposes rapidly increased, and it was only a short time before the makers of colored rubber goods were forced to give up their manufacture, as Moroccoline was found infinitely superior and only slightly more expensive.

It is noteworthy that after twelve years' experience, the original compounds and formulas of the company have never been changed, and in principle the goods are made today as in 1890. Through these years they have maintained a research department and every conceivable improvement has been tried. Every raw material and finished article is tested carefully, the source and chemical properties of raw materials, colors and proportions used, viscosity of compound employed, manner of coating and rapidity, temperature of curing, method of producing the leather grain—these and many other points of like character have been studied and must be understood or there is involved crocking of color, blistering, pin holes, growing harsh with age, fading out of the grain, etc. Today their backing is made on looms built for the purpose, even the mixing, coating and embossing machinery is made to meet their requirements, a condition possible only with a business of large proportions.

The uses of their goods are varied, and the qualities required must of necessity be understood and reproduced. From battlefield to ball room is literally true of their products. Hospital sheetings, goods for book bindings, shoe linings, hat sweats, suit-case and trunk covers, plain and tufted upholstery work, railroad car sheets and curtains, carriage tops, hand decorated and tooled leathers, antique and modern—these are the lines they make in quantity. No small measure of their success is due to the support received from the railroads. Their goods are now used by sixty-two roads in America.

Moroccoline is not a substitute for anything, but an individual product, meeting certain requirements—being used when it is the best thing to use, waterproof, unacted on by air, capable of taking leather grains or fancy designs, comparable to leather in quality, preferable for some purposes. It has not crowded out leather and never will; in fact, it is now used for purposes mentioned in much larger quantities than leather. Its use is extending rapidly as it is becoming known and appreciated.

Zinc White

THE consumption of zinc white in America has risen during the past decade from about 25,000 tons to over 50,000 tons annually. This increase far exceeds the proportional increase in domestic paint consumption, and therefore can mean only that increasing proportions of zinc white are being used in the construction of paints.

Another fact in this connection has become more and more insistent during the past few years. It is that whereas manufacturers of paints who used zinc white in the construction of their paints, formerly did so furtively, as if it were an adulterant, at the present time there is a lively competition among them in advertising the advantages obtained by its liberal use. Readers of paint advertisements and paint literature must have been struck by this significant change of front.

The reason for the change is not far to seek. Painters had for centuries been schooled to look upon straight lead in oil as the unvarying requisite for the best results, and the manufacturers, without attempting the colossal task of combating this settled predilection, either boldly appropriated the "lead and oil" label, or maintained a discreet reticence upon the subject. But experiment and investigation at home, the activity of the sanitary and other authorities abroad and the better organization of zinc producing facilities have gradually demonstrated the unique and peculiar qualities of the pigment, so that where it was regarded askance only a short time since it is now demanded as essential to advanced practice in exterior and interior painting.

The reason for the earlier repugnance on the part of painters to the use of zinc white was due partly to prejudice and partly to the ignorance inseparable from the advent of an innovation. It was not realized first that moisture would seriously militate against success with it, and that its very virtues would become defects unless utilized intelligently. Consequently when this new pigment was applied over old paint already loose, the firm grip of the fresh coat would detach it, and cause peeling. "Cracking" and "peeling" thus established themselves in the minds of unreasoning painters as defects inherent in zinc; and the familiar demonstration of the fact that any paint would exhibit the same defects under similar conditions failed to affect the conclusion reached. The self-evident fact, however, that for absolute whiteness and consequently for pure tints, zinc was the only pigment available, necessitated its retention. Continued use in this limited sphere, as well as the later revelation that paint manufacturers had been using it liberally in their products all the time, gradually familiarized the trade with its qualities, until the result outlined above has been attained.

Heretofore it has been used as a base most extensively in combination with lead and other pigments, except for interior enamel effects, but results recently achieved by grinding it in specially designed and prepared linseed oil would seem to indicate that the difficulty of giving it "body" or opacity has been entirely overcome, and that in the near future it will be available for all purposes without admixture, with body and working qualities indistinguishable from the same qualities in lead, and with greater elasticity and lustre.

Rust

STEEL bridges have many friends and only one enemy, and that is Rust. The life of steel bridges depends upon how long they can be kept free from rust. The reputation of steel bridges depends upon rust. The safety of railroad trains, that cross steel bridges, depends upon rust. The lives and limbs of our families depend upon rust. Your life and limbs depend upon rust. Lastly, millions of dollars may be lost by the rusting of steel.

In a large building in New York one steel girder became so much corroded by rust that the safety of the building made it necessary to take the rusty girder out and replace it with a sound one. To do this cost thirty thousand dollars. This entire expense might easily have been prevented if the steel used in building this structure had been thoroughly cleaned from mill scale, dirt, grease and rust and then painted with three coats of Prince's "Double Label" Mineral Brown mixed with pure linseed oil, before being used on this building. It would have been a merely nominal cost and it would not have been necessary to have changed a rusty, rotten girder for a sound one. This paint, with linseed oil, makes the best preservative and protecting coating for steel known to date.

In 1898 D. P. LeFevre, the County Civil Engineer, examined forty-five steel bridges over George's Creek, Maryland. Eleven of these had been painted with the above mentioned paint and linseed oil (one coat only) in 1893. The remaining thirty-four bridges had been painted with other paints, a variety of kinds, some of them having been painted only nine months before examination was made. The eleven were the only ones which were absolutely free from rust. So it seems that there is an article known, and well known by many people that, if steel is cleaned as it should be, then painted with this paint and this painting repeated once in five years, will prolong the life of steed indefinitely.

This is no new thing. It has been used all over the country for forty-five years. No one who gives it a trial, using good, pure linseed oil, has been disappointed. It covers well, adheres well, does not chalk, crawl, run, scale or peel, expands and contracts with the metal, is not injured by rain, snow, fog, smoke, cinders, dust, heat or cold. What more would you have?

Old Paint Man.

Infringement of Patents

THE suit of Cass L. Kennicott against the Industrial Water Company of New York is pending in the United States Circuit Court for infringing the patents of the former covering the automatic soda regulating device. This suit will be vigorously prosecuted. The Kennicott Water Softener Company, represented by Cass L. Kennicott, grant no licenses for the employment of their device in other than their own apparatus. Therefore any other use of the devices covered by their patents is an infringement of the same.

Personal

Mr. Max Toltz has resigned as mechanical engineer of the Great Northern.

Mr. Charles Ellis, general foreman of the Missouri, Kansas & Texas shops at Denison, Tex., has resigned.

Mr. A. Shields has been appointed master mechanic of the Canadian Northern, with office at Winnipeg, Man., vice Mr. C. Raitt.

Mr. E. T. Warman has been appointed general foreman of the shops of the Union Pacific at Grand Island, Neb.

Mr. C. S. Murray has been appointed road foreman of equipment of the St. Louis & San Francisco Railroad, with headquarters at Springfield, Mo.

Mr. M. A. Malloy has been appointed master mechanic of the Pennsylvania Railroad at Pittsburg, Pa., to succeed Mr. W. Lininger, transferred.

Mr. D. D. Kessler has been appointed road foreman of engines, of the Pittsburg & Lake Erie, with office at McKee's Rocks, Pa.

Mr. W. H. Collins, heretofore acting master mechanic of the Fonda, Johnstown & Gloversville, has been appointed master mechanic, with office at Gloversville, N. Y.

Mr. A. C, Hinckley, formerly master mechanic of the St. Joseph & Grand Island, has been appointed master mechanic of the Denver & Rio Grande.

Mr. J. C. Homer has been apopinted master mechanic of the Toledo & Ohio Central, with office at Kenton, O., to succeed Mr. C. J. Cooper, resigned.

Mr. S. M. Dolan, master mechanic of the Wiggins Ferry Company at St. Louis, Mo., has resigned and has been appointed general local inspector of the Southern Railway at Washington, D. C.

The headquarters of Mr. G. R. Joughins, mechanical superintendent of the Coast Lines of the Santa Fe have been removed from San Bernardino, Cal., to Los Angeles, Cal.

Mr. Robert Patterson has been appointed master mechanic of the Rio Grande Southern, with office at Ridgway, Colo., to succeed Mr. John Schlacks, resigned.

Mr. E. O. Smith has been appointed master mechanic of the St. Louis & Hannibal, with office at Hannibal, Mo., to succeed Mr. M. W. Phillips, resigned.

Mr. W. J. Hayward, in addition to being superintendent of the Chesapeake Beach Railway, is also master mechanic of that road. His headquarters are at Washington, D. C.

Mr. W. C. Carter has succeded Charles Hern as general foreman of the Baltimore & Ohio shops at Glenwood, Pa., Mr. Hern having been transferred to Grafton, W. Va.

Mr. Charles W. Lee has been appointed master mechanic of the Southern Railway at Lawrenceville, Va., to succeed Mr. J. J. Bayly, who has been appointed master mechanic at Sheffield, Ala., in place of Mr. M. W. Elliott, resigned.

Mr. Grant Hall, master mechanic of the Pacific division of the Canadian Pacific, has been appointed assistant superintendent of rolling stock of the lines east of Fort William.

Mr. E. B. Thompson, heretofore mechanical engineer of the Chicago & Northwestern, with headquarters at Chicago, has been appointed division master mechanic at Mason City, Ia., to succeed Mr. E. W. Pratt.

Mr. H. A. Fergusson, assistant superintendent of motive power of the Chicago Great Western, has resigned, to accept a position in the sales department of Joseph T. Ryerson & Son, Chicago.

Mr. S. D. Morgan, formerly road foreman of engines on the Sandusky division of the Northwest system of the Pennsylvania lines, has been appointed to a similar position on the Cleveland & Pittsburg, with office at Wellston, O.

Mr. H. J. Underhill, road foreman of engines of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed trainmaster of the Peoria & Eastern division of that road, with headquarters at Indianapolis, Ind.

Mr. A. W. McElvaney has been appointed master mechanic of the Missouri, Kansas & Texas at Greenville, Tex., in place of Mr. M. McComas, who has been transferred to Denison, Tex., as foreman of shops.

Mr. James S. Pearce, heretofore master mechanic of the Norfolk & Western at Roanoke, Va., has been transferred to Portsmouth, O., as master mechanic of the Scioto and Cincinnati divisions.

Mr. William Augustus, heretofore superintendent of machinery of the Keokuk & Western, has been appointed master mechanic of the Chicago, Burlington & Kansas City, with office at Centerville, Ia.

Mr. John Andrews, who for some time has been general foreman of the car department of the Santa Fe at San Bernardino, Cal., has resigned that position and has been appointed master car builder of the Mexican Central Railroad.

Mr. H. T. Herr has been appointed master mechanic of the eastern grand divison of the Norfolk & Western Railroad, with office at Roanoke, Va. Mr. Herr recently resigned as master mechanic of the Atchison, Topeka & Santa Fe at Fort Madison, Ia.

Mr. A. C. Deverell, heretofore superintendent of shops of the Great Northern at Havre, Mont., has been ap- assistant superintendent of motive power of that road, wtih office at St. Paul, Minn.

Mr. Henry Yoerg, heretofore superintendent of shops of the Great Northern at Havre, Mont., has been appointed superintendent of shops at St. Paul, Minn., to succeed Mr. A. C. Deverell, promoted.

Mr. B. A. Orland, formerly master mechanic of the Mobile & Ohio at Whistler, Ala., has been appointed general foreman of the St. Louis division to succeed Mr. Robert Bencini, transferred to Murphysboro, Ill., as general foreman of machine shops.

Mr. J. J. Bayley has been appointed master mechanic of the Southern Railway at Sheffield, Ala., to succeed Mr. M. W. Elliott, who has resigned on account of ill health. Mr. Bayley has heretofore been master mechanic of this road at Lawrenceville, Va.

Mr. J. G. Neuffer, heretofore general master mechanic of the Baltimore & Ohio Southwestern, has been appointed superintendent of motive power of that company, and the former title held by him has been abolished. Mr. Neuffer's headquarters are at Cincinnati, O.

Mr. W. M. Baxter has been appointed mechanical superintendent of the Tennessee Central, with office at Nashville, Tenn. Mr. Baxter is a son of Jerre Baxter, president of the company, and succeeds Mr. R. J. Farrell, master mechanic, who has resigned. The office of master mechanic has been abolished.

Mr. William F. Yergens, heretofore general foreman of the Fort Wayne shops of the Wabash, has been appointed master mechanic of the Chicago & Erie division of the Erie R. R., with office at Huntington, Ind., to succeed Mr. J. A. McLaren.

Mr. J. T. Wallis, heretofore assistant engineer of motive power of the Pennsylvania at Altoona, Pa., has been appointed master mechanic of the Northern Central at Baltimore, Md., to succeed Mr. James Milliken, who was recently promoted to be superintendent of motive power of the Philadelphia, Baltimore & Washington.

Mr. Robert Palmer has been appointed road foreman of engines of the Northwest system of the Pennsylvania Lines, with office at Toledo, O., to succeed Mr. C. Wing. Mr. J. G. Williams has been appointed assistant road foreman of engines, with office at Columbus, O.

Mr. A. J. Dunn, heretofore master mechanic of the Atlanta, Knoxville & Northern, has been appointed master mechanic of the Virginia & Southwestern, to succeed Mr. John B. Camden, with office at Bristol, Tenn.-Va.

Mr. W. H. Bartlett, master mechanic of the lines of the St. Louis, Keokuk & Northern north of Hannibal, Mo., has resigned, and is succeeded by Mr. I. N. Wilbur, master mechanic of the lines south of Hannibal, with office at Hannibal, Mo.

Mr. L. C. Engler has been appointed general road foreman of engines of the Hocking Valley, and will also have jurisdiction over the Toledo & Ohio Central and the Kanawha & Michigan, with office at Columbus, O. Mr. J. H. Haynes and Mr. H. H. Hill have been appointed assistant road foremen of engines under Mr. Engler.

Mr. T. M. Feeley, master mechanic of the Southern Ry. at Birmingham, Ala., has resigned, and Mr. George B. Siddell, heretofore general foreman at Alexandria, Va., has been appointed master mechanic at Birmingham, Ala., to succeed Mr. Feeley. Mr. Feeley has been in the service of the Southern for ten years.

Mr. G. A. Miller, heretofore master mechanic of the Florida East Coast R. R., has been appointed superintendent of motive power of that company, with office at St. Augustine, Fla. Mr. C. D. Vanaman has been appointed master mechanic in place of Mr. Miller, and will also have his headquarters at St. Augustine.

Mr. W. J. Bennett, heretofore general foreman machine shop of the Chicago, Indianapolis & Louisville, has been appointed assistant superintendent of motive power, with headquarters at Lafayette, Ind. The office of assistant master mechanic has been abolished, but Mr. C. Coller will retain his position as master car builder.

Mr. J. F. Enright, master mechanic of the Atlantic Coast Line at Montgomery, Ala., has been appointed master mechanic of the Mobile division of the Mobile & Ohio at Whistler, Ala., to succeed Mr. B. A. Whistler, who has been made general foreman of the St. Louis division, in place of Mr. Robert Bencini, transferred to Murphysboro, Ill., as foreman of machine shops.

Mr. S. J. Anderson has been appointed master mechanic of the Atlanta, Knoxville & Northern, with office at Blue Ridge, Ga., to succeed Mr. A. J. Dunn, who has taken service with the Virginia & Southwestern. Mr. Anderson has heretofore been foreman of the shops of the Atlanta, Knoxville & Northern at Blue Ridge, Ga.

Mr. W. Perrine, master mechanic of the Delaware division of the Erie, has been transferred to Jersey City, N. J., as assistant master mechanic of the New York division. Mr. Thomas O'Day has been appointed general foreman at Port Jervis, N. Y., and will assume the duties heretofore performed by Mr. Perrine.

Mr. William Kelly, heretofore master mechanic of the Cascade division of the Great Northern, has been appointed general master mechanic of the western division, with office at Spokane, Wash., to succeed Mr. George H. Emerson, promoted to be superintendent of motive power. Mr. Kelly is succeeded as master mechanic at Everett, Wash., by Mr. T. J. Clark, heretofore traveling engineer.

Mr. W. J. Bennett, heretofore general foreman of the machine shop of the Chicago, Indianapolis & Louisville, has been appointed assistant superintendent of motive power of that company, with headquarters at Lafayette, Ind. The office of assistant master mechanic, which has been held by Mr. Charles Coller in connection with the title of master car builder, has been abolished, Mr. Coller retaining the latter title.

Mr. A. F. Hockenbeamer has been appointed assistant to the general superintendent of motive power of the Baltimore & Ohio, having supervision, under the direction of the general superintendent of motive power, of the accounts of the motive power department. Mr. S. B. Mason has been appointed chief clerk to the general superintendent of motive power. The offices of both the above are at Baltimore, Md.

Following the retirement of Mr. L. T. Canfield, master car builder of the Delaware, Lackawanna & Western, the car and locomotive departments have been consolidated and placed in charge of Mr. T. S. Lloyd, who will have the title of superintendent of motive power and equipment, with office at Scranton, Pa. Mr. R. F. McKenna has been appointed superintendent of the car shops, with office at Scranton, Pa.

Mr. M. K. Barnum, who was recently appointed assistant mechanical superintendent of the Southern Railway, has been appointed superintendent of motive power and equipment of the Chicago, Rock Island & Pacific, with headquarters at Chicago, to succeed Mr. George

F. Wilson, resigned. Mr. Barnum, previous to his appointment on the Southern Railway, was master mechanic of the Union Pacific at Omaha, Neb.

Mr. H. J. Helps, general foreman of the Plattsmouth shops of the Burlington & Missouri River, has been appointed master mechanic at that point, to succeed Mr. D. Hawksworth, who has been acting as master mechanic since his resignation as superintendent of motive power a year ago. Mr. Hawksworth now retires from the service on account of his advanced age. Mr. R. T. Smith has resigned as master mechanic at Lincoln, Neb.

Mr. James McNaughton, general superintendent of the Brooks Works of the American Locomotive Co., at Dunkirk, has been appointed general superintendent of the American Locomotive Co.'s plant at Schenectady, N. Y. He will continue as head of the Dunkirk works, with headquarters in Schenectady. Mr. McNaughton was for several years master mechanic of the Northern Pacific R. R., and more recently superintendent of motive power of the Wisconsin Central.

Mr. W. H. Bartlett has been appointed assistant master mechanic of the Chicago, Burlington & Quincy, with office at West Burlington, Ia. He will have full supervision over the engine men running on the east Iowa division and of the Burlington roundhouse. This appointment is in the nature of an advancement, Mr. Bartlett's former position being that of master mechanic of the Chicago, Burlington & Kansas City Ry. and the north end of the St. Louis, Keokuk & Missouri line from Hannibal to Burlington. Hereafter the business of the motive department of those roads will be transacted in the office of Master Mechanic I. N. Wilbur in Hannibal.

Mr. Eliot Sumner, whose appointment as assistant superintendent of motive power of the Buffalo & Allegheny Valley division of the Pennsylvania has been announced, was born at New Haven, Conn., on October 18, 1873. He is a graduate of Yale, and entered railway service in 1896 as special apprentice at the Altoona shops of the Pennsylvania Railroad. In February, 1901, he was appointed inspector of the West Philadelphia shops, and in October of the same year was made assistant master mechanic at the Renovo shops, which position he held until his recent appointment.

The announcement is made in English papers that Mr. F. W. Webb, for thirty-one years chief mechanical engineer of the London & Northwestern, and for fifty-two years connected with that road, has tendered his resignation. As a student under Francis Trevithick, son of Robert Trevithick, the pioneer locomotive builder, Mr. Webb's experience may be said to bring up to date the entire development of the steam locomotive in England. During his service at Crewe the road has built over 4000 locomotives. It is said that Mr. Webb's resignation was made because he did not wish to take up the new problems involving the probable adoption of electric traction, but preferred to retire on his well-earned laurels, and leave these problems to younger men. He is probably best known in the United States in connection with the Webb system of compounding locomotives.

Mr. John R. Gould has been appointed master mechanic of the Clifton division of the Chesapeake & Ohio Railway.

The following promotions have been made at the Southern shops, Atlanta, Ga.: Mr. W. H. Dunlop has been appointed general foreman, vice O. H. Attridge resigned. Mr. George P. Pitchford has been appointed engine house foreman at North Avenue. Mr. Wm. Davidson, Mansford, to South Engine House, vice W. H. Dunlop promoted.

Notes of the Month

It has been announced that the Pennsylvania R. R. was so well satisfied with experiments heretofore undertaken with nickel steel rails that it had been decided to lay all of the sharp curves between Altoona and Pittsburg with rails of this quality, and that for this purpose 5,000 tons of nickel steel rails had been ordered. In answer to an inquiry for a verification of this report the railway officials inform us that the company will continue experiments with nickel steel rails, but at present they do not feel in position to express themselves regarding the merits of the same.

The railroad which has been under construction by the Cuban Company, extending from San Luis, in the province of Santiago de Cuba, to Santa Clara, in the province of Santa Clara, thus establishing direct railroad communication—by connection with other lines—between Santiago and Havana, has been completed and opened to the public. Trains carrying mail and passengers leave Santiago for Havana every Monday, Wednesday and Friday. and arrive in the same city from Havana every Tuesday, Thursday and Saturday. The passenger rate is: first class, $24; second class, $12.

On Jan. 16 there were loaded at the mines for forwarding over the Lehigh Valley R. R., 1,522 cars of anthracite coal, containing a total of 40,500 tons, an average of 26½ tons to the car. On the same day the Lehigh Valley unloaded from cars into barges at Perth Amboy 530 cars of anthracite coal, and in addition sent 55 cars by float to Brooklyn. To handle its large tonnage of anthracite coal the Lehigh Valley is continuing to draw largely on its supply of box cars, regardless of the demands for these cars in the merchandise traffic, and this policy, it is declared by officials of the road, will be continued, so that every ton of coal that the mines can produce will be promptly distributed to meet the pressing demands for fuel.

The association of motive power department officials of the Vanderbilt lines has agreed upon standard dimensions for the height of passenger car platforms. The new rules provide that it shall be 50 ins. from the top of the rail to the top of the platform on coaches and 51 ins. from the top of the rail to the top of platform on baggage cars. This difference in height on baggage cars is provided to compensate for the greater possible variation in the load that may be carried. The distance of 16 ins. has been maintained from the center of the coupler shank to the top of the platform in both classes of cars and the distance from the top of the rail to the center of the coupler shank is respectively for the coach and baggage car 34 and 35 ins. These are the maximum figures allowed; the minimum has not as yet been decided upon. The association has recommended the removal of air brake hose on all equipment after a service of three years, to reduce the possibility of interruption from this source. This applies to all lines in the association and the responsibility for this change is equally divided among the companies interested, inasmuch as under the rules adopted any hose may be removed from any car owned by any of the lines by either of the several companies interested and a bill rendered for the new hose against the individual company owning the car which is chargeable to an account for renewals of air brake hose for this specified reason. The members of this organization represent a mileage of 10,079 and roads which own and control 3,625 locomotives, 3,602 passenger cars and 148,105 miscellaneous cars.

Mr. B. M. Tate, assistant to the president, Magnus Metal Company, Buffalo, N. Y., was elected assistant secretary of the Central Railway Club at its annual meeting on January 9th. Mr. Tate's address is No. 830 Ellicott square, Buffalo, N. Y.

George J. Buckeye who has been the Chicago representative of the J. Thompson & Sons Manufacturing Company, has resigned his position to become assistant manager of the W. B. Rose Supply Company of St. Louis. Mr. Buckeye will assume the duties of his new position next Monday.

The Wheel Truing Brake Shoe Company of Detroit, Mich., manufacture a brake shoe for dressing tires while in service. These shoes wear the portions of the tire which are not attacked by the rail, thereby increasing the length of service between the times at which it is necessary to shop wheels for truing. A judicious use of a tire dressing shoe is very beneficial to the tire in maintaining its proper form.

After this date, the business and affairs of the Q and C Company will be consolidated with those of the Railway Appliances Company, and will be conducted under the name of the Railway Appliances Company. This consolidation allows greater facilities in the conduct of the business of the company increasing their lines of devices, while retaining in the new company the individuals heretofore connected with the Q and C Company.

The Republic Railway Appliance Company, of which Mr. E. S. Marshall is president, situated at St. Louis, Mo., is now the southwestern representative of the Falls Hollow Staybolt Company. Mr. E. S. Marshall has held the position of S. M. P. with several of the leading railway companies in the West and is therefore well posted in the merits and advantages of Falls Hollow iron, having used carloads of it, and the company therefore looks for a good business from Mr. Marshall.

To overcome the difficulties usually encountered in keyseating the Newton Machine Tool Company of Philadelphia have designed a machine which produces a good keyway in much less time than is taken in pursuing the usual methods. The machine is designed with two spindles, one operating a horizontal cutter and the other operating a vertical cutter. The majority of the stock is removed with the horizontal cutter; the vertical cutter being operated to remove the stock left at the ends of the keyway by the radius of the cutter. An interesting feature is the provision of a pair of V-blocks and clamps. The front V-block is rigid, and the rear one is on a taper base, so that when keyways are to be cut in shafts of two diameters, the rear block can be adjusted to keep the shaft in line.

G. J. Buckeye is well known among the large manufacturers of the country. Previous to 1894 he was employed by the D. M. Osborne Harvester Company of Minneapolis. In 1894 he resigned to take a position with the J. Thompson Manufacturing Company, with which firm he has been ever since. For several years he had charge of the agricultural implement business, but later, during the last three years, he has had charge of the railroad business in the south and southwest, handling the gas and gasoline engines the firm manufactures.

Realizing the requirement and demand for a good indicator to meet present day service conditions, the Star Brass Manufacturing Company of Boston have fitted up their shops and machinery with the latest appliances for manufacturing and testing the Star Improved steam engine indicator.

Viewed from the outside the instrument is apparently designed somewhat on the lines of the celebrated Thompson Indicator, inasmuch as the pencil movement is of the Thompson pattern improved. This movement is chosen because it furnishes the most rigid arrangement of delicate levers that can be found for obtaining the rectilinear motion of the pencil desired. It is strong, light in weight, and in all ways satisfactory. There is also provided a jacket space filled with working steam completely surrounding the interior shell, and it secures a uniform temperature with absolute immunity from unequal expansion.

A noticeable feature of this appliance is the means for unscrewing and removing the cap from the cylinder with the parts attached to it. The cap has a milled edge of the usual construction, but, unlike instruments of previous makes, the edge is protected by a hard rubber non-conducting covering. This covering can be handled with absolute comfort to the one using it, whereas in the indicators heretofore made, as every one who has operated an indicator knows, it is impossible to unscrew the cap without risk of burning the thumb and finger with the hot metal.

At Claridge's Hotel, London, on the night of January 9th, Mr. George Westinghouse entertained at dinner a large company of British railway managers, financiers and scientists. Two speeches were made of unique interest. One of these was by Lord Kelvin, the other by the host of the occasion.

In a few well-chosen words Lord Kelvin commended the excellent work accomplished by Mr. Westinghouse in advancing the air brake for railway equipment, for his part in the advancement of the electrical industry and for bringing American methods to England, as well as causing these methods to be duly appreciated.

Replying to Lord Kelvin's complimentary words, Mr. Westinghouse described the necessities in America which demand advanced methods and the use of labor and time-saving devices to make up for the deficiencies due to the comparatively limited supply of labor. As an illustration he cited the case of the Homestead mills, where they produce with about 4,000 men three times as much steel as the Krupp works produce with 15,000 men, a result which is simply wonderful.

Mr. Westinghouse invited his guests to inspect two inventions, the Hewitt mercury vapor lamp, for which he predicted a valuable future, and the Hewitt Static Converter for converting alternate currents into direct current at low cost in comparison with the sum heretofore expended for equivalent results.

Manual for Resident Engineers, by F. A. Molitor and E. J. Beard.—A portion of the information contained in this book was first published by the authors in the form of instructions to the resident engineers of the Choctaw, Oklahoma and Gulf Railroad during the construction of the road across the state of Arkansas. This fact is an indication of the practical information therein contained and the directions set forth for the guidance of resident engineers are worthy the consideration of those interested in track construction and maintenance. An observance of the general information on construction would materially assist in obtaining uniformity of methods of doing work as well as in the character and appearance of the results. Several pages are devoted to specifications for material and a number of pages include tables of level cuttings. This book contains 118 pages and is well bound in cloth. Published by John Wiley & Sons, New York City; price $1.00.

Machine Shop Arithmetic, by Colvin and Cheney, is a valuable little handbook containing practical information, which should appeal to the mechanic actively engaged in the shop. As the name of the book would indicate the text is a practical application of the principles of arithmetic which confront the average mechanic in every day life. All explantions are of an elementary nature in order that shop men who have not had the opportunities in mathematial education, may readily understand the principles involved which have been considered by some to be puzzling and difficult. A commendable feature of this book is the explanation of the use of formulae, their derivation and application; not only showing how formulae are derived but giving practical examples from which the value of using formulae is readily grasped. The text continues with rules for selecting change of gears for screw cutting, speeds of machine tools, etc. There are contained tables of decimal equivalents, metric measures with English equivalents, tables of bolt threads, tap drills, etc. The book is cloth bound and contains 131 pages. Published by the Derry-Collard Company, New York; price 50 cents.

The Civil Engineer's Pocket Book.—By John C. Trautwine, C. E. Revised by John C. Trautwine, Jr. and J. C. Trautwine, 3d. This is the 18th edition (seventieth thousand) of the work. Trautwine's Engineer's Pocket Book is so well known that an outline of its contents in detail is quite unnecessary. The first edition appeared in 1872, and from time to time the book has been revised to date. In the present edition more than 370 pages of new matter have been added, making the edition about 100 pages larger than any of its predecessors. Among the new matter in this edition is a section on logarithms, arranged with bold-face type for the figures in multiples of 10. Seventeen pages are devoted to digests of specifications for bridges and buildings. There is new matter on cement and concrete, on water meters and water consumption in cities, and on cost of water pipe and laying; a digest of specifications for iron and steel, a price list of manufactured articles, a business directory, and a bibliography of engineering literature. Many of the articles in previous editions have been entirely rewritten. Twenty-five pages are devoted to conversion tables of units of measurement, containing the equivalents of both English and metric units, and each of these in terms of the other. The price list of engineering materials and appliances should be a useful guide in roughly estimating the approximate costs of work. The new matter is fully illustrated, with cuts engraved expressly for the work. This revision of one of the standard and best known works on engineering should receive a generous greeting from the engineering profession. Published by John Wiley & Sons, New York city. Price, $5.00.

A Manual of Drawing by C. E. Coolidge, assistant professor of machine design, Sibley College, Cornell University, Ithaca, New York. This book is written with a specific purpose in view, viz., to outline a definite system of mechanical drawing which might be followed to advantage by the student of engineering in preparing himself to meet the conditions demanded by commercial drafting. The environment of the student draftsman being unlike that of the commercial draftsman, it is essential that he should be taught by methods which as far as possible conform with those in a commercial drafting room. Realizing that this manual would be more serviceable as a guide to the student rather than as a complete treatise on the subject, the author has left every other page blank intending that the student should supplement the text with notes compiled from instruction obtained in the lecture courses and from his own experience as he progresses. About one-half of the book is devoted to a discussion of the instruments and material used in the execution of mechanical drawings, including the essential features to be considered in their selection. The remaindr of the book is devoted to the consideration of commercial drawings, the types of drawings employed in representing different classes of work, conventional forms which are generally followed, etc. Several pages of plates are included illustrating the methods therein set forth. Published by John Wiley & Sons, New York City; price $1.00.

Non-Corrosive Steel Coating

To the Editor of the Railway Master Mechanic:—

I have for a long time been a constant reader of your valuable journal and have been greately interested in the many articles published by you regarding the practical uses of railway materials. I am now glad to be able to contribute to you a few words regarding a new discovery of great interest to railroad and steel car men, and in fact to all users of iron and steel in any form which is subject to rust and corrosion.

The material referred to is Rogers' Non-Corrosive Steel Coating, which, if properly applied by either brushing, dipping or spraying to any iron or steel surface from which the bloom has been removed by pickling or sand blast, will absolutely prevent corrosion. This Non-Corrosive Steel Coating is a happy combination which combines all the good qualities and omits the bad qualities of all former materials prepared for this purpose. The fact that it will dry on steel in two hours and a half and its ability to positively arrest all corrosion of iron and steel will render it invaluable in the erection of bridges, the framework of buildings, and, in fact, all the uses where iron and steel needs to be protected from rust and corrosion.

Rogers' Non-Corrosive Steel Coating is manufactured by the Detroit White Lead Works of Detroit, Mich, who, I am sure, will be glad to furnish full information on application.

D. S. W.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. Portrait Gallery

JOHN P. STROUD

Some of the master painters, by the good care of their wives, no doubt, retain their good looks and young ways indefinitely (the editor of these columns, for instance), so while the accompanying portrait of our fellow associate, John P. Stroud, of the Allegheny Valley road at Verona, Pa., is not from a very recent photo, it is, nevertheless, a fair likeness of the man to-day.

MR. JOHN P. STROUD.

Mr. Stroud was born in Allegheny City, Pa., and has lived all his life within ten miles of that place, where he learned house painting when quite young and entered the service of the Allegheny Valley R. R. as a journeyman painter in 1874, and there he has remained ever since, evidently a loyal and faithful employee, being made master painter in 1880, which position he still holds.

He joined the Association in Washington in 1891 and has missed but one convention since that time—that at Detroit two years ago. He says he feels that he owes much to the knowledge gained from these annual exchanges of opinions and methods and hopes to meet with "the faithful" in Chicago this year. Modest and unassuming, he "hangs out no more clothes than he washes and bites off no more than he chews," as the saying is, but we should say, from our knowledge of him, that he is one to be depended upon for true service wherever stationed.

The Uniform Stenciling of Freight Cars

As to the matter of uniform stenciling of freight cars in the hands of a committee which Mr. McLaughlin refers to in his article in another column, the Boston & Maine has for years had its descriptive lettering concentrated to points on body of box cars just over truck centers; such as "Cap.," "Wt.," "Out. L'gth" and "Ins. L'gth," which is over center to the right facing car, and "M. C. B. Pkt. Coupler," "Nat'l Hollow B. Beam" (or whatever the kind of beam) "& Air Brake Complete" to the left over the other truck center. These are 2-inch and 2½-inch Egyptian letters. The name of road and number of car on each side of car in 9-inch Roman letters and figures, and 8-inch initials and numbers on ends complete the job. What better style can the committee suggest for uniformity?

If they will recommend a white stenciling that will not chalk and wash off, but last as long as the body paint, they will obtain the everlasting gratitude of a host of painters, the writer included; also shippers and consignees.

Uniform stencils for the small names of large roads and the large names of small roads are feasible enough if the "WABASH" will agree to have their gigantic letters cut down to some size that the "NEW YORK CENTRAL & HUDSON RIVER" and the "NEW YORK, NEW HAVEN & HARTFORD" can adopt; but will they so agree? Will the New Haven surrender that gigantic, intertwined fac simile (or sick family) of their time-table cover they are stenciling on the largest of their box cars? We "trow not," because it is an "ad" of theirs, and if the patent medicine venders are to have the fences, can't they have their own cars? They confine themselves to their initials, "N. Y., N. H. & H." on other cars, and, of course, they could on all, if they so chose; but all roads could not adopt initials, as a similarity, if not identity, would exist and cause confusion. The writer remembers when, many years ago, the Boston & Maine used to mark its freight cars "B. & M. R. R.," but they often got so confounded with the "Burlington & Missouri River" that the then superintendent, William Merritt (father of the superintendent of the West Division) gave orders to have it put on in full to Warner Bailey, who was then master painter of the road at Lawrence, for whom, in his early days, the writer worked; and he has vivid recollections of cold fingers during this work with a pencil brush for awhile until stencils were adopted. So it is pretty safe to say that the "Boston & Maine" will not return to "B. & M. R. R.," though the Burlington & Missouri River R. R. puts on "in Neb." to locate its cars.

Still, for all this and much more, we believe the uniform stenciling of freight cars to be perfectly feasible and reasonable and desirable, and the various railway officials ought to be led to think so, but whether they can be is another question.

We are of the opinion that the higher officers will regard their way of doing things as a matter of individuality and live advertising that they do not care to part with, any more than they would consent to all agree to have their passenger equipment painted the same body color, the B. & O. yielding up its "Royal Blue" and the "Big Four" and "C. & O." their cadmium yellow, and so on. But "where there is a will there is a way," and there is no way but many objections without this will. There is no reason why a uniform style and size of stencil, say 8 or 9-inch Roman, could not be adopted for the names, initials and numbers of all roads on their various classes of cars, and then the foreman painter could have a few standard alphabets on hand to maintain to do the work for all as they happen to come to him for repairs, instead of having a horse load of stencils on hand all the time to paw over to get the right style and size, or having to continually make new ones with tracing paper galore. If, say, a 9-inch Roman letter was considered small for a road with a small name they could lengthen it out by putting on the word "Railroad" or "Railway," which, under other conditions, is considered superfluous; so, for example, "Erie Railroad," "Wabash Railway," etc. Then there are some with a long-drawn-out name, as may be seen by scanning "the Pocket List" of roads. Well, if too long to put on in one line of letters large enough for the roads with small names, then let two or more lines be used. It can be done; and when the roads "stand pat" let the private lines follow suit, "Quaker Oats," and all the other meat, refrigerator and "pork product," etc.; ad libitum, et literatim, ad infinitism, ad nauseam lines. But let us "not bite off more than we can chew." Whoop her up to the railroads first and get them systematized, and let the private lines advertise their wares.

The Gold Leaf Booker

Booking gold leaf is an occupation that has been exploited by women for a century past, and today they have almost a monopoly of it in this country. In England the work is still done by men, as of old. When the gold beater has finished his work he has put 1,000 leaves in a mold. The mold is passed on to the booker, whose duty it is to cut the leaves to a uniform and standard size and to place them in paper books for the market. The mold itself is a book of 1,000 leaves, five inches square, and made from the intestines of cattle, each mold requiring 500 head of cattle to furnish the necessary material for it. It is made by a secret process in England, and costs about $50.

The gold leaf is taken from the mold by a pair of long box-wood pincers, known in the trade as chopsticks, and placed on a cushion consisting of a very thin piece of oak-tanned calfskin. The little finger of the left hand is used for the purpose of holding the leaf and then a quick gust of breath blows it flat. Brime or powdered gypsum is used to keep the leaf from sticking to either the cushion or the hands. The leaf is cut to the required size by wagons—little light box-wood frames having two blades resting on the cushion like the runners of a sled. The blades are of mulacca cane, sharply beveled, the hard exterior being used for the edge. The pincers, the point of the little finger of the left hand and a breath are used to place the leaf in a book. A book contains twenty-five leaves.

The work is paid for by the piece, the standard price in this part of the country being 2½ cents a book for short or square leaf, where one wagon is used in the cutting, and three cents a book where two wagons are used. The standard size of a short leaf is 3⅜ by 3⅜ inches, and of a long leaf 3⅜ by 3⅞ inches. Twenty books are called a pack. A booker will book anywhere from 40 to 80 books a day, and will make from $6 to $12 a week. It takes about six weeks to learn the trade.

Gold booking is a work that can be done at home, yet one objection to it on the part of manufacturers is the great value of the material and the tools. A mold full of gold is worth about $100, and a dozen moldfuls would be required to keep an expert booker busy for a week.

The gold booker works usually in a cotton wrapper, with an apron attached to the table covering her lap, for the purpose of catching the fragments and clippings. A mold, although containing 1000 leaves of gold, will not make over 37 books, and sometimes not more than 30. There is much waste in the process of booking. At the end of the day's work all trimmings are gathered up, a rabbit's paw being used for the purpose, and remelted, after which it is ready for the gold beater again.—From "Women Workers" in Boston Globe.

A Reply to Cleveland

St. Louis, Mo., Dec. 31, 1902.

Editor Railroad Paint Shop:—

With the greatest respect and kindliest consideration for my friend Cleveland regarding his senior qualifications in paint making, I can't help but feel that I wouldn't be a true American if I didn't at this time press home the idea that I first started out to inculcate in my first article. However, we all know that the old adage of "Diamond cut diamond" will bring about friction somewhere, and yet "it's an ill wind that blows nobody good," at least I have been benefited at this end of the so-called gauntlet, by the critical position that an elder and possibly one more experienced, from a manufacturing standpoint, may have taken. But still is there not a possibility of one taking a position that, because of his vast and overwhelming experience, he undoubtedly thinks that he is infallible and has reached a realm of perfection that must not be considered for a moment? Now to be very considerate about what I say, knowing that there are hundreds who may take up the same matter, I want to go on record as one who claims that there is no height in perfection, but what there may be improvement, and giving all credit to the improvements that have been made, which I claim is due principally to just such controversies and differences, there is still plenty of room left for advanced study in preparing coach colors.

If this were not so the next generation would be in sore straits to meet the demands that are gradually encroaching upon us; we have to advance, friend Cleveland, and keep going, if we do get out hints from the laymen; however, can any one lay claim to the fact that there can't be anything new spring from any place or anywhere than his own cosy workship or surroundings and does the advanced state in manipulating numerous mills and various modes of arranging the same, with every improvement possible, have anything whatever to do with the bringing together of medium and pigments, so as to get the most lasting results in the durability of color? I still say "nit," and claim that it is possible to learn from the laymen on this, the main question at issue, i. e., the need of improvement in the stability of colors when mixing for painters use in car and carriage works.

In the very beginning of the reply to my last letter, it is stated that improved machinery is one of the most vital factors in securing a stable color; nay verily, only one however, but not the main one. Fine grinding and all the improved mills on the earth will not give stability to any color, if it is not ground in the proper medium; and just here is the point at issue, and where friend Cleveland has "flew the coop."

My first claim was that there was not the advance made in the improvement in the stability of color by color manufacturers that there should be, while admitting the fact that there were vast strides in machinery and apparatus for getting the stuff out on the market. This doesn't help the matter a little bit, and I haven't been convinced as yet, with all the added light that Brother Cleveland has given us about superior facilities in large factories, etc.

We all admit that this very thing has been forced upon our large paint producers by the demands of the vast growing trade in our country. Improved machinery is necessary if you want to stay in the business; but while the fineness and thoroughness of mixing is all right for the pigment and also for the painter's use, to that extent that it will give better wearing qualities as a protective, it has nothing whatever to do with the cast of color which holds up and keeps from fading or tarnishing because of the medium in which it is ground in, and vice versa. It turns dark or fades out on account of the improper medium used. Can anyone deny the fact? In other words, the action of the elements, the sunlight, rain and oxygen, on the color (not the paint surface) is different on different mediums. The same principle applies to the paint surface in time, but that is not the issue in this controversy. I can prove this proposition by asking Brother Cleveland one question, i. e., Why does the action of the sun and air on certain colors show a richness when mixed in one medium and not show it mixed in another? Another: Why will certain pigments show a flatness mixed a certain way, and a rich blooming cast when mixed another way? This is a very pertinent way of getting down to facts, but the truthfulness of the above can be verified by any layman in the country if he knows his business. He does not have to run the stuff through a big lot of improved machinery, either, to get results; he may mill it on a stone or knife it on a piece of smooth glass. The facts are, when a certain degree of fineness is reached the color-cast cannot be improved if you run it all day long through a dozen mills; in fact you can ruin it by to much grinding.

But this is getting off the rail entirely, and away from the point at issue; my only aim is to show that what I claimed at first still stands, although I may not have made it as plain as some professional might have done.

Lastly, in the latter part of the letter in the last issue we have this broad assertion: "Does Friend Koons think with his limited facilities," etc. Let the reader re-read the balance, as I haven't the time; and I don't suppose Friend Copp will acquiesce in my using so much of his valuable space. However I want to say that Koons or any other layman that makes his business a matter of study and puts into practice his theories in an experimental way, so as to prove whether he is "up against it" or not, whether he has limited or unlimited facilities, it is possible for him to get onto an idea, or something new and valuable to the practical man as well as the trade, and all the other twenty-five or even one hundred professionals in the same line, and in the same business, not know anything about it. I don't think Friend Cleveland wants to take the position that we individually know it all; there are always others, and more oftentimes the very best ideas come from quarters that we least expect them, from obscure parts of the country with limited resources for development, yet they show up here and there. History verifies the above statement without any doubt about it. The encouragement and protection in our laws that our country has seen fit to provise would be a farce if this were not the case. Through it the possibilities of the rising American genius cannot be curbed or downed by any amalgamated action of enlarged facilities; neither are they scared out by overwhelming numbers of expert experiments.

There is one thing that cannot be downed or drawn from the individuality of the thoughtful workman, if he doesn't want to give it up, and that is his discoveries. No matter in what line he may make improvements, if he wishes to improve the standards no one can say him nay; and if he happens to trample on the hobbies of the forefathers that is no reason why he should be placed in the background. Give all the devils their due, and if there is any virtue in the young ones give them at least a fair hearing. There is plenty of time to disprove their claims when in the actual test they are found wanting.

The Latin phrase is very applicable—"sine qua non"—to all trade improvements, and for that matter to all conditions of life. What if we had to be wearing knee breeches and silk stockings, or using the antiquated tools our early parents used, possibly in the paint shop? I say: "No, sir; give every encouragement to anything and everything that gives us something new."

If it comes from the highest and best fitted to push it to the front, so much the better; we will get it that much quicker; but if it has to be fought for to get a hearing, let's have a hearing at any cost.

Very respectfully,

Chas. E. Koons.

Uniform Stenciling and Other Subjects

Springfield, Mo., January 11, 1903.

Editor Railroad Paint Shop:—

I think your Committee on Uniform Stenciling of Freight Cars are up against a hard proposition. But, with steady pressure and perseverance they may be able to evolve a system that will be far in advance of present methods, and it is this constant hammering and persistency that forges new ideas and brings to light new ways of doing things far ahead of old ones. The writer hereof has often thought that some way might be agreed upon whereby freight car stenciling could be simplified or systematized. A great deal of the lettering on freight cars—that part of it that is scattered over the cars, such as weights, capacities, length, height, width, air brake, M. C. B. coupler, etc.—could be concentrated at one point on each side of the car and made of standard size, whereby one stencil could be made to do the work of several. A standard size of letters in names of roads, initials and numbers for sides and ends would be an advantage, if a certain style, size and width of letter could be agreed upon. One set of alphabets, or numbers, would fill a long-felt want. While there are a great many cars that we could not do much with at present, time and custom may eventually bring them into line and find a way whereby simpler methods can be used. (All roads become merged into one great system, for instance!) So let the committee keep on moving; though their gait be slow the better the joy may be when the work is done.

And, Mr. Editor, as to the "repeating of old subjects," of which mention has been made, I am in favor of it, as some of those old subjects are ever new and bring out new arguments, and will until they are satisfactorily solved. Some of the old evils in the paint shop are like some of the old diseases which the doctors have studied and worked at for years; but, as yet, while they know what they are, have not found or agreed upon a remedy for them. Still, they are not discouraged but keep on fighting them. So, like the doctors, we painters know those old evils, but have not found, or agreed upon, a remedy for them. So we must not give up but continue bringing up those old evils of paint and varnish until we find a way to overcome them and make our work more perfect. We still have them and their causes have not been satisfactorily explained, nor have we yet struck the correct remedy for them. We must keep at them and study them until we are able to find some way of obliterating them.

Another old question, and there are many of them, is color. Are our colors giving the satisfaction they should? Or can they be improved? Do they stand as well as formerly? I believe there is room for argument on this question. The bulging of putty on work—has there been found a remedy to prevent it? All old questions, but it is not what we know about painting so much as what we don't know that we are after. There is a vast field before us; let us explore it, examine it, find its good and bad points and get them down to the minutest details that we may make our task as nearly perfect as possible.

Sincerely yours,

E. H. McLaughlin.

A Note From the West

Enclosed with his official notice of Advisory Committee meeting Friend Gohen sends us the following letter which contains such interesting items that we are constrained to insert same, as it is not marked personal.

Friend Copp: Am just in receipt of a letter from Robert McKeon, in which he says: "I fell about three weeks ago and broke my arm, but it will be all right by time Committee meets." He also says his eyesight is not improving, but his general health is good.

Got a letter from Little a few days ago, in which he said that they are all torn up improving the shops; narrow gauge roads and little construction engines bobbing all over the grounds so much he can hardly keep from being run over. He says they are very busy. We have experienced just such proceedings all the fall, shops and roundhouse being enlarged, but now we are "in the swim," as the additions are completed. However, if prosperity continues to prosper a new difficulty will soon be apparent in the scarcity of cars for shops. Our passenger business has so increased and so many additional trains are needed that fewer cars are available for the shops; and it is sometimes hard to get available ones to shop, because our trains are nearly all "flyers" now, and the locals are heavy, so that delivery is not so prompt as it was when we weren't so busy. Strange anomaly, isn't it—We are so busy that it is hard work to find work enough to keep us busy? Well,, I guess the paint shop can stand it if the others can.

J. A. G.

Advisory Committee Meeting

OFFICIAL NOTICE

Editor Railroad Paint Shop:—

A meeting of the Advisory Committee is arranged for at Cleveland, Ohio, Saturday, February 21st, at Colonial Hotel. All members residing in the vicinity of Cleveland are earnestly requested to attend and assist in formulating a program for our next annual meeting at Chicago in September. Distant members who may have subjects, or queries to suggest, can materially advance the object of our meeting by sending such subjects or queries to Secretary McKeon, Kent, Ohio, prior to date of meeting. J. A. GOHEN, Chairman.

Obituary

ALEXANDER CAMPBELL.

Mr. Alexander Campbell, Master Painter of the Manhattan Elevated Railway, New York city, died at his home, 4:10 p. m., Sunday, Dec. 31, 1902, after an illness of two weeks, having been stricken with paralysis while at church on the second Sunday previous, according to our informant's note of Dec. 17.

Mr. Campbell was born in Marine City, Mich., in January, 1841, consequently nearly reached his sixty-second birthday at the time of his death. He entered the service of J. Sheriff & Co., carriage builders, when a boy sixteen years of age, where he served an apprenticeship at coach painting, and afterwards was appointed foreman painter of their shops. He moved to Bay City, Mich., in 1864, and engaged in the business of carriage and house-painting until 1872. He removed to Detroit, Mich., in 1873, and entered the service of the Pullman Company, and was sent to England in 1874 by that company as foreman, and remained there until they closed their shop in 1877. He removed to New York city in 1878 to take charge of the painting of cars and engines of the Metropolitan Elevated Railway Company, and was, in 1879, appointed foreman painter of cars and engines of the Manhattan company, where he remained until the time of his death.

Mr. Campbell became a member of the Master Car and Locomotive Painters' Association in 1880, and, though usually quiet and reserved, has served in various capacities, his last duty, as we remember, being that of chairman of the committee of arrangements for the convention at the Park Avenue Hotel, New York, in 1896, to which position the writer had the honor of appointing him while president of the association at Cincinnati in 1895. Though retaining his membership, the last convention he is on record as attending was at Detroit in September, 1900.

Through a friend we learn the following particulars of the recent death of Mr. Alexander Campbell, whose obituary appears elsewhere: "Wednesday, December 17, Mr. Campbell left the shop at 5:30 p. m. as well as usual. Had dinner and, with Mrs. Campbell, went to a church meeting in West Farms. While there had a stroke of paralysis; was taken home in a carriage; and after a few days seemed to be improving; but on December 27 was taken worse—I presume another stroke—and did not rally. He died December 31 at 3 p. m. Funeral was at his home, Lincoln street, Van Ness, Friday night, January 2, and the burial in Greenwood cemetery Saturday, January 3."

Notes and Comments

The typos made "a holy brush" out of "a holy hush" in our article "The Finisher," page 25, January issue. Holy smoke! Well, never mind this, but a matter of more importance is the age of the M. C. & L. P. A., page 27. Its birth is given as "November 9, 1890,"—it should have been twenty years before that, or 1870. Unlike the ladies, we brag of our old age.

With the 3:55 train five hours late and the 4:10 two hours and twenty minutes and 5:40 the first train to go on to Boston, there is nothing better for "ye editor" to do January 12 in the Fitchburg depot than to kill time talking to "our boys" with the pen. We'll try to not swear. Just been to call on Foreman Painter Lord of the B. & M.'s car shop at this place. He has on hand one of those delightful jobs "to make as good as new" that sometimes fall to the painter in this climate—an interior of a Pullman sleeper all turned white and the glue protruding from the inlaid work on the face of the polished bunks, caused by the heating apparatus freezing up throughout the car and bursting on a connecting line of road. Say, if ministers were foreman painters they would feel sometimes as the latter do when they swear. Now it is no fool trick to make one of these jobs look as good as new, but a careful cleaning with wood alcohol, following up with an oil polish as quickly as the white film disappears under the cutting effect of the alcohol, will do wonders towards it. But that protruding glue—there's the rub. No sure cure for this but to put those bunks face down in a vat of varnish remover and clean the old varnish off and "stock up" and rub and polish them again, but if the protrusions of glue and varnish are removed only pits appear that are hard to fill.

By some changes in methods of painting the new 36-foot 30-ton box cars at the Fitchburg shops, the amount of paint required per car, two coats, including one coat on edges of sheathing, faces and tops of sills and tops of stringers, has been reduced from 11¼ and 11¾ gals., reported in tests in our last issue, to 8 7-20 gals., which is very close to Warner Bailey's figures for same work at Concord, between whom and George W. Lord, there was a difference of four to five gallons per car, occasioning a change of visits of these two veteran painters to see how each other did it. Pretty good idea to compare notes between shops on same system.

We learn that the Gladstone shop of the Northern Pacific has been closed and the work transferred to the St. Paul shop. This will increase Associate Bishop's force of men and volume of work.

By a recent call on Associate "Sam" Brown at the Roxbury shop of the New York & New Haven system we found him busy with a force of 38 men on full time putting the equipment of that road in good shape with paint and varnish. That company is installing a mammoth car plant at Readville, some eight or ten miles out of Boston, that will likely be occupied the coming season. In this all the car equipment of the "Eastern District" of this big road will be taken care of, besides much if not all the new construction will be done there. We hope to visit this new plant in the near future and give our readers some account of it.

Mr. Judd, formerly assistant to Mr. Alexander Campbell, deceased, is now (January 19) acting foreman painter of the Manhattan elevated Railway shops, New York City.

It was a brilliant subject and one not to be made light of at the N. E. R. R. Club's January meeting. It was "Car Lighting," and five different systems were represented by papers read, each system being "the best," of course. The Pintsch gas people had an exhibit of lamps on the platform in the hall and the acetylene gas folks had a working exhibit in the corridor outside. Pintsch gas, acetylene gas, the axle light, the steam turbine system and the Pyle-National were the systems represented by papers, while another, the Gould, had a representative there who received the apologies of the club for being inadvertently left without proper notice, but who, however, made some remarks. We wondered, as we heard the various sides of the subject, what kind of a verdict a jury of twelve disinterested experts would bring in if they were to retire for that purpose. It would be as difficult to empanel such a jury as one on a murder case all of whom had formed an opinion. Brilliant as the subject was and followed by sharp sallies of wit in the discussion, we believe at this writing, January 14, that "Ladies' Night," January 27, will outshine it all.

In the lunch that followed the caterer outdid himself. On the table was an illuminated (we do not know whose system of lighting) candy car, lettered "Special Car, New England Railway Club, No. 2024," with a bridal couple of the Tom Thumb variety on the platform.

Putty and Puttying

Not romantic in name and nature, yet next to the priming, in point of time and importance in car painting, is the putty and its application. There are many and varying shop formulae for the making of this important article; but all are, as they must be, composed chiefly of white lead, mixed with the requisite vehicles and tinted to suit the ground color to follow. It should dry so hard, and yet be elastic, in a few days that it can be cut down with sandpaper or block pumice to a smooth and level surface. Its composition will settle the question whether or not it will stay where it is put, or loosen and drop out. Right here let us nail that campaign lie, circulated by some would-be foreman painter, that he can make a putty that will never swell and protrude from the hole. Putty never swells, but will shrink, if it has a chance; but this chance is too often cut off by the more rapid contraction of the wood, or the expansion of the nail or screws under it, or the moisture from frost, forcing it out.

If the putty is elastic and adhesive it will stay, though raised above the surface; if dry and brittle in its nature it will work loose and drop out. Unquestionably the after-raising of putty above the surface may be largely, if not wholly, prevented by suitable seasoned lumber, kept dry until the priming is well worked into the holes, and that in turn gets thoroughly dry, as well as the well-made putty to follow. In a word, all must be "knit together," like the broken surfaces of a bone, if they are expected to stay put. When a batten will shrink away an eighth or a quarter of an inch from a panel, revealing a stripe of the priming color, it is not just to condemn the painter's putty, nor the durability of his painting. We have seen this many times with regret.

Now as to putty-making; this has been done in the shop for this purpose from our earliest recollection. It is usually composed of about equal parts of dry white lead and white lead in oil, mixed with about equal parts of rubbing varnish and japan gold size and tinted with color to suit the work, usually a little lampblack. The proportions are varied somewhat according to the nature of the materials we have and the requirements of the work; but the main features are adhered to. When this putty gets dry it is as hard and tenacious as the wood itself; and therefore all unevenness that the coats of surfacer to follow will not fill, may and should be glazed full with some of this putty, softened to a working consistency for the purpose.

Some agitation of late has been made by the painters to have this putty made and put up in air-tight cans by the paint dealers for use; and doubtless some of it is already on the market. Unquestionably this would be a great convenience, for it can be better compounded by machinery than by hand, and thus a dirty job is saved to the painter. But it should be made by the formula furnished him, or some practical painter; and, if the manufacturer can be trusted to always put in the right materials, we do not see why this cannot be as sucessfully put upon the market as our glazing lead, which we have been wont to buy for years.

With our putty ready, the next thing is to rightly use it. It takes a finished workman to be a good puttier. We do not know but that it would be a good thing to have degrees for painters and put "G. P." after the names of some—Good Puttier. We were taught to press the putty into the hole so hard that when the knife passed over it it would spring up and leave the hole more than full, to afterwards shrink to a nearer level. "House painter's puttying," so-called, done by shoving the knife between the thumb and the putty and cutting it off level—oftener less than level—with the hole, will not do. It must be used hard and pressed in hard to insure good work. With the holes puttied, then all unevenness caused especially by gouges in burning off and scraping or otherwise, must be carefully and painstakingly glazed. Here close inspection must be made, or regrets will follow when the tell-tale varnish is put on and the job is completed. Above all, do not hurry the puttying beyond the point of doing the best work, for this is a part of the foundation you are laying. Hurry the striping and varnishing all you please, but do take time with the puttying.

We will here add that we omitted, at its proper place, that the liquids entering and composing the putty, will be found to produce good work if of the same nature as those of which the priming is mixed; but here let us say that a less elastic putty can be immediately used after a very elastic primer, for it will absorb oil from the latter around the holes; and the reverse of this is true—that a more elastic putty should be used after some of the prepared primers on the market that are so quick-drying, if the putty is to be prevented from pulling out.

Car Foremen's Association of Cleveland

Minutes of meeting of Car Foremen's Association of Cleveland, O., held at the Kennard Thursday, Jan. 15th, 1903.

Meeting opened at 8 p. m., by President Berg, with the following present:

A. Berg, J. V. Berg, W. Battenhosen, C. E. Harrison, W. Krage, W. Hauseman, S. S. Langdon, D. O'Leary, W. Gonnerman, C. Schneider, H. R. Linn, G. A. Taylor.

Minutes of previous meeting were read and approved.

Officers present reported favorably on the outlook for the Association.

The following applications for membership were received, and their names placed on the roll:

Wm. Krage, Asst. Fore., B. & O. R. R., Elyria, O.

C. E. Harrison, Pass. Inspector, B. & O. R. R., Cleveland, O.

Secretary-Treasurer's report for the year 1902 was read, and on motion was received and accepted as correct.

Proposed amendment to article 7 of the by-laws was read, and passed until next meeting for adoption.

The subject committee appointed Mr. C. Schneider on the affirmative and Mr. W. Gonnerman on the negative side, on the questions submitted relative to safety and interchange inspection, the discussion to take place at the next meeting.

Under the head of the order a lively and useful discussion took place on the subjects of "steam heat," "change of passenger car wheels," and "flaws in journals."

Mr. Hauseman, steel expert, gave many interesting and instructive hints on tool steel.

Meeting adjourned to meet Thursday, Feb. 19th, at The Kennard, at the usual hour, of which the members will please take note in reading the Railway Master Mechanic.

The Car Foremen's Association of Chicago

January Meeting

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, Jan. 14th, 1903.

Meeting was called to order at 8 p. m. by President Parish.

Among those present were the following

Bourell, J. W.	Heisterman, Wm.	Ranson, P. B.
Baldwin, M. J.	Johnson, Axel.	Ryding, A.
Bruce, W. J.	Jones, R. R.	Shoemaker, C. A.
Bates, G. M.	Kennedy, J. H.	Schultz, F. C.
Cardwell, J. R.	Kline, Aaron.	Schultz, Aug.
Cather, C. C.	La Rue, H.	Stimson, O. M.
Crosman, W. D.	Lyon, A. W.	Stocks, W. H.
Dahlgren, P. M.	Morris, T. R.	Senger, J. W.
Deans, J.	Mittels, E. H.	Thomson, Geo.
Depue, Jas.	Nord, Chas.	Treptow, A.
Downing, David.	Pettis, C. D.	Taylor, L. H.
Dewey, L. R.	Parke, P.	Warlick, Geo.
Evans, W. H.	Parish, L. G.	Willcoxson, W. G.
Earle, Ralph.	Peterson, A. F.	Williams, T.
Godfrey, J.	Peterson, C. H.	White, P. W.
Harris, S. H.	Powell, C. R.	Wharton, R.
Hansen, A. P.	Rohrback, G. T.	Whitchusch, T. E.
Haig, M. H.		

President Parish: The first in order will be the reading of the minutes of the previous meeting. They have been printed in the Railway Master Mechanic, and if there are no objections they will stand approved as printed.

Secretary Kline: The following have made application for membership:

E. S. Barstow, Gen. Car Inspector, B. & M. R., Lincoln, Neb.
A. P. Betz, Inspector, C. B. T. Co., Chicago.
N. B. Colton, Asst. Car Foreman, C. & E. I., Danville, Ill.
L. R. Dewey, Passenger Foreman, C., B. & Q., Chicago.
John High, Asst. Car Foreman, C. & E. I., Danville, Ill.
L. F. Klein, Car Inspector, L. S. & M. S., Chesterton, Ind.
John Linden, Car Inspector, C., R. I. & P., Chicago.
H. O. Lapp, Car Foreman, C. & E. I., Danville, Ill.
Thos. Murphy, Foreman, M. P. Ry., Atchison, Kan.
L. H. Taylor, Foreman, Pintsch Compressing Co., Chicago.

President Parish: We now come to the program of the evening the first subject being "Defective Railway Crossings and the Damage They Cause to Car Equipment." This subject was carried over from the last meeting, and I believe it affords room for further discussion, and would like to hear from the members on it.

Mr. Evans (B. & O.): I think that the subject was quite thoroughly discussed at the last meeting, but was held over for the purpose of giving our president an opportunity to give us his views on the subject. I think it is a question that is worthy of more study than we have given it, and would like to hear from our president on the matter.

President Parish: I do not know that I have anything further to offer on this subject. We wished to have it brought up in order to bring it before the railroad officials who come in direct contact with that class of work. It was quite thoroughly discussed at the last meeting and I hope that those who read the proceedings will take interest enough in the question to watch the trains as they are passing over these crossings. I often thought that a great many of our broken brasses and possibly a few broken axles were due to these defective crossings. I believe that all roads should pay more attention to their crossings in the fall of the year before cold weather comes on, because after the weather gets cold it is almost impossible to do anything to the track to any extent. I have some crossings in mind which are defective, and I presume all of us, since this subject was taken up, have observed crossings more or less and have noticed the severe shocks that are produced when cars are passing over them, and I hope, as I said before, that all the officials who have anything to do with track will do something to relieve the situation. Would like to hear from some of the members on this subject.

If there is no further discussion we will pass on to the next subject, which is "Steam Heating of Passenger Trains."

There are a great many systems in use in heating passenger trains, and a great many troubles in connection with the handling of nearly all of these systems. We would like to hear about the systems, their construction, maintenance, etc., and also from some of the passenger car foremen who have trouble with these different systems. Mr. Peterson, we would like to hear from you.

Mr. C. H. Peterson: I am somewhat at a loss as to how to handle this subject; in the first place I do not know how much time is allotted me, and in the second place I feel that the time must be limited as it is.

It is hardly necessary to go into a discussion as to the merits of steam heating. Every railroad man will acknowledge that it is the only way to heat a passenger car in regular service to-day. There are a great many reasons for this statement. In the first place there is one reason why steam heat should be used on passenger trains, and this has become so generally accepted that it is very seldom that you hear it mentioned. Ten years ago, however, it was the great argument that it was the only safe way to handle a train. This has become so generally accepted that at the present time a steam heat man travelling around the country seldom has to use this argument, as it is recognized that it is the only way to eliminate danger from fire and thus safely heat a car.

Another advantage is its great cleanliness, and to the passenger foreman this is especially important, who have to keep down expenses. With steam heat the ashes, dust and dirt produced by other methods of heating are entirely done away with, and when the car is in service it not only makes it cleaner in so far as this dust and dirt are concerned, but also the air in itself. In a steam heated car the air is always purer than where it is heated with a Baker heater, with its obnoxious gases.

Another advantage of steam heat is its cheapness and simplicity in maintenance. There has been some argument as to how much it costs to heat a passenger car with hard coal. It is not necessary to dwell on the high price of this article at the present time, but under ordinary conditions it requires from 75 to 125 lbs. of coal for every 24 hours to heat it with a Baker heater, but when the car is heated with steam you eliminate almost entirely this cost.

The other day I received a letter from Mr. G. W. Rhodes of the B. & M. R. R. They have just started steam heat, and he wished to know how much it costs to heat a train with steam; that is, how much additional fuel would be burned on the locomotive, and we simply had to tell him that we had tried to get these figures from our railroad friends, and that none of them had as yet been able to tell us how much it cost, because the difference on the locomotive is so small that it cannot be measured in pounds of coal. One man on the B. & M. R. R. said that it added 5 per cent, but this was at once voted down as being too high. The Pennsylvania R. R. with all its engines, equipment, and testing machinery have never been able to tell how much it costs, so that we can say that it costs so very little that it is not a factor to be taken into consideration. The Illinois Central R. R. with their engines in suburban service, which are very hard pushed to keep up schedule time, have never been able to arrive at those figures. Ordinarily a man would think that it would take lots of steam to heat a train of cars, and generally when steam is first started in passenger cars the first cry will come from the engineers and firemen and when trains come in frozen up the excuse will be that the engineer would not give steam because he wanted to make time and shut the steam off. This has been proven to be mere nonsense; a railroad engineer can just as well keep 60 lbs. on his train pipe and will save just as much money as if he were giving only 10 lbs. One great difficulty that we have with steam heat is that we cannot get the engineer to keep pressure up on his train pipe. The train pipe is entirely independent of the steam heating apparatus in each car, and simply carries the steam back from car to car. If the conductor will keep his train pipe alive, that settles a big factor. If he has any trouble then it is with individual cars.

As far as the different systems in use are concerned, it is hard to get into a discussion on this without becoming personal. One thing that I have in mind is that a great many men ask why some roads use direct steam and others Baker heaters. We know that in a direct steam heated coach the steam is used in open radiators, which heat the cars. If a car heated by direct steam heat has the steam cut off, the only way to heat it is by stoves, and this is undesirable for many reasons. On some roads it is necessary to heat cars part of the time by steam, and then when they go off on some branch line, they have to fall back on Baker heaters, and you will find that west, and especially northwest of Chicago, the cars are heated with Baker heaters used in conjunction with one of the several heating systems, which simply substitute steam from the locomotive for fire in the heater. Different roads have different methods of applying this steam, but if a car is laid up on a siding and it is necessary to heat it by some other means than with steam, they simply make a fire in the Baker heater and heat the car just as well as before the steam was cut off. Another point is that in sleeping, parlor or chair cars where there are different compartments, it would be impossible to heat them with a stove. If you take a chair car with a smoking room and the steam heat were cut off, you could not keep the smoking room warm with a stove, so that in parlor cars and sleepers and the like you will always find that Baker heaters are never used.

I think that my remarks have been wide enough in scope to start a discussion, and I will try to answer any questions that may be asked by the members of the association.

One thing that I know is of interest to all of us is the facilities for heating cars at terminals. All the roads in Chicago are short in this respect. One road in particular was laid out badly last winter and in consequence had to send some of its cars into service cold. This year they have put in improved facilities. The N. Y., N. H. & H. R. R. is especially up to date in this respect. They heat all their cars with hot water used in connection with steam heat, and they have no Baker heaters and no stoves. The pipes run along the side of the car, two pipes sticking out through the roof of the car with the drum on top, and steam heating connections are made in the car. When you realize that these pipes are full of water and that they cannot remain without some heating agency for over an hour at a time without freezing, you can see that the facilities for caring for the cars are first class.

Mr. Willcoxson (C., M. & St. P.): I would like to ask if all of their freight engines are equipped with steam-heating connections as well as their passenger engines.

Mr. Peterson: That is a practice which is becoming recognized as very important, and on a great many railroads they at least make an attempt to have their freight engines so equipped. The expense is very small in view of the benefits derived.

Mr. Morris (C., M. & St. P.): I infer that the Baker heater pipes in these cars referred to are filled with fresh water, and I would like to ask if it would not be preferable to have them filled with salt water?

Mr. Peterson: Personally I think that salt water is preferable. A great many railroad men have an idea that salt water is injurious to Baker heater pipes, and that it will eat the pipes to pieces. but if the Baker heater system is perfectly tight as it should be. the action of the salt water on the pipes internally is very slight. It is only when joints leak that it cuts the threads. Nearly all of the steam heat men think that salt water is very much better. as it will not freeze until the temperature is about ten degrees below zero. Another thing is that after fresh water has been used in these Baker heaters it becomes what we term boiled water. and being much more free from impurities than ordinary water. it will freeze very much quicker.

Mr. Morris (C., M. & St. P.): I would like to ask if there is any difference in the circulation of fresh and salt water?

Mr. Peterson: None, as long as the water is not at too low a temperature. When you get almost to the freezing point of salt water it does not freeze hard, but becomes slushy, and of course the circulation will stop. If sufficiently cold it will freeze enough to break the pipes. Before a low temperature is reached there is no difference in the circulation, and there should be none as the theory is that one column of water counterbalances the other. It does not make a great deal of difference, however, in this regard whether you use salt or fresh water or, as the C., M. & St. P. did at one time, use a calcium chloride solution. This last is a very heavy mixture, but made very little difference in the circulation.

In the preparation of salt water, however, mistakes are made which are responsible for most of the criticisms which have been made against its use. For instance a car comes in when it is cold weather, and it is extremely risky to try to draw the water out of Baker heater pipes and pump them up with fresh water, so you go to the salt water barrel and nine times out of ten you find that you have none made up. The result is that you will fill the barrel up with fresh water, dump in a couple of pails of salt and stir it around, and before the salt becomes dissolved, you pump it up into the Baker heater pipes. The probabilities are that you have too much salt in your water, and this extra salt will settle down and plug up the circulation. You cannot understand then what is the trouble, but when you blow out your pipes you find them all filled up with salt, and the cry goes up that salt water is not the proper medium of circulation.

Mr. Morris: How much salt should be used to a barrel of water?

Mr. Peterson: You fill the barrel with water and then add as much salt as the water will dissolve. In order to be sure that you have a saturated solution, you should put enough in so that there is salt in the bottom of barrel when through and then be sure that your suction pipe is above this salt.

Mr. Willcoxson: I would like to ask Mr. Peterson if he knows of any Pullman cars that are equipped with expansion traps?

Mr. Peterson: I know of exceptional cases where they have cars so fitted. The Pullman Company has not equipped their cars with expansion traps for the past eight years, and all Pullman cars today are equipped with a simple one-inch angle valve.

Mr. Evans: I would like to ask Mr. Peterson what is the best way to clean out pipes that have become clogged with salt, and also the best method of charging with salt water.

Mr. Peterson: The best way to clean out Baker heater pipes is to make steam connections to expansion drum, and open the draw-off cocks, when, if you have sufficient pressure, you can blow your pipes free. One practice is to connect one draw-off cock with steam and open the other, the result being that they lift all of the water and dirt through the pipes, while if you connect the steam to the top of the drum where the tapping for the safety valve is located you will blow everything through your draw-off cocks without lifting it through the circulation.

As far as filling the piping is concerned, there are a great many methods followed. The ordinary one is to connect a pressure pump with one of the draw-off cocks under the car, pump all of the water through this circulation, allowing it to flow out of the expansion drum. There are really only two correct methods. One is to make the connection immediately below the expansion drum on either the up or down pipe, charging the circulation from this connection. When the piping is all filled, the water, of course, will rise in the opposite pipe and pass out into the expansion drum. Another method, which is a very good one, but to which objection has been made that it takes too long a time, is to make the same connection to one of the draw-off cocks under the bottom of the car, and to also extend the pipe from the top of the expansion drum into the barrel of salt or fresh water with which it is desired to charge the piping. Steam is then turned on and will quickly free all the piping of air, which will bubble up through the water in the barrel. When the steam is shut off the steam remaining in the piping will condense, forming a vacuum in the pipes, causing the water in the barred to be sucked up into the circulation and filling all of the pipes solidly with water.

In connection with direct steam radiation one railroad company recommended and insisted that in future all piping in their cars should be put together with right and left couplings, and will not have any right-hand couplings at all.

Mr. Whittebusch (C., B. & Q.): I would like to ask Mr. Peterson if he ever looked into the matter thoroughly as to whether boiled water freezes more quickly than any other. The reason advanced by this theory, I believe, is that boiled water becomes what you might term dead water, and having so many less molecules its freezes quicker; but I see that it has been denied by all the authorities.

Mr. Peterson: It has been generally accepted that pure water freezes more quickly; this, of course, depending somewhat upon the nature of the impurities. I may be mistaken in this, and the authorities may be against this theory, but I have always had that understanding.

Mr. Evans: I would like to ask what system will result in the trainmen (and particularly the porters) keeping the traps closed as much as possible and thus avoid the cloud of steam that generally follows under the cars.

Mr. Peterson: That is a question which has been discussed between the Pullman Company and the railroads for years. On some roads the porter is not supposed to touch the steam heat apparatus at all, but go to the trainmen when any change is desired. On other roads the porter is allowed to operate the inlet valve, but is not allowed to touch the drip valve; and it has always been a question as to which was the better scheme. The best method would seem to be that the man attending to the car should attend to the steam heat also.

Mr. La Rue (C., R. I. & P.): I would like to ask Mr. Peterson if he thinks that the present size of train pipe—ordinarily one and one-half inches—is adequate, with the necessary connections that are used nowadays, for the length of trains that are being hauled at the present time—from ten to twenty cars in a train. Is it the most economical?

Mr. Peterson: It is a question that has been discussed, and may result in the use of a larger train pipe. It did result in one road ordering couplers of a large size. On the universal coupler used, the gasket is about one and one-eighth inches while the train pipe is one and one-half inches. When you figure the portion of the areas of one and one-eight-inch and one and one-half-inch circles it makes considerable difference. If the railroad companies will use a larger coupler this condition will be helped to a large extent. Couplers one and three-eights inches in the clear are being tried, and would be increasd to one and one-half inches, but there is the same difficulty as when they started to use the automatic coupler, being such as are always attendant upon the change of standards; so they tried to reach a compromise so as to couple with the present coupler.

An official of an eastern road tells me that they intend making an experiment, putting on a train with a two-inch train pipe and with couplers in proportion. There is no question but that a larger train pipe would be a good thing. For example on some of the roads out west, where they run thirteen to fifteen-car trains, to push steam through a train of this length and have it reduced at every coupling takes a good deal of pressure. It is a condition that will probably work itself out in the future, but it will take quite a good deal of money to do so, as it will mean the rejection of all couplers and train lines in use.

Mr. Stocks (Gold Car Heating Company): Speaking about large couplers I can say of a road in the east that they have been experimenting with a coupler that has one and one-half-inch opening for some time, and as far as I could gather it was giving very good satisfaction; and I can also say that that coupler would couple with a one and one-eighth-inch coupler, and I believe they are intending to use it more extensively on that line.

Mr. Evans: What pressure on the locomotive would ordinarily be considered sufficient for a ten-car train as usually made up?

Mr. Peterson: The general practice on railroads where they have steam heat is to put on a maximum pressure to get the train pipes clear. The Illinois Central, when they start out with cold cars, put on from sixty to seventy pounds to blow the train pipe out and thus free it of the condensed water. After the cars are once heated the amount of steam is very small. As a rule they allow five pounds per car, and some heating companies allow a maximum of forty pounds for eight cars, and then five pounds for every additional car. The great trouble is that you very seldom get as much steam as the engineer says he is giving you. If he sees you coming he will turn the steam on, only to shut it off the moment your back is turned.

Mr. Willcoxson: Do you not think it well to have a connection in the baggage car and have the steam inspector put on a gauge once in a while?

Mr. Peterson: That is the proper way to have the test made, just as some of the roads have done on the Westinghouse air brakes; but most roads have no steam inspectors. They run until they get into trouble, and then they call on the steam heating companies. Steam heat is not given the prominent place it should have. It is very much as some of the car builders have told me: They put everything in a car in the way of ornate finish and decoration, and then they finally come and apply the steam heat, and put it in any way they can. It is much the same way when they get a car on the road, but it should be the other way, for if you keep a man warm you usually keep him in good humor.

Mr. La Rue: I would like to ask Mr. Peterson in regard to the larger train pipe; if he had a sixteen-car train, and the fourteenth car from the engine had a larger pipe and the two cars behind it had smaller pipe, would it deteriorate the heating power in the two rear cars?

Mr. Peterson: Do you mean fourteen cars with one and one-half-inch pipe and the fifteenth and sixteenth cars with smaller pipe?

Mr. La Rue: No. I mean thirteen cars with one and one-half-inch pipe, the fourteenth car with two-inch pipe, and the fifteenth and sixteenth cars with one and one-half-inch pipe. Would it make any difficulty with the two rear cars by having the fourteenth car with a larger pipe?

Mr. Peterson: If anything, I think it would help it. The steam would meet with less resistance. You would have a proportionate area of nine to sixteen there.

Mr. Whitehusch: I would like to ask Mr. Peterson if he thinks there is enough attention paid to covering up pipes.

Mr. Peterson: When you take into consideration that the amount of steam required to heat a train is so small that it cannot be figured, it makes it look as though the covering of today were certainly efficient enough. If there is any great loss it would show up in the coal pile of the locomotive, but the amount of coal burned is so small that with steam heat it does not figure much.

Mr. La Rue: I think what the gentleman has just asked is this: Some companies will advocate a covering so thick; another company will come along and say, "I have another covering" (probably sold by the pound) "that is only so thick and will answer the same purpose." Now, what I would like to arrive at is, which is the best? You take, on the other hand, if there has been any repairs on the car, and say only six inches of pipe has been left exposed, that is equivalent to the condensation produced on the greater portion of the car, especially when the car is going through the country at a great rate. If that place were covered it would mean economy in fuel.

Mr. Peterson: The point I make is that economy is not so much to be considered as safety in a covering. It is true that there are a great many kinds of covering. The best can be none too good for a railroad company.

President Parish: I would like to hear something from the foremen about their troubles with frozen drips.

Mr. Senger (L. S. & M. S.): I would like to ask Mr. Peterson if there are any objections to putting automatic traps on sleeping cars; and if so what they are.

Mr. Peterson: I do not know what they are, Mr. Senger.

Mr. Senger: I would like to ask if they do not have trouble with frozen drips. Mr. La Rue, do you have very much trouble?

Mr. La Rue: Yes, on some of them.

Mr. Willcoxson: I would like to ask Mr. La Rue who pays for the frozen drips on sleeping cars on his line.

Mr. La Rue: According to whose charge they are in. The main trouble with Pullman cars is experienced while they are standing around in the yard when they are in the Pullman Company's charge. When they are in the railroad company's charge they are taken care of as much as possible, and we aim to do that in the very best possible manner. We have very little trouble with cars freezing up in the yards if we have the necessary pressure of steam. Of course we are all having more or less trouble at this time when, as the papers say, we are burning bituminous mud, but we have not had a great deal of trouble this year with Pullman cars, and that has been more through neglect than otherwise—cars being taken off trains and left too long without care. This is the great trouble.

Mr. Powell (I. C.): Before Mr. Peterson sits down I would like to ask him if he has ever had any figures to show what it would cost to heat one car a given number of miles or a given number of hours while being transported in a train.

Mr. Peterson: I have never been able to get these figures. The railroad companies must answer that question. On the Illinois Central suburban service they say that the only noticeable difference after steam heat is started is that the pop valve does not blow off as often at the different stopping places as before the steam heat was turned on. It is a good thing in this way, because the steam flowing back through the train pipe is a relief on the boiler, as, owing to numerous stops, the fireman has to keep pressure at nearly blowing-off point all the time.

Mr. Powell: We had occasion to ask several roads who use steam heat if they ever made any tests of that nature, and I think that out of seven or eight roads on whom we called for information we got only one reply stating that a test had been made, and they figured that it took twelve pounds of coal per hour to heat one car.

Mr. Peterson: The only way to get at this would be to catch the water of condensation, and then figure on the amount of coal which would be required to evaporate that amount of water; but as a generally accepted fact we find that steam heat has no appreciable effect on the amount of coal used. For instance, if it were twelve pounds per hour you would not notice that on one engine.

Mr. La Rue: I do not agree with Mr. Peterson in regard to the fuel burned on locomotives. I think the way to arrive at that would be for some party that has an independent heating plant to keep a certain number of cars on steam through the day, or for a certain length of time, and keep track of the fuel that is used to keep these cars on steam. I may be wrong, but it looks to me that way.

Mr. Pettis (I. C.): After the train is heated with high pressure to start I think the exhaust from the air pump will nearly supply sufficient steam to heat a train of seven or eight cars.

Mr. La Rue: I would like to ask if anyone is trying to heat a train with the exhaust from the air pump?

Mr. Peterson: I answer to Mr. La Rue. I am not here to argue; but if a careful inspection was made of all the terminal plants for heating in Chicago, I think that the figures would bear me out in stating that more steam is being wasted in piping, or from defective connections, both in hose and pipe, than what you see coming out of the drips of the cars, although it would be very difficult to compute this exactly. You would be up against the same question there, as you would have to figure the condensation in the many pipes. For instance, the North-Western is putting in a new plant here in Chicago with six-inch steam mains between the tracks. When you figure the condensation in these pipes a quarter of a mile long with all branches, conduits and connections, the cars really become the smallest factor in the condensation of steam.

Mr. Evans: I would like to ask Mr. Peterson if he considers the practice of blowing out the train pipe before arriving at a station has any advantage over blowing out the train pipe after the train is put in the coach yard.

Mr. Peterson: If we consider the congested condition of Chicago terminals, it has an advantage. If you are sure that the train can come into the station and back into the yard before the couplings freeze, you are all right; but if you are held up for an hour or more, as is frequently the case, you are up against it. It is a very simple matter for the trainmen to open the rear valve and blow out the train pipe; in fact it becomes a habit with them.

Mr. Evans: The point which I wished to bring out was that if a train was pulled directly into the yard would it not be better to wait until then to blow out the train pipe and save steam, as I have noticed that some train crews seem to blow out a great deal more steam than is necessary to clean the pipes.

Mr. Peterson: This always occurs at the end of a run and this additional steam does not amount to much as the chances are that the fireman has ceased firing.

Mr. Wilcoxsou: I would like to see all the railroad companies demand of the Pullman Company that they have all their cars equipped with expansion traps, and, if they cannot do that, to ask if some of the pipes leading to the expansion valve cannot be done away with. As it is, some of their cars have 7 or 8 feet without covering.

Mr. Dewey (C. B. & Q.): I would like to say that we have on the "Q." four cars, operated with expansion traps, running between Chicago and St. Paul, and so far as the repairs are concerned, The Pullman Company does that work at their own expense.

Mr. Senger: I believe that we should have another subject called "Defects in Steam Heat." The greatest trouble that we have with the Pullman equipment is with the drips particularly. The Pullman Company has some cars that have automatic traps; these are on the Wagner type of cars, but the latest style do not have them. We also have a lot of trouble from the safety vents blowing off. It would seem that they were not properly tested at the works.

President Parish: We have several other members present who are foremen at passenger yards, and I would like to hear from some of them on this subject.

If there is nothing further we will pass to subject No. 3, which I will ask the secretary to read.

Secretary Kline: 3. B delivers A's car home at a junction point with two draft sills spliced, without defect card or repair card attached. In view of Rule 63 is this a cardable defect?

Mr. Powell: It appears to me in this question that inasmuch as the rules of the M. C. B. Ass'n has decided that draft timbers or center sills must not be spliced, that in promulgating that rule the Association was of the opinion that if the timbers or sills were spliced car would be unsafe to handle. It would therefore appear that the road receiving a car with spliced timbers should be entitled to demand a defect card, on the ground that the car was not safe. I believe that the receiving road is entitled to demand a card and to refuse the joint evidence. I believe that if a car has draft sills spliced, that it is immediate notice to the connecting line that this is a cardable defect, and it is their duty to protect the car owner and in all cases demand a defect card. This throws responsibility back on the party who made the wrong repairs in the first instance. As the road making the wrong repairs is responsible to the owner and there is no repair card on the car, then the connecting line is presumably acting for the owner, and in case it misses the defect and the owner refuses the car home with spliced draft sills, it has no redress, unless there is a repair card on the car. In case in question there is no evidence to show who made the wrong repairs in the first instance and I believe that under Rule 63 a defect card should be issued.

Mr. Thompson (L. S. & M. S.): I do not quite agree with Mr. Powell in that, as I do not consider that the delivering company should be held responsible or should be called on to issue defect card for sills that it had not spliced. I think, however, they should trace back as a matter of courtesy for the receiving road, and if possible locate the road responsible for the wrong repairs and get defect card, but failing to do this, I do not think it would be proper to have the delivering company issue defect card. The party who spliced the sills I think is solely responsible to the owner.

Mr. Powell: Could not the road who issued the defect card trace car and secure offset card provided he received car from connecting line with draft sills spliced? It appears to me this is the proper manner of handling case.

Mr. Thomson: In that case you would be holding the delivering road for spliced sills that it did not repair. Providing it issued defect card for the spliced sills and was unable to locate the guilty party, where is his protection coming from? I think that if it fails to find the guilty road that the matter should be up to the owner. If the matter were investigated it could show that it was unable to find the party splicing these sills and that it was unable to get protection. The owner, I believe, should take it that way.

Mr. Jones: It is an owner's defect unless there are other defects to form a combination denoting unfair usage and the party splicing the sills would not make bill, because they are not allowed to splice sills. He could put in two sills and charge the owner. The owner can put in the sills and save billing.

Mr. Bates (C. B. & Q.): It is simply a case of wrong repairs. Rule 44 says: "Any company making improper repairs is solely responsible to the owners, with the exception of the cases provided for in Rules 31, 40, 41, 42 and 43." It does not say anything about Rule 63. Therefore you cannot hold the intermediate road responsible in the way of defect card. All you can demand is a joint evidence card. I think that Mr. Powell would have a hard time to get a defect card. I know that I would refuse such a demand, and I hold that the Rules would justify me in doing so.

Mr. La Rue: I would like to ask for information. Is there much of this splicing of sills business coming up? That is, of draft sills? I would like to say of my own experience that I have only had one case of spliced draft sills offered in interchange. It may be that I have not had much interchange.

President Parish: I believe that some of our inspectors can put us right on this.

Mr. Trepton: In talking the matter over with some men the other day, one man said that he had spliced a good many draw sills over in Packingtown. I asked him how it was done over there. He said that it was quite common to splice a draw sill over there and after cover it up with insulation, so that no one could ever see whether a draw sill had been spliced or not on a refrigerator car. In regard to this case I do not see where the owner is out any, because two draw sills broken are on owner's defect, and I do not believe the party splicing these sills will be foolish enough to send in a bill for same. On the other hand, the party that spliced the sills could have billed the owner for replacing two draw sills, as it is an owner's defect, but we know the splicing of draw sills are wrong repairs and a cardable defect. But the delivering road should not be held responsible if it did not make the repairs. The owner has the car home now and can replace the sills and be nothing out.

Mr. Cather: I would say in regard to the number of such defects that to my knowledge the I. C. Rd. has received three cases of spliced draft timbers, not draft sills. I know of my own experience of three cases of draft timbers spliced, which, of course, would be just as bad, from a wrong repair stand point, as the sills. Now, another point I would like discussed is this. Supposing a road spliced a sill or timber, which was primarily an owner's defect, and they put on a repair card marked "no bill" stating that they had spliced it, would the owner be entitled to bill against that road?

Mr. La Rue: The owners should certainly be entitled to protection, as wrong repairs were made as covered by the rules in this case, the supposition being that the spliced sills are not strong enough to protect the rest of the car, which would bring it into consequential damage.

Mr. Cather: Suppose that I should splice a center sill on a C. R. I. & P. car and that I put on a "no bill" repair card showing that I had done so; would you be entitled to bill against me for a new center sill, bearing in mind that the defect was purely an owner's?

Mr. La Rue: We certainly would; for new sills.

Mr. Cather: It is an owner's defect.

Mr. La Rue: It was wrong repairs. You weakened the condition of the car.

Mr. Cather: What has it cost you? If I do not bill the owner for it, he is nothing out, and is justified only in rebilling the party making the wrong repairs to the extent of what it has cost. Such I think is the intent of the rules.

Mr. La Rue: You can repair a car if you do not impair the strength of it. When you splice a center sill you impair the strength of the car. A wrong defect is a cardable defect between the party making the repairs and the owner. You call upon the party making the repairs.

Mr. Cather: In this case I consider that the conditions are such that you can say that no repairs have been made to the car at all. The party making repairs has simply put the car into good temporary condition. The conditions in this case are similar to those wherein a broken sill would be "planked" or "boarded" to make car as temporarily safe as conditions will permit. Other illustrations of this point are the nailing on of a side door or slatting up a bulged end. Such things are really not repairs (right or wrong) at all, but mere makeshifts for which no charges are made, and so long as defect is owner's there is no claim against such practices.

Mr. La Rue: I think that is the general sense that spliced draft sills impair the strength of a car, and is so decided in the Rules. Decision 484 says that it is the duty of all roads to put cars into safe hauling condition, and in case of breakage or damage resulting from neglect to do this, they are responsible for the consequences of such neglect. I do not see how you can get around this.

Mr. Jones: It is all right if there are no other damages that these two sills were spliced. I do not see how the owner of the car can bill on his own defects. Suppose you break two sills and put two timbers in and bolt them up and send the car home, and do not bill them. It is an owner's defect just the same.

Mr. Bates: When a railroad once splices a draft sill it is wrong repairs, and when that is done, and the guilty party is located, he is responsible to the owner in the way of defect card. The rules say in speaking of J-E card that joint evidence card shall not be used as authority for rendering bill, but shall be sent to the company against whom the evidence is presented, and it shall issue defect card covering the wrong repairs if it made them. Now I think that is pretty plain, and that if anyone splices a sill and the owner gets a joint evidence card and sends it to the party making repairs, he is to be furnished with a defect card.

Mr. Stimson (S. R. L.): I move you, Mr. President, that the construction as placed upon this question by Mr. Bates be accepted as the sense of the meeting.

Mr. Powell: The remarks of Mr. Bates are not pertinent to the question. The question is not one of wrong repairs. I do not believe there is any doubt but spliced draft sills are wrong repairs and that the owners are entitled to defect card. The question is as to whether it is a cardable defect or not in view of Rule 63.

Mr. Bates: I have already stated that it is not a delivering company's defect and quoted Rule 55. I do not see that Rule 63 has anything to do with making an intermediate road responsible for spliced draft sills.

Mr. Powell: We must look at the intent with which the rules were made. I understand that in the subsequent rules covering wrong repairs that only the owner is the judge as to whether the repairs are standard. In this case it is self-evident to every one interested that spliced draft timbers or sills are wrong repairs, and therefore the receiving road is not protecting the owner unless it sees that there is a repair or defect card on the car when owner offered in interchange. That is the only safe way of protecting the car owner. That merely traces the matter down to the party who made the wrong repairs in the first instance. The party who made the repairs will find the minute he tries to get the car off his hands, the intermediate or receiving road asking for defect card.

Mr. Bates: There are many other wrong repairs that you cannot get defect card for. There are a great many cars that have trussed wooden brake beams. If some other road puts on a common beam, the intermediate road is not responsible. All you can get is a joint evidence card.

Mr. Stimson: I move you, Mr. President, that it be considered the sense of this meeting that when a car is delivered to the owner with center or draft sills spliced, joint evidence is all that he can ask.

Motion was carried.

The Car Foremen's Association

of Scranton

January Meeting

On Saturday evening, January 10, 1903, the Car Foremen's Association of Scranton held its regular monthly meeting in the Board of Trade rooms, Board of Trade building, Scranton, Pa. Vice-President R. B. Rasbridge in the chair. Present 60.

Mr. Rasbridge: The minutes of our last meeting not being published, on account of their failure to reach the office of the Railway Master Mechanic before the paper went to press, if there are no objections, we will dispense with the reading of the same and approve them as entered upon the secretary's record. Not hearing any objections it is so ordered. The next order of business is the reports of officers. Under that head comes the report of the auditing committee, which has not up to date made any report.

Secretary: The following is report of the auditing committee: "The auditing committee beg to advise that the accounts of the secretary and treasurer have been carefully audited and found to be correct up to September meeting, 1902, but would suggest that the next committee appointed to audit these accounts be instructed to audit them from the time of organization to September 1, 1903.

R. B. Rasbridge,
Wells Harris,
Auditing Committee."

Mr. Hall: I move you that the report be accepted and filed. Seconded and carried.

Secretary: The following is the list of applicants for membership from November to date:

NOVEMBER 15TH, 1902.

Otto Bicht, Foreman Car Repairers, St. Clair Shop, P. & R. R. R.
M. Ennis, Master Mechanic, D. & H. R. R.
George H. Moon, Chief Clerk M. P. Dept., Delaware & Hudson R. R.
J. W. Coombs, Car Foreman, D., L. & W. R. R.
F. G. Gray, Clerk Motive Power Dept., D., L. & W.
E. M. Rine, Supt., D., L. & W.
Bartley Fuller, Machinist, Car Shops, D., L. & W.
James N. Kane, Chief Joint Inspector, B. & O. and P. & R. R. R.
Sam'l Disterway, Upholster Foreman, D., L. & W. R. R.
C. F. Courter, Truck Foreman, D., L. & W. R. R.
D. J. Gilleland, Flood & Conklin Var. Co.
O. R. Ford, Mgr. Chicago Var. Co.
R. Roberts, Salesman, J. B. Sipe & Co.
W. L. Ferguson, Secretary, J. B. Sipe & Co.
H. G. Taylor, Salesman, J. B. Sipe & Co.
C. J. McCarthy, Inspector, D., L. & W. R. R.

DECEMBER.

D. E. Casey, Road Foreman of Engines, D., L. & W.
F. J. May, Traveling Fireman, D., L. & W.
A. G. Elvin, M. M., D., L. & W.
Edwin R. Kent, Steel Mfg., Edward R. Kent & Co.
Chas. H. Fitch, Plush Dyeing, Fitch process for dyeing plush.
John S. Hanbert, Eastern Agent for Greenlee Bros. & Co.

JANUARY.

E. W. Mann, Foreman, Erie R. R.
F. E. Quest, Traveling Salesman, Cleanola Co.
F. Acker, General Car Foreman, C., R. I. & P. R. R.
Joseph Barton, Machine Hand Saw Mills, D., L. & W.
Harry Egolf, Clerk, P. & R. R. R.
John E. Hickey, Car Repairer, Phila. & Reading R. R.
Henry Kunz, Foreman Car Dept., Erie R. R.
Geo. H. Lenney, Foreman, Lackawanna R. R.
Henry F. Morlock, Representing as Manager of Imperial Car Cleaning Co.
Frank Praed, Saw Mills Machine Hand, D., L. & W.
Chas. E. Robinson, Foreman Carpenter, M. P. Dept., D., L. & W.
Andrew Straber, Car Inspector, Phila. & Reading R. R.
Harvey Stair, Clerk, C. R. R. of N. J.
Robt. D. Wilson, Acting General Car Inspector, Penn. R. R.
G. E. Probst, Carpenter, C. R. R.
Grant G. Honeywell, Pipefitter and Air Brake, C. R. R.
John P. Allen, General Wood Working Machine Hand, C. R. R.
Henry Beringer, Apprentice Painter, C. R. R.
William E. Bean, Painter, C. R. R.
Thomas Grisco, Painter Helper, C. R. R.
Vincent M. Harrigan, Painter, C. R. R.
Ewald Heuttemann, Foreman, C. R. R.
J. Lynch, Painter, C. R. R.
Henry Middledorf, Upholsterer, C. R. R.
J. Mack, Painter Helper, C. R. R.
Stanley J. Pawlek, Carpenter, C. R. R.
J. B. Robins, Foreman Pattern Shop, C. R. R.
Louis A. Roy, Upholsterer, C. R. R.
Fred Reeder, Burnisher, C. R. R.
John W. Shutter, Painter Helper, C. R. R.
Chas. M. Tucker, Painter Helper, C. R. R.
A. L. Yetter, Painter, C. R. R.
H. N. Turner, Representative Acme White Lead & Color Works.

Mr. Rasbridge: Gentlemen, you have heard the names of the new applicants for membership read, which have been approved by the executive committee. If there are no objections they will be enrolled on our records as members.

Mr. Bundy: Under the head of new business, I would like to say that when I was in Scranton on New Year's day I called upon the secretary of the R. R. Y. M. C. A. and had a little chat with him. He told me he expected the new building would be ready for our February meeting; if not February, it would surely be ready for our March meeting. We will have a very nice home there in the new Y. M. C. A. building; janitor, light, heat and everything nice and comfortable, free. I thought it would be well for the members to know what is being done for us, and how we are being cared for.

Mr. Basbridge: That is very gratifying, and I am certain we all appreciate the good news. It has come to my notice that some of the members have not received the Master Mechanic. If there is any member present, or any member knows of another member not receiving it, I think it would be well to communicate with the secretary, so that he can take it up with the publisher.

Secretary: I have the following letter from Mr. Canfield:

Office of Master Car Builder, D., L. & W. R. R. Co.
Scranton, Pa., Dec. 17, '02.

Mr. R. B. Rasbridge, Vice-President Car Foremen's Association of Scranton, Reading, Penn.

Dear Sir:—Having severed my connection with railroad work I hereby tender to the Scranton Car Foremen's Association, through you, my resignation as president, to take effect at the earliest convenience of the association.

It is my desire to take this opportunity of expressing to the association as a body the extreme interest I have taken in the past in the work they have done, and to say how deeply I am interested in the success that the association has met with, both in organization and since we have become a representative body. I will be as deeply interested in the future of the association as I have been in the past, and will give it all the attention that I possibly can.

Kindly express to the association and to its individual members the regret I feel in giving up active participation in its management, and the deep regard I have for all of its members.

Yours truly,
(Signed) L. T. Canfield.

Mr. Hall: I move you that the resignation be accepted with regret. We are all aware that Mr. Canfield has severed his connection as far as railroad work is concerned, and I am sorry to say for one—and I think it is also the sentiment of the rest of the members—that we are to lose him. He was what we could consider the head of this organization; he was the father of it, its instigator, and a worker in its cause. I hope that by his resignation the members of this association will not lose hope nor faith. Mr. Canfield has no doubt bettered his position by retiring from the D., L. & W. We all understand that we are not working for our health. We are interested in railroad matters for all we can possibly get out of it. We give our time to the company that employs us and I know that he has done the same with the D., L. & W. since he has been with them. He has seen fit to accept a position which no doubt pays him a great deal more money than the railroad company could. It was with great regret that I heard of his resignation. I have seen these matters published in the newspapers of late that he was about to resign, but I did not take much stock in it until the secretary read that letter tonight. I hope every member will take just as much interest in the association as they did when Mr. Canfield was our president. No doubt if his time will permit he will be with us occasionally. I have known the gentleman ever since he came from the west. I have had a good many meetings with him and I will say that I have always found him to be a perfect gentleman, and a man as far as car work is concerned, to get along with, you can't beat him in this land.

Motion seconded and carried

Mr. Rasbridge: I think I am expressing the sentiments of this association when I say that it is with regret and a great deal of reluctance that we accept this resignation. I think the association will bear me out in the statement that Mr. Canfield, no doubt, has given us a great deal of his time that possibly could have been taken up in other channels, but we were of first consideration, from the fact that he realized just what benefit this organization would be to the different railroad companies and to us as individuals. I am very sorry that circumstances have brought this about, but I am convinced that Mr. Canfield will be permitted to associate with us and give us the benefit of his knowledge and wisdom. I cannot help but say that I feel he has been our strength and back-bone, and to him most largely is the wonderful success of this organization due. If any of you gentlemen have followed up the history of similar organizations you cannot help but say that the growth of this organization has been wonderful. We have certainly met with success, and our meetings have met with the notice of railroad people throughout the country. We have had editors of mechanical journals refer to our meetings with a great deal of credit to the association. Of course we are young, I might say we are yet in our infancy, we are growing, and I feel with delight that we have had the support of each member of the club. I think the officers have been alive and active, especially our president, and the committees appointed on various subjects have given unstintedly a large portion of their time to thorough investigations for our enlightenment and knowledge. I am also pleased to note the liberal response that has been made to the request of the secretary in regard to our financial condition. As you are aware with the notice of the present meeting the secretary forwarded application blanks, requesting that each member present an applicant for membership at this meeting. The notices being sent out at a late date no doubt deprived many of us from securing new applicants. I hope the response will be greater at our next meeting. We have received encouragement from Mr. Canfield that we have not received from any other officer in the same position on any railroad. He is about the only Master Car Builder that is connected with the association. We all appreciate this and feel satisfied in saying that, although Mr. Canfield has tendered his resignation as president of our club, his interest in our welfare will not grow lax; it will be just as great and he will be just as anxious to see us prosper and move along as if he were our presiding officer. (Applause.)

Mr. Bundy: I move you that the secretary be instructed to write Mr. Canfield expressing the sentiments of this meeting. Seconded and carried.

Mr. Rasbridge: That brings us up to the program of the evening, the first subject of which is:

"Are broken brake hangers, when hung from the body of car, considered unfair usage when failures occur through rounding curves?"

Mr. Bundy: I think brake hangers broken on cars when rounding curves are certainly owners' defects. I do not know how it could be classed as anything else. I do not think there are curves in any railroad track that are so sharp that a car could not, if properly constructed, go around them without breaking the brake-hangers, and I think that a brake hanger when broken rounding curves should be charged to the owners.

Mr. Rasbridge: I do not like to be obliged to call upon any member. I like to see a member if he has anything to say get up and say it. Some people are very sensitive about it. We have many private sidings, refrigerators, cold storages, etc.. and some have very short curves and this question has been taken up at different times by the car owners in regard to a car equipped with brakes on both trucks, where you will find sometimes four hangers on a truck broken, claiming unfair usage. The M. C. B. Association tried to discourage the equipment of cars with brake hangers hung from the body, the same as they did at the time the pocket coupler came into use; tried to discourage the use of the tail pin. Take a car under load and you naturally decrease the braking power of the car, and where you are obliged at times since we got air brakes to keep the air-brake rigging coupled up to get the proper piston travel, you often times find a few brake hanger failures. We might have two, three or four in one truck. The idea is to bring out a discussion on this subject. It refers to broken brake hangers. It has come to my notice that some roads say when one brake hanger is broken it should be considered an owner's defect; if both are broken, due to rounding curves, the repair card should be marked "No Bill." I do not see that there is any justice in that. My personal opinion is that the car owner would be chargeable with the failures no matter whether one or four in a truck. The railroads are familiar with just what service these cars are put into. They are principally refrigerator cars or cars in special service, and if they do not take advantage in their construction, to construct their cars to get the best service out of them, I think they ought to be held responsible for it. I personally think that brake hanger failures from this cause is properly chargeable to the car owners.

Mr. Hall: I do not see that there is any room for argument in the matter whatever. I consider that where a brakehanger is hung from the body of car, if the hangers break, it is simply an owner's defect. I do not see how you can get out of it regardless of your curves, elevations or anything else.

Mr. Dyer: I do not see that there is any way for the car owners to get out of paying for brake hangers when broken under such circumstances. It seems to me that it would be necessary for the M. C. B. Association to say just what degree of curvature should be permitted, and as there is no such ruling the car owners would have to stand for it. That is my opinion.

Mr. Streicher: Regarding breakage of brake hangers under foreign cars, and the question as to who is responsible for repairs, I would say that, excepting repairs necessitated by derailment or wreck, the owner of the car is chargeable for such repairs.

It is a well known fact that brake hangers will break in service under fair usage, in particular the style of hangers that are commonly called loop hangers, if hung from the body of the car and tight fitting about the brake head, so as not to permit freedom in lateral motion of brake beam when car is rounding sharp curves. Judging from personal observation and experience I am free to say that the majority of this style of hangers do not wear out but have to be renewed on account of getting broken or bent out of shape a long time before the metal in same is reduced by wear to such a size that would make renewal necessary.

The "C" shaped hanger, which is used to a large extent during later years, in connection with outside hung brakes or brakes hung from the body of the car, however, gives much bettter service. I do not remember of ever having seen one of this kind of hangers broken by car rounding sharp curves. No doubt this is due to the fact that its design affords most perfect freedom of lateral motion of brake beam.

If I understood correctly, one of the gentlemen who have spoken said that he thinks a ruling should be made to show what degree of curve should be held responsible for the breaking of brake hangers. In reply, I would say that such ruling is hardly necessary. Brake hangers should be designed, constructed and applied in such a manner as to permit cars to be hauled over any curve over which cars will pass coupled up.

Concerning the question as to who is responsible for broken hangers on brakes hung from the body of car I would state that I consider it an owner's defect, and nothing else, if the defect is not caused by derailment or wreck.

I agree with you, gentlemen, that the principal cause of broken body brake hangers is due to original construction and design. I do not understand where broken hangers suspended from body can be charged to unfair usage except derailments and wrecks. When cars pass through curves most of the body brake hanger failures occur. Either the hanger is broke or the bolt is pulled out. Brake hanger failure under such condition is due to defective construction, and car owners are responsible.

Mr. Stuckie: I consider that the Master Car Builders' rules are very explicit in this matter. It is an owner's defect pure and simple, except when car is wrecked or derailed.

Mr. Bundy: I move that the sense of this meeting be that when brake hangers, hung from body of car, fail in rounding curves, be considered an owner's defect.

Seconded and carried.

Mr. Rasbridge: The next subject we have for discussion tonight is "Shop cleaning: What is the best and cheapest method of keeping shops and repair yards clean?"

Mr. Bundy: This is a subject that I have given a good deal of thought in my time. It has been a difficult matter to keep repair yards and shops in as clean a condition as they should be. At our Dover shop we repair a great many heavy-repair cars per day where we take out and apply a large number of sills. draft timbers, and all that kind of timber. I have made it a practice lately to put a gondola in along with the bad orders and throw our refuse wood, etc., into the car, switching it around to the boiler room where it is burned up. Heretofore it was the practice to haul it out on little buggies. I find we do it a great deal cheaper by handling it by the car load. We also handle our wrought and cast scrap in the same manner. We pick it up and throw it into a gondola, switching it around to the scrap bins where it is sorted out and placed in the proper bin. After we have all the heavy material picked up we take a broom and sweep the yard. In that way we are able to keep our repair yard in apparently good condition. That is the best method I have found as yet in disposing of scrap material that accumulates in the repair yard.

Mr. Streicher: Cleaning yards and shops is a matter that had to be settled according to the location of the shops, and the facilities you have for getting the stuff out. The great trouble so far as my experience goes is that our superior officers very often look at it as an unnecessary expense, although I am perfectly satisfied that in large railroad yards and shops a good many thousands of dollars could be saved if the companies would be liberal enough to furnish the necessary men to do the work. In our yard and shop (which covers considerable territory) we have at different times made attempts to designate certain classes of men to do the cleaning, and have very well succeeded in keeping them clean; but along comes an order to curtail the expenses. and you have to knock off the men. That is the time you get behind with your cleaning. I would say that for a shop handling 100 cars per day, where you have four tracks to work on, the shop being a couple of hundred feet long, working inside and outside, above and below, they will manage to keep the yard and shop fairly clean, provided you give them an occasional lift of an hour or so to load up the heavy stuff, such as sills, body bolsters, etc. I am very much in favor of keeping the yards and shops clean. It pays. You can pick up hundreds of dollars worth of nuts. nails, washers, bolts, etc., that are otherwise buried in the mud when you have bad weather. We are occasionally handicapped for help. It is an easy matter to keep a shop and yard clean provided you can get help. By that I do not mean extravagance.

You do not need an army of men. Six men can clean a fairly large shop and yard that will turn out on an average of from forty to eighty cars per day, heavy and light repairs.

Mr. Downing: I would like to ask the gentleman who last spoke what class of repairs he handles turning out from forty to eighty cars per day, having only six men to keep the yards clean. On the D., L. & W., at Dover, we have a large amount of old lumber and iron that is thrown out now on account of our reconstructing old cars. We have more than that number of men on one side of our yard, and we cannot keep it as clean as it should be. If Mr. Streicher can keep his yards fairly clean with only six men I would like to have a few of them down at Dover.

Mr. Stuckie: I believe the most profitable way and cheapest method to do this is to have a certain man assigned to a certain territory and hold him solely responsible for that territory. There is lots of material thrown into the scrap pile by men who are incompetent to sort the scrap rightly, or by men who are instructed to clean up the scrap but not held solely responsible for it. Where is the economy in that? Suppose he throws a lot of steel in the wrought scrap; when you go to sell it where are you at? I think one man should be held solely responsible for keeping the yards clean. When it comes to picking up material there should be a man assigned to this who thoroughly understands all classes of scrap material.

Mr. Bundy: I think the remarks of Mr. Stuckie are well taken. One thing that has got to be watched closely in picking up scrap is the question of getting the scrap in its proper bin. At Dover that work comes under the jurisdiction of the blacksmith foreman.

Mr. Streicher: To substantiate what I said I would like to answer the gentleman from Dover. If he will pay a visit to our shops at Ashley I think I can convince him in a very short time. You are perfectly at liberty to call on any of my associates here tonight. For instance, Mr. Hangen can tell you that at present I have less than six men, and we try to get along. With six men you can do a great deal of work if you go at it in the right way. Of course you must understand that all yards are not constructed alike. Our shop and yard are built on the gravity principle. We get the cars in one way and they go out the other. If you have twenty-four tracks you never get done at the same time on the twenty-four tracks. When we get one track done we try to clean up before another batch of cars comes in. If you watch the matter closely you can keep your yards clean with a limited number of laborers.

Mr. Hangen: I am one of Mr. Streicher's assistants, and I can verify the statements he has made. Mr. Bundy speaks about putting a gondola in. If they wait until they get a carload of material piled up to be loaded in a gondola how can they do justice to their work? They are tumbling over the sills, body bolsters, flooring, etc. The minute we get a sill out of a car it is placed on a truck and taken away to the mill where it is sawed up for engine wood, and I would say that we saw this up for engine wood and load it with the same men.

Mr. H. D. Canfield: I would like to have some or all of the gentlemen who are of the opinion that a shop like the one I have at Scranton can be kept clean by six men, come down in our yards and try the experiment. I would like to have them pay me a visit next Monday morning and note the condition of the yard at 7 o'clock and then again at 11 o'clock after the cars (about twenty-two in number) are torn down—it taking about four hours to tear them down, having two men on a car. I think they would agree with me that no six laborers would keep that yard clean. I have found that the best way to keep the shops and yards clean is to pick out a gang of laborers, putting one man over them at an increased rate of two or three cents per hour; taking them away from the shop foreman, because if there is any running around to be done the shop foreman will invariably pick out some of the laborers. I would like to ask Mr. Streicher if he has any of the car men help his laborers.

Mr. Streicher: I do not like to occupy the floor so much, but I would like to say a few more words to verify my assertions. A couple of years ago the C. R. R. of N. J. had 15,000 old jimmy cars which they concluded to tear down. We had a shop 400 feet long with room for twenty condemned cars. We started in the morning and worked until 6 o'clock at night, tearing down from seventy-five to one hundred cars, separating the scrap iron from the wood. The next morning when we came to the shop we had another batch of from 75 to 100 cars to start on. The principal cleaning was done by twelve men at night. This is an absolute fact. Gentlemen, six men can do a great deal of work in the line of shop cleaning if you get at it in a systematic way.

Mr. Stuckie: It seems to be a twenty-four hour shift, night and day.

Mr. Fuss: It does not seem anything of the kind. The men did the cleaning at night. Now there are as many differences in shops as there are shops. Perhaps our shops are more convenient than others.

Mr. Bundy: I do not think six or even twelve men could keep our repair tracks as clean as I would like to see them. On the D., L. &. W. we are reconstructing a great many cars. We tear the car right down and rebuild it, taking out all the sills, draft timbers, truck bolsters, end sills, flooring, etc., which means all new iron and new wood work in the body of the car; and where you do as much work as we do at Dover I am sure there are no twelve men who could keep the repair track clean. In regard to using the gondola. As fast as the car is torn down the lumber is thrown into the gondola and we can dispose of it quicker in that way than by wheeling it to the boiler room which is probably 100 yards distant.

Mr. Rasbridge: I do not know that I can add a great deal to what has already been said, but I think this is a subject that is entitled to a great deal of consideration; and if we would all feel at liberty to discuss it and give the methods we would apply under different conditions, we may possibly benefit one another. I realize under what conditions our neighbors, the C. R. R. of N. J., are working, and I believe it is possible for them to do just what has been said tonight. I have in mind a yard that I had control of as general foreman of both departments, and during my time we had a great many changes in administration; and usually parties visiting our shops would remark as to its condition, which was to our credit. Upon my first appointment as foreman of the locomotive shop one of the things that I was impressed with very strongly was that "cleanliness was next to godliness," and that was about the first thing that would make an impression upon anybody visiting our shops and yards. I have in mind a yard where we repaired from 250 to 300 cars per day with about thirty-eight men. The class of repairs included anything outside of longitudinal sills, truck bolsters, body bolsters, end sills, draft timbers, etc. I rather hesitate about making the assertion from the fact that the statements of our neighbors here have been questioned, but we kept those yards clean with one man. (Applause.)

The capacity of the yard was 125 cars. In the morning there was a sufficient number of cars placed at night to keep the men going until noon, when the cars were shifted and additional cars put on the tracks, it being only necessary to shift the yard twice a day at 12 and 6. Our conditions there were such that one man could keep the yards clean. He had the assistance of the car repairers. If a man wanted a draft timber when he started a car, the foreman would see that it was framed ready for him, and all he had to do was to go to the shop and get it. By the time we had the old timber out, the new one was ready. The arrangement of the yard was such that we had outside of the yard what we called a material track. It was not possible to put a car on that track, and our framing shed was possibly 85 yards from the nearest end of the shop track. By this means it was possible to apply wheels at any location on that track because you could run them from one end to the other, and we used what we called a skidding-plank. We had a boy in charge of the material shed, and in addition to keeping it in order, he would report to the storekeeper when he was running short of different materials. This we found to be a great advantage. In the construction of yards oftentimes shop tracks are laid out and no consideration given those who are supposed to take care of those tracks. I believe this is a big mistake. I think it is a good idea to consult the men who are in charge and in direct control, and very often in this way you can make conditions very favorable for repairs, and keep your tracks and shops in excellent condition.

Mr. Bundy: On our road the conditions are different. We work piece work, and the material is all brought out to the men; they are not expected to pick up anything at all, so that we could not handle our yard in the manner Mr. Rasbridge has just cited.

Mr. Rasbridge: If no one else has anything to say on the subject we will consider it as closed. As you will see by your program we were to have an address by Mr. Canfield, but he has been detained in the West on account of business.

Mr. Bundy: On the first of this month, I saw Mr. Canfield, and he consented to be here tonight and deliver an address. However, he said, if he was unable to be here tonight he would be with us at our February meeting. His address will be included in our program for next meeting.

Mr. Rasbridge: The resignation of Mr. Canfield as president, having been accepted, there is a vacancy for the presidency. The executive committee in connection with the nominating committee, in accordance with our constitution and by-laws, have presented a report which the secretary will read:

Secretary: The following is report of nominating committee:

For president— R. B. Rasbridge, P. & R. Ry. Co.

For vice-president—R. F. McKenna, D., L. & W. R. R. Co.

Mr. Henchy: I move you that we suspend the rules, and the secretary be instructed to cast the ballot for both nominees. Seconded and carried.

Mr. Rasbridge: I appreciate the honor conferred upon me, and will try and do all I possibly can in the interest of the association. I would request the liberal support of each and every member. I assure you that I have the interest of the association at heart. If there is no other business on hand to transact, a motion to adjourn will be in order.

Mr. Bundy: I move you that we adjourn to meet the second Saturday in February, at the call of the Secretary. Seconded, and carried. Adjourned.

R. W. Burnett, Secretary.

Established 1878.

RAILWAY MASTER MECHANIC

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Bruce V. Crandall, Editor. Charles S. Myers, Manager.
Maham H. Haig, Associate Editor.

AN interesting modification of practice usually followed in American locomotive service appears in a recent design of passenger locomotive for the Great Eastern Ry. (of England). This variation is in the arrangement of lateral motion of one pair of driving wheels to reduce the length of rigid wheel base. The locomotive is supplied with neither forward nor rear trucks. The driving boxes of the rear drivers are allowed lateral motion against their shoes, the rear side rods being jointed to permit this lateral motion. The tires of the second pair of drivers are blind, which is not unusual practice, however, the clearance for lateral motion being other than between driving boxes and hub liners is a practice entirely foreign to America.

A number of interesting features appear in the design of this locomotive, a description of which appears on another page of this issue.

THE boiler being the life of the locomotive, it naturally follows that the continued increase in size of the locomotive must be accompanied by a corresponding increase in the dimensions of its boiler. The source of heat in its turn being the origin from which the boiler derives its power, the fire-box presents limiting conditions which have brought about a more decided change in locomotive design than any other one point, considering, of course, that the track must remain at its present standard gauge. When compared with a stationary plant the locomotive is decidedly at a disadvantage in its limitations, and while designers have made wonderful advancement in locomotive construction, which redounds great credit to their efforts, it has been at the expense of fuel, for it is a well known fact that a locomotive burns a vast amount of coal in excess of any other form of boiler plant per square foot of grate area. As it has been impossible to supply sufficient grate area for the same amount of power developed compared with other types of boiler plant, it has been necessary to increase the intensity of combustion so as to burn the necessary coal in a small space. The wide fire-box alleviated this difficulty to some extent by presenting a wider surface over which to distribute the fuel, thus reducing the intensity of combustion. The advent of the heavy locomotive, however, necessarily imposed greater demands on the grate and the advantage gained for more efficient combustion barely meets the increased demand of the heavy locomotive, so that while the grate area has increased in size the intensity of combustion, the rate at which fuel is consumed per square foot of grate surface, has hardly been reduced.

THE purification of feed water before delivery to locomotive tanks has not in past years received the consideration justified by its importance. That railway mechanical men are realizing the necessity of purifying feed water before it enters the boiler, rather than attempting to counteract its evil effects by applying so-called water softening compounds within the boilers, is becoming apparent. This fact is indicated by the unusually large attendance at the February meeting of the Western Railway Club, on which occasion methods for treating feed water previous to its delivery, were ably presented. The matter was treated in the form of a lecture by Mr. George M. Davidson, chemist and engineer of tests, of the Chicago & Northwestern Railway, wherein he described the methods followed by this road in purifying water before delivery to the locomotive tanks.

Water which leaves no deposit, causes no corrosion of the boiler metal and results in no foaming, would be ideal feed water for locomotive boilers. In consideration of the great distance traversed by large railway systems, not only is bad water encountered, but the water also varies in the character of its impurities. This, therefore, necessitates treating the water on each division according to the character of the scale-forming material.

The principle followed in the purification of water described by Mr. Davidson, consists in introducing chemicals which will precipitate the scale-forming matter. The precipitate thus formed settles in the bottom of the settling tank and is drawn off from time to time. The water to be delivered to locomotive tanks is drawn from the supply tank at a point near the water line, the intake end of the supply pipe being attached to a float which thus governs the position of the intake opening.

The apparatus used provides a means whereby the chemicals are automatically weighed and mixed with the water as it is obtained from its original source. The mixture is directed into a tank where the precipitate settles, the pure water so obtained being fed to the locomotive tanks and the sludge disposed of as circumstances direct. The same equipment is used for all tanks, the capacity being dependent upon that of the steam pump and that of the settling tanks. Each settling tank has a capacity of 60,000 gallons after allowing for the space occupied by the sludge. Sixty thousand gallons of water can be softened in each 12 hours, or 120,000 gallons per tank per day of 24 hours. The sludge is removed once a month, being let out of the tank by a valve and run into a drain, from which it is carried into storage tanks in the ground, thence transferred to tanks on flat cars; or stored by other means and afterwards carried in the tank cars to some place where it can be utilized. It is used for making whitewash and is especially adapted for spraying machines. Experiments are now being conducted to learn its value as a component of boiler lagging. The material is about of the consistency of thick cream, when removed from the tank, and is very fine and soft when dried.

MR. ROLLIN H. WILBUR.

GENERAL MANAGER OF THE LEHIGH VALLEY RAILROAD.

Mr. Wilbur was horn at Bethlehem, Pa., September 3rd, 1863, and graduated from Lehigh University in 1883. He entered railway service in September of the same year as clerk in the office of the general superintendent of the Lehigh Valley Railroad. Since this date he has held a number of responsible positions with both the Lehigh Valley and the Philadelphia and Reading Railroads. At the time of his appointment as general manager of the Lehigh Valley, Mr. Wilbur was general superintendent of the entire system of the same road.

The first one of these purifying plants was installed at Council Bluffs, Ia., being put in operation July 30, 1902. All the water used in locomotive boilers at that point since the above time has been softened by the apparatus. This water is of a very poor quality and is practically not usable untreated. By treatment the amount of scale-forming material is reduced from 6.69 lbs. per thousand gallons to .51 lbs. per thousand gallons. Six other plants are in operation and eleven in the process of construction, while 25 machines are being built, to be installed as rapidly as possible.

This apparatus has been found by the "North Western" to be simple, inexpensive and automatic. No extra power is required and the regularly employed pumper attends the machine. The cost of treatment varies from 1 cent per thousand gallons as a minimum to 10 cents as a maximum, this being the expense above that required for pumping and delivering the untreated water. The maximum cost refers to a water which would be practically unusable if not treated.

AT this time when locomotive builders are so pressed by demands for motive power that it is impossible to supply them within what was previously considered a reasonable time, it is impossible for designers to obtain immediate results from their work. There are many instances in which a mechanical official has originated a design of interest and tested its practical features before employing it to any extent. This has been accomplished by having a single locomotive built according to his plans and carefully observing its performance. If the test locomotive proved a success a number of similar type would have been constructed, usually with some improvement upon the original design. Under existing conditions such an experimental engine would be long in proving its results.

With such conditions existing there are other directions in which attention may be turned and more opportunity allowed for investigating the defects of present service. The engine report offers an opportunity for observation. By tabulating the records of broken parts shown thereon, a definite idea may be obtained of the parts among which failures are commonly occurring. Such systematic observation followed by an attempt to strengthen the parts showing continued effects of weakness, would lead to the reduction of a number of failures, which while not apt to be the cause of serious accident, would materially reduce the number of minor breakages that hold locomotives in the round house or cause them to lay over a run for which they were scheduled.

The number of locomotives shopped for new flues and the continued trouble caused by leaky flues resulting from the use of bad feed water, forcibly demonstrates the necessity of purifying feed water before supplying it to locomotive tanks. This, therefore, presents a condition worthy of considerable and extended investigation.

Turning from the locomotive to the shop, a number of points present themselves which are worthy of being observed, especially in the old shops designed and built some years ago. The shop of the present is hardly the shop of the past. Shops have previously been designed to meet the demands of service in existence at the time. Now shops must be built to meet the demands of the future as well as the present. This fact is particularly noticeable at this time when the weight of locomotives is rapidly increasing to meet the demands of heavy traffic. In this particular the crane serving the erecting floor attracts special attention. It can hardly be designed to lift the heaviest locomotive on the system and be expected to be of sufficient capacity to handle the heaviest locomotives of ten years hence. It is necessary to anticipate the increasing size of locomotives and be guided accordingly in deciding upon the capacities of the cranes to be installed.

The cutting speed of tools cannot be left to the discretion of men whose training was largely received at a time when speeds were necessarily slow because the machines then in operation were incapable of maintaining high speeds and the tool steel unable to bear up under high speeds and heavy loads. While the theoretical speed at which a machine should operate may not be obtained it is nevertheless expedient to make such observations the results of which would tend to indicate the speeds at which different tools performing given classes of work might be operated to greatest advantage.

The introduction of electricity in modern railroad shops is becoming general and the consideration of the most appropriate method for driving the individual tools is attracting the attention of the most progressive roads. These and other considerations employ the minds of operating officials, so that a cursory glance over the details of the mechanical department demonstrates that while it is necessary to employ the most economical and efficient motive power it is equally essential to be equipped with up-to-date machinery and supplies for the effectual maintenance of the same.

Heavy Freight Locomotive, Chicago, Burlington & Quincy Railroad

THE accompanying illustrations represent one of a number of heavy 2-8-0 locomotives built for the Chicago, Burlington & Quincy Railway. The half-tone illustration herewith presented represents a locomotive for the Hannibal & St. Joseph, a branch of the C., B. & Q. Designated by the road's system of classification, this locomotive is of the D 4 class. Seventy-five of these locomotives have been ordered from the Schenectady Works of the American Locomotive Company, twenty-five of which have been delivered. An order for twenty-five locomotives of the same type has been placed with the Baldwin Locomotive Works.

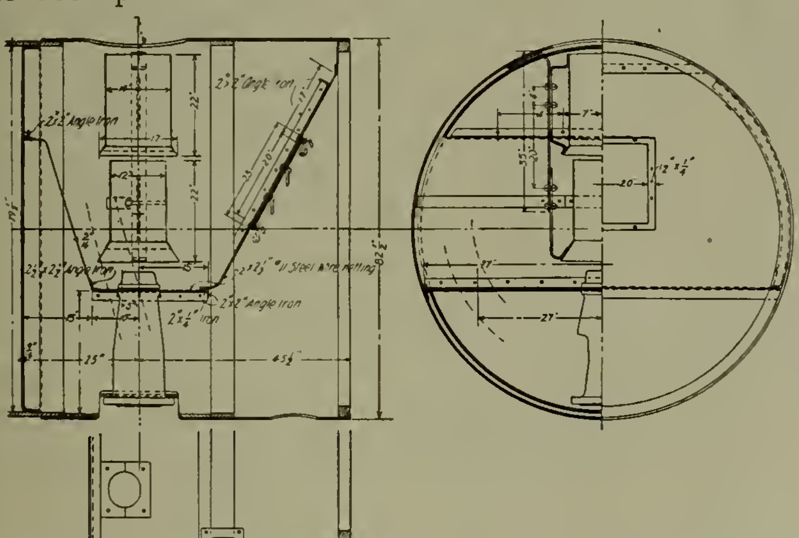


FIG. 1—HEAVY FREIGHT LOCOMOTIVE, C., B. & Q. RY.—FRONT END ARRANGEMENT FOR LOCOMOTIVES BURNING BITUMINOUS COAL.

The boilers are of the wide firebox type, and a number of the locomotives are to burn bituminous coal, the remainder to burn lignite. In order to accommodate the lignite the grates are arranged with fine fingers, and to conform to the conditions of the same fuel a front end arrangement is necessary which differs to some extent from that used by the locomotive burning coal. The stronger exhaust necessary to induce sufficient draft for bituminous coal would be of such great strength as to lift the lignite fires almost bodily from the grates. It is, therefore, necessary to have a larger exhaust nozzle and different form of stack. This stack, shown in one of the accompanying detailed drawings, is of the diamond type, and is necessarily very short to clear obstructions on the line. The nozzle in the front end of the lignite-burning engine is lower than the nozzle of the bituminous coal burners. Both front ends are supplied with two petticoat pipes, the petticoat pipes of the lignite burner having a larger diameter to conform to the jet of steam which issues from the larger exhaust nozzle. The details of the two front ends are shown in Figures 1 and 2. With the exceptions

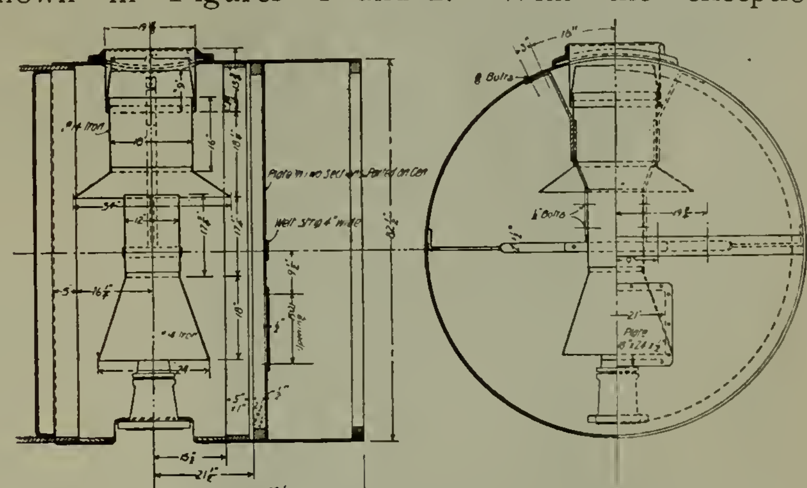


FIG. 2—HEAVY FREIGHT LOCOMOTIVE, C., B. & Q. RY.—FRONT END ARRANGEMENT FOR LOCOMOTIVES BURNING LIGNNITE.

here mentioned the construction of the locomotives is similar. They are designed to operate under 210 pounds of steam and are to be used in heavy freight service. This design is the heaviest type of locomotive built by the Burlington Company.

The firebox is supplied with a fire-brick arch. The valves are of the piston type and the pistons are supplied with extended piston rods. The boiler is radi-

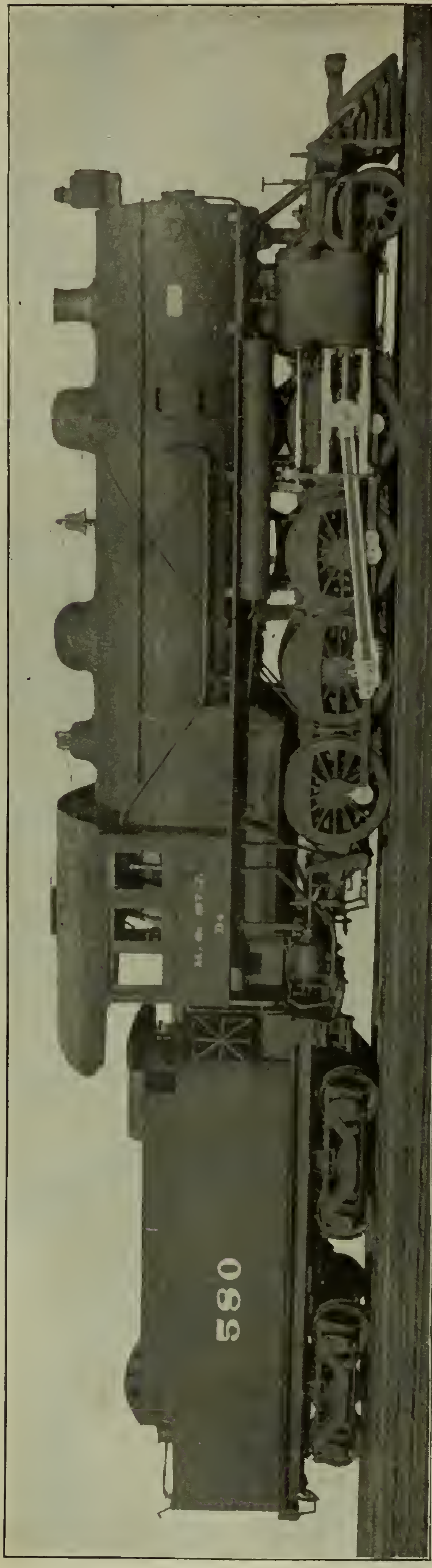


FIG. 3—HEAVY FREIGHT LOCOMOTIVE, C., B. & Q. RY.—GENERAL VIEW, CONSOLIDATION FREIGHT LOCOMOTIVE.

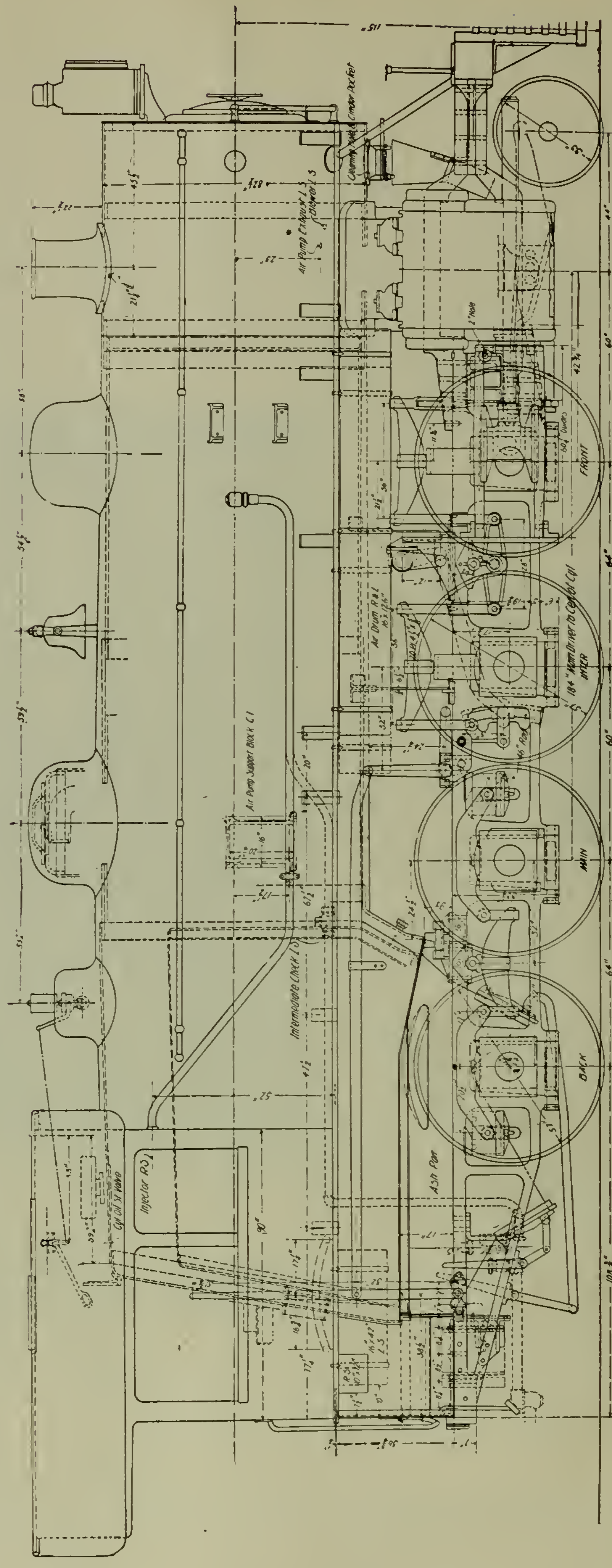


FIG. 4—HEAVY FREIGHT LOCOMOTIVE, C., B. & Q. RY.—SIDE ELEVATION.

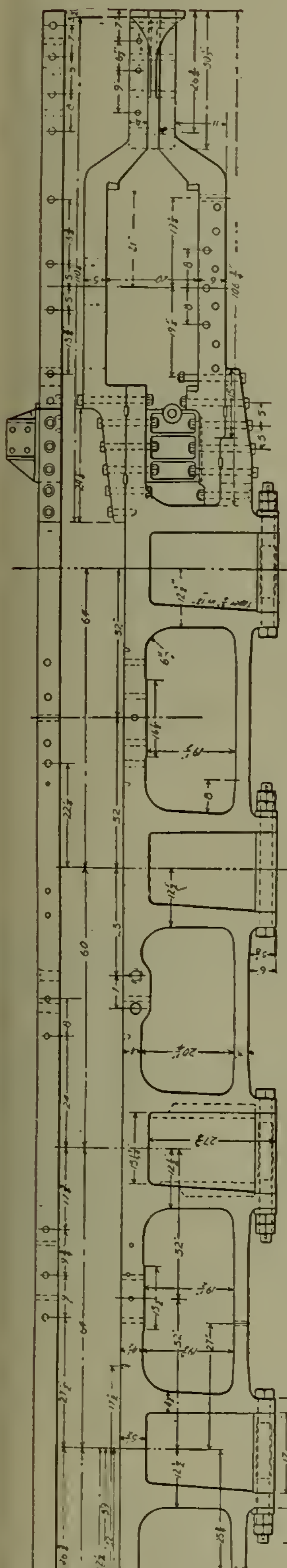


Fig. 5—Heavy Freight Locomotive, C., B. & Q. Ry.—Details of Frame.

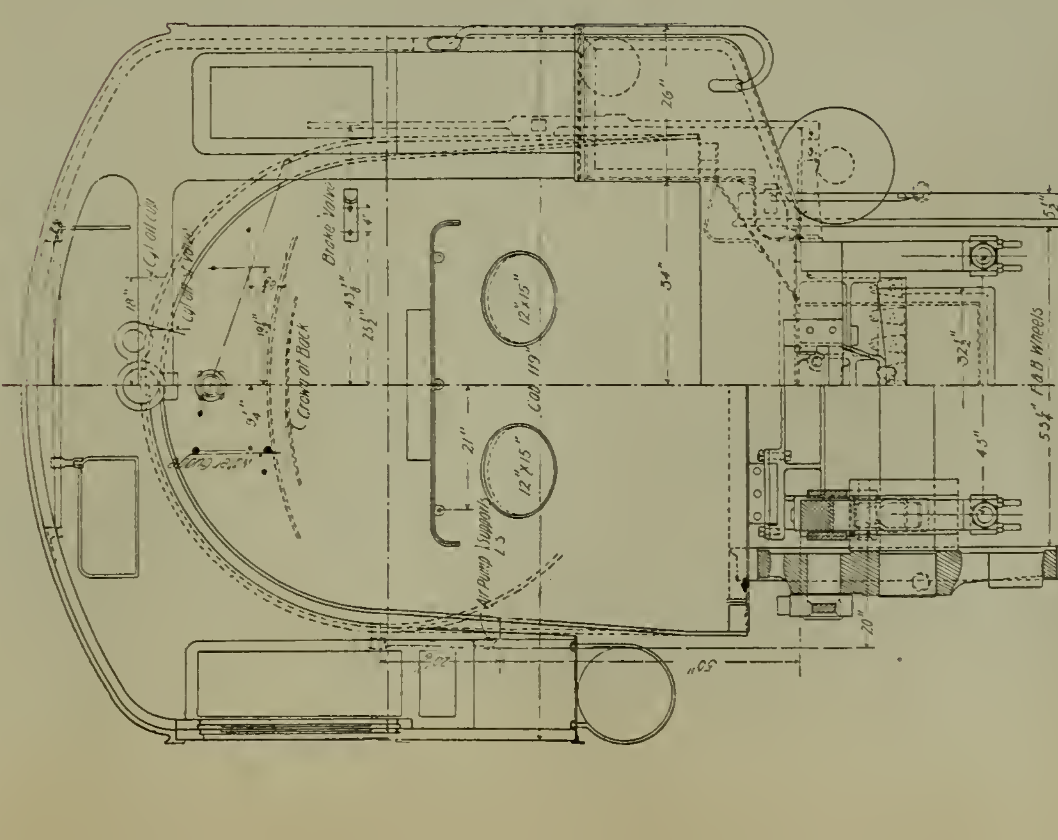


Fig. 6—Heavy Freight Locomotive, C., B. & Q. Ry. —Rear Elevation.

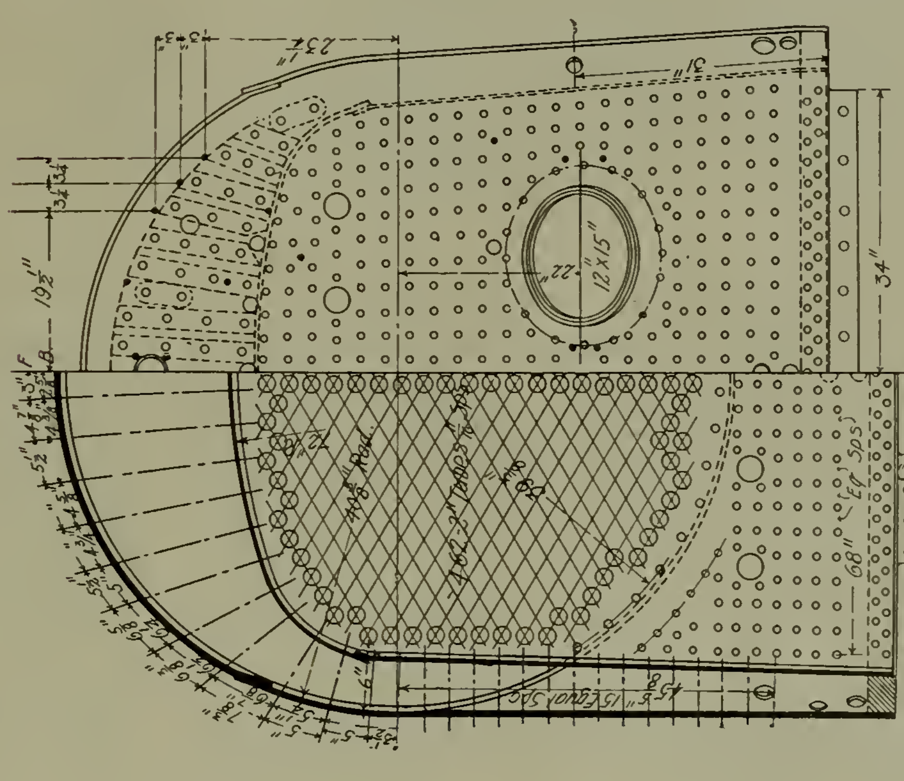


Fig. 7—Heavy Freight Locomotive, C. B. & Q. Ry. Cross Section Through Boiler and Firebox.

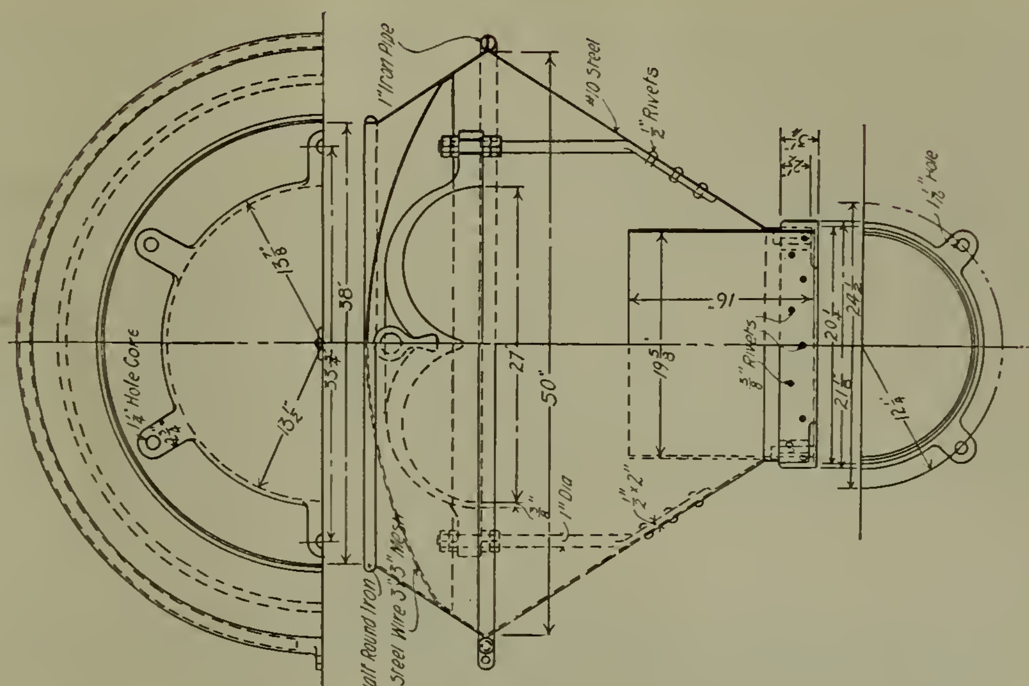


Fig. 8—Heavy Freight Locomotive, C., B. & Q. Ry.—Sectional and Half-Plan Views of Diamond Stock for Lignite-Burning Locomotive.

ally stayed and there are three rows of expansion crown stays with fourteen stays in each row. The flue sheet is braced with rod braces. The back head of the boiler is sloping.

The ash pan is peculiar to the Chicago, Burlngton & Quincy system and is the standard of that road, presenting a form which is very quickly and readily cleaned. While the pan has not the capacity of others with flat bottoms, the self-cleaning feature is of sufficient importance to make this design more desirable. The pan is operated by a hand lever.

The eccentrics present an interesting feature of design which is largely used on this road. By reference to Figure 10 it is seen that a supplementary collar is supplied to add to the strength of the eccentric. The two parts are held together by two studs and two bolts. The position of the eccentrics on the axle is maintained by two set screws, which bear upon two hardened steel keys. One of these keys is shown herewith in detail. The lower surface of the key, which bears upon the axle, is of saw-tooth form, in order to prevent its slipping over the axle. This type of key is used instead of a key which is seated partially in the axle and partially in the eccentric. This arrangement is found to give perfect satisfaction and has the advantage over other forms of keys of being readily adjusted without the necessity of machining an offset to allow for the change of position at any time that it is necessary to shift the position of the eccentric.

The check valve is arranged with a by-pass which permits hot water to flow through a small passage back to the injector pipe, this arrangement being devised to prevent water from freezing in the injector pipe during cold weather. The by-pass opening is controlled by a small valve seat operated by hand. In warm weather this valve may be closed when the hot water feature is not desired. The by-pass of the Burlington valve is cast in the metal rather than using a small supplementary pipe as is sometimes done.

The tender is supplied with a supplementary cab to protect the fireman. The lockers are built above each water leg and the roof of the supplementary cab arches the distance between them. This arrangement is found to protect the fireman more satisfactorily than the single cab, the roof of which extends some distance over the tank. It has been found that with the single cab, a strong draft enters just beneath the rear end of the roof and in passing to the fire door is very uncomfortable for the fireman. The supplementary cab is found to break this draft, adding thereby to the comfort of the fireman.

With the two kinds of fuel used, two different water capacities of tank are arranged. One type of tank has a capacity for 6,000 gallons of water, 7,000 gallons being the capacity of the other type. Both are designed to carry 12 tons of coal.

The coupler at the front end of the locomotive is of the Chicago type which is used generally on the C. B. & Q.

Determining the tractive effort from the given dimensions of cylinder and driving wheel, the engine is capable of exerting a starting power of 42,018 pounds. The weight on drivers being 187,800, the ratio of adhesive weight to tractive effort is 4.46; the ratio of tractive effort to total heating service is 11.04, and the ratio of total heating surface to grate area is 70.6.

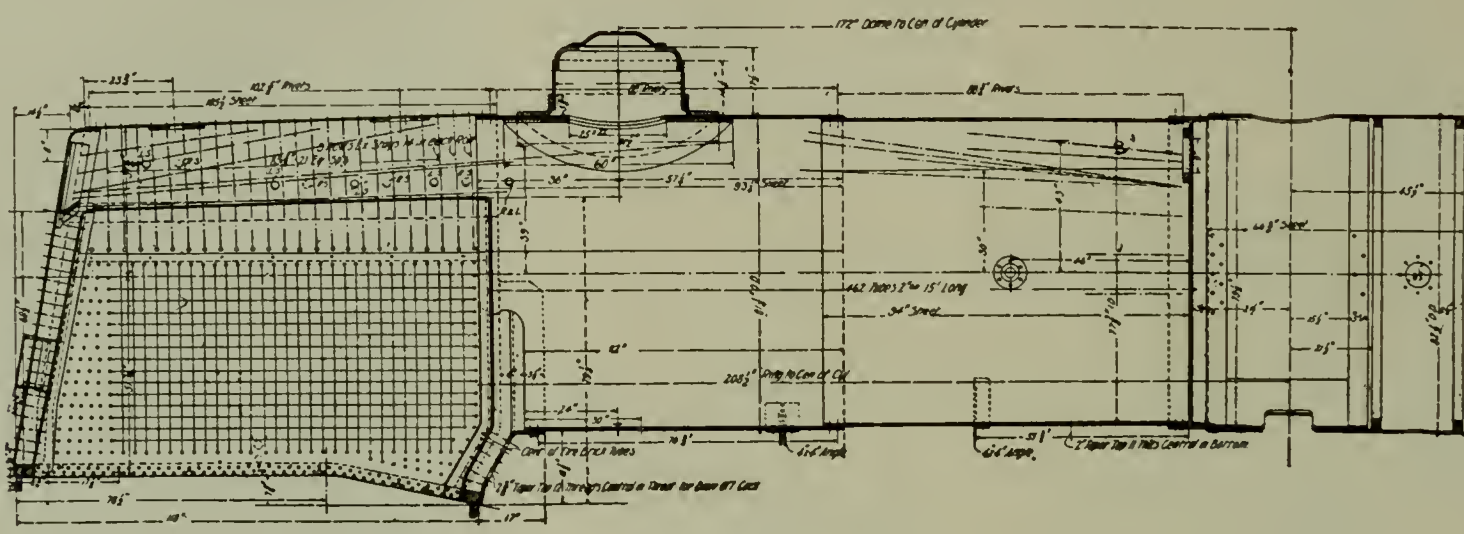


Fig. 9—Heavy Freight Locomotive, C., B. & Q. Ry.—Side Elevation of Boiler.

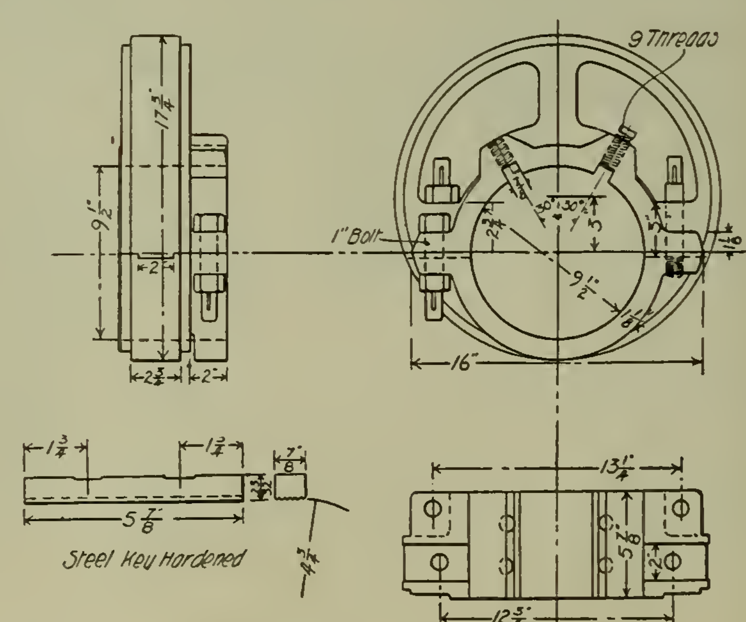


Fig. 10—Standard Eccentric of C., B. & Q. Ry.

In presenting the illustrations of these locomotives, we acknowledge the courtesy of Mr. C. B. Young, Mechanical Engineer, and Mr. J. S. Goddard, Chief Draftsman of the Burlington system.

The following table presents the general dimensions and further details of construction.

Class by roads designation	D4
Gage	4 ft. 8½ in.
Fuel	Bituminous coal, lignite
Weight on drivers	187,800 lbs.
Weight on truck wheels	21,100 lbs.
Weight, total	208,900 lbs.
Weight tender, loaded	112,200 lbs.
Wheel base, total, of engine	24 ft. 4 in.
Wheel base, driving	15 ft. 8 in.
Wheel base, total (engine and tender)	55 ft. 2¼ ins.
Height, center of boiler above rails	9 ft. 7 ins.
Height of stack above rails	15 ft.
Heating surface, firebox	195.06 sq. ft.
Heating surface, tubes	3605.8 sq. ft.
Heating surface, water tubes	26.71 sq. ft.
Heating surface, total	3827.57 sq. ft.
Grate area	54.21 sq. ft.
Drivers, diameter	57 ins.
Journals, driving axle, size	9½ ins. x 12 ins., main. 9 x 12 ins.
Journals, truck axle, size	6 x 10 ins.
Cylinders, diameter	22 ins.
Piston stroke	28 ins.
Piston rod, diameter	4 ins.
Valves, kind of	Piston
Valves, greatest travel	6 ins.
Valves, outside lap	1 in.
Valves, inside clearance	⅛ in.
Valves, lead in full gear	Line and line at front with ¼-in. lead at one-quarter cut-off.
Boiler, type of	Radial stayed
Boiler, working steam pressure	210 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel and outside of firebox	9-16 in., ⅝ in., ¾ in., 13-16 in., ⅞ in. and 1 in.
Crown sheet stayed with	Radial stays
Firebox, length	108 ins.
Firebox, width	72¼ ins.
Firebox, depth, front	79¼ ins.
Firebox, depth, back	68½ ins.
Firebox, material	Steel
Firebox, thickness of side and back sheets	⅜ in.
Firebox, brick arch supported by water tubes.	
Firebox, water space, width	4½, front 4½ in., sides 4½
Tubes, number	462
Tubes, material	Charcoal iron
Tubes, outside diameter	2 ins.
Tubes, length over sheets	15 ft.
Exhaust nozzle	5⅓ ins., 5¾ ins., 6-in. diameter
Stack, diameter	16 ins.
TENDER.	
Tank capacity for water	6,000 gals. and 7,000 gals.
Coal capacity	12 tons
Type of under-frame	Wood, with center sills of steel
Total weight of empty tender	42,200 lbs.

Cranes for Railroad Shops

By Mr. G. R. Brandon, General Engineer of the Whiting Foundry Equipment Company

WITH modern shop methods, electric traveling cranes of the highest type have become increasingly indispensable. Work is not only done with greater speed, but cost is so reduced by proper crane facilities that no one one in competitive business attempts to do without. It is an accepted fact that cranes have done more than any other single agency to reduce the cost of production to the present basis. This is especially true in railroad shops.

In the foundry, machine and boiler shops usually included in railroad plants, the same principle applies in selection of cranes as in other similar enterprises, but in the locomotive departments this opporunity is multiplied. In this service the maximum load is generally handled, and without proper cranes the task of lifting a locomotive in order to withdraw the running gear is extremely slow and laborious.

To expedite the work and reduce the cost cranes should cover almost the entire area of the shops, the power to be provided depending on the nature of the service. The heavy molding floor in the foundry and large machine and assembling floors in machine and boiler shops should be served by electric travelers, reinforced as required by stationary or transferable bracket jib cranes mounted on the building columns, or by traveling jib cranes along the traveler runways. These auxiliary cranes must not interfere with the free operation of the travelers over the entire crane space when desired.

The illustration in Fig. 1 shows traveling crane in boiler shop in Northern Pacific R. R. shops, Brainerd, Minn.

The side bays, where smaller tools are located, should be furnished with traveling cranes of lighter capacity. Machinery should be driven by independent motors or by shafting arranged so as not to interfere with operation of the traveler. Where work is light and span moderate, hand power can be used; otherwise electric power is preferred. In shops already constructed, where not permissible to make radical changes in the installation of machinery, the walking jib crane may be utilized. This type of crane practically consists of a jib crane mounted on a truck which operates on a floor track, and also having a truck at the top so arranged that the lateral forces are resisted by a suitable track attached to the framework of building overhead. Clear floor space must of course be provided for such a crane, and it does not cover the space nor can it be operated as conveniently as a traveler, but it may be used to great advantage in cases where a traveler can not be installed. These are preferably equipped with electric power.

Certain machines, such as axle lathes or other tools where operations on heavy pieces are constantly repeated, may be furnished with individual cranes to

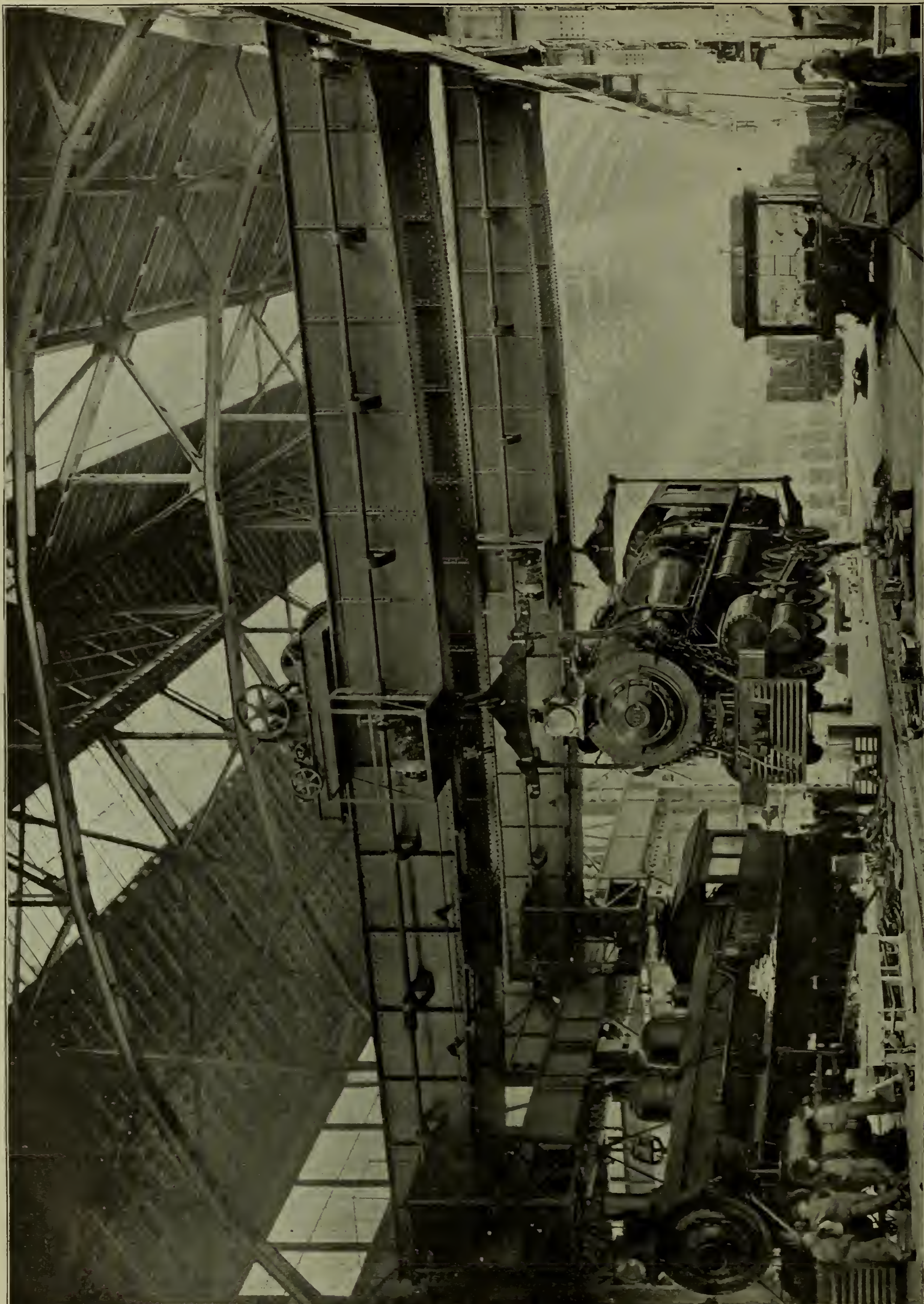


FIG. 5—HEAVY FREIGHT LOCOMOTIVE, WEIGHING 260,000 POUNDS, READY FOR SERVICE, BEING LIFTED BY TWO ELECTRICALLY-OPERATED TRAVELING CRANES OF 60 TONS CAPACITY EACH, MANUFACTURED BY WHITING FOUNDRY EQUIPMENT CO., TOPEKA SHOPS OF THE ATCHISON, TOPEKA AND SANTA FE RAILWAY.

great advantage. Cranes under these circumstances are called on for frequent service, and as usually the capacity is small and other requirements moderate, the expense of supplying these cranes is not to be considered, in view of the great benefit in cutting down the cost of work. Compressed air hoists mounted on bracket jib cranes or small travelers are especially available to meet these conditions. An illustration of axle shop equipped with air hoist bracket cranes is given in Figure 3.

Another place for isolated cranes is found in the forge shops, at hammers, bulldozers, and similar machines. These cranes may be of the jib type, but so arranged as not to interfere with electric travelers operating overhead. The self-supporting pillar cranes can be obtained, providing there is sufficient work to warrant a crane.

An idea of the advantage of cranes for this service is obtained when it is considered, neglecting practical consideration, that with an electric traveler using 60 H. P. motor for hoisting, a load of 60 tons can be lifted 5 feet in one-half minute, but with hand power devices operated by, say, ten men, theoretically it would require at least 20 minutes. In practice, however, the results are much more favorable to the use of crane than in the example given. In the first place, the preliminaries attending a lifting operation require much less time with a crane than without; only a "hitch" on the load is required for the crane, as compared with the long preparation for "picking up,"

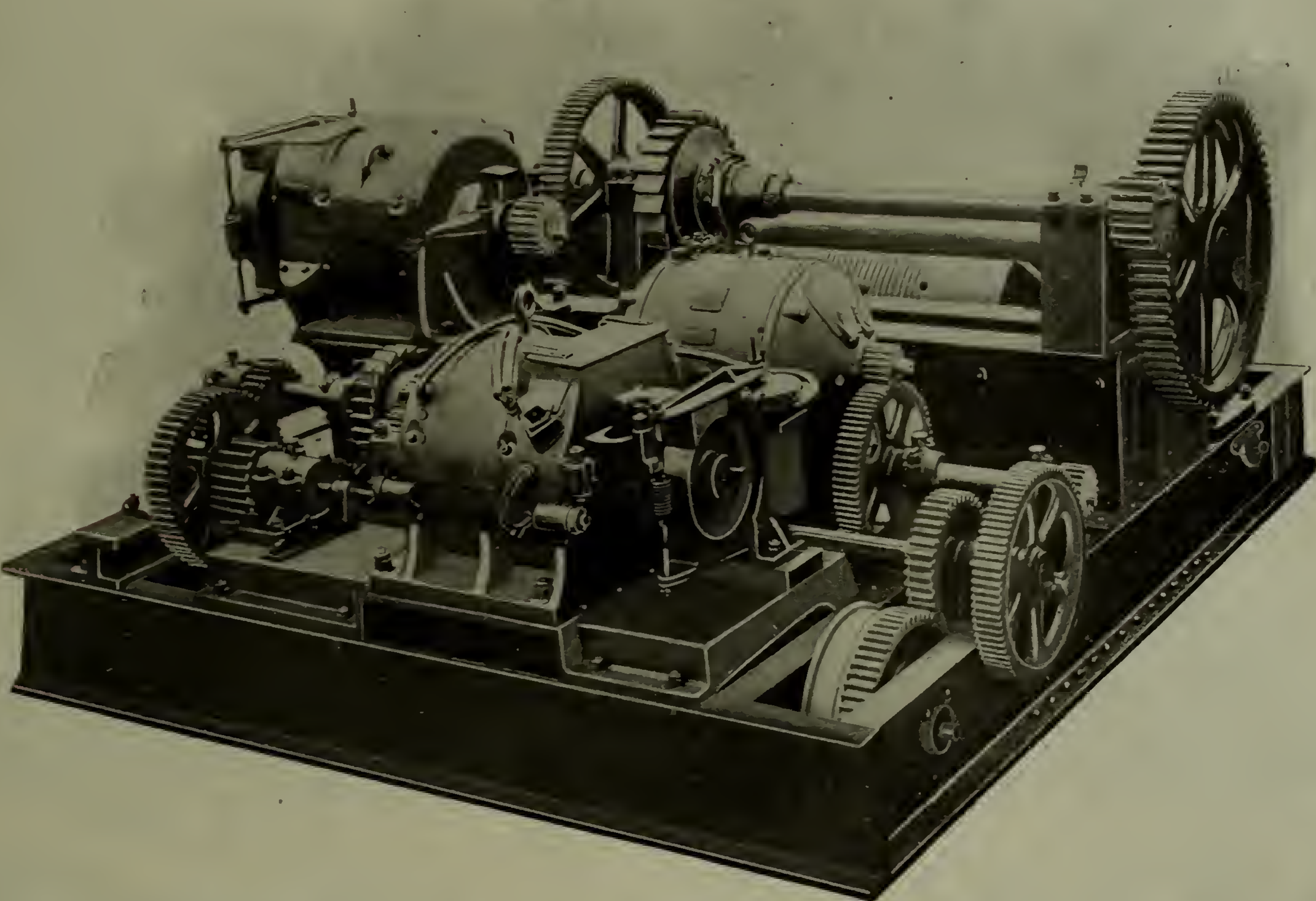


FIG. 1—THREE-MOTOR TROLLEY FOR CRANE, CAPACITY 60 TONS, FOR ATCHISON, TOPEKA AND SANTA FE RY., TOPEKA, KANSAS.

even when pneumatic jacks or other power appliances are used. In lifting, the crane is positive and reliable, while with men there is always delay from some cause. It must not be overlooked that besides the great saving in labor and expense, cutting down the time of these operations increases the output of the shop proportionately.

Cranes for the locomotive department will consist of electric travelers of capacity for maximum load of a complete locomotive, and also other travelers operating on same or higher runways for handling lighter parts.

or wall bracket jib cranes will answer, operated by hand or compressed air. Stock will be delivered and finished product carried away by the traveler, and also this crane can be used in making repairs on hammers or other tools which are frequently required and for which adequate facilities are seldom provided.

While the ecenomy and advantage of cranes in other departments is conceded by the railroad officials, there has been a tendency noted in some sources to reject these claims as far as the locomotive shops are concerned, and shift is made with old methods rather than incur the larger investment for installation of cranes. The fact is, however, that even greater saving

Fig. 2—Four-Motor Traveling Crane, 25 Tons Capacity Main Hoist, Equipped with Alternating Current Motors, for Northern Pacific Railroad, Brainerd, Minn.

Fig. 4—Electric Traveling Crane with Two Double Hoist Trolleys, Capacity 70 Tons, for Missouri Pacific Ry., Baring Cross, Ark., Manufactured by Whiting Foundry Equipment Company, Harvey, Ill.

across or lengthwise the building. In the former case one crane is usually installed, having the capacity of the heaviest load to be lifted. Figure 4 illustrates such a crane in shops of Missouri Pacific R. R., Baring Cross, Ark. A transfer table in the yard is required with this plan to transfer locomotives from the various pit tracks to the switch tracks. In the case of longitudinal pit tracks, two cranes are required, and a locomotive is lifted between them. Each crane has capacity for about 60 per cent of full load. One or both may be fitted with auxiliary hoists of moderate capacity and high speed, with which to handle the ordinary light loads. An installation of this kind is given in Fig. 2, showing A., T. & S. F. R. R. shops, Topeka, Kansas.

Fig. 3—Twenty-six Air Hoist Bracket Jib Cranes, for Howard Axle Works, Carnegie Steel Co., Homestead, Pa.

No transfer table is required with the longitudinal system, and this, together with great saving in yard room, more than offsets the expense of two cranes over one. The local conditions must determine which system should be adopted.

As to requirements in the cranes themselves: Design is most important. The best crane, other things being equal, is the one having simplest construction and the smallest number of working parts. Parts having different functions should be independent and all shafts, motors, etc., should be easily removable in case of necessity. This feature of accessibility is vital, for if repairs are difficult to make, not only are they more expensive, but the operation of the whole shop may be delayed in consequence.

In electric travelers, the efficiency of mechanical and electrical brakes determine the utility of the crane in a large measure. Both brakes should be self-contained and simplified in every way. Necessary adjustment should be easily made and design should be such that they may be readily taken apart.

A factor of safety of at least five in all structural parts and a larger factor for working parts is recommended. While it is desirable to have strength, increased weight is not always evidence of a stronger crane. Design should be such that superfluous weight is avoided, as any increase in this direction only means additional power for operating the crane.

Two hundred and twenty volt direct current is most commonly used. Alternating current is rapidly coming into favor and this power is very successfully applied for operating cranes. Former difficulties with reference to regulation of speeds have been entirely overcome.

While the crane builders should have all facilities for the complete mechanical construction of crane, it is best to use electrical apparatus, such as motors and controllers, which is manufactured by those making this business a specialty. In this way standard apparatus is obtained, which can be replaced with the least difficulty should occasion arise, and, furthermore, the latest improvements in construction are thus insured.

The illustrations in the article are from protographs of installations made by the Whiting Foundry Equipment Co., Harvey, Ill.

The New York Railroad Club

THE history of the origin and career of the New York Railroad Club is given in a paper presented to the club in May, 1902, and we are permitted by the author, Mr. M. N. Forney, to quote the following:

"A number of the officers and members of the Master Car Builders' Association some time ago concluded that its usefulness could be very much extended if a place were provided in New York for holding meetings, social reunions, etc. With this object in view a consultation was held, which resulted in renting several very convenient and comfortable rooms at No. 111 Liberty street. Through the exertions of Messrs. Garey and Smith the rooms were neatly carpeted and furnished with conveniences for writing, etc. It is intended to make them a sort of rendezvous for the members of the association, to supply every convenience for the transaction of business, and to make them the depository of the archives of the association, and for all records, drawings, models, etc., which it may be thought desirable to preserve. It was designed, in fact, to make the place a sort of club room for the members of the association while they are in New York.

Mr. H. H. Vreeland, President of the New York Railroad Club.

About thirty members of the association assembled, with as many of their friends, for the purpose of celebrating the opening of the rooms. The chair was taken by Mr. Andrews, and the objects of establishing the rooms were stated by Mr. Garey and others. A number of members and their friends presented their congratulations and a substantial lunch was then served." (The club began by eating and has continued it ever since.) "After a liberal consumption of solids and absorption of liquids, a committee which was appointed to prepare resolutions reported as follows:

Whereas, The Master Car Builders' Association has been in special convention assembled in the rooms provided in the City of New York for the permanent occupation and casual meeting of its members; and

Whereas, The fittings and appointments of the same and the purposes for which they are provided meet our unqualified approval; therefore,

Resolved, That the thanks of this association be, and the same are hereby, tendered to Messrs. Garey and Smith for their ability, taste and discretion in the selection and appointments of these headquarters.

The resolution was unanimously adopted. A committee consisting of Messrs. Garey, Smith and Forney was appointed for the purpose of receiving applications from inventors, manufacturers and other parties for the privilege of presenting models or drawings of their inventions to the notice of the members in the rooms of the association.

A resolution was also adopted appointing the third Thursday evening of each month as the time for holding a business and social meeting in the rooms.

All the members of the association are invited to make use of the rooms while in New York, and especially to meet there at the times appointed for regular monthly reünions."

(The foregoing paragraphs are from the press of 1872 and were repeated by Mr. Forney.—Ed.)

If my memory serves me correctly, Mr. Depew was present at that meeting and was the author of these resolutions.

It will thus be seen that the New York Railroad Club was started as a sort of appendange of the Master Car Builders' Association. Later its name was changed to that which it now bears.

Of its early proceedings, even if there were time, no connected account could be given, as no regular minutes were kept, but it may be said that the meetings of their early days were good, bad and indifferent. Often not as many as a baker's dozen of persons were in attendance. We succeeded, however, in getting such men as William and Coleman Sellers, George Westinghouse, Professors Thurston and Wood, then of the Stevens Institute in Hoboken, to come and give us talks. Of course there were many others whose names do not now occur to me. We often had interesting and instructive discussions, but at other times it must be admitted they were very dull.

On one occasion Professor Thurston had one of his testing machines sent over from Hoboken and some of the manufacturers of cast iron car wheels were induced to send test pieces of cast iron, of the strength and resistance of which graphical records were made by the professor's machines. It was one of the earliest instances of using that method to represent the qualities of cast iron. Many of the wheel makers attended and the subject was continued for discussion for a number of evenings, and probably did a great deal to improve the quality of chilled wheels supplied to railroads. Mr. William Sellers talked to us about screw threads, the standard for which had been adopted not long before, and of which I will have something to say later on. Mr. Westinghouse talked to us about brakes. On another occasion Professor Thurston also exhibited and explained the construction and operation of his machine for testing lubricants.

Quite some years ago, while your speaker was editing a paper, we had an occasional visitor who, when he had finished his interview with my assistant, would inquire of him whether "he ever lubricated the amenities of civilized life." It was intended to be a polite invitation to take a drink. Quite a regular attendant at these early meetings of the Railroad Club was a member in the supply business. He would usually remain in the lobby outside the meeting room and with the door ajar would catch the eyes of different members who were railroad men and crook his finger, which had the same meaning as the euphonious invitation of our visitor of former days. In this way many experiments in different kinds of lubricants were made outside of the Liberty street rooms, besides those which were made within; in justice to the members, though, it should be said that they rarely lost their bearings!

If we make a comparison of some of the meetings of those days with our recent ones, the contrast will be very great. It was hard then to maintain interest in the proceedings, although we sometimes worked ourselves up into a high temperature, but these early members who kept up their interest in the proceedings and their allegiance to the club and its objects, like Dickens' character, deserved a great deal of credit for being "jolly." Nevertheless, the proceedings of the club, to a very great extent, served their purpose by exciting interest in subjects in which railroad companies and railroad officers were concerned.

The efficiency of discussion, of agitation, or disputation—talk, if you choose to call it that—is of very great importance in nearly all relations of life—the friction of minds against each other is like that of putting encrusted locomotive tubes into a rattler and revolving it; it knocks off the scale and corrosion and makes them clean and bright. Men's minds get encrusted with all kinds of delusions, mistakes, prejudices and fallacies. Put them into an assemblage like this, and let them come in contact with each other, and the mental excrescences will be knocked and worn off and you may finally be able to take them out of this intellectual rattler clean and bright and leave the incrustation behind.

These considerations bring up the important question, What is or should be the chief object of an organization of this kind? It has been said that every assembly—except a Quaker meeting—in its prime intent and use is a talking body. The word "parliament" is composed of the word "parley"—which means to speak with another—and a suffix. It has been said, too, that in most controversies there is some truth on both sides, and therefore the purpose of discussion is to bring out the truth of each side. Dr. Holmes said that not only are there two sides to all questions, but he thought most subjects are at least hexagonal. If they be many sided, then the object of discussion should be to bring the truth from all sides, and as the value of talk, like that of all other human activity, depends upon its quality, the main purpose of this club and its meetings should be to hear the fullest, ablest and most intelligent discussions of the subjects brought before it. All other objects should be subordinated to that, and the continued success of the club will depend upon the character of its proceedings—that is, of its talk. If this is interesting and instructive, intelligent members will attend the meetings; but if the papers and the discussions are flat, stale and unprofitable, that kind of people will stay away. Let it be the aim of all of us, then, to keep the standard of the proceedings as high as possible, knowing that the present and future prosperity of the club will depend upon that alone and not on the flavor of the punch or the quality of the lunch which is served.

Largest Dining Car in Service

THE Pullman Company has recently turned out an elaborate dining car for the American Tourist Association. This car has a seating capacity of forty-eight, seats being provided for forty persons in the main section and seats for eight more in a private dining room. This seating capacity is greater than that of any dining car yet built. The car is modern in every detail and complete in all its appointments.

Immediately upon the completion of the car it was sent on a tour to Mexico, in which service it is engaged at the present time. In this service it is part of a special train under the management of the American Tourist Association. An unique feature of the train is an observation car specially designed to permit unobstructed view of the scenery passed. The design of this car is such that its sides and top may be opened, making it a popular car for sight-seeing in warm climates.

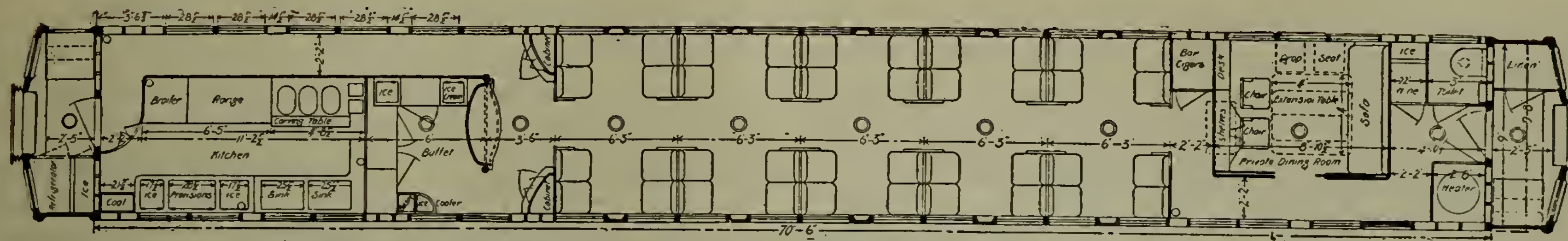
Large Dining Car of American Tourist Association —Interior.

The dining car is illustrated in the accompanying half-tone engravings and the plan of the car is shown in the line drawing. It is Pullman standard height and width and is 78 feet over all. It is carried on two six-wheel trucks and fitted with Westinghouse automatic brakes. Lights are supplied by gas, electricity or oil. By supplying connections for the several systems of lighting the car may be adapted to conform to the methods of lighting in operation on railroads in any part of the country in which it may be in service. The same applies to a certain extent to the heating apparatus. The car is piped for steam heating connections and is supplied as well with a Baker heater, to be used under circumstances in which steam is not available. The Pullman standard color prevails throughout the car, with special decorations in gold, exterior and interior. The name Quantzintecomatzin, seen on the car in the illustration of the exterior, is an Aztec word which means "the noble eater of the royal dish."

Large Dining Car of American Tourist Association —Exterior.

The grand saloon, or main dining section, occupies a position nearly central in the car. This section is 31 ft. 3 in. long. Opening into a passage leading from the main section to the platform is a small private dining roow 8 ft. 10½ in. by 5 ft. 5 in, having a capacity for eight persons. The kitchen and pantry are at the opposite end of the car. The arrangement of these two compartments is similar to the general design of such sections in usual service.

For the illustrations herewith we are indebted to the Pullman Company and the American Tourist Association of Chicago.



LARGE DINING CAR OF AMERICAN TOURIST ASSOCIATION—PLAN VIEW.

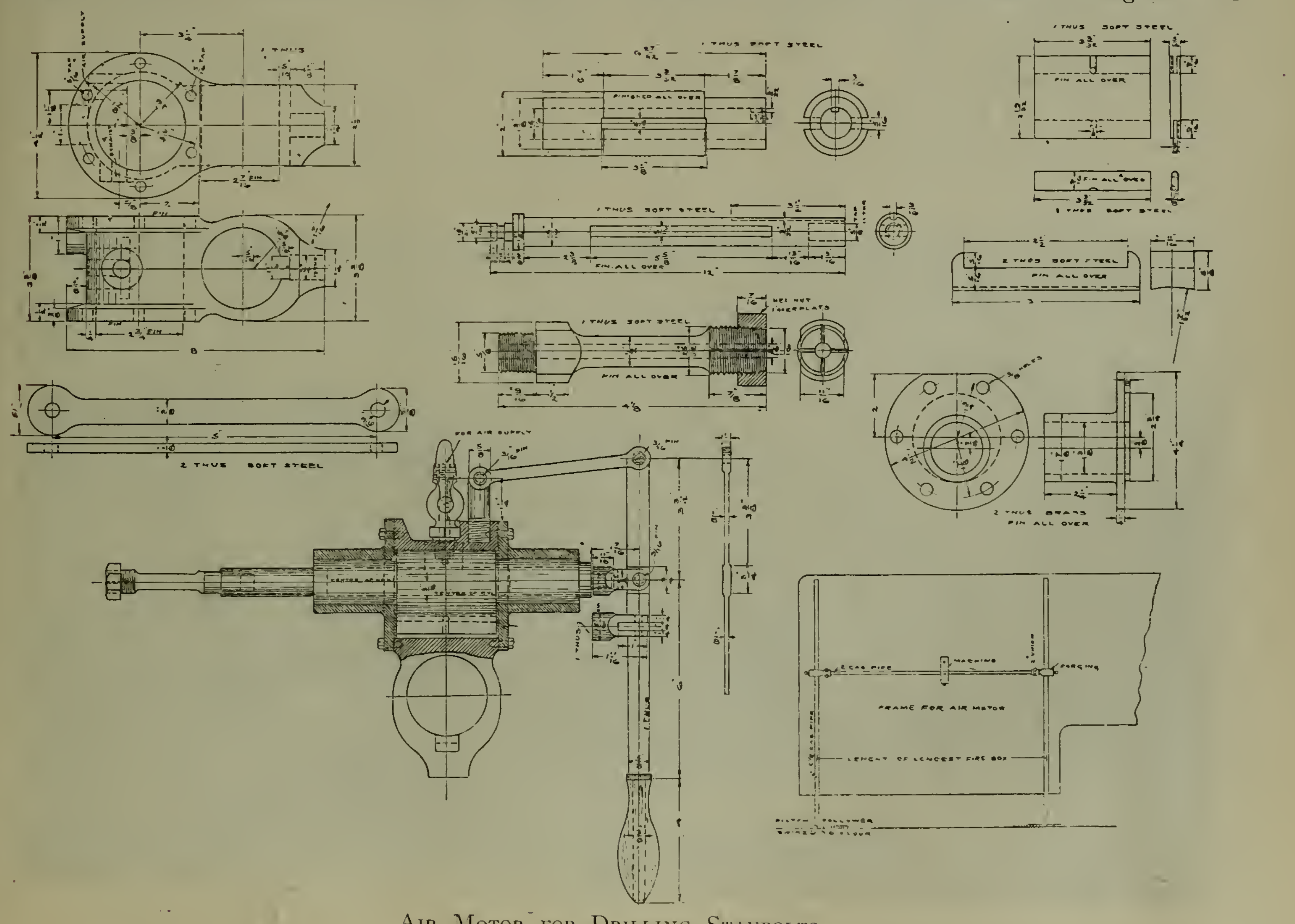
Air Motor for Drilling Staybolts

THE accompanying line drawing illustrates an interesting device for drilling telltale holes in staybolts. The apparatus is designed for use after the staybolts are in place. The machine is operated by air and is capable of drilling 36 stay bolts per hour.

When in operation the machine is rigidly attached to a horizontal bar, which in turn is supported by two vertical members. The vertical supports are of 2½-inch gas pipe and the horizontal piece is of 2-inch pipe. In order that the horizontal bar may be raised and lowered to conform to the height of the rows of staybolts in the boiler, each end is attached by a 2-inch union to a forged lug which may be made to slip along the vertical piece and which is supplied with a set screw to hold it in any desired position when the proper adjustment has been made. The unions facilitate the dismembering of the parts of the supporting frame when not in use. In order that the frame may maintain a rigid, upright position, the vertical pieces terminate in wide bases, which may be spiked to the floor.

A lug is cast beneath the machine, which encircles the horizontal, or guide, rod. A set screw maintains the position of the machine when adjusted.

The several parts of the machine are shown in detail and assembled. The center line of the drill is offset ⅜-inch from the center line of the cylinder. The drill socket is applied to an arbor which extends throughout the length of the machine, terminating at the opposite end in a lug to which the feeding handle is



AIR MOTOR FOR DRILLING STAYBOLTS.

attached. Revolving with, and about, this arbor is a spindle, the diameter of the arbor being such as to allow it to slide longitudinally, without restraint, within given limits. This movement is given by the feeding handle, which is operated by hand.

Through the spindle is a 5-16-inch keyway 3 3-32 inches long, and through the arbor is a 5-16-inch keyway 5⅝ inches long. The keyways of the two are made to conform by a dowel pin. A steel feather 5-16 inch thick is inserted within the keyway thus made. In such a position with relation to the spindle and arbor the feather offers a surface to receive the force of air supplied through an airport passing through the walls of the cylinder. The force of the air against this feather rotates the spindle and arbor, thus giving impetus to the drill. In order that air may not leak past the edges of the feather, packing strips ⅛ inch thick are inserted.

The offset of ⅜ inch between the center lines of the cylinder and the spindle exposes the surface of the feather, which extends beyond the diameter of the spindle, to the force of the air supplied. At the same time this offset is such as to cause the spindle to bear continually, though lightly, against the wall of the cylinder. This arrangement prevents the passage of air directly from the supply port to the exhaust port. Being thus obstructed across the shortest distance between the two ports, the air must pass around the spindle, and in so doing forces the feather around before it.

As explained above, the keyway through the arbor is longer than the keyway through the spindle and the arbor is of such diameter as to slide within the spindle. It is therefore evident that by operating the handle attached to the end of the arbor, the drill may be fed to or drawn away from the staybolt.

For the illustration presented herewith we acknowledge the courtesy of Mr. T. A. Lawes, superintendent of motive power and machinery of the Chicago & Eastern Illinois Railroad.

Atchison, Topeka & Santa Fe Railway Locomotive Crane

THERE has recently been turned out of the shops of the Atchison, Topeka & Santa Fe road, at Topeka, a novel form of locomotive crane for service in the yards and shops at that point, which consists of a light four-wheel switching engine somewhat altered in construction and having mounted on the smoke-box a four-ton hoisting crane. In the accompanying illustrations the half-tone engraving shows the machine in service, a pair of driving wheels being loaded upon a car, and the line drawings represent sectional and elevation views, in which the dimensions of various detail parts are indicated. The design of this device was prepared under the direction of Mr. Edward Grafstrom, mechanical engineer of the Atchison, Topeka & Santa Fe Railway, and the construction carried out under the supervision of Mr. David E. Barton, general foreman locomotive department, Topeka shops, to which officials we are indebted

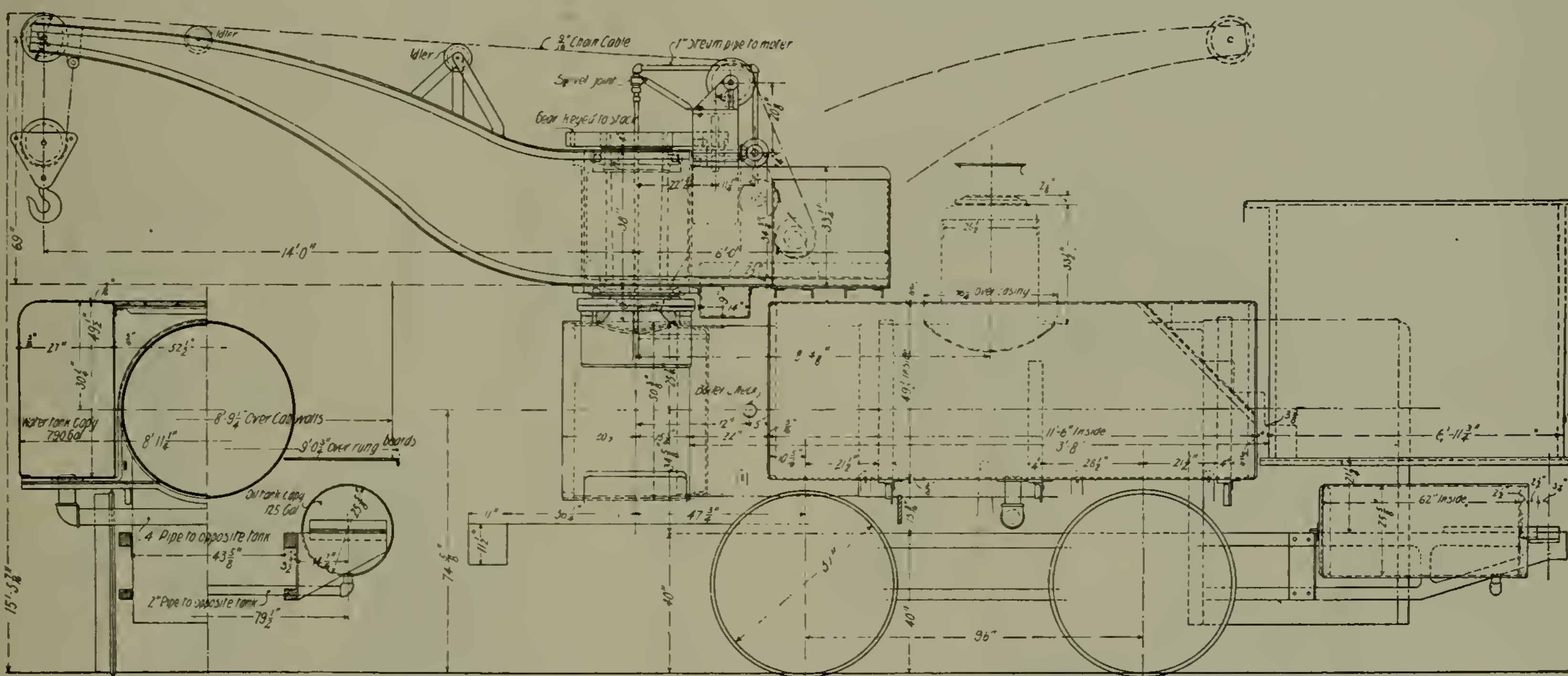
View of Atchison, Topeka & Santa Fe Ry. Locomotive Crane in Operation.

for the photograph and drawings from which the illustrations were prepared, and for other details upon which the following description is based.

This arrangement comprises a novel, economical and serviceable device for the purpose intended. Operating, as it does, independently of an overhead construction for maintenance of equilibrium, and developing its own motive power, it may be used conveniently in transferring material between the shop and yard, and, though not designed for such, can be utilized in wrecking service in emergency cases. The rapidity with which heavy material may be transferred by the machine as compared to movement through the agency of a gang of laborers is immediately apparent.

balance is constructed an enclosed platform or box in which the operator stands when employing the mechanism.

In order to dispense with a tender and to increase the weight and stability of the machine, the locomotive has been supplied with side water-tanks and the fire-box has been rearranged to burn oil as fuel. The oil tanks are cylindrical in form and secured to the frames immediately beneath the cab, the capacity of each being 125 gallons, the inside length 62 inches and the inside diameter 25⅝ inches. A 2-inch pipe connects the two tanks, being led from an elbow placed in the bottom. The inside dimensions of side water tanks are length 11 feet 6 inches, height 49½ inches and width 27 inches, these tanks being con-



Elevation and Section, Atchison, Topeka & Santa Fe Railway Locomotive Crane.

The crane attachment is located above the smokebox, as previously stated, and the latter is reinforced within to bear the added strain. The sleeve or swinging device supporting the crane encases the smoke stack. The power by which the crane is swung and the hoisting movement is supplied by an air motor. The motor may, however, be operated by steam from the locomotive boiler, having been double piped in order to be so operated when necessary. The supply pipe through which the power for operating the hoisting motor is delivered is led up the axis of the crane and fitted with swivel joint at the top, the steam pipe to the motor being of 1-inch diameter. The swing of the crane is on a 14-foot radius and the hoisting cable consists of a 9-16-inch chain. The crane is counter balanced to oppose the overbalancing of the weight being lifted when in service, and above the counter-

nected by a 4-inch pipe led from the bottom underneath the boiler shell and over the frames. Each of these has a capacity of 790 gallons, and is carried on a framing consisting of angle irons, as shown, and tied by angles at the top, over which a wooden flooring is placed, extending above and across the boiler shell. The braking power is supplied by straight air. Blocks are arranged between the frame and forward driving boxes, leaving a clearance of one inch. This arrangement is to relieve the spring rigging of the added strain should the weight being hoisted by the crane be sufficient to lower the frame a distance greater than the clearance above mentioned. It is proposed to place swinging jacks under the front end of the locomotive to further assist in maintaining a rigid support, should it be found necessary. Further details of the apparatus may be had by reference to the line drawings.

Heavy English Locomotive

SEVERAL interesting features appear in the accompanying line drawings illustrating the design of a number of locomotives of the Great Eastern Railway (of England), one of which was recently built at the company's shop at Stratford. This locomotive has been designed by Mr. James Holden, locomotive superintendent of the road, to meet the demands of heavy suburban traffic, a locomotive being required which is capable of accelerating very rapidly. It is of the 0-10-0 type, having ten wheels coupled, and neither forward nor trailing trucks. In order to obviate an excessively long, rigid wheel base the driving boxes of the rear drivers are allowed lateral movement against the shoes, and to allow for this movement the rear side rods are double jointed. The wheel base is 19 feet 8 inches, the wheels 4 feet 6 inches in diameter and the main driving wheels are blind. Westinghouse air brakes are applied to the drivers and the additional precaution of hand brakes is included.

There are three cylinders, two outside hung and one between the frames. The cylinders are 18½ inches in diameter and the piston stroke is 24 inches. The pistons of the outside cylinders are connected to the main drivers (the middle pair) by rods to crank pins and the inside cylinder piston is connected to the second axle by a peculiar rod especially designed. The second axle is arranged with a crank at its center. The first axle is lightly cranked to clear the connecting rod of the inside cylinder. Referring to the side elevation, Fig. 1 and the plan Fig. 2, this arrangement of cylinders, rods and axles will be seen. The inside connecting rod is made in two parts, one arm of which passes above the first axle and one below. At the cylinder end the two arms are connected to a block which forms the cross-head connection. The eccentrics are on the main axle, to which the main rods are connected.

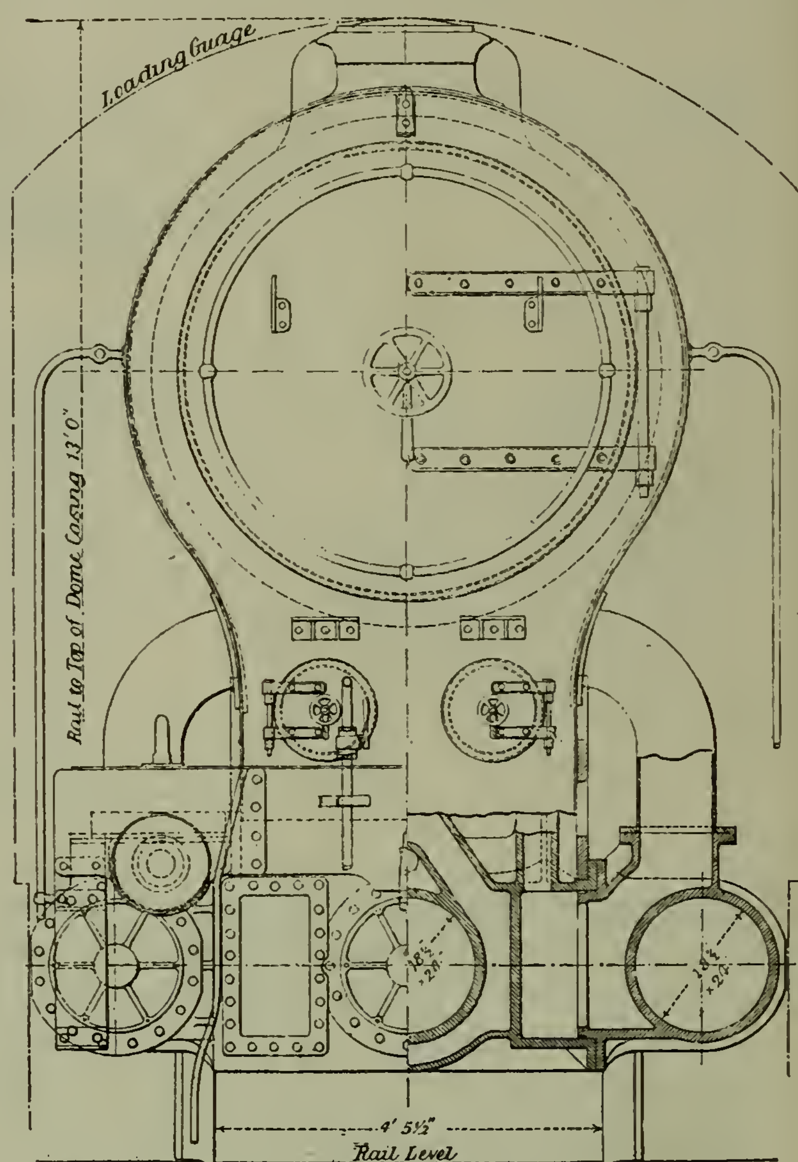


Fig. 4—Front Elevation and Section Through Cylinder—Heavy English Locomotive.

The boiler is similar in design to the wide fire box boilers of the United States for burning soft coal, which appears to be a recent departure in English practice. The boiler is designed to carry 200 pounds of steam, the grate surface is 42 square feet and the total heating surface 3,010 square feet, areas which

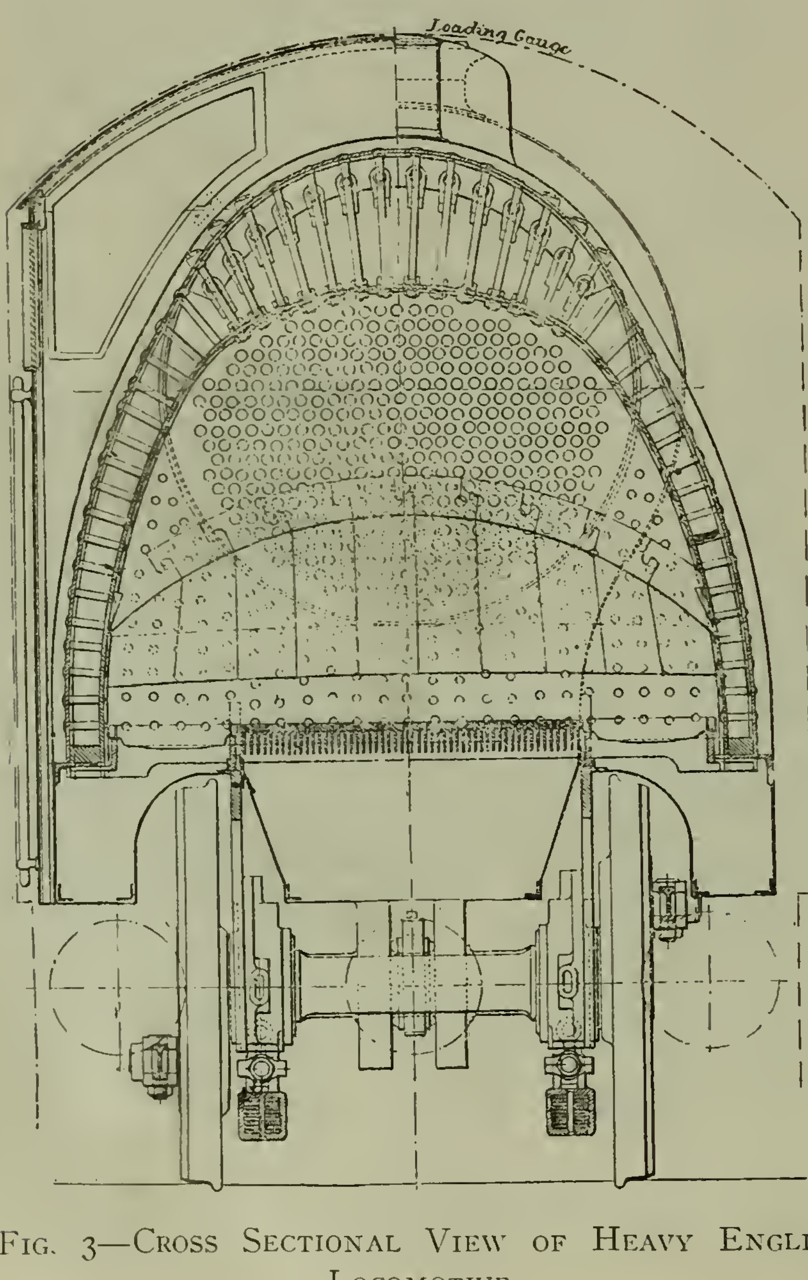


Fig. 3—Cross Sectional View of Heavy English Locomotive.

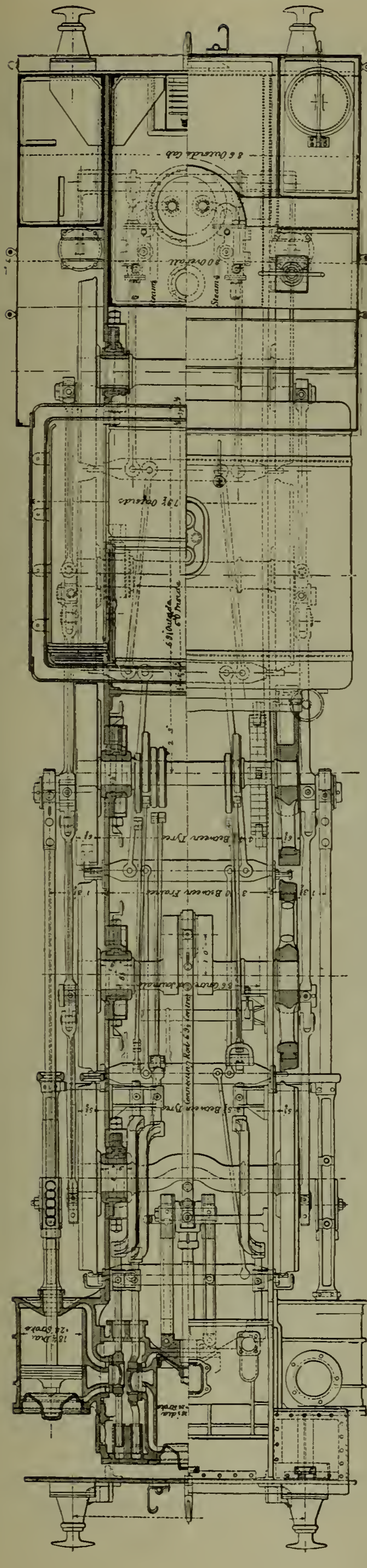


Fig. 2—Plan View—Heavy English Locomotive.

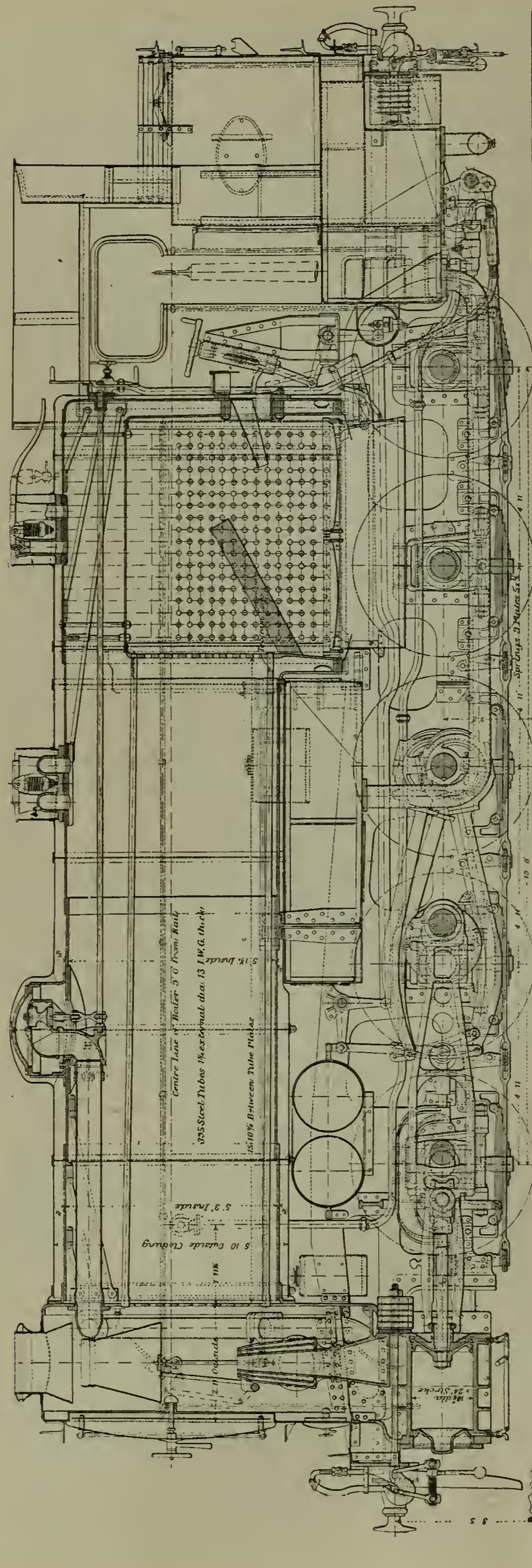


Fig. 1—Side Elevation—Heavy English Locomotive.

exceed any previously designed in England. Of the total heating surface 131.7 square feet are in the fire box and 2,878.3 in the tubes. By reference to the cross-sectional view, Fig. 3, it will be seen that the grates are in three sections, each section being supplied with a separate ash pan. The central section is arranged lengthways with the boiler and the outside sections at right angles to the same.

The barrel of the boiler is 5 feet 3 inches in diameter inside the outer rings, and is of steel plates 5/8 inch thick. It is of such length as to give a distance of 15 feet 10 7/8 inches between tube plates. The tubes, which are of steel, are 395 in number, 1 3/4 inches in diameter, and No. 13 I. W. G. gauge. The center line of the boiler is 9 feet above top of rail.

The boiler is fitted with three safety valves, each 3 1/2 inches in diameter. The smoke box is seen to be very short in comparison with American practice. The smokestack is very short, a part of it extending within the smoke box and a petticoat pipe being supplied below. The exhaust nozzle, shown in section, is of unique design, having a central nozzle surrounded by two annular nozzles, each cylinder exhausting through a separate nozzle.

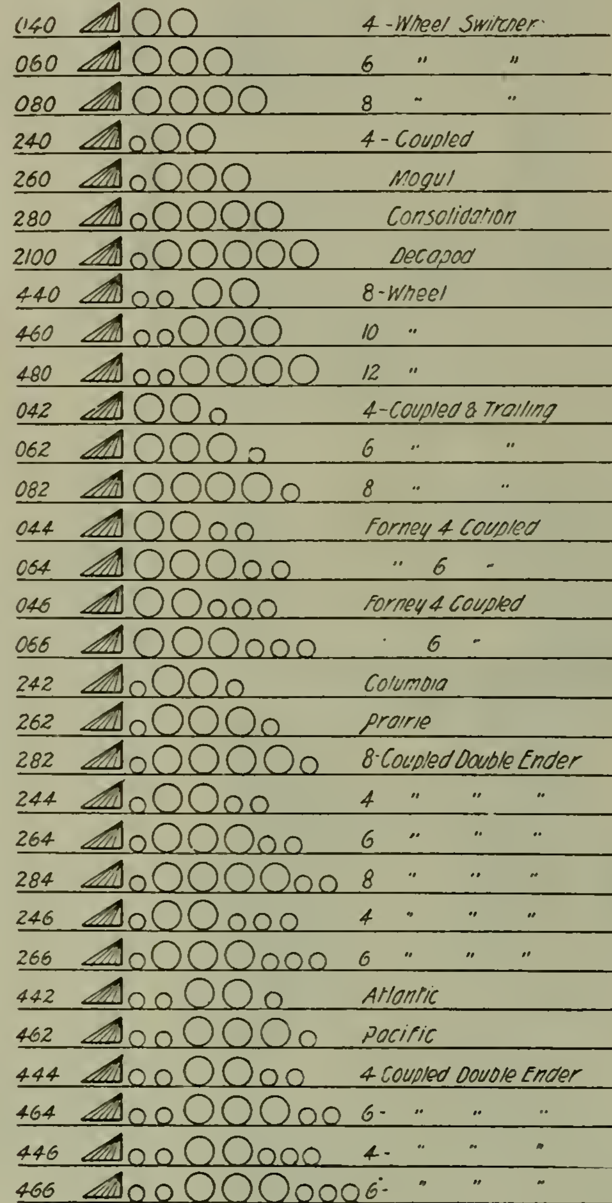
The total weight of the locomotive, in working order, including fuel and water, is 134,000 pounds. The tank has a capacity of 1,300 gallons of water and space is provided for two tons of coal.

A recent issue of Engineering (London) contains full description of this locomotive, from which the drawings are reproduced herewith.

The American Locomotive Company Adopts the Whyte System of Locomotive Classification

WHILE the F. M. Whyte system of classification of locomotives by their wheel arrangement was suggested two years ago, this system has never before been formally adopted by a locomotive building establishment, a railroad or an organization of railway officials, though the advantages of the system were recognized and many drifted to it in the way of classifying locomotives by the arrangement of wheels, or number of sets of wheels under the locomotive. The American Locomotive Company has recently decided to adopt this method of designating locomotive classes in order to simplify the existing discrepancy in the classification of locomotives by names which are purely arbitrary.

This system, originated by Mr. F. M. Whyte, mechanical engineer of the New York Central & Hudson River Railroad, is based upon the wheel arrangement of the locomotive and therefore follows a system which indicates a specific meaning. Each set of wheels is represented by a numeral, and the numbers are read from the front end of the locomotive to the rear. As it is not probable that the numbers of sets will be increased above three, three numerals are used in the designation of all classes. For instance, a locomotive with a four-wheel forward truck, four driving wheels and a two-wheel trailing truck would be represented as a 4-4-2 type, and an eight-wheel four-coupled passenger locomotive would be designated as a 4-4-0 type. This system is quite a fortunate substitution for the perplexing and confusing names of types, such as "American," "Atlantic," "Chautauqua," "Prairie," etc.



WHYTE'S LOCOMOTIVE CLASSIFICATION.

The American Locomotive Company proposes to omit the hyphen between the numerals indicating the wheel arrangement and in order to give further information regarding the locomotive will add its total weight in thousand pounds, the figures indicating the wheel arrangement being separated from those representing the weight by a hyphen. For instance, a 4-4-2 locomotive weighing 173,000 pounds would be designated 442-173. In the case of compound locomotives the hyphen will be substituted by a C, and the above would be written 442C173. Tank locomotives, now very common in suburban service, would be indicated by substituting the letter T for the hyphen. A tank locomotive having a two-wheel leading truck, four drivers and four wheels under the tank, weighing 140,000 pounds, would be designated 244T140.

The accompanying diagram indicates the wheel arrangement of locomotives, and given therewith is the Whyte system of classification, together with the names previously in vogue.

Staybolt Clipper--C., B. & Q. Ry.

A STAYBOLT clipper of such shape and dimensions as to be conveniently handled in inaccessible places is of great assistance in boiler making and repairing. The accompanying line drawings illustrate a form of staybolt clipper which may be conveniently handled within a fire box. Fig. 1 represents the machine for operating the clippers and Fig. 2 illustrates the form of the clippers.

When in operation the machine is suspended by a lug in the back head, the machine being thus made to hang in a vertical position. The ends of the two levers of the clippers are inserted within the holes in the lower ends of the levers of the machine. It is thus seen that the clippers will be in position at right angles to the machine and perpendicular to the boiler sheets as well.

The downward motion of the piston within the cylinder will force the ends of the levers apart, thus bringing the cutting edges of the clippers together. Unless the motion of the piston was cushioned near the end of the stroke at the instant that the staybolt is severed, the sudden reduction of the strain would have a tendency to force the piston suddenly against the cylinder head, with serious results. In order to obviate this difficulty an air cushion is instituted by exhausting the air ahead of the piston through a very small opening at the end of the stroke. At the side of the cylinder, Fig. 1, is shown the piping by which air is supplied to the cylinder from the air hose connected with compressor line. The cock is so arranged in this piping that when air is admitted behind the piston it is exhausted to the atmosphere from the front of the piston. The main exhaust opening is placed some little distance from the head of the cylinder and a supplementary exhaust opening, of greatly reduced diameter, is drilled at the extreme end of the cylinder and connected with the principal exhaust. When the piston has completed the greater part of its stroke it passes over the main exhaust opening, thus closing the connection with the atmosphere. The remaining air ahead of the piston must therefore be forced through the restricted passage, thus cushioning the motion of the piston at the end of the stroke. The piston is packed with leather.

In the West Burlington repair shops of the C., B. & Q. Ry., where this machine is in service, the boilers are supported on rollers while undergoing repairs and when so supported may be turned to any desired position. While working with the fire box the boiler is supported with the mud ring up. In such position it is a very simple matter to so suspend the clipping machine that it may be used conveniently to clip the ends of staybolts within the fire box. A small swinging crane, which may be adjusted upon the mud ring, is used in connection therewith, allowing the clipper quite a large range over which to operate before readjusting the crane.

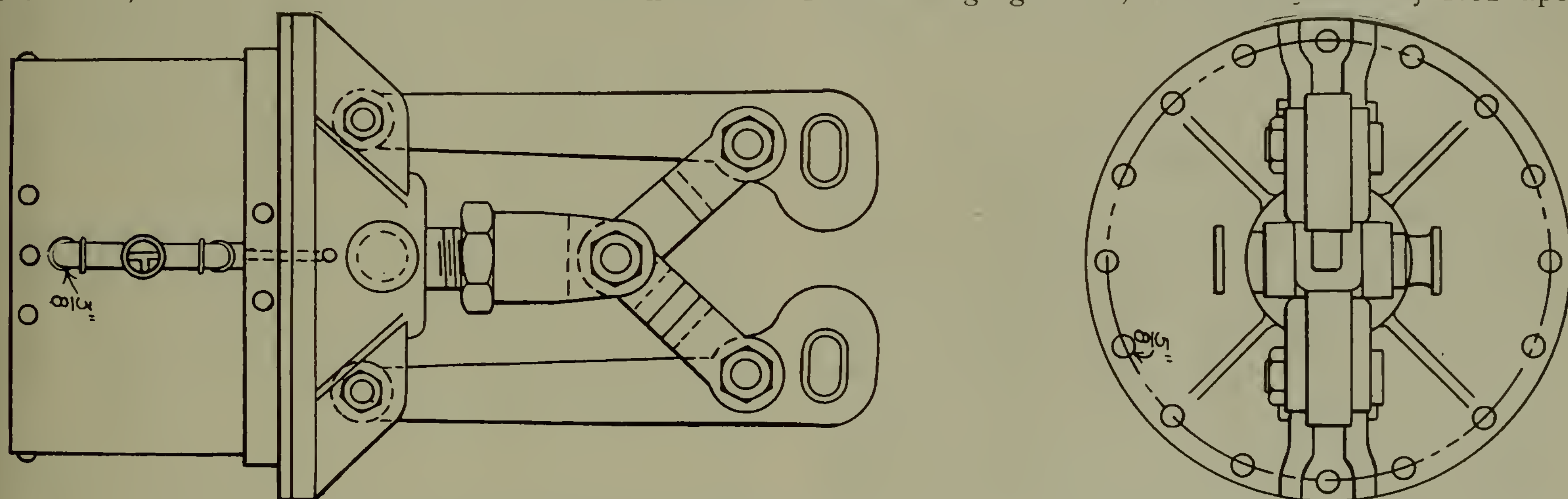


Fig. 1—Staybolt Clippers—C., B., & Q. Ry.

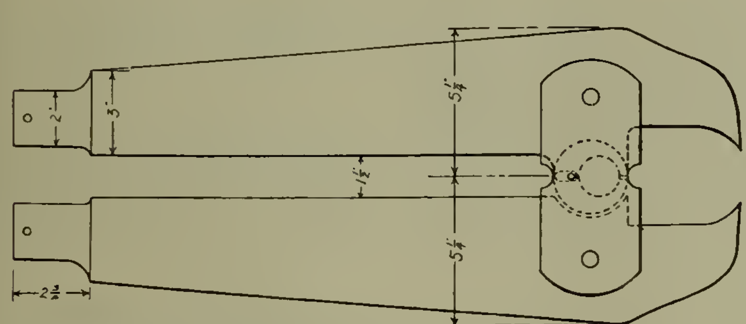


Fig. 2—Staybolt Clippers—C., B. & Q. Ry.

An Extensive Tour in the Interest of the American Locomotive

IN order to investigate thoroughly the possibilities of increasing the export of American locomotives, Mr. R. J. Gross, second vice president of the American Locomotive Company, is about to undertake a tour around the globe in the interest of the locomotive building establishment which he represents. The company desires to establish permanent business relations in every country and to introduce the American locomotive in those countries in which it has not already been in service.

The American locomotive has been in great demand for the past two or three years in many countries, and particularly so in the Orient, South Africa, Spain and other countries that do not manufacture their own locomotives. This demand could not be met on account of domestic contracts and the exceptional business conditions that have been prevailing in this country for that time. The recent awakening, developments and industrial expansion in China, Siberia, South Africa and other countries promises a large field for placing American locomotives in those countries, and when the improvements and enlargements that are now under way and those contemplated in the different plants of the American Locomotive Company are completed, the company will be in a much better condition to build foreign locomotives and will no doubt get its due share.

Mr. C. M. Muchnic, who has recently resigned as mechanical engineer of the Denver & Rio Grande system, and formerly connected with the Brooks Locomotive Works, is to accompany Mr. Gross as secretary.

These gentlemen will sail on the Siberia from San Francisco March 11th for Japan via Honolulu. They will stop at several cities on their way to the Pacific coast, to consider business propositions. While in the Orient they will visit Japan, Korea, Siam, China and thence via the Trans-Siberian Railway to Russia, and on their way home, via New York, will visit practically every country in Europe.

Double Cylinder Planer and Smoother

The accompanying half-tone engraving of a double cylinder planer and smoother presents several interesting features. The makers declare without hesitation that it is the best double cylinder smoothing planer ever designed and built for general surfacing, and the fact that it is meeting with unequaled success wherever in use, seems to well bear out their claim. It is designed for general work, and good for all woodworking shops. It was patented December 6th, 1899, February 6th, and May 8th, 1900, and special attention is invited to the following features:

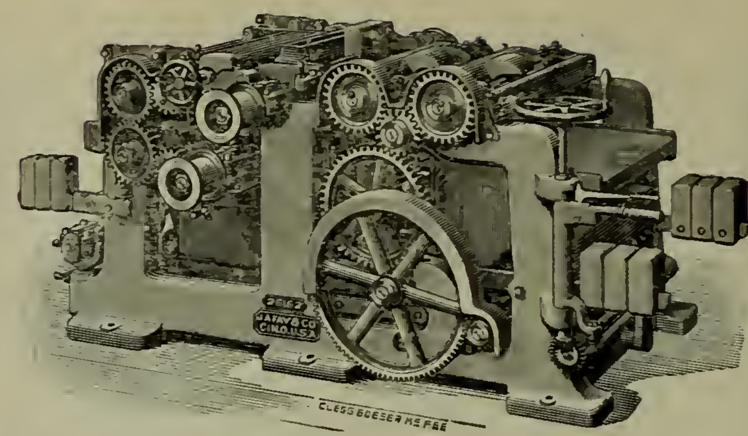
1. It is made to plane 26 to 42 inches wide and 6 to 8 inches thick. The table is raised and lowered on ball bearings, and controlled by hand-wheel convenient to the operator, and is quickly adjustable for different thicknesses.

2. The feed is six powerfully driven rolls, four of which are placed before the cutting cylinders, and the other two after them, so that each piece of material is fed clear of the cutters. The patent upper feeding-in rolls are centre-geared with gear driven downward; all upper rolls have sectional weights for nicely regulating the pressure. The upper feeding-out roll raises parallel for difference in thickness.

3. The variable feed changes from slow to fast, or vice-versa, while machine is running, is always under instant control of operator, and can be furnished with any feed desired. It is reliable, simple in construction and efficient in operation.

4. Lower cylinder and receiving plate after same draw out for sharpening knives, and provision is made for insuring uniform thickness, and for surfacing thin lumber. The machine can be fitted with a sectional pressure bar for feeding several narrow pieces of uneven thickness at the same time.

The makers, J. A. Fay & Egan Co., of No. 145 to No.



No. 20 Double Cylinder Planer.

166 West Front St., Cincinnati, Ohio, will willingly send further particulars, terms and cuts, on demand, and also their new and complete catalogue of woodworking machinery, to those writing for the same.

Personal

Mr. William Ball has been appointed master mechanic of the Great Northern at Grand Forks, N. D.

Mr. W. D. Hall has been appointed electrical engineer of the Grand Trunk Railway system, with headquarters at Montreal, Que.

Mr. A. B. Thomas has been appointed general foreman of the shops of the Pennsylvania at Oil City, Pa., to succeed Mr. C. C. McCormick, transferred.

Mr. C. Paskerson has been appointed master mechanic of the Cane Belt R. R., with office at Bonus, Tex,, to succeed Mr. D. J. Timlin, resigned.

Mr. W. J. McGee has been appointed acting master mechanic of the Atlantic Coast at Montgomery, Ala., in place of Mr. J. F. Enright, resigned.

Mr. John Spellen has been appointed road foreman of engines of the Buffalo, Rochester & Pittsburg, with office at Du Bois, Pa.

Mr. G. Mudd has been appointed division master mechanic of the Wabash R. R. at Moberly, Mo., to succeed Mr. S. Cooper, resigned.

Mr. W. H. Evans, general foreman of the Baltimore & Ohio shops at South Chicago, Ill., has resigned.

Mr. William A. Pratt has been appointed general foreman of the Baltimore & Ohio at Benwood, W. Va., to succeed Mr. J. F. Bowden, resigned.

Mr. E. M. Fitz has been appointed motive power inspector of the Pennsylvania Lines, Southwest System, at Columbus, O., to succeed Mr. E. J. Lewis, promoted.

Mr. Pablo Rios has been appointed superintendent of motive power of the Tehuantepec National, with headquarters at Coatzacoalcoz, Mex., to succeed Mr. G. C. Morton, resigned.

Mr. C. C. Edwards has been appointed acting master mechanic of the Chicago Great Western, with office at Red Wing, Minn., to succeed Mr. George Gregory, resigned.

Mr. Arthur Detro has been appointed master mechanic of the Lehigh & Susquehanna division of the Central Railroad of New Jersey, with headquarters at Mauch Chunk, Pa.

Mr. Arthur J. Slade has been appointed mechanical engineer of the New York Central & Hudson River R. R., with office at New York, N. Y. Mr. Slade will have charge of the designing and construction of heat, light and power plants and water and fuel stations. In this position Mr. Slade succeeds Mr. Edwin B. Katte, who has been appointed electrical engineer.

Mr. G. M. Lovett, general foreman of the Texas & Pacific at Longview Junction, Tex., has been appointed division master mechanic at Texarkana, Tex., to succeed William Laing, deceased.

Mr. Charles W. Lee has been appointed master mechanic of the Southern Railway at Lawrenceville, Va., to succeed Mr. J. J. Bayley, who has been transferred to Sheffield, Ala.

Mr. T. Fielden has been appointed master mechanic of the St. Louis & San Francisco, with headquarters at Sapulpa, Ind. Ter., to succeed Mr. T. S. Reilly, resigned.

Mr. W. B. Best has been appointed master mechanic of the Bayfield Western Railway, with office at West Superior, Wis., to succeed Mr. E. W. Monahan, who has been made general manager of the same road.

Mr. A. L. Studer, master mechanic of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia., has been appointed assistant superintendent of motive power, with headquarters at Chicago.

Mr. Peter Harvie, heretofore general foreman of the shops of the Great Northern at Havre, Mont., has been appointed superintendent of shops at that point, to succeed Mr. Henry Yoerg, recently transferred.

Mr. R. D. Hawkins has been appointed mechanical engineer of the Great Northern, to succeed Mr. Max Talz, recently resigned. Mr. Hawkins has heretofore been assistant mechanical engineer of this company.

Mr. R. F. Terrill, who has been foreman of the shops of the Chesapeake & Ohio at Richmond, Va., has been appointed master mechanic of the shops at Covington, Ky., to succeed Mr. G. M. Hepburn, resigned.

Mr. Alex Stewart, master mechanic of the Union Pacific at Cheyenne, Wyo., has resigned, to accept the position of master mechanic of the Southern Railway at Knoxville, Tenn., to succeed Mr. I. B. Michael, promoted.

Mr. George N. Seidel, master mechanic of the Lehigh Valley at Buffalo, N. Y., has resigned, and has been appointed master mechanic of the Birmingham division of the Southern Railway.

Mr. M. Hickey, master mechanic of the Northern Pacfic at Seattle, Wash., has been appointed master mechanic at Spokane, Wash., to succeed Mr. William Moir. Mr. H. H. Warner succeeds Mr. Hickey as master mechanic at Seattle, Wash.

Mr. E. W. Monahan, heretofore master mechanic of the Bayfield Western, has been appointed general manager, with headquarters at Duluth, Minn., to succeed D. M. Sabin, deceased. Mr. W. B. Best has been appointed to succeed Mr. Monahan as master mechanic, with office at West Superior, Wis.

Mr. C. F. Thomas, master mechanic of the Southern Railway at Columbia, S. C., has resigned that position to become general inspector with the American Locomotive Co. at Richmond, Va. Mr. J. F. Sheehan, master mechanic of the Southern at Selma, Ala., has been transferred to Columbia, S. C., to succeed Mr. Thomas. Mr. S. R. Richards, formerly at Lawrenceville, Va., succeeds Mr. Sheehan as master mechanic at Selma, Ala.

Mr. George S. Lovett has been appointed master mechanic of the Texas & Pacific, with office at Texarkana, Tex., to succeed Mr. W. Laing, recently deceased. Mr. Frank Kelly has been appointed general foreman of the roundhouse of this company at Longview, Tex., and Mr. J. H. Hudson, foreman of the machine shops at Marshall, Tex.

Mr. J. Billingham, master mechanic of the Baltimore & Ohio at Cumberland, Md., has been transferred to the Ohio River division in the same capacity, with headquarters at Parkersburg, W. Va. Mr. T. E. Lewis, heretofore general foreman of the Norfolk & Western at Portsmouth, O., has been appointed master mechanic of the Baltimore & Ohio at Cumberland, Md., succeeding Mr. Billingham.

Mr. J. B. Michael, master mechanic of the Knoxville division of the Southern, with office at Knoxville, Tenn., has been appointed assistant mechanical superintendent for the entire Southern system, with headquarters at Washington, D. C., to succeed Mr. M. K. Barnum, who recently resigned to accept service with the Chicago, Rock Island & Pacific.

Circulars have been issued announcing a revision of territory in the motive power department of the Baltimore & Ohio. In the future the jurisdiction of E. T. White, superintendent of motive power, will extend over the Philadelphia, Baltimore, Cumberland, Monogah, Shenandoah, Wheeling and Ohio River divisions, with office at Baltimore. The jurisdiction of A. Kearney, superintendent of motive power, will extend over the Connellsville, Pittsburg and New Castle divisions, with office at Pittsburg. J. E. Muhlfeld has been appointed superintendent of motive power with jurisdiction over the Newark, Chicago and Cleveland divisions, including the Zanesville car shops, with headquarters at Newark, O.

Mr. T. F. Dreyfus, heretofore general foreman of the Cincinnati & Muskingum Valley (Pennsylvania Lines) at Lancaster, O., has been promoted to the general foremanship of the Pennsylvania Lines, Southwest system, at Cincinnati, of the Pendleton shops, and is succeeded at Lancaster by Mr. E. J. Lewis, heretofore motive power inspector of the Pennsylvania Lines at Columbus, O. Both Mr. Dreyfus and Mr. Lewis are products of the special apprenticeship system, having completed their apprenticeships at the Burnside shops of the Illinois Central, Chicago, somewhat more than a year ago, taking service with the Pennsylvania Lines shortly thereafter. The former is a graduate of Stevens Institute of Technology, class of '98, and the latter of Cornell University, class of '99.

Mr. Thomas O. Cole has been appointed superintendent of car service of the Lehigh Valley Railroad, with headquarters at South Bethlehem, Pa. The office of car accountant is abolished.

Mr. Charles Raich has been appointed general foreman at the West Superior shops of the Great Northern Railway.

Colonel Henry G. Prout has resigned as editor-in-chief of the Railroad Gazette and has been appointed first vice-president and general manager of the Union Switch and Signal Company. Colonel Prout saw act-

ive service in the Army of the Potomac from 1863 to 1865. In 1867 he entered the University of Michigan where he graduated with the degree of Civil Engineer. For a few years he was engaged on railway surveys and construction. After this experience, he entered the service of the Khedive of Egypt, as a Major of Engineers. He remained in that service about four years and a half and reached the grade of a Colonel in the General Staff. After the first year, he went to the Soudan in command of an expedition to Kordofan and Darfour, and thence he was sent to the head of the Nile as Governor-General of the Provinces of the Equator. Colonel Prout's work here was largely administrative. He had 3,000 soldiers under him and was supreme over finance, civil and military affairs. After his return to America, he was for a little over a year signal engineer to the company out of which The Union Switch & Signal Company grew. Colonel Prout was in business in the city of New York for a few years, and in March, 1887, became the editor of the Railroad Gazette. As editor of the Gazette he built an enviable reputation, well founded upon his high professional skill and his character as a man. Along with his journalistic work, Colonel Prout has done a great deal of consulting and expert work with engineers and officials of many important railroads. He is now the editor of the railroad division of the new volumes of the Encyclopedia Brittanica, is a member of numerous societies, clubs and associations and has served them all in some official capacity. Not only an engineer and a man of affairs, Colonel Prout is as well a much sought after speaker and a splendid lecturer.

Notes of the Month

The Kern River Power Company, of Los Angeles, Cal., has recently purchased from the Westinghouse Electric & Mfg. Co. two Type C, compound-wound, 150-kilowatt generators to be installed in its power house.

Effective on the first of February, the Denver & Rio Grande R. R. announced a new schedule, increasing the rate of pay of the machinists, boiler makers, blacksmiths, tin workers, inspectors, car repairers and their helpers employed on that system, 2½ to 5 per cent.

A reprint of the paper read by Mr. Charles Day, of the firm of Dodge & Day, modernizing engineers of Philadelphia, before the New York Electrical Society on the 17th ult., on "Requirements of Machine Tool Operation with Special Reference to the Motor Drive," will be sent by mail postpaid, on application to R. D. Lillibridge, 170 Broadway, New York.

The Adams & Elting Co., of Chicago, are distributing tastily designed catalogues, embodying a number of unique features, illustrating their wood finishers' supplies and paint specialties. They have enlarged their factory from time to time, using the latest and best machinery for the manufacture of their specialties which are now very generally used throughout the United States.

The Black Diamond express of the Lehigh Valley Railroad, which was discontinued west of Wilkes-barre some time ago, has been restored to service. For a time the freight congestion was such that it was impractical to operate this train west of the point above mentioned. This congestion however has been cleared and the situation now permits the train to be run to and from Buffalo.

It has been announced that every workman employed in the Pullman car shops will be paid ten hours' wages for nine hours' work. This change goes into effect April 1st. Nearly 8,000 men will be affected and it is said that more than $70,000 will be added to the company's payroll each month. One thousand extra men will be required to perform the work heretofore accomplished in the tenth hour.

Solid die automatic bolt threading and special tapping machinery is illustrated in a neat pamphlet of fifteen pages issued by the Webster & Perks Tool Company, to demonstrate the class of machinery which they manufacture. They also manufacture self-oiling, grinding and polishing machinery, bar and knife-making machinery for reaper and mower manufacturers, aluminum reducing wheels for engine indicators, and special machinery designed and made to order.

Record of recent construction number 40, of the Baldwin Locomotive Works, contains an able and interesting paper entitled Proper Handling of Compound Locomotives. This paper was presented by Mr. W. J. McCarroll before the September, 1902, meeting of the Traveling Engineers' Association. The importance of the subject is indicated by the lively discussion which followed the presentation of the paper. This paper on compound locomotives is worthy the consideration of all interested in locomotive operation and design.

Previous records for runs of more than a mile were broken by the Empire State Express train of the New York Central & Hudson River R. R., on Jan. 29. The train covered 7.29 miles between Palmyra and Macedon, N. Y., in 4 minutes flat, or at a speed of 109.35 miles an hour. This record was made with the regular train of four cars. The engine attached to the train was a new one and the entire run of 302 miles between Albany and Buffalo was accomplished in 295 minutes.

The Llewellyn Iron Works, of Los Angeles, Cal., are to be equipped throughout for driving by electric motors. Induction motors will be direct-coupled or belted to lathes, planers, and other machinery, and line shafting will be entirely done away with. The Pacific Light and Power Company has recently purchased from the Westinghouse Electric & Mfg. Co. for this plant 20 induction motors, ranging in size from two-horse-power to 75-horse-power, which are now being installed.

Messrs. Dugold C. Jackson, C. E., and William B. Jackson, M. E., have opened an office in the North West for the practice of engineering and are fully prepared to pursue engineering work of all classes. These gentlemen have had extended experience in engineering lines and are unusually well adapted for work of this nature. All correspondence should be addressed to D. C. and Wm. B. Jackson, Madison, Wisconsin. Engagements for consultations and conferences in Chicago, Milwaukee, St. Paul, and other points can always be made when desirable.

Six complete locomotives are now turned out per working day at the Baldwin Locomotive Works. Relative to the present demand for motive power by the various railway systems, Mr. John H. Converse, of the Baldwin Company, is quoted as follows: "We are working continuously, night and day and are turning out an average of one complete locomotive every four hours. The various branches of our plant are rushed with work and the demand for motive power by the railroads does not seem to slacken. The Baldwin Works employs 13,000 men.

The history of the Plunger Elevator Company and the construction of the devices which they manufactured is outlined in a catalogue which has recently come from press. This catalogue is neatly arranged and well illustrated. Among the illustrations are included a number of the buildings in which their elevators are in operation, types of the elevators and the mechanism which operates them. The industry had its beginning in the shops of the Worcester Polytechnic Institute where it was continued until 1896, when the business outgrew the needs of a school shop. Constant improvement of the product and steady expansion of the business have characterized the company since its inception.

The Derry-Collard Company, 256 Broadway, New York, are preparing a series of "Practical Papers" which is devoted to the methods of turning and boring tapers that are usually found. It is intended to make these practical, as the name implies, and to treat one subject only in each paper. They will be uniform in size and style, and can be bound together or kept separately, as desired; a neat case for holding ten of them being furnished at a nominal cost. In this way one can secure just the particular information he desires without buying a large volume, nine-tenths of which may not interest him.

Although the price is but twenty-five cents, there is nothing cheap about the cuts, paper, or press-work.

The McConway and Torley Company, of Pittsburg, Pa., have presented our office with a one-fourth size model of the Kelso coupler, complete in all its parts.

This coupler has been designed to meet the most severe conditions of service. In it is embodied all the good points of the Janney coupler with the additional features of a "lock-set," which makes it unnecessary to lock up the uncoupling lever by means of a special bracket on the end sill, as in former practice, or to hold up the uncoupling lever by hand in order to effect a "cut-off" of cars. With this coupler, the trainman, to make a "cut," simply raises the uncoupling lever to the unlocking point, and then permits it to drop to normal position. The Kelso "lock-set" is positive in its action, and effective. It will not drop the lock to the coupling position until the knuckle has opened 80 per cent of its total outward movement.

Indicating locomotives is not as familiar to engineers as other branches of indicator work, and for this reason Mr. Lippincott, of Scranton, Penna., thinks perhaps a photograph of a heavy pattern locomotive, rigged up with wind-guards and all apparatus for a "fast mile," may be of considerable interest to engineers who will write him and ask for a copy.

Several weeks ago he made a "run" on No. 1003, one of the heaviest Lackawanna locomotives, from Scranton to New York, using a "Lippincott" indicator and reducing wheel, and a 11x14-inch photograph of the engine has been reproduced on enamel paper, suitable for framing, and will be sent to any engineer who encloses the names of at least six prominent engineers of his acquaintance, with their addresses.

The supply of these photographs will not last longer than this month, so that applications should be made at once to Mr. A. C. Lippincott, 1236 Marion street, Scranton, Penn.

F. M. Hicks has recently received orders for equipment to be rebuilt at the Hicks Locomotive & Car Works, as follows: One 8-wheel 16x24 in. locomotive, for the Crossett Lumber Co.; one 16x24 in. Mogul engine, for Louis Werner Saw Mill Co.; one 17x24 in. 6-wheel engine, for the American Metal Co.; one 4-wheel switch engine for the Albany & Northern Ry.; one 66 ft. 6 in. private car, for Mr. Levi R. Lupton, evangelist; one 66 ft. exhibit car for the Cuba Rolling Stock Company; one combination passenger and baggage coach, for Boca & Loyalton R. R.; one Pullman combination passenger, mail and baggage car, for the Georgia Northern Ry.; one passenger coach for the Georgia, Florida & Alabama Railway. Also 80 flat cars to the Susquehanna & New York Railway, and miscellaneous freight cars to the following: Albany & Northern Ry., Santa Fe Central Ry., Globe, Nehalem & Pacific Railway."

"Locomotives, Simple, Compound and Electric," is now appearing in its fourth edition. This work was formerly entitled "Locomotive Mechanism and Engineering." It is devoted to the consideration of the locomotive from the standpoint of the locomotive engineer and is written by a locomotive engineer for the improvement and instruction of engineers and firemen. Taking up the subject with the boiler, the origin of the power supplied, the author considers in detail the many parts constituting the locomotive engine. The several classes of compounds are investigated, their details entered into and discussed. As an important adjunct in observing locomotive performance a short chapter is devoted to the indicator and the interpretation of indicator cards. Emergency repairs, so necessary in case of minor accidents, are demonstrated to enable the engineer to be in a position to recover the use of the locomotive in case of accident some distance from a point where assistance may be had. A section of the volume is devoted to the electric locomotive, which is treated in elementary detail. The subject of the locomotive as herein considered appears in the form of a description of existing mechanism, rather than illustrating the theory of operation and principle of design. This book, nevertheless, presents a valuable tratise on the locomotive and is worthy the consideration of those interested in locomotive operation and maintenance. Published by John Wiley & Sons, New York City. Price $2.50.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

Transfer-Graining Apparatus

Mr. T. J. Hutchinson, foreman painter Grand Trunk Railway shops, London, Ont., kindly furnishes us with two views of his transfer-graining rolls and apparatus with which he does his work described in his article in another column, which we are pleased to reproduce herewith, and will briefly describe as follows:

VIEW NO. 1.

Fig. 1.—Cylinder frame, lined with sheet zinc. Fig. 2—Bottom plate for same, iron straps and rubber ring. Fig. 3—Wooden roller, top cover and bolts for same. The wooden roller is made of well-seasoned, light, dry wood; glued and nailed in narrow quarter-circle strips, breaking joints, as shown in view.

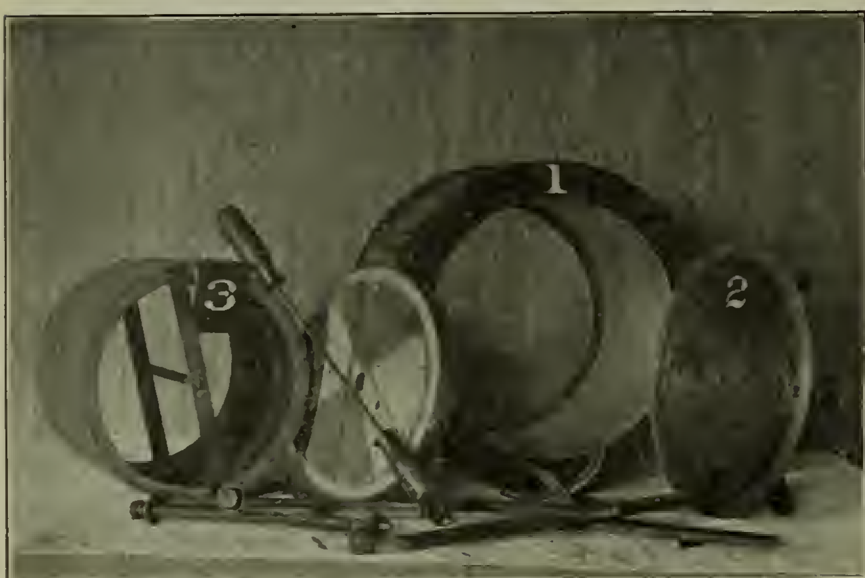


FIG. 1.
1. Cylinder Frame Lined with Sheet Zinc. 2. Bottom Plate, Iron Straps and Rubber Ring. 3. Wooden Roller, Top Cover and Bolts for Same.

VIEW NO. 2.

Fig. 4—Impression board, 1 ft. wide, 1 inch thick and 5 ft. long, with side-strips 2½ ins. wide projecting ¾ ins. above and below face of board to prevent scraping color over edge.

Fig. 5—Wheel and stand for same complete, composition of gelatine showing ¾ in. thick. Fig. 6—Rocker covered with same composition of gelatine ready for use. Fig. 7—Rocker frame, zinc-lined; showing piece of sheet rubber for bottom of frame and bolts for same. Article marked thus "X" is a sole leather scraper, used to scrape the color to end of board.

The background of both views, if it reproduces so that it can be readily seen, are samples of the graining done by this process on Manila paper, previously prepared by the paper painted grounded color, in which scarcely any lap of wheel can be discerned.

We will add that no shop is up-to-date without some such an outfit as this, and somebody who knows how to use it. It will be seen that Mr. H. has a mold (Fig. 1, View No. 1) in which he casts the gelatine on to the graining wheel or roller (Fig. 3). This is one way to do it. Another good way, which is our practice, is to cast the gelatine flat on a plate-glass slab of suitable length and width, with, of course, a molding around edge to serve as a dam for the liquid gelatine until it cools; then the latter is taken out and bent around and mounted on the roller with some of the hot gelatine applied over the cotton cloth with which the roller has been previously covered. If properly done it will stick like a bicycle tire and last as long. Of course there will be a joint in it when the ends are butted together, but this can be used as a starting and ending point in rolling on the graining, so as to ensure no laps.

Oxide of Iron and Rust Producer

The theory advanced by some, who have a paint of another nature that they are pecuniarily interested in, that pure oxide of iron as a pigment, regardless of the vehicle in which it is mixed, is only not a preservative against rust, when

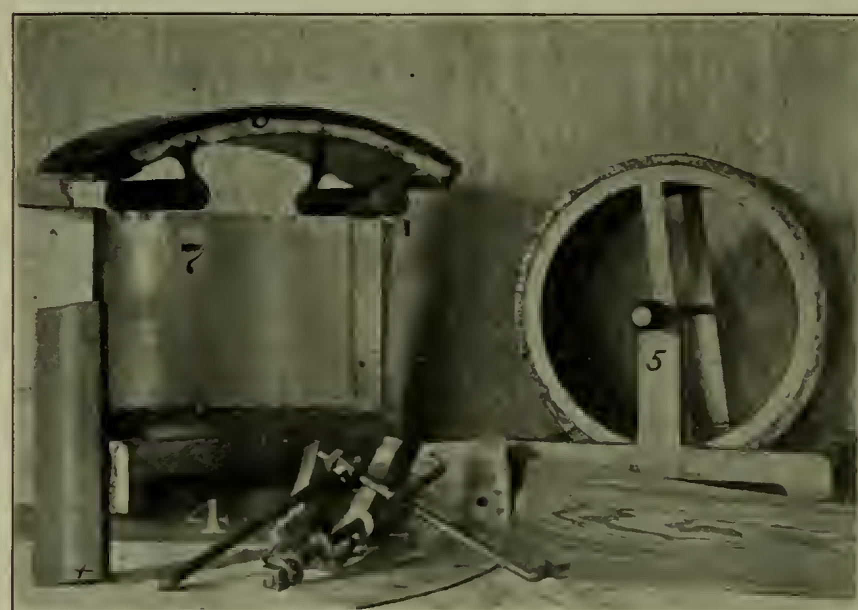


FIG. 2.
4. Impression Board. 5. Wheel and Stand Complete. 6. Rocker Ready for Use. 7. Rocker Frame. 8. Sole Leather Scraper Used to Scrape Color End of Board.

applied as a paint to iron and steel, but an actual cause of rust is rather absurd. Facts will not sustain it. More depends upon the proper preparation of the surface of rolled or pressed steel surfaces to remove the fire-scale, etc., than what it is painted with. Such surfaces are covered with an almost imperceptible tissue of such scale, caused by cooling from the furnace under which air and moisture gathers until it is loosened, and in time rust forms and a growth ensues which later on will throw off this scale. It is then, though red with rust, in better condition to receive paint than formerly when the iron was apparently free from it; because no loose scale remains to be thrown off, paint and all. A little observation of pressed steel product left exposed in the air to all weathers will, from time to time, prove the truth of these statements. Of what use is it then to cry down one paint and crack up another for this purpose, regardless of the surface to which they are applied? One might as well paint a shipyard and expect a profitable return for his money as to paint some of these unprepared surfaces with never so good a paint as the one about to be applied with "sounding brass and tinkling cymbal."

This is not saying that oxide of iron is the best possible paint for this purpose. Nor is it the worst, if of good quality and properly prepared and mixed in the right vehicle. They say that oxide of iron is rust; therefore, it will produce rust. One might say with the same logic (?) that as lead is lead it will produce lead, if applied to lead as a paint. To be sure oxide of iron is in a sense iron rust, but it has had a roasting in a furnace or retort that has produced a chemical change in its nature, even before mixed with oil. White lead is lead, but it is the carbonate of lead, which must undergo other chemical changes before being applied as a paint. Theoretically, of course, inert materials—those which the weather elements, against which effects they are designed to protect against, do not cause to be active—are evidently the best materials to make into a paint, and so carbon, graphite, barytes etc., are said to be the best pigments for paint. But all the ins and none of the outs can be claimed for any one article for a pigment; what you gain on one point is lost on another. Undoubtedly some inert material is a benefit to a paint.

One might as well say that because some homeopathic medicines will produce certain symptoms when administered to a well person they will intensify those same symptoms existing in a sick person if administered to them. It is too well known now to waste space to prove that the opposite of this is true—that "like cures like" in this regard. Why may not the same principle, to some extent at least, apply to pigments as paints?

Possibilities of the Graining Roller, Etc.

London, Ont., Jan. 20, 1903.

Editor Railroad Paint Shop:

As I have been doing my graining, such as sash, doors, stops, water tanks and window sills, with a graining roller and rocker since last spring, and with better success than with anything I have ever used heretofore, I thought for the benefit of our associates, who might like to adopt it, I would send you for publication the enclosed photos and description of a new roller and cylinder I have just had made and with which the samples I also forward herewith have been done and from which you will be able to judge as to the merits of the work.

The formula for the composition that I use and any information I will be glad to give to any who will write me.

Also, as a new departure in headlining work, I would like to call your attention to the piece of headlining you see in the background of the picture behind the cylinder, if it comes out good in the print. This has been covered with a heavy smooth piece of stencil paper glued on, the same as veneer, then painted and grained, and is of course one piece, without joints, or seams.

Now, as you are aware, all roads now-a-days have quite a number of cars with light-colored wooden headlinings that, as a rule, are so discolored that they cannot be finished in the natural wood again, therefore the varnish has to be scraped off and these finished in color; and, for good work, scraping is necessary to prevent the old decoration from showing through when varnished. This work, having to be done carefully is quite expensive; and, as economy is the order of the day, in all departments of railway work, by the use of the paper over half of this expense and delay can be saved, besides being of good weight, when necessary, it strengthens the lining, covers all imperfections and will adhere and last as long as any other finish. The work is done quickly either in color or ground, same as samples submitted.

On a new painted white-wood lining I am now doing, the mahogany border, in imitation of inlaid work, is made to conform to outline of decoration around the panel; this gives a very pleasing rich effect; the color of panel can also be blended in shade from dark to a light center, and further decoration added here as desired. And, again, the oak panel would be an agreeable change for some cars from the present overdone, green-colored linings; and, as far as harmony in color is concerned, in many cases, would be much more agreeable to the esthetic eye.

And, right here, Brother Copp, don't you think, "Harmony in Color in Finishing and Furnishing the Modern Railway Passenger Coach" should be a subject for our advisory committee this year? [To which we have replied, Yes; and written said committee to that effect and advised that Bro. H. be appointed to write a paper on it; but they may have too much other matter on hand for this year.—Editor.]

We have been unusually busy since last September, and I am glad to say that through the efforts of our Master Car Builder we have had this shop thoroughly equipped with the electric light, and have thus been enabled to work over-time in several departments.

Of course you have heard the "Grand Trunk Pacific" intends to make tracks to the Pacific coast? This means a great deal of new equipment and busy times in all departments in the near future for us. So, you see, our prospects are good. At present we are just completing the last hundred of a 500-lot order of new 60,000 lbs. capacity flat cars, and more to follow.

In conclusion, on behalf of our Master Car Builder, I take great pleasure in extending to you and our fellow-associates in the East a cordial invitation to visit us on your return trip from our coming convention in Chicago. Come! Look us over. Secure your ticket via the Grand Trunk Railway and be happy. [Which we will be only too glad to do, if that ticket is a pass.—Editor.]

Sincerely yours,

T. J. Hutchinson.

Note.—We have received some decorated samples of paper linings from Mr. Hutchinson, done with the graining roller, stencils, etc., that are fine; but as they are 3 x 4 ft. in size it is not intended to reproduce them for publication.—Editor.

Obituary

We clip the following from the Kent Courier of Jan. 30, 1903. This is sad news to us. Secretary McKeon will have the heartfelt sympathy of all our members and his many friends:

Mrs. Robert McKeon died very suddenly at her home on Mantua street last Friday at about 3:30 p. m.

She was sitting in a rocking chair, conversing with friends and sewing, when her head dropped and with a slight moan she was dead.

The affair was a sad shock to her family and a wide circle of friends. She had been in rather poor health for about four years past, due to heart trouble, yet was able to be up and assist in household work.

Mrs. McKeon was a native of Albany, N. Y., being born Feb. 4, 1837. Her maiden name was Elizabeth J. Lobdell. At the age of 16 years she moved with her family to Norwalk, O., which place was her home for some years.

At Stuyvesant Falls, N. Y., on Aug. 8, 1860, she was married to Robert McKeon. They resided for five years in Norwalk and a year in Brooklyn, N. Y., coming to Kent in 1867, when Mr. McKeon was appointed foreman of the Erie paint shop. This place has since been their home.

Mrs. McKeon was a woman universally respected and esteemed, possessing many noble qualities of mind and heart. In the home and the community her sudden taking away is deeply mourned.

She was a charter member of Whittier Lodge, Daughters of Rebekah. She had often accompanied her husband to the annual meetings of the Master Car and Locomotive Painters' Association of the United States and Canada, held in various cities, he being secretary and treasurer of the association for nearly a third of a century. She had formed the acquaintance of the members and their wives, to all of whom the news of her demise will bring much sorrow.

Mrs. McKeon leaves, besides her husband, three daughters, Mrs. Fred Seigel, of Barberton, and Clara and Nellie at home. Two children died in infancy. She is also survived by her aged mother, Mrs. Eliza Lobdell, and two brothers, W. H., of Kent, and Ira, of Cuyahoga Falls.

The funeral was held Monday afternoon, conducted by Rev. O. W. Holmes, of Canton. Rev. T. S. Smedley assisted. Services were held first at the home, afterwards at the M. E. church. There was a very large attendance of friends. There were a score of floral offerings, including designs from the Rebekahs, Supt. Stutzman and teachers, board of education, official board of M. E. church, Epworth League, M. E. Sunday school, Erie paint shop, Cone's store, and from friends in Barberton. The Rebekahs conducted services at Standing Rock cemetery, where the burial took place.

The Lake Shore Shops at Collinwood, Ohio

Collinwood is a suburb of Cleveland and is located about six miles east of the city. It has good car service, being located on the "Shore Line" of the Cleveland & Painesville Electric Ry., and the Collinwood Line of the Cleveland Electric Ry. The writer, being interested in railroad shops, recently visited this plant and will herein try to describe them so that others may have "a pen picture" of them at least.

The ride from Cleveland was not inspiring to the esthetic mind of the writer, who was born and brought up near Boston and has been used to her stately boulevards and "sandpapered" roads. At this season of the year Collinwood's streets are veritable bogholes, or, to use the term of the conductor on whose car I rode, "lakes of mud." The soil in this part of Ohio is of a soft clay nature, and under the influence of "Old Sol" and a little rain, becomes a mass of slimy ooze. After leaving the car and crossing an overhead bridge, under which the main line of the "Lake Shore" runs, one sees an ideal railroad plant on a level plain. This is on made land, being filled in in places to a depth of ten feet. The first building which greets the eye is the Master Mechanic's office, which looks like a fair-sized school house. This is set back from the street some 50 or 60 ft. and is a fine looking structure. It contains, besides the M. M.'s office, the drafting rooms, the chemical laboratory, and room for the clerical force. Situated back of this, across a level area of about 200 yds. are the massive buildings of the boiler, machine, locomotive shops, storehouse and paint shop in the order named and in a straight line. The first impression is of the immense size of these buildings. The entire plant is fenced in and admission can be gained only by applying for a permit at the M. M.'s office. This broad expanse is to be turned into a beautiful lawn, spotted here and there with flower beds, and no doubt will be a much better looking place than the average car shops possess for grounds.

Some idea of the size of these buildings may be imagined when one is told that the first building, which is really three in one and containing the first three shops previously mentioned, is 600 ft. long, 300 ft. wide and 60 or 75 ft. high. This building has an immense roof which comes as near being all glass as it is possible to make it, and consequently is nearly as light as out of doors. In this building are four traveling cranes, each capable of lifting the heaviest locomotive and carrying it bodily the entire length of the building. Everything is scrupulously neat and there are no piles of scrap iron lying around on the floor. The machines in the shops are all new with the exception of about six.

Passing into the boiler shop, I saw strung along one side some barrels and tanks, which proved to be the temporary paint shop, pending the completion of the one now in process of erection. Having my nerve with me I sought out the "boss," and being a former "knight of the brush," the rest was easy. The gentleman who presides over this precinct answers to the name of R. B. Pebbles, and was at the Norwalk shops of the same road five years, the Elkhart, Ind., shops one and one-half years, being transferred here upon opening these. By his kindness we inspected the plant, making occasional notes for the benefit of his fellow craftsmen. Passing through the boiler shop, we crossed another space of about 50 yds., which separates these buildings and which contains the brass foundry, bolt shop, blacksmith's shop and wheel and axle shop, all in one, being in the shape of the letter "L." This building is about 600 feet long on one side and 400 on the other and has a depth of about 100 feet. Back of this are the store bins for coal, scrap iron and larger castings. Passing through this building and across the tracks, you come to the mill in which will be located the wood-working machinery, but as the foundation is only in the size of this building can be seen only in the figures. It will be 800 x 150 ft. and will house everything in the wood-working line. Beyond this is the carpenter shop in which the cars will be assembled. This is 300 x 150 ft. and has a transfer table in front to connect its tracks with the mill which is situated lengthwise. Back of this is the paint shop, which is separated from the carpenter shop by another transfer table, making the tracks independent of those in the other shop. This shop will be a dream; not "a pipe dream" from which one will awaken, but a great, light, roomy shop the size of the carpenter shop already described. The roof of this building will be almost entirely of glass and the interior has only four posts. The structural work is entirely of steel throughout the entire plant and there is not a wooden building on the place. The floors are of cement and the heating is done by the hot air process. This will be one paint shop in which there will be an embargo on all carpenter work, and clean work will be a reality at last. Permanent staging will be the rule, and in fact everything will be "up-to-the-minute" in every respect.

Having made a circuit of the shops, we now proceeded, down the center through the store-house, and what a storeroom it was! This is the headquarters for the entire system and everything which is needed in the running of a railroad, from lamp-wicks to headlights and nails, lumber, stationery, etc., too numerous to mention. Beyond this is the power house. The power of the plant is electricity and here are located the generators, three in number; two are of 650 H. P. and the other 125 H. P. There are also two immense air compressors of about 250 H. P. each. The boiler-room has six large boilers which are automatic. The coal is brought in hopper-bottom cars which are dumped outside, the coal running down through the tracks into conveyors which carry it into the fire-boxes. The ashes are taken out automatically and there are only two or three men needed to look after these boilers and the pumps.

The appointments of these shops are first-class and the comfort of the men seems to have been looked after much better than is the rule in the average shop. In the machine shop there are 600 lockers, each with a combination lock and well ventilated. The toilet rooms have cement floors and porcelain bowls and open plumbing. These conveniences have been put in for the accommodation of about 2,000 men, which is expected to be the size of the force when in full operation.

A few words about Mr. Pebbles' duties will be interesting to the trade. He has to look after the painting of the buildings, machinery, engines, boilers, in fact everything about the place. This will call for immense quantities of machine paints of all descriptions. There is enough machine work to do to keep thirty or forty busy for a considerable length of time. There are twenty-four locomotives in the shop at present and with the tracks full of them outside the shop there is every prospect of a busy season. Most of these were huge freighters, with a very few of the old-timers. The contrast between these huge machines and the engines of ten years ago was impressed on the mind of the writer during this visit, and he wondered where they will stop in point of size. This means a great increase in the duties of the painter. S. W. Cleveland.

Report of Advisory Committee Meeting

At a meeting of the Advisory Committee of the Master Car and Locomotive Painters' Association, held in the Colonial Hotel, Cleveland, O., Feb. 21, 1903, the following members were present and presented the list of subjects for discussion at the next annual meeting in Chicago, Sept. 8th to 11th.

Those present were, J. A. Gohen, "Big Four" Ry., D. A. Little, P. R. R., J. H. Kahler, Erie R. R., T. J. Rodabaugh, P., Ft. W. & C., and W. O. Quest, P. & L. E. R. R., of the committee, and Robert McKeon, secretary. The following members of the association also attended and took part in the proceedings: D. W. Smith, P., Ft. W. & C., Chas. Becker, "Big Four," John Gearhart, P. R. R., J. G. Hilpert, C., L. & W., Robert Shore, L. S. & M. S., and H. C. Lafferty of the Pressed Steel Car Co.

The following visitors were present: H. J. Kuhn, Flood & Conklin Co., Thos. Murray, Protectus Co., M. L. Sims and C. F. Copp, S.-W. Co., Mr. Harding of Berry Bros. and Mr. Hopkins of the Patterson-Sargent Co.

LIST OF SUBJECTS ADOPTED.

1. The best method and material for interior finish of modern passenger cars, including hardwood, acid-burning treatment, filler, stains, etc.
2. Heating and ventilating car and locomotive paint shops.
3. Which is the best method to pursue, touching up, or cutting in?
4. Harmony in color in finishing and furnishing of the modern railway passenger car.
5. The proper method of painting and maintaining a locomotive engine.
6. Best method of painting and maintaining steel cars.
7. Is the authority and responsibility of the Master Painter co-equal?
8. The copper-sheathed car.
9. What is the best material for cleaning passenger cars preparatory to painting or varnishing?

QUERY LIST.

1. Does any member advocate the use of steel wool in the paint shop?
2. Do we pay enough attention to the front ends of our locomotive engines?
3. Can we successfully paint galvanized iron without degalvanizing it?
4. What glass, if any, should be bedded?
5. Does any member still use a paint sprayer? If so, why?
6. Is there anything better than straight white lead for stenciling freight cars?

A daily exhibition of paint shop appliances by manufacturers and users.

Committees have been assigned on subjects, but it is thought not best to publish them in advance of acceptances.

Robert McKeon, Secretary.

Notes and Comments

Mr. Geo. L. Miller, General Foreman B. & M. Car Shops, Portland, Me., met a tragic death, Feb. 17. He was at a wreck directing the loading of a locomotive tank onto a flat car when he noticed that something was giving away and shouted to his men, who all got out of the way, but he was not able to, and was crushed to death instantly by the tank. He left a wife and an unmarried and talented daughter. Funeral at his late residence in South Portland, Jan. 19, which the writer and most of the general foremen of the car department and others attended.

This note is penned in sadness. "George" was intimately associated for many years with the writer as a foreman of passenger work at the Lawrence shop, and Feb. 24, 1885, he was appointed to the head of the Portland shop, and thus lacked just one week of completing 18 years at that place.

Mrs. McKeon was as well known as her esteemed husband among the Master Car and Locomotive Painters' Association, to whose annual conventions she always accompanied him, and her sudden taking away will be sincerely mourned by our members and ladies, and her presence greatly missed Mr. McKeon's failing eyesight has made her companionship all the more valuable to him for the last year or two and in this great bereavement he will have the sincere sympathy of us all. Cheer him up with a letter, "boys!" We insert elsewhere in this issue the extended notice of her death that appeared in The Kent Courier. There were also resolutions from "the Daughters of Rebekah," of which organization she was an honored member.

The N. E. R. R. Club tried the experiment, Jan. 27, of a "Ladies' Night" for the first time in its history, and we think it has led all other clubs in this regard. It was a complete success. A ticket-rate of 50 cents per person was fixed to cover price of entertainers, and about 300 were sold, the club furnishing the banquet at about 75 cents per plate. There was a male quartette, a soprano, a reader and impersonator, a baritone and an orchestra. It was a fine concert, which was followed by the refreshments; then came dancing shortly after 10 until 12 o'clock, the floor having been cleared of chairs while the party were at lunch in adjoining rooms. The free use of the hall was tendered by Miss Post, as the club patronizes it eight nights annually for its meetings. There were about 260 present. At about a stone's throw from the Copley Square Hotel, where our last convention was held, with the same man at the head of the entertainment committee (Frank Barbey), and some paint and varnish supply men present, it seemed like the spirit of an entertainment night of our convention flitting past. There has been a wish for something of this kind for years by some members of the club, but the officers have been skeptical of its practicability. The success of this would seem to warrant another effort another year. "All work and no play makes Jack a dull boy" (and Gill a dull girl).

Another car, a combination smoker and baggage, is being burned off at the Lawrence shop (Jan. 27) that was built at this shop in 1887 and painted straw color. In July, 1896, it was painted Pullman color over the straw color, and though the car has not been burned off in all this fifteen years of service it was in fair shape—no blistering, chipping or peeling, and not so badly cracked as some cars we have seen in service. We mention this simply to show the lasting qualities of the old straw color, which, of course, was composed chiefly of lead and was applied in several thin coats. There's nothing like lead.

It is said that "All things come to him who hustles while he waits," and so at last a new shop, we hear, is coming to friend Jenest, of the Pittsburgh & Lake Erie. We hope after he gets out of that smoky old round-house and into this light and airy shop, he will after awhile wake up from his dreams of fairyland and give us some description of it, with photos, for these columns, as such things are "good for sore eyes" among painters, next to a new shop of their own. And any other associate similarly blessed is hereby invited to do the same thing. Let it be "catching."

It is the best practice for a railroad to get its book gold leaf direct from the beater, and therefore get a good article. There is much cheap, second and still poorer quality of leaf put upon the market which jobbing houses take up as a leader to draw in other trade on the supposition that they are giving a first-class leaf at cut rates, when they are not. It is full of holes where not badly patched, mussed and torn, and its use is more expensive than a first grade leaf at a fair price.

As to shop outputs, if a paint shop puts out two and one-half times its car capacity it may be said to be doing very well; that is, if each car gets two coats of varnish. In other words, if a shop holds 16 cars, 44 would be a good output, and 20 cars, 50 is the output, and so on. This is as many as can be properly done and give requisite time for drying between and after coats. And this is on the basis of regular cleaning and varnishing. If there are many new painting jobs from the wood which have been burned off or resheathed, or any new cars to finish inside, or many interiors to varnish this quota can hardly be properly maintained without a loss in quality of work.

During the month of January, 1903, the output of passenger equipment from the Boston & Maine paint shops was 181. Every car not painted complete was cut in with the new or lighter shade of Pullman color, or 156 in all cut in, 23 painted complete and two copper covered cars renovated. We do not regard it good practice to cut in cars every year, but with the new shade of color and with many, if not most, of its cars running three to five years by touching up and varnishing and badly spotted and stained, it is opportune for the Boston & Maine to cut in its cars this year and come out with a clean, bright equipment. The difference in time and output is scarcely noticeable in comparison with touching up and varnishing.

Enterprising paint makers are "scenting the battle from afar" and girding up their loins to produce what above all others is the crying need of the hour, and that is a protective paint for steel that protects. Many are firing at this target and the fellow who hits the bull's eye right in the center should be crowned. Among others the Detroit White Lead Works are out with a booklet on this subject setting forth the claims of the "Rogers Non-Corrosive Steel Coating" for the steel car, architectural steel work, interior of locomotive tanks, bridges, etc., in which they say, "We offer you a perfected article, the experimental stage of which is passed." The writer knows nothing of it by personal experience, but doubtless it is worthy of a thorough trial. It is in three standard shades—black, brown and cream color. Special shades made to order.

The N. E. R. R. Club had for its subject at the February meeting, "Draft Rigging;" but, judging by the able paper by Mr. R. A. Parke, of the Westinghouse Company, it might have been termed with equal propriety "Battering Rams," so much consideration was given to the question of resistance against impact that draft gear gets in shifting and coupling cars in regular work, not to mention accidents. To be sure, a draft rigging, if it can stand all this, as a friction gear is said to do, there will be no trouble with its hauling features. The fact is, more damage is done to cars, old brittle paint and varnish included, in yards shifting and shunting than the wear and tear of regular service.

In further explanation, in response to the editor's inquiries as to applying a decorated paper lining over an old varnished wooden headlining, Mr. Hutchinson writes, as follows, Jan. 29:

"As to applying the paper on wooden linings, of course, in my experiment on the panel described, I removed, or roughed up, the varnish with warm, strong lye sufficiently so as to get a proper foundation for the paper to adhere to. And I would say right here that this is not a new trick, but one practiced by house decorators, both with cloth and paper, over painted and varnished surfaces, quite often; and from my comparative test made, in estimating the cost of scraping by the woodworker and the labor also of knifing in and smoothing up for the color coats by the painter, I found it would be double the cost of applying the paper, as above. I am aware there is a deep-rooted objection to the use of anything in the paper line for this purpose by car men, objections that I admit are serious ones to overcome. For this reason I was careful in making this test, or experiment. However, I have thought, as you say, so few linings are taken down during the year the amount saved would be small; and for this reason, and that the scheme would not likely be considered, therefore, as I thought at the time, the article is too long anyway, and I will thank you to cut this out with reference to the use of paper and correct, or re-write and oblige me."

Mr. Hutchinson will pardon us for using his article as he wrote it, and also his additional note above. We have not cut out that part of it relating to paper for the reason that he has given the matter much thought and experiment, and we believe the experiment is worth trying by others. "Nuffin venter, nuffin have," as the colored brother said. As Mr. J. T. Chamberlain once said about painting a baggage car with air, "The experiment is worth trying if you spoil the painting of one car."

Mr. J. T. Chamberlain, M. C. B., B. & M. R. R., sailed Feb. 25, for Jamaica for a brief vacation of about eighteen days. This is an ideal way for a busy railroad man to get a little respite from pressing, absorbing duties and get that rest and recreation needed. The salt water trip is bracing (by the way, Mr. C. is "an old tar" on the water—never sick), and the climate of the tropical islands is balmy in comparison to the rigors of this northern clime at this time of year. In fact, the scenery is so entirely new that it must seem like a birth into a new world; and thus one comes back feeling like a new man.

Since furnishing us with the interesting matter in this issue, our associate, Mr. T. J. Hutchinson, of the Grand Trunk shops at London, Ont., has met the sad loss of the death of his wife. He referred to her illness in a note received in January, and we wrote, making some inquiry, to which he replied under date of Jan. 29, that she underwent an operation for internal cancer in that city last June, and up till about two months ago was thought recovering, but at the time of writing the physician informed him that she had a recurrence of the old trouble and in her then present weak condition the chances were against her recovery. Today (Feb. 20) we have received a copy of the London Advertiser of Feb. 14, from which we clip the following account of her funeral.

We bespeak for Mr. Hutchinson the sympathies of our association in his bereavement:

BURIED AT PORT HURON.

The remains of the late Mrs. T. J. Hutchinson, of East London, were taken to Port Huron this morning for interment. The funeral was held from the family residence, 509 English street, the services being conducted by Rev. C. C. Owen, rector of the Memorial Church. Many friends of the deceased were present, and as a mark of respect the painters at the Grand Trunk Works, over whom Mr. Hutchinson is foreman, accompanied the remains to the depot. Other departments were also represented. The pall-bearers were chosen from the car shops and the Knights of the Maccabees. Master Car Builder Treleaven, and Messrs. W. Reid, Joseph MacWood, Chas. Fitzgerald, W. Kendrick and W. Leslie, went to Port Huron with the remains.

Mrs. Hutchinson formerly resided in Port Huron and came to London with her husband when the car works were rebuilt. She was 52 years of age and leaves two daughters. Cancer, from which she had suffered for several months, was the cause of her death.

Warner Bailey hands us the following clipped from a newspaper, which shows the common want for a paint of this kind: "Of the many wants now felt in the arts, few are more important than that of a satisfactory paint for iron and other metals. Thousands of tons of paints are used annually on bridges and other structures, but it is pointed out that no compound tried gives perfect protection. The perfect paint must be tenacious, pliable, adhesive, inert and proof against moisture, oxygen, and the fumes from burning coal."

William Francis Chapman, one of the best known paint and oil men in New England, and a former resident of Newtonville, Mass., died suddenly of apoplexy at the Massachusetts General Hospital Jan. 6. He was in perfect health apparently, up to thirty-six hours before his death. He was stricken at his apartments in the Lenox Hotel, and was removed to the hospital Monday afternoon. Mr. Chapman was born in Paris, Me., fifty-nine years ago. At an early age he removed to Boston and began his business career in that city as an employe of the Stimson Varnish Co. In 1878 he was made manager of the New England branch of Berry Bros., Limited, varnish manufacturers, of Detroit, with headquarters in Boston, which position he held at the time of his death.

The Car Foremen's Association of Chicago

February Meeting

Regular meeting of the Car Foremen's Association of Chicago was held at Room 209, Masonic Temple, Chicago, Feb. 11, 1903.

Meeting was called to order at 8:00 p. m. by President Parish.

Among those present were the following:

Bossert, Chas.	Haig, M. H.	Ransom, P. B.
Bates, G. M.	Joseph, H. A.	Ryding, A.
Bourell, J. W.	Kline, Aaron.	Richardson, Wm.
Cuthbert, J. R.	La Rue, H.	Shoemaker, C. A.
Cardwell, J. R.	Marsh, Hugh.	Taulor, C. O.
Clark, I. N.	Nordquist, Chas.	Treptow, A.
Deans, Jno.	Parish, L. G.	White, P. W.
Etten, L.	Pettis, C. D.	Warlick, Geo.
Heisterman, Wm.	Plummer, A. K.	Wessell, W. W.
Harris, S. H.	Powell, C. R.	Ziemer, Chas.

President Parish: As I understand that the February issue of the Master Mechanic has not yet been gotten out, we will have to dispense with the reading of the minutes of the January meeting until next month.

Secretary Kline: The following have made application for membership:

Mathias Bach, Car Inspector, G. T. Ry., Chicago.
E. W. Bowen, Draughtsman C. R. I. & P. Ry., Chicago.
Gustav Bahr, Car Inspector, C. B. & Q. Ry., Chicago.
C. Brodersen, Painter, C. B. & Q. Ry., Chicago.
H. F. Ball, Supt. Motive Power, L. S. & M. S. Ry., Cleveland, O.
Jno. W. Bowlby, Tinner Foreman, S. R. T. Co., Chicago.
Jas. Cairns, Car Inspector, C. B. & Q. Ry., Chicago.
Thos. Collins, Car Inspector, L. S. & M. S. Ry., Goshen, Ind.
W. A. Carter, Car Inspector, Swift R. T. Co., Chicago.
M. Cooper, Air Brake Man, Swift R. T. Co., Chicago.
H. L. Ebert, Chief Car Inspector, Standard Oil Co., Chicago.
C. H. Emerson, Car Shop Foreman, E. J. & E. Ry., Joliet, Ill.
S. K. Edwards, Foreman, N. Y. O. & W. Ry., Middletown, N. Y.
E. H. Ellis, Carpenter Foreman, Swift R. T. Co., Chicago.
F. C. Falbisaner, Car Inspector, C. B. & Q. Ry., Chicago.
B. J. Julier, Repair Track Foreman, Standard Oil Co., Chicago.
Wilbur Lloyd, Car Inspector, E. J. & E. Ry., McCook, Ind.
Jno. Montel, Car Inspector, E. J. & E. Ry., Matteson, Ill.
W. A. Mitchell, Foreman Car Dept., L. & N. Ry., Nashville, Tenn.
W. A. Middleton, Clerk, Swift R. T. Co., Chicago.
Geo. M. Pooler, Car Foreman, Swift R. T. Co., Chicago.
M. Quilter, Car Inspector, N. Y. C. & St. L. Ry., Fostoria, O.
J. H. Roney, Car Inspector, Standard Oil Co., Whiting, Ind.
Jas. Schimandl, Asst. Foreman, Arms P. H. C. Co., Chicago.
H. Schiminsky, Mill Foreman, Standard Oil Co., Whiting, Ind.
B. F. Soaps, Shop Foreman, Standard Oil Co., So. Chicago, Ill.
Wm. Sulke, Car Inspector, C. M. & St. P. Ry., Chicago.
S. J. Stevenson, Car Inspector, Swift R. T. o., Chicago.
Edw. Schlesser, Car Inspector, C. N. Y. & B. Co., Chicago.
J. H. Tinker, M. M., B. & O. R. R., Garrett, Ind.
C O. Taylor, Salesman, J. B. Sipe Oil Co., Chicago.
Clarence Utt, Asst. Yard Foreman, Swift R. T. Co., Chicago.
C. O. Van Deveer, Clerk, Swift R. T. Co., Chicago.
E. O. Wells, Car Inspector, E. J. & E. Ry., Leithton, Ill.
Chas. Ziemer, Clerk, C. R. I. & P. Ry., Chicago.

President Parish: Under the head of new business we will appoint a Committee on the Revision of Rules, which will report at the March meeting. Mr. Bates, is that earlier than the report of last year, or about the same date?

Mr. Bates: I do not think it is for the reason that after the committee makes its report it always has to be changed somewhat and then has to be gotten into shape for the secretary of the Master Car Builders' Association before April 21st, and I think we will need all that time to get things in shape.

President Parish: I will appoint the following committee: Messrs. Bates, Morris, Stimson, Treptow and La Rue.

We will now take up the program of the evening.

Subject No. 1.

Secretary Kline: Rule 91 reads, "Air hose applied, $2.00." When hose is missing on defect card what is the proper charge for labor and material? When is the labor charge of three cents, referred to in Rule 109, to be made?

Mr. Bates (C. B. & Q. Ry.): I do not know who brought up the question, but as I view Rules 91 and 109, you cannot make a labor charge for applying air hose on defect card under Rule 91. Rule 109, as I take it, permits a labor charge only when removing a good hose in order to mend a pipe or something of that sort which requires that the hose be removed in order to get at it to make the repairs, because it says in Rule 109,—"Air hose removed and replaced, three cents." Now that means when you take a good hose off and put it back on after doing some other work. I think the word "applied" in Rule 91 prevents anyone from making a labor charge when air hose is missing on defect card. I have looked up the decisions of the Arbitration Committee and would call your attention to Case No. 7; it is way back, but at the same time I think it applies to this case. The U. P. Rd. made a charge against the C. & N. W. Rd. of 40 cents for applying an end door besides the regular charge for the end door, and the Arbitration Committee decided that this was not proper. For that reason the word "applied" was added to the Rules, and I would like to have the secretary refer to that case and read it to the members.

Secretary Kline: The U. P. Rd., under date of July, 1888, rendered bill against the C. & N. W. Rd., in which it made a charge of $3.00 for an end door and of 40 cents for labor of applying same. The C. & N. W. Rd. objected to the charge of 40 cents for the labor, claiming that the regular charge under the Rules covered the labor of application. The U. & P. Rd. claimed that under Rule 87, the charge was correct or else it would not have been necessary to put in the word "applied."

Decision: This subject was discussed at the meeting of the Master Car Builders' Association, and the decision was that the charge allowed in the Rules of '87 for end door included the labor of application. The Rule was made more explicit to cover this point by the insertion of the word "applied." The decision of the committee therefore is that this charge is not in accordance with the Rules of '87 and '88, and should not be paid.

Mr. Bates: That was what I wished to call attention to; that the word "applied" was added for just that reason; to stop the labor charge when the price given in the Rules was suffcient to cover both, and I think that the $3.00 covers both the labor and material in the case of applying an air hose.

President Parish: Is there anything further on the subject? I believe in view of the fact that there appears to be a decision pending on this question from the Arbitration Committee it might be well to pass it.

Secretary Kline: There is another part to that subject: "When is the labor charge of three cents, referred to in Rule 109, to be made?"

Mr. Bates: The charge would be proper if a train pipe is broken so that you have to unscrew the fittings and remove the hose in order to make the repairs.

Mr. Powell (I. C. Ry.): I do not think there is much object in placing three cent labor charge in the rules, as it is very seldom that you can bill for a train pipe inasmuch as the association has decided that train pipes and air brake fittings cannot be broken in fair service. I see but very few cases where the charge could be made.

Mr. Bates: I do not quite agree with Mr. Powell that you cannot charge for a train pipe in all cases for the reason that very often you find the train pipe bursted. Now in that case it is certainly an owner's defect; or, if the threads break where the pipe is connected together for coupling, say about half way back under the car; that is certainly fair usage, and I know we have often made these repairs and collected for them. One road objected to it but paid the bill when we explained the matter. Of course where the pipe is broken on the front end by means of pulling off the hose and angle cock, then I agree with Mr. Powell that you cannot charge, but when it is burst or broken way back where it is nothing else but fair usage you can charge the owner for it, and these are the cases where you can make this charge of three and six cents.

Mr. Powell: While I am not exactly familiar with how a train pipe can be broken in fair service, the arguments generally are that it is due in most cases to neglect in allowing the train pipe to strike against the body of the car; at least that is the argument usually presented. It is on that ground that I say that a train pipe could not be broken or burst in fair service.

Mr. Bates: I have seen numerous cases where train pipes were broken under a car due to the fact that the car sagged down in the middle and bent the pipe and broke it right where the thread was cut on it. Now that was certainly not unfair usage, and train pipes do burs where there is a poor weld. I recall the case of a new car in which the train pipe was bursted right at the point where it was bent. At one end of the car the pipe is bent to one side and at the other it turns over and goes to the other side. Now if the weld is poor and the pipe is found to open, that is not unfair usage.

Subject No. 2.

Secretary Kline: At what rate should labor be charged on steel cars?

Mr. R. Wharton (C. & N. W. R. R.): We handle a great many steel cars, but have had so few repairs other than broken drawbars and the like that I am unable to pass an opinion on this subject. It would all depend upon the parts that gave way. We have had cars off the tracks and put them back on again without doing any damage to the trucks or bodies, but as to drawbars, we break considerable of them for which we make the usual charge.

President Parish: I presume it is the intention to bring out an opinion as to what labor charge should be made for repairing the sheet metal on the car or the repairing of any pressed parts.

Mr. La Rue (C. R. I. & P. Ry.): Under the present circumstances I do not see where you can do any better than to charge the current price for the pressed articles, the same as the quoted price of the company that manufactures them, and the actual amount of the labor. I think, however, that the Master Car Builders' Association this year will take this matter up. What decision it will give I cannot say. I have not heard it discussed, but it seems to me high time that something were done in this direction. Of course bills can be questioned for the reason that some points that have a great deal of that steel car work are breaking in men purposely for that work, and of course they are men that are not as high priced as the regular boilermakers. At other points where there is only a small amount of that work I suppose the boilermakers' rates will have to govern, but whether there will be a hard and fast rule made regarding the repairs to these cars I am hardly able to say. At present the same rates would have to govern as on wooden cars.

President Parish: I would like to ask the members if any of them have received a bill where the charge for labor was any more than the ordinary labor charge as given in the rules?

Mr. Bates: I believe I have seen a bill for repairs to one of these steel cars. I think it was about a year ago that I furnished a defect card for a whole end punched in on a steel car, and we received bill, but the labor charge was 20 cents per hour. Of course they had quite a number of hours charged, but we could not question that, and the rate was 20 cents per hour. I do not see how you can charge any more than that under the present rules. Rule 91 says that the labor charge per hour for freight car work is 20 cents, and until that rule is changed I do not see how you can charge any more. I have looked up this matter of blacksmith labor and the like, and find that in case 65 there was a labor charge made for 50 cents per hour for blacksmith labor, and the arbitration committee decided that that was all wrong and that all you could charge was 20 cents per hour. Now, if any of the members wish to hear that decision the secretary can read it. Under that decision and the present rules I do not see how any more than 20 cents per hour can be charged.

Mr. Pettis (I. C. Ry.): I would like to inquire in regard to Mr. Bates' remarks on blacksmith labor how we can charge any blacksmith labor at all. Do not the rules charge an arbitrary price for bolts, etc., of 3 cents per pound? At the prevailing rate of bar iron to-day the difference between that and the allowed price of 3 cents per pound would give you a liberal allowance for labor. As far as the rate of 20 cents an hour is concerned, it is a fact that higher charge cannot be made under existing rules. Moreover, I believe that in the charges that are being made for repairs to steel cars the higher rate that is paid for that class of work is offset by the greater number of hours that is shown on the bills. In other words, if an hour is expended at 30 cents, they charge 1½ hours at 20 cents opposite that item. I saw a bill recently for replacing side stakes in a steel car. There was hardly any question as to the price of the side stakes themselves. In fact, we are not discussing the price of material, but of labor, and I think it is agreed and admitted by all the members of this association that there are very few boilermakers making 20 cents an hour. I believe there are charges made for repairs to tank cars today that undoubtedly require a higher rate than 20 cents per hour, and the bill is made up showing for the number of hours the result obtained by dividing the amount expended for labor by the rate of 20 cents per hour. Under the existing rules there is no discrimination between wooden and steel cars, and I believe with Mr. La Rue that probably at the next convention of the Master Car Builders' Association there will be some changes made, and they are certainly necessary. I have never seen a bill with a charge on it for more than 20 cents per hour, but I have seen some bills on which the number of hours charged ran up pretty high.

Mr. Bates: With regard to Mr. Pettis' remarks regarding bar iron: I did not have reference to anything like that and I think that if the secretary will refer to that decision he will find that it was the blacksmith's labor in repairing parts of cars that were damaged, not for bolts, etc. Three cents per pound cover manufactured wrought iron articles. This decision came up for the reason that blacksmith labor was charged for at the rate of 50 cents per hour, and the decision was against the road that made the charge.

Mr. Pettis: I think if you go back to the subject of wooden cars you will find that there are not many roads running out of Chicago who are getting work done for 16 cents per hour. There have been times past when the amount expended in making repairs involving truck hands' and carpenters' labor would not equal the total number of hours allowed at 20 cents, but with the remarkable increase in rates paid I do not think there is any money in it at 20 cents an hour for making repairs to wooden cars.

Mr. Powell: I have received a number of bills for work on steel cars. The Illinois Central Railroad has no steel constructed cars and I do not believe we have ever had any figures showing what it costs to repair them, but in reference to Mr. Pettis' remarks I think I can agree with him on the number of hours charged. To my knowledge the Illinois Central Railroad never received a bill on which the labor charge was more than 20 cents per hour.

Mr. Plummer: If we make repairs to steel cars we bill at the rate of 20 cents per hour, and we take the foreman's word as to the number of hours consumed in making the repairs. Personally I do not seen any objection to the owner of a car making repairs and billing it at whatever the actual cost may be. I think that is the best way to handle it. We repaired a Bettendorf bolster in our shops yesterday, which was bent pretty badly, and I do not think that our blacksmith could do the work at 20 cents per hour; not less than 27 cents. We had to put it under a steam hammer to straighten it and that took the man who runs it, with a blacksmith and two helpers, and they could not do it at 20 cents an hour, so that as has been said, it would be necessary to double up the hours, and we might just as well have a higher rate.

Mr. Pettis: I would like to have a committee appointed to take up the question of rules. I do not think it is good policy in interchange and billing between ourselves to resort to subterfuge, and that it might be well to establish a price that is going to cover the actual cost of labor expended, so that the bill may show the actual number of hours used in doing the work, and I think that other prices should also be made to cover boiler work. There has never been any price set on boiler work. It cannot be done for 20 cents, and we might just as well realize it, and if we have to pay 30 cents an hour I am sure the Master Car Builders' Association will be fair enough to make a right price. The two classes of work are certainly not very much alike and it might be well for the Association or committee that is going to recommend these changes to recommend that these changes be given a good discussion. Let us have a price and show the actual number of hours. We then have something to work at to arrive at the actual cost of expenditure.

Mr. La Rue: I hardly agree with Mr. Pettis in that matter. As I stated before, I think that the actual price should be charged. We do not do very much of that work, scarcely any at all, but we are all coming to it, and very soon. I would like to ask the members if they think that the present charge of 20 cents an hour is right for wooden cars, at this time and age. I would just like to have this as an expression for the guidance of the deliberations of the committee.

Mr. Bates: I think 20 cents an hour fully covers all sorts of work on wooden cars. I do not think there is a road in town paying more than 20 cents for carpenter work, and very few pay more than 16 cents per hour for trucksmith work. Now it is a well-known fact that trucksmiths are used for tearing down cars, taking out sills, etc., and all the carpenters do is to frame them and the trucksmith puts them up again. The truckman takes off the sheathing and the carpenter puts on the next. For this reason I think that 20 cents per hour is sufficient.

Mr. Pettis: I think that if you would inquire of some of these gentlemen representing private lines you will find that many of them have carpenters at 20 cents an hour, and as far as truckhands are concerned I think you will find that the rate at the stockyards is considerably more than 16 cents per hour. From my observation of the general all-round run of repair work the actual number of hours expended in doing the work multiplied by 20 cents an hour will not give the cost to do the work. The time is not very far gone that 16 cents an hour was a pretty good price for truck repairers or the class of men who might be called handy men, who do no more than tear down sheathing, but I think that time is past. In fact, I do not know but that on wooden as well as on steel car repairs, there may not be more hours added to obtain the increased cost, but I believe that with the general run of work 20 cents per hour is not too liberal, and it may be that some roads are adding to the hours to obtain the full cost.

Mr. Plummer (C. B. & Q.): I do not believe that 20 cents an hour is enough. Mr. Bates may think so, but we cannot get good men at that price any more. You can get common men at that rate, but most of them are not worth even 16 cents, and I would rather pay a man well and have him do a day's work; we should have good men and get our cars out on the road. Our men make 27 cents an hour down at Aurora, the best of them, and some of them make 30 cents. That is on a piecework basis. It is a good deal better for the company that these men do make these rates, because they do twice the work of a man paid by the day and the cars are gotten out that much quicker. We repaired a Bettendorff bolster in our shops yesterday which was bent pretty badly, and I do not think that our blacksmith could do the work at 20 cents per hour; not less than 27 cents. We had to put it under a steam hammer to straighten it and that took the man who runs the hammer, with a blacksmith and two helpers, and they could not do it at 20 cents an hour, so that as has been said, it would be necessary to double up the hours, and we might just as well have 25 cents per hour and put in the proper time. We do all work on foreign freight cars as on our own cars, by piecework, and should look at it from that standpoint. I think the rate should be 25 cents for all car repair work, wood or iron.

Mr. Bates: It is a well-known fact that pieceworkers will do more work than dayworkers, and the men will probably average more than 20 cents per hour, but we must take into consideration that they do more work.

Mr. Plummer: We do all work on foreign cars as well as on our own cars, by piecework, and must look at it from that standpoint.

Mr. La Rue: I hardly think that piecework comes into this question. The question in my mind resolves itself into this: Does the number of hours allowed by the Master Car Builders' Association for a certain piece of work at 20 cents per hour cover the cost of the labor?

Mr. Powell: It might be that the rate for labor allowed by the M. C. B. rules would not cover the situation in Chicago or large terminals, yet take it as an average all along the line, it appears to me that the labor charge of 20 cents an hour is, as Mr. Bates says, sufficient. Of course these changes made under the M. C. B. rules are usually light running repairs, where as a result the time consumed does not equal that allowed by the rules, so that I think the rate now is about as equitable as it can be made; at least that has been my experience. As far as raising the rate of labor chargeable, you might say the same thing of material, because, as we all know, some of the material on which an arbitrary price has been decided by the Master Car Builders' Association is costing a great deal more than we are allowed to charge for it, and that has been brought to the attention of the Master Car Builders' Association several times, although no action has been taken. I believe 20 cents per hour to be sufficient.

Subject No. 3.

Secretary Kline: Should a switching road be held responsible for damage done to a car by load shifting?

Mr. Bates: I think I am responsible for that question being on the program, and the reason that I suggested it for discussion was that several switching roads take the stand that they are not supposed to furnish defect cards for any damage done by loads shifting, unless it is a combination, and of course I could not see it that way, for the reason that Rule 114 states plainly what a switching road may repair and bill the owner for, and it does not say anything about the breaking out of the end of a car. If a switching road handles a car and shifts the load and breaks out all the end sheathing, they should certainly pay for it. I have cancelled several cases to avoid dispute. These switching roads tell me that ours is the only road which ever called on them for defect card for this item. I thought it rather strange that our road was the only one and for that reason I cancelled the charges. I would like to ask the other roads if they are allowing the switching roads to break out the ends of their cars free gratis. If so, I suppose we will have to do the same thing, but I do not think it justified under the rules.

Mr. Treptow (L. S. & M. S. Ry.): I think it is right to hold the switching roads responsible, since the cause of the load being shifted is nothing more or less than rough handling. Of course the railroads, belonging as they do to the Master Car Builders' Association, have an agreement between them, but these switching roads pay no mileage and do not come into this, but Rule 114 says what they can charge for and it does not mention the breaking out of the ends of cars, so that I think they should be held responsible.

President Parish: Are there any switching roads represented here to-night?

Mr. Bates: I think we should hear from the railroads first and see how they are doing about these cars with ends broken out.

Mr. Powell: I am willing to give Mr. Bates the benefit of what experience I have had. I believe that under similar circumstances I would endeavor to hold the switching road responsible, as I do not know of any reason why they should be exempt from this charge. The Master Car Builders' Association has stated in so many words what they are entitled to bill for, and as Mr. Treptow has remarked, it seems to me that the case between a switching road and a railroad are not similar. A switching road pays no mileage and very few of them have any cars, consequently the railroads do not damage their cars and therefore there would be no offsetting of one another's claims. The switching roads are paid a higher rate for handling cars and it seems to me that they should be held to strict accountability and entirely by the M. C. B. rules. They are members of the association, as a usual thing, and we all know they do more or less damage to cars. Their records are very strict and they endeavor to know just what they receive on their line being in position to do that better than the ordinary road, and can generally determine conditions of loads and endeavor to prevent damage by shifting, which, as Mr. Treptow has said, is usually caused by rough handling.

Mr. Bates: I would like to ask Mr. Powell whether he ever knew of a case where a switching road broke out all of the end sheathing and refused to card for same.

Mr. Powell: I do not remember any case of that kind. I remember that we had some controversy in the last few weeks where we tried to hold them to the M. C. B. rules and did so. They raised some objection to the condition of the cars which I did not think justifiable, and as further evidence there were a great many corrections on their bills, which went to show that the positions taken by our road were correct. As far as having the end sheathing broken out is concerned, it has never been brought to my attention that a card has been received or requested.

Mr. Pettis: I do not know that I can give any further information on this subject, but I concur in the general sentiment that the breaking out of car ends by loads shifting seems to be the result of misuse, and in the absence of any definite provision for it in the rules to the contrary, it certainly throws the responsibility on the switching road. Under these conditions I believe that persistency in claim for defect card is perfectly justifiable.

Mr. Bates: I have already stated what my position is. I think the rules back me up in what I said. Rule 114 gives a switching road the privilege of making a whole lot of repairs to railroad company's cars at owner's expense, and in fact I think they really have more than they should have, and if we are going to let them break out the ends of our cars without cost to themselves, they will be looking for some other advantage—will lose off side doors and charge us for them, and there is no telling where they will stop. The rules are very plain and I think they are quite sufficient, and I believe we should go on record one way or the other. The "Q" does not wish to be arbitrary, and these switching roads have told us time and again that no other road asks them for these things. It seems to me that there should be some one here who has had a similar case. I should be very glad to hear from him.

Mr. Powell: There are some private line people here who probably have some connections with switching roads. They have private cars and are more strict in inspection.

Mr. Marsh (A. R. L.): I do not believe that I can add anything to what has been said. I believe that a switching road should be held responsible for the damage which they do, and I think I am safe in stating that none of them will go into the hands of a receiver on account of the amounts of the bills they pay for such things. It is pretty hard to handle switching roads. You can never tell what they do do, but so far as liability is concerned I think they should be held strictly accountable for it. The rules now give them more latitude than they should have and I think it is time to draw in a little bit and that it would be well for this association to go on record that they should be held responsible for the damage which they do, the same as any one else. Our cars are damaged frequently by switching roads, and we have trouble in collecting repair charges on them. They go back on the rules and there we are without redress. They bring in the mileage argument and talk us out. I think we should hold them down to the rules.

Mr. Powell: I am not going to take the side of the switching roads at all, but it hardly looks fair to them to hold them for some of the damage they do. It appears to me that a great many defects to cars should be chargeable to the owner as a matter of equity, and it seems to me as if the Association were taking a stand against the switching roads evidently for the fact that they receive higher rates for handling equipment as a switching road, but when you get right down to the right or wrong of it, it appears that in such cases as brake shoes missing and certain other items that are of minor importance, the association would permit a switching road to bill and yet they hold them responsible if a car has these articles missing. I cannot see the equity of it. It seems to me that a brake shoe would become missing on a switching road the same as on any other road.

Mr. Bates: Mr. Powell is certainly mistaken when he says they cannot charge for follower plates. If follower plates are broken or missing on their line they can make repairs and bill for them. If the part is missing when the car is delivered to another road they must card for it. Now it does not mention brake shoes, but at the same time it mentions a whole lot of things that get broken by unfair usage and they can bill for them. I think it is all one-sided anyway and that they have the best of the bargain, and if they do any damage by the shifting of a load they should pay for it, because we cannot shift a load in their cars, since they have no cars. They do not pay us any per diem or mileage, and I have known of cases where they kept our cars for months and we did not get a cent of revenue from them. They get all they can and give up only when they are obliged to do so.

Subject No. 4 was passed over and adjournment taken to allow members to become acquainted with one another.

The Car Foremen's Association

of Cleveland

February Meeting

Minutes of meeting of Car Foremen's Association of Cleveland, Ohio, held at The Kennard, Thursday, February 19, 1903.

Meeting opened at 8 p. m. by President Berg, among those present being the following:

A. Berg, W. Battenhause, J. C. Dennerle, W. Gonnerman, C. E. Harrison, W. C. Green, W. Krage, G. A. Taylor.

Minutes of previous meeting were read and approved.

Reports of Committees.

Mr. Taylor: You may expect a talk on Air Brake from Mr. Hutchins, of the eWtsinghouse Air Brake Company. I wrote him last week and received a letter yesterday stating that he would be here to-night. I was somewhat disappointed on account of the debate scheduled for to-night, but received a telegram from Mr. Hutchins this evening in which he said he was unable to come on account of the serious illness of his son. Presume we may expect him at our next meeting.

The questions on "Inspection" were taken up, and Mr. W. Gonnerman opened the discussion.

No. 1—What is the idea or proper way to handle inspection at division terminals that are also interchange points?

No. 2—What should safety inspection consist of?

No. 3—What should interchange inspection consist of?

No. 4—How many men per train for safety inspection, and how should they work together to get the best results, considering that they are to remove and apply blue flags and lights?

No. 5—What should the average time per car be for safety inspection?

No. 6—What should the average time per car be for interchange inspection?

No. 7—Should the oil box lids be raised, or box merely felt, in safety inspection?

No. 8—How should the box question be handled in interchange?

No. 9—How far should the matter of repairs go without cutting out cars, in safety inspection?

Mr. Gonnerman: To question No. 1 would say that my idea in handling inspection at division terminals that are also interchange points is to give cars a close and careful inspection. Allow the inspectors to use their own judgment and try and keep freight moving with as little delay as possible. Yardmasters should assist inspectors and give them all the information required.

No. 2—Safety inspection should merely go as far as to see whether cars are safe to load; running gear, draft gear, roof and ladders should be the main parts looked after.

No. 3—Interchange inspection should consist of a close and careful inspection of all parts of cars. M. C. B. defect card should be attached for all defects for which the ower is not responsible; cars should not be stopped for small or minor defects, and should be accepted if in safe condition to run in train.

No. 4—I would judge that three men would be sufficient for safety inspection; one man on each side and the third on the roof. The man on the roof can remove blue flags or lights.

No. 5—I should allow one and one-half to two minutes per man per car for safety inspection.

No. 6—I would allow from three to three and one-half minutes per man per car for interchange inspection; the conditions and kinds of cars govern the time of inspection to a great extent.

No. 7—When cars are inspected immediately on their arrival at a station, if the boxes are simply felt it is sufficient; but if cars are inspected say two or three hours after arrival I would insist on having the lids raised, dope, journals and bearings examined.

No. 8—I insist on having all lids raised and the dope and journal bearings properly inspected.

No. 9—I do not think it is necessary to cut cars out in safety inspection, unless they have draft timbers down, cut journals, broken or chipped flanges, broken arch bars, column bolts, or any other defect which is liable to cause accident. Cars may be allowed to run with draft spring broken once, broken draft bolts, if not too many, couplers cracked in face, or any defect which is safe to run in train until car reaches some point where there are facilities to make necessary repairs.

Mr. Harrison: I have no particular comments to make criticising any of the answers, except to questions 4 and 7.

In regard to question 4, two men on the sides and one man on the roof to apply and remove blue flags or lights. According to my ideas it could be done in less time by two men working from opposite ends, and the man from the east end, say, put flag there, and the man from the west end put flag on that end, both to remove the flags when they get to the other end of the train, and wait at each end until the next string of cars comes in, each man to take record of what he has found for safety inspection.

Relative to question No. 7, when cars are inspected immediately on arrival, I think it is good policy at all times to open the lids, for the reason that in many cases a car may be picked up, say, six or eight miles from the point where it is set out for safety inspection, and probably is running cool. You oftentimes open a box and find it half empty for want of dope, yet it is cool.

Mr. Gonnerman: In reply to Mr. Harrison's remarks I wish to say that the interchange inspection should take care of that part. I see no reason for raising the lids in safety inspection. After arriving at an interchange point, perhaps twenty-five miles away, the train stops and is gone over and lids raised. That is what the interchange inspection is for.

Mr. Harrison: Are there not cases where a car does not get to an interchange inspection?

Mr. Gonnerman: I think not.

Mr. Harrison: I think there are. Take supply cars, for instance, or cars similar to them, that never get to an interchange inspection. How would you know about the condition of the journals, boxes, etc.?

Mr. Gonnerman: These cars would start from a division point, which is considered similar to an interchange point. The journals, boxes and everything is in good condition before they are allowed to leave that station.

Mr. Harrison: In answer to question No. 2 you mention safe to load, but say nothing about safe to run.

Mr. Gonnerman: If a car is not safe to load it is not safe to run.

Mr. Harrison: There is another point in regard to safety inspection, and that is to see that the draft timbers are properly secured and no broken wheels or chipped flanges. It makes no difference, according to your idea, how thin the flanges are?

Mr. Gonnerman: Yes, sir. I stated, or any other defect which is liable to cause accident. What do you think of the time allowed for safety inspection?

Mr. Berg: At Ashtabula we get 300 cars in an hour's time, and you have two inspectors. Where would you be? You would have the yard tied up so tight you could not budge.

Mr. Gonnerman: Another thing, Mr. Harrison says one man starting from one end of train and the other man from the opposite end. It seems to me that is awkward. If one man found a broken wheel, or something like that, he would have to crawl over to the other side and mark it. If they work together, one man from one side can call attention of the other man to such defects.

Mr. Harrison: The car is supposed to be carded on both sides; you go down one side and I on the other. I find a hot box, or whatever the case may be; I put a card on the end of car for you to put on your side. After we pass I find something on my side, will have to crawl over; the same with you on your side.

Mr. Berg: The inspection has to be handled according to the conditions of the yard and locality. What is applicable in one case would not be in another. However, there is no question but what there is less time allowed than is required. The fact of the matter is that inspection is like everything else; it is beyond any one's control. There is one thing I think ought to be done, and never neglected, and that is to inspect a train while it is in motion. You can detect bent axles or flat slidden wheels very well if you watch a train while it is in motion. A man can sit down on the track and see the train pulling in, with a piece of chalk in his hand, and keep looking ahead one car length, and when it comes he can reach up and give her a chalk mark, and when he goes over the train he can see whether it is safe or condemnable.

Mr. Gonnerman: Those remarks are good ones. I saw a car the other day with a bent axle; it was bent ¾-inch. I just happened to see it while the crew was switching, otherwise the car would probably have got away. I believe it would be a good idea for all inspectors to practice that. But how would you inspect axles at night?

Mr. Berg: It was always customary, wherever I had charge, for the inspector to set his lantern or torch, whatever he used, so as to be about a car length, and then look where the light is thrown on the wheels. You can detect defects just as well in the night as in the day time.

Mr. Gonnerman: It has always been my practice to look at the opposite flange on this side, when I was inspecting, and when I came down the other side would follow the same practice. In this connection would ask whether any one here ever found a bent axle on a passenger equipment car?

Mr. Battenhause: Yes, sir. I found one last summer.

Mr. Gonnerman: How much was it bent, and what was the cause?

Mr. Battenhause: About ⅝-inch. I cannot say as to the cause. A train of three cars was pulling out of the depot when I happened to see the wheel. I ran quite a distance before I got the train stopped. The superintendent stood there, and everybody wanted to know what the trouble was.

Mr. Gonnerman: Do any of your inspectors ever find a wheel put on crooked?

Mr. Berg: Yes. They are sometimes bored crooked.

Mr. Gonnerman: What do you call the inside plate of wheel?

Mr. Berg: The inside is towards the axle, and the outside towards the journal box.

The following changes in the M. C. B. rules were discussed and recommended for adoption, the suggestions offered by W. Gonnerman.

No. 1—Wheel gauge, as per Figure 1, should be 1-16 inch thick, instead of ⅛ inch, as they are now too heavy.

No. 2—A pocket coupler may be substituted, if practicable, in case of a broken spindle, and repairs charged to car owners, account of the spindle being an inferior attachment. The latter is too weak for the heavy trains of the present day, and is the cause of a great many trains breaking in two. New rule should be inserted.

No. 3—Loaded cars should not be accepted from connecting lines with side doors missing, even on defect card. Empty cars may be accepted with missing side doors on M. C. B. defect cards, providing such cars are on their way towards home. New rule should be inserted.

No. 4—Sill steps, ladders, hand holds or grab irons on steel cars may be secured with bolt in place of rivet. It is considered a difficult job for an inspector in the majority of cases to replace rivets when broken, account of lack of facilities. New rule should be inserted.

The question of taking steps to provide for a spread or banquet was taken up and on motion of Mr. Taylor the following committee was appointed to arrange for same:

G. A. Taylor, G. M. Ferguson, E. S. Humiston, W. J. Frey, J. McCabe.

The following resolution, read at previous meetings, was discussed and on motion of Mr. Taylor was adopted:

"The election of officers take place at the December meeting, the officers to be installed at the January meeting, nominations to be made by members present at the December meeting."

Meeting adjourned, next meeting to be held Thursday evening, March 19th, at The Kennard.

Established 1878.

RAILWAY MASTER MECHANIC

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Bruce V. Crandall, Editor. Charles S. Myers, Manager.
Maham H. Haig, Associate Editor.

BEGINNING with this issue the Railway Master Mechanic will publish a series of articles on "Railroad Shop Tools", by Mr. Charles H. Fitch. At this time when the character and output of machine tools is receiving so much attention and the railroad companies are endeavoring to install the most up-to-date machines in the new shops under construction, a subject of this nature appears to be of very general interest.

This series of articles will constitute a record of machine tool practice in railroad shops and may be outlined briefly as follows: Beginning with machines of twenty-five or thirty years ago, the progress of machine tool design will be outlined and the tools of the present compared with those of the past, indicating, thereby, the important relation existing between the development of machine tools and the development of the locomotive. The many different types of tools will be described and discussed, considering both the machines constructed and developed by machine tool manufacturers and those originated in railway shops designed to meet demands of local conditions. The methods of machine driving will be thoroughly considered, discussing the most economical arrangement with regard to the output of the shop and the convenience of handling material.

CO-OPERATION among the several departments of railroads has never been more essential than under existing conditions of railway maintenance and operation. This is especially noticeable in consideration of the increasing weight of motive power and rolling equipment and the consequent effect upon track, brdges, etc. In order that one may be designed and operated to meet, as far as possible, the demands of the other, the considerations affecting both the mechanical and maintenance of way departments might well be taken up mutually by representatives of both departments. Heavy rolling equipment has come to stay and every indication points to a continual increase in weight of the same to meet the demands of increased traffic. In order to maintain this heavy equipment and be prepared to continue successfully with increasing weight of the future, the track must receive due attention as it is an important factor offering limitations to the increasing dimensions of locomotives and cars. Heavy rolling equipment is necessarily severe upon track, roadbed and bridges and while the maintenance of track does not come under the jurisdiction of mechanical officials, nevertheless, they can to a certain extent reduce the severity upon track equipment by following such designs likely to impose the least abuse upon the track and it is exceedingly advantageous to the railroad company for mechanical officers to use such judgment. The question of economy deciding the use of heavy engines and the addition of pushers to get over ruling grades or the improvement of grades and alignment, is a matter to be settled by the higher officials however, joint reports from mechanical and maintenance of way officials would greatly facilitate the solution of the problem.

THE development of the railroad shop is rapidly approaching that stage in which the shop, as a whole, may well be compared to a machine, a condition, when finally realized, which represents the ideal condition of shop practice. It is such development, together with systematic management, which makes possible the production of the modern locomotive at a cost which could not have been anticipated a number of years ago. The locomotive of today is not built at so low a cost at that of the past; however, it is a far superior machine and capable of greater return for the original outlay. Comparing the facilities of modern shops with those existing ten or fifteen years ago, it may be readily realized that had the modern locomotive, in its present stage of development, been attempted at that time, its cost of production would have been far in excess of present prices. This fact indicates the advantages gained by the development of shop tools and shop methods, showing at the same time the effect which the development of the one bears upon the development of the other. The perfection of the locomotive has demanded tools of the best character, while tools of high efficiency have made possible the product of high class motive power. The necessity of tools of the best character is being recognized to the fullest extent by the installation of the best modern tools obtainable to reduce the cost of work and neglecting no facilities to enable these tools to be handled to the best advantage. It is not alone sufficient that the best tools be installed, and operated under the most economical methods of machine driving, it is further necessary to assure their maximum output. The operation of tools at full capacity is maintained in locomotive building establishments by the piece work and contract system, a system which has been instituted in all locomotive works of this country. This is being followed to advantage by a number of railroads though it has not yet been generally established among them.

A further indication of advances made through the systematic development of shop machinery and methods of operation, is the fact that while prices of skilled and unskilled labor have increased steadily, the cost of production has still been continued on a profitable basis and repairs are made at costs which may be considered comparatively cheap.

IN consideration of the interest taken in this country, in the development of technically trained men for railway official positions, the following from Consul-General Richard Guenther appears worthy of notice: A regular professorship of railroading is to be created at the Technical High School of Berlin. Since 1901, a course of six lectures on railroading has been delivered at this school; but as this limited course was not sufficient for the important branch (for which a programme of instruction has been agreed upon in conjunction with the management of the state railroads), it is now proposed to establish a full professorship. Much more attention has recently been paid in the school to the construction of locomotives and to signaling.

MR. W. W. ATTERBURY.

GEN'L. MANAGER OF THE PENNSYLVANIA R. R.

Mr. Atterbury was born January 31, 1866, at New Albany, Ind., and graduated from the Sheffield School of Yale University in 1886. He entered railway service the same year, as an apprentice in the Altoona shops of the Pennsylvania Railroad and, due to his unusual ability, received rapid promotion in the motive power department. Mr. Atterbury was general superintendent of motive power of the Pennsylvania Lines east of Pittsburg, at the time of his appointment as general manager, an appointment which is another pleasing instance of the recognition of training received in the mechanical department as fitting for the position of general manager.

A DECIDED modification in the construction of the framing of steel cars was introduced by Mr. E. W. Summers, structural engineer, at the March meeting of the Railway Club of Pittsburg, when he presented a design of steel car having no center sills. Mr. Summers believes that the design of steel car has been made to follow too closely the past forms of wooden car structure, without sufficient resort to the determination of strains imposed by vertical load and buffing stresses. The development of the wooden car has been brought about by experiment and addition of material here and there where failures took place. Since the early development of car construction, methods have been introduced for the computation of stresses in frame structures, and it is now practical to give attention to the function of some of the members in the framing of the car, thus simplifying its construction.

"One radical change to be suggested is doing away with the center sill in cars of all steel construction, as it is largely a redundant member which adds weight to the car, with little or no advantage. This is especially true in gondola cars and hopper cars. The M. C. B. standard height for couplers and the location of the car floor and truck render it necessary to make the center sill a comparatively shallow beam, which is at the expense of material and weight.

"The side retaining walls of a car have position and depth well adapted to economically carry the vertical load, and with its location above the line of the buffing force on the couplers, the compression due to buffing is counteracted by the tension in the lower side of the girders from the vertical load.

"In a gondola car without center sills the transmission of the buffing and tugging stresses from the draft sill to the side girders, is accomplished through the medium of the floor plates, which have a superabundance of material for this purpose."

Mr. Summers illustrated three types of cars, and by a comparison of their respective stresses showed wherein a car having no center sills weighs less than the other types, and is capable of resisting the same loads, vertical and horizontal, with a lower fiber stress in the critical material and a greater percentage of revenue freight to total weight.

Railroad Shop Tools

By Mr. Charles H. Fitch

IN the following series of articles it is proposed to report upon railroad shop tools and practice in a comprehensive way which will "round up" the subject in all its bearings. The general course of these articles is laid out as follows:

First, a brief review of the growth of locomotive building and its effect on tool practice working with it to make a development both of improved methods and improved product, for tool practice owes much to its great patron, locomotive building.

Second, more particular reference to the unique developments of the last twenty or twenty-five years. This constitutes an epoch signalized by some impressive changes, and the writer naturally makes the year 1880 a point of departure because he then prepared reports for the United States census office in which the state of the art was described, with numerous illustrations and examples of economy in work. No such general report has since been made. Improvements up to that time are very considerable, and merit respected attention. They were then thought to be wonderful, and few realized that there remained so much room for improvement as has since been made.

In the third place we will consider in course machines in different classes, steam and power hammers, pressure forming tools, die machinery, bending rolls, shearing, punching and sawing machines, lathes, boring mills, belt and screw machines, radial and special drills, drill presses, planing, slotting, shaping and milling machines, tool grinders, grinding machinery, hydraulic, compressed air and electrical and magnetic appliances, and tools of special convenience in repair work.

In going over these subjects in the order stated they might be considered as cross-referenced by other matters which force themselves upon the attention and require allusion or more extended reference. Such are the problems of electrical drive which come up in connection with every class of tool, the principles of automatic action and repetition in labor saving, the standardizing of railroad details and equipment, tendencies toward special or universal tools, the relative cost, and service of different tools making a locomotive producing or repair plant, effect of shop arrangements as a whole, changes of material both in tools and machinery, the well-worn but by no means exhausted question of tool speeds and feeds, and the effect of machinery upon the efficiency of men.

The matter of machine details is so extensive that it will have to be treated by selection. The writer will be glad to receive information of new devices and details which may not be covered by his already extensive inquiries. The combinations possible are infinite, but many of them are not of significant worth or extensively used.

If we determine two points, the extension of a right line drawn between them locates a series of other points. When we have defined past and present practice we have established the trend or line of direction of probable future practice. Hence comparisons which must constantly recur as we consider detail after detail are a prolific source of suggestion. In some things there has been little change during the past decade. In most things there has been a great gain in weight, power and extent of use if not in principles of design. Other things still have the force of modern creations which have made repair a new art. Prophecies will not be indulged, but reasonable forecasts can easily be made. Great as has been the progress of the past we are, no doubt, on the eve of still greater changes and developments in machine tools.

It is not only interesting to be reminded of conditions and changes, past and in progress, all of which have been or are the staple of current topics and remarks, but it is desirable that knowledge of these things should be emphasized to us and grouped in different relations, that we may be the more ready to seize and use them in their proper bearings. Enterprising men are not content to accept such information, but must treat it as a point of departure for new improvements.

When Mathias W. Baldwin undertook the building of locomotives, cylinders were bored by a chisel fixed in a block of wood, such an emergency outfit as might now be resorted to only in some mining camp remote from the conveniences of transportation. Blacksmiths could hardly weld 1½-inch iron bars. Joints were made with canvas and red lead. With such facilities he built a locomotive with 54-inch drivers and 9½x18-inch cylinders, and a double treadle to throw eccentric rods into forward or reverse gear. This engine weighed four or five tons, was priced at $4,000, and drew a train at thirty miles an hour. It was advertised to run between Philadelphia and Germantown on fair days only, at a price of 25 cents per passenger. Such was the trial of building it, running it and getting paid for it that the builder accepted it as the alpha and omega of his locomotive building. It was the first, and Mr. Baldwin also said: "That is our last locomotive."

Obviously he changed his mind, for the works bearing his name have produced between twenty thousand and thirty thousand more, including decapods weiging some 130 tons, with compound engines 11 inches and 27 inches by 28 inches or larger.

We find the drivers of these latest locomotives only a little larger than those of the first engines built, and yet, placing "Old Ironsides" by the side of the modern "decapod," it appears like an insignificant toy. The Ironsides had a tail stack like a threshing engine. The latest engines have stacks higher above the track, but so enveloped is the great growth of boiler that only a collar or necking appears above the top of the boiler.

This great growth of boiler has been the significant fact of locomotive development from 1832 to 1903. Trucks and drivers and stocks are of similar size. Only the boiler expands, if I may use an expression from one of H. C. Bunner's stories, to "burst her seams," that is, to fill out to the fullest extent the limitations of design by which it is restricted. The changes in locomotive design have been incessant, and detailed plans of new variations are still the staple showing of our railroad papers, but as the railroad mileage has increased from nothing in 1830 to 8,000 miles in 1850, 29,000 in 1860 and 163,000 in 1890, the most significant change has been the comparatively recent one, the imported one of steam cylinders to help out boiler capacity, the compound engine. When cylinders have done the most possible to help boilers, and boilers have "burst the seams" imposed by the standard gauge, we may expect a rapid and radical innovation to put more power upon the tracks, without resort to either boilers or cylinders.

In some rough types of mine machinery (rock crushers) jaws and crushing members are of cast iron backed and jointed with spelter. In the thirties the difficulty in casting a chilled wheel in one piece led to the making of track and tender wheels with hubs in three pieces jointed with spelter and banded with wrought iron. This may now seem very rude, but it was practical, and the spelter jointed castings made for rock crushing to-day stand a prodigious amount of most exacting service.

By 1836 Baldwin built as many as forty engines in a year, the largest with 12½x16-inch cylinders, and weighing, loaded, thirteen tons, which he said was "as heavy as he ever expected to make." He was a conservative man, who limited his horizon, but this very fact no doubt contributed to his practical success in his time. The practical man journeys over the face of the earth one step at a time, but by these short steps leaves one horizon after another behind him, and is undisturbed by other horizons than the one in sight, which alone concerns his day and generation.

In 1835 progress of lathe work is indicated by the turning of boxes and the boring of pedestals to fit in a lathe. That this was an irksome and expensive job appears from the patent of 1840 for casting cylindrical pedestals in chills to avoid the expense of boring and turning them. This shift, however, was soon abandoned as unsatisfactory and the machine tool requirement was squarely met.

In 1837, 300 employes built forty locomotives—that is, it took seven or eight men a year to build a locomotive. In 1902, 13,000 employes built 1,500 locomotives, that is, it still took eight or nine men to build a locomotive, but each man averaged a handling of ten times the weight of material. If the later engines had been of the same simplicity of detail as the earlier ones, only heavier, these figures would indicate no great economy of labor, but the character of the work must be considered. It is largely laying out work with numerous changes of detail to suit different master mechanics, greater exactions of work and much greater elaboration of detail in the later designs.

It is also to be conceded that the movement for labor saving in locomotive work has been a dignified and conservative one. High-class constructions require to be built on honor to obtain great safety and durability in service are not subject to cheap competition. The workman in such service must be maintained on a plane of high wages and unhurried action. The only resorts to economy permissible are in the formulation of better systems of work and the invention of better machinery.

It is apart from our purpose to follow the changes of detail made in American locomotives from the earliest times, excepting so far as they affect machine tool work. There was a time when inadequacy of tools affected the design of locomotives. During this period changes in design concern our subject. But after the American type of locomotive was fairly developed machine tools had reached a status at which they were in principle equal to any demands upon them. As a matter of fact they have been redesigned to serve the production of larger and heavier details more rapidly and with greater convenience, but no radical changes were made until the recent introduction of high-duty tool steel.

The Baldwin works as strong survivors merit the great fame which they enjoy, but this obscures in familiar knowledge and estimation the contributions to locomotive building made by early contemporary works. One of these is commemorated in a marble carving of a locomotive contributed by the employes of Norris' Locomotive Works to the Washington Monument, and finally placed in that monument after many years of waiting for its erection. Norris, Boyden, Rogers, Brooks, and others were pioneers in locomotive construction, and the rivalry of their efforts was a help to practical progress.

Mr. Baldwin's employment of ground joints in place of lead and convas enabled him to carry high pressures and was a notable improvement. Grinding was, however, an early resort when the lathe and planer work was in its infancy, and the practice of grinding was naturally inherited from its use in gun work. In 1841, when the first invasion of Europe was made in the export of a locomotive with link motion for an Austrian railway, it was proposed to use over 100 lbs. steam, as was Baldwin's practice, using ground joints, but to meet foreign limitations and prejudices the engine was re-designed to use only 60 lbs. steam.

The Baldwin six-wheels connected engine put upon the market in 1842 was a design distinctively American and characteristic of the period in its adaptation of means to an end—flexibility with increased adhesion and power. This design was mathematically inexact, with necessary lost motion, but it was practically effective, and so popular as to enable Mr. Baldwin to recover his fortune, which had come to a low ebb in 1842. But the requirement of rigidity and exactness of fit in so powerful and high-speeded a machine as the locomotive was not satisfied by the six-wheels connected locomotive, and it was soon laid aside in favor of the standard arrangement with four coupled drivers and four-wheeled truck, patented by Henry R. Campbell, with equalizing beams, patented by Joseph Harrison, Jr. It is notable that the firm most successful in business in the long run was not the firm which introduced some of the most characteristic features of the American locomotive, but this firm was broad-minded enough to be open to conviction, and ready to accept and work upon the best approved lines. The link motion, with its facility of reversal, was long a subject of prejudice to Mr. Baldwin. In 1853 he wrote, "The link motion, which I could never be entirely satisfied with," but after several years' effort to make something more simple, less liable to be deranged, and perhaps more his own, he felt obliged in 1857 to adopt it exclusively.

By this time the American locomotive was established as a type essentially unchanged for nearly half a century, excepting in the matter of increased weight and power. The steady progressive demand for more weight and power, backed by the ability to pay for it out of the advancing wealth of the country, has been the customer for greater weight and power in machine tools.

(To be continued.)

Topeka Shops of the Atchison, Topeka & Santa Fe Railway

THE headquarters of the Atchison, Topeka & Santa Fe Railway are situated at Topeka, Kan. The principal shops of the system are also located at this point, having been so situated since the early construction of the road. The shops are under the supervision of a shop superintendent, who reports directly to the superintendent of motive power, this plan being followed because of the fact that the shops are for the maintenance of the motive power and rolling stock of the larger part of the system rather than for the repairs of equipment of a single division or given number of divisions. The immediate supervision of the shop by the superintendent of motive power is facilitated by the situation of the headquarters of the motive power department at the shop plant.

Being situated on the main line of the system, all new locomotives as supplied by the builders will be received at this point and prepared for service. Much of the heavy work, such as flanging firebox sheets, heavy machine work, etc., will be done at this point, the facilities being more adequate for such work than the equipment of the smaller division points through-

FIG. 2—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY. VIEW LOOKING NORTH. LOCOMOTIVE AND BOILER SHOP TO RIGHT, PORTION OF CAR SHOP AT EXTREME LEFT, POWER HOUSE AND LAVATORY BETWEEN.

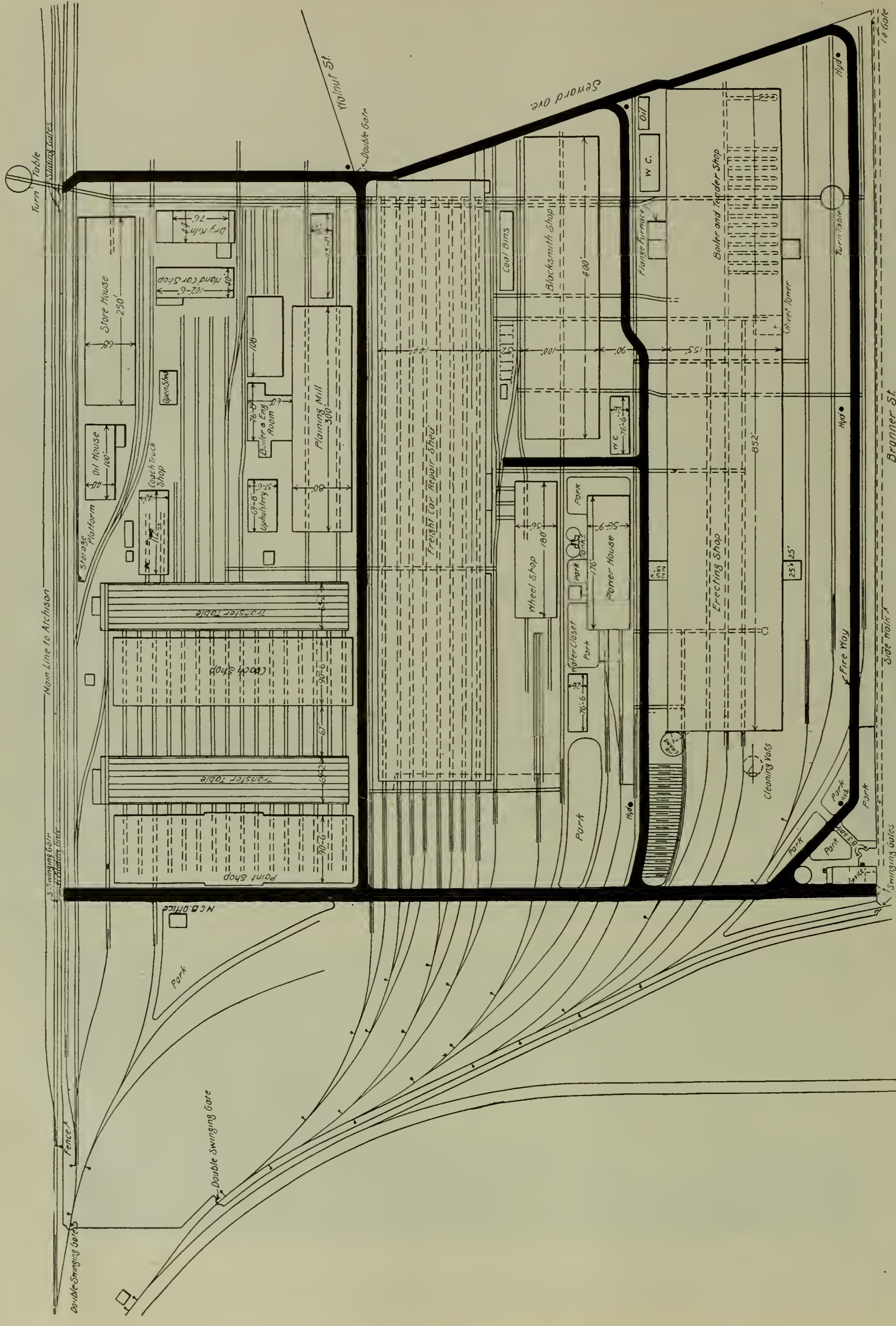


Fig. 1. Topeka Shops of the Atchison, Topeka & Santa Fe Railway. General Plan.

out the system. The principal storehouse of the system is located at the Topeka shops, from which supplies are delivered for the entire system.

The present site of the shops was acquired by the railroad company in January, 1878, having been previously occupied by the King Bridge Company. The buildings previously used by the bridge company were sufficient to accommodate the machine, erecting and blacksmith shops, and it was necessary to erect an additional building for the accommodation of the boiler shop. These old buildings, together with the roundhouse, are situated west of the main line to Atchison. In 1880 adequate buildings were erected for the accommodation of the car department. These buildings were constructed on land east of the main line to Atchison, and are shown in the accompanying line drawing Fig. 1. This drawing includes the plan of the new power plant and shops, which will be successively described in detail in future issues. The old buildings, situated west of the tracks, heretofore mentioned, are not shown. Those now in service as shop buildings will be dismantled and substituted for by the new buildings. Other buildings west of the Atchison line and not shown herewith are the roundhouse, coal chutes, pattern shop, pattern storage house, water service department, modern brass foundry, scrap bins and offices of the motive power department.

The shops here to be considered are those recently constructed and those under construction, erected to supplant the old shops, which have become inadequate to meet the demands of present day service. Referring to the plan, Fig. 1, these buildings are shown east of the freight car repair shed.

In consideration of the economy of handling locomotive building and repairs by up-to-date methods and the saving of time and labor by the installation of modern shop machinery and tools, the old machine erecting, boiler and blacksmith shops are to be abandoned. Power for the entire plant is to be supplied by a central power station through the medium of electric distribution, and all artificial light for the shops and yard is to be supplied from the same source. The transfer tables serving the paint and coach shop, which have heretofore been operated by steam, have been changed to operate electrically. The arrangement of pits in the locomotive shop is such as to make the installation of a transfer table unnecessary. The two cranes, however, serving this shop and supplanting the transfer table are operated electrically.

The heavy machines throughout the plant are operated by individual motors, in some cases directly connected and in other instances the motors are connected to the machines by belts. The lighter machines are grouped, a group of light machines being driven by a single electric motor.

The two cranes serving the locomotive shop are illustrated on page 126 of the March issue of the Railway Master Mechanic, the illustration appearing in an article entitled "Cranes for railroad shops." The photograph from which this illustration was prepared was taken by a representative of the Railway Master Mechanic while collecting data for the preparation of an article descriptive of the Topeka shops. The cranes are shown in the act of lifting a heavy freight locomotive of the 2-8-2 type, weighing in service condition 260,000 pounds. With the exception of the single heavy tandem decapod locomotive weighing 267,800 pounds, the locomotive shown in this illustration is representative of the heaviest type of locomotive in present service on the Santa Fe system. Each of the cranes shown has a capacity of 120,000 pounds, giving a total capacity of the two cranes of 240,000 pounds, or 120 tons.

To obviate the difficulty encountered in the old shop by the lack of sufficient natural light, every precaution has been taken to supply ample lighting facilities, both natural and artificial. By reference to the accompanying illustrations from photographs of the several buildings and to the illustration of the interior of the machine and erecting shop on page 126 of our March issue, it will be seen that the shops are lighted by large windows, as well as through skylights in the

Fig. 3—Topeka Shops of the Atchison, Topeka & Santa Fe Railway. Blacksmith Shop.

Fig. 4—Topeka Shops of the Atchison, Topeka & Santa Fe Railway. Locomotive and Boiler Shop. Showing Saw Tooth Arrangement of Roof, Riveting Tower and Fan Houses.

roofs. Attention is called to the saw tooth arrangement of the roof over the side bays of the machine shop. The vertical sections of this roofing being entirely composed of window sash, additional light is supplied from this source.

As heretofore stated, with the exception of the few buildings specified, the entire plant will be situated east of the main line to Atchison when the old shops have been abandoned. The line to Kansas City passes immediately south of the shops, so that the buildings are situated at a point almost at the junction of the two lines. The Kaw river lies immediaely north of the shops. The shop yards are not cut up by streets, so that no interference or inconvenience is offered from this source. In case of fire, special precautions are taken to keep a fire way open to facilitate the rapid transportation of apparatus operated and maintained by the railroad company to be used in such emergencies. This fire way is shown in the line drawing Fig. 1.

The foundations of the new buildings are of concrete, mixed in the proportion of 1 part of cement, 2 parts of sand and 3 parts of stone. The walls are of brick and the roof trusses of steel. The architecture of the buildings is modern in every particular. Careful attention has been directed to the lighting and ventilation of the structures, with the result that all of them are light and airy.

The Kaw river, flowing immediately north of the shops, is a convenient water supply immediately at hand. Considerable difficulty is encountered with the scale forming material found in this water, and to obviate this difficulty all boiler feed water is purified by the Tweedale water softening and purifying methods before being supplied to the boilers. The two tanks, in which feed water is purified, are shown in position near the power house, Fig. 6.

While the old shops turned out from eighteen to twenty locomotives a month it is anticipated that with

Fig. 5. Topeka Shops of the Atchison, Topeka & Santa Fe Railway. Showing General Arrangement of New Buildings. Blacksmith Shop at extreme left, Power House near center, Lavatory in Foreground and Locomotive and Boiler Shop in Background.

the modern facilities of the new shops this number will be increased to twenty-eight or thirty. Included in this number will probably be four new locomotives per month as the road intends to construct some of its own motive power. In consideration of the increasing dimensions of locomotives the turntable serving the roundhouse at these shops have been increased from 54 feet to 75 feet in diameter.

A number of interesting features are presented by the construction and equipment of these shops, the details of which will be brought out in succeeding articles relative to the Topeka shops. The power house will be considered in our next issue.

Fig. 6. Topeka Shops of the Atchison, Topeka & Santa Fe Railway. Power House—Showing Base of Stack, Purifying Tanks and Wire Distributing Tower.

Heavy Passenger Locomotives, Chicago & Alton Railway

AFTER a number of exhaustive tests made with passenger locomotives borrowed from other roads and considered to be representative of the most efficient passenger locomotives of present day service; the Chicago & Alton Railway has deemed it necessary to build two locomotives, superior in size, weight and capacity to any passenger engines heretofore built, to meet the demands of the heavy passenger traffic on the Chicago, St. Louis & Kansas City through trains. These engines have recently been built at the Baldwin Locomotive Works and are the heaviest passenger locomotives in service. They are the first of the 4-6-2 type of passenger locomotives of standard gauge built at the Baldwin works, though narrow gauge locomotives of similar wheelbase arrangement have previously been built by this company.

In order to determine by experience the diameter of driving wheel best adapted to the prevailing conditions of service, one of the two locomotives has been designed with driving wheels of 73 inches in diameter, while the diameter of the driving wheels of the other is 80 inches. The Player traction increaser has been applied to the locomotive having the smaller pair of driving wheels, by which 15,000 pounds may be transferred from the forward and trailing trucks to the driving wheels.

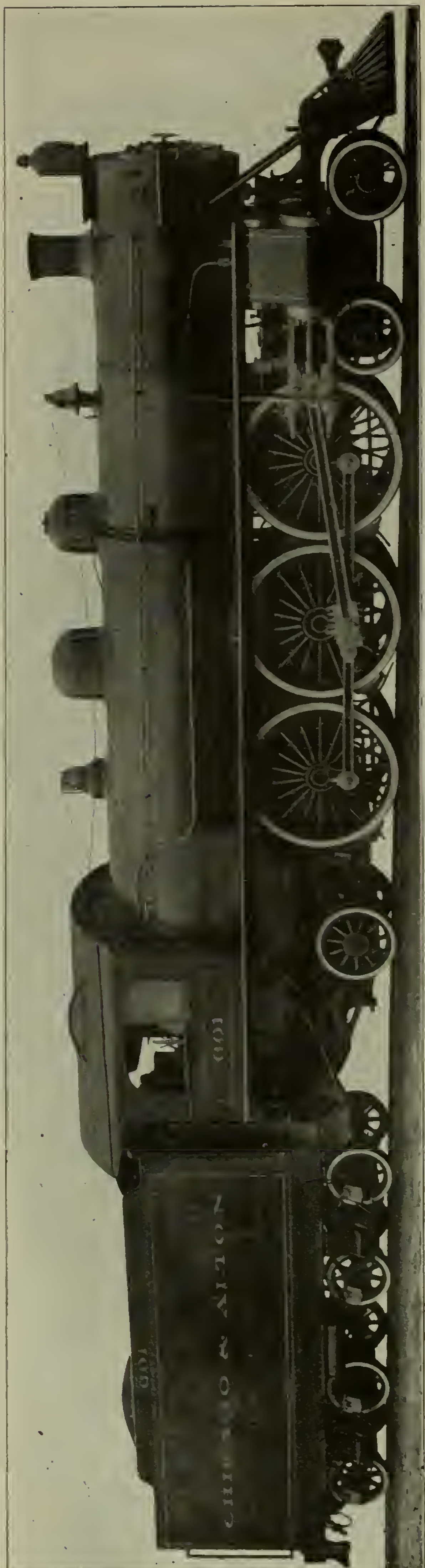
Both locomotives are equipped with the Rushton radial swing side bearing truck under the overhanging firebox. This makes it possible to pass without difficulty curves of 14 degrees which are encountered on the line.

Reference to the accompanying side elevation and half-tone engraving will show these engines to be equipped with exceptionally long smoke boxes, 101 inches, in the face of the fact that a number of mechanical men are arguing against the efficiency of such design.

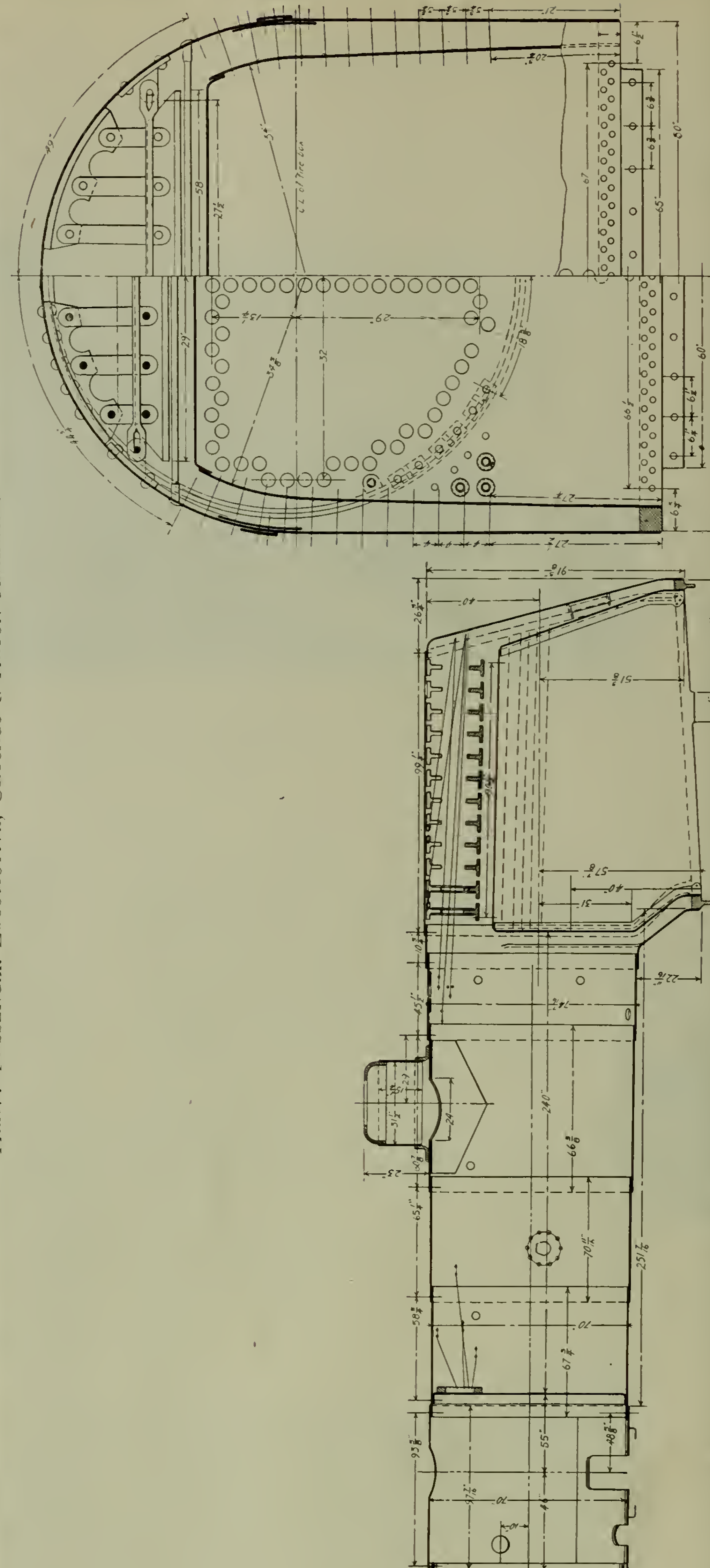
The tender is of the eight-wheel type, having steel channel underframing and gravity hopper, water bottom tank, with a capacity of 8,400 gallons of water and nine tons of coal. While the coal capacity of this tender is less than that of a number of tenders built to serve smaller engines than those under consideration, the water capacity is unusually large.

The trains which are to be hauled by these engines are estimated to weigh over 670 tons and will be scheduled to maintain an average speed of about 46 miles per hour.

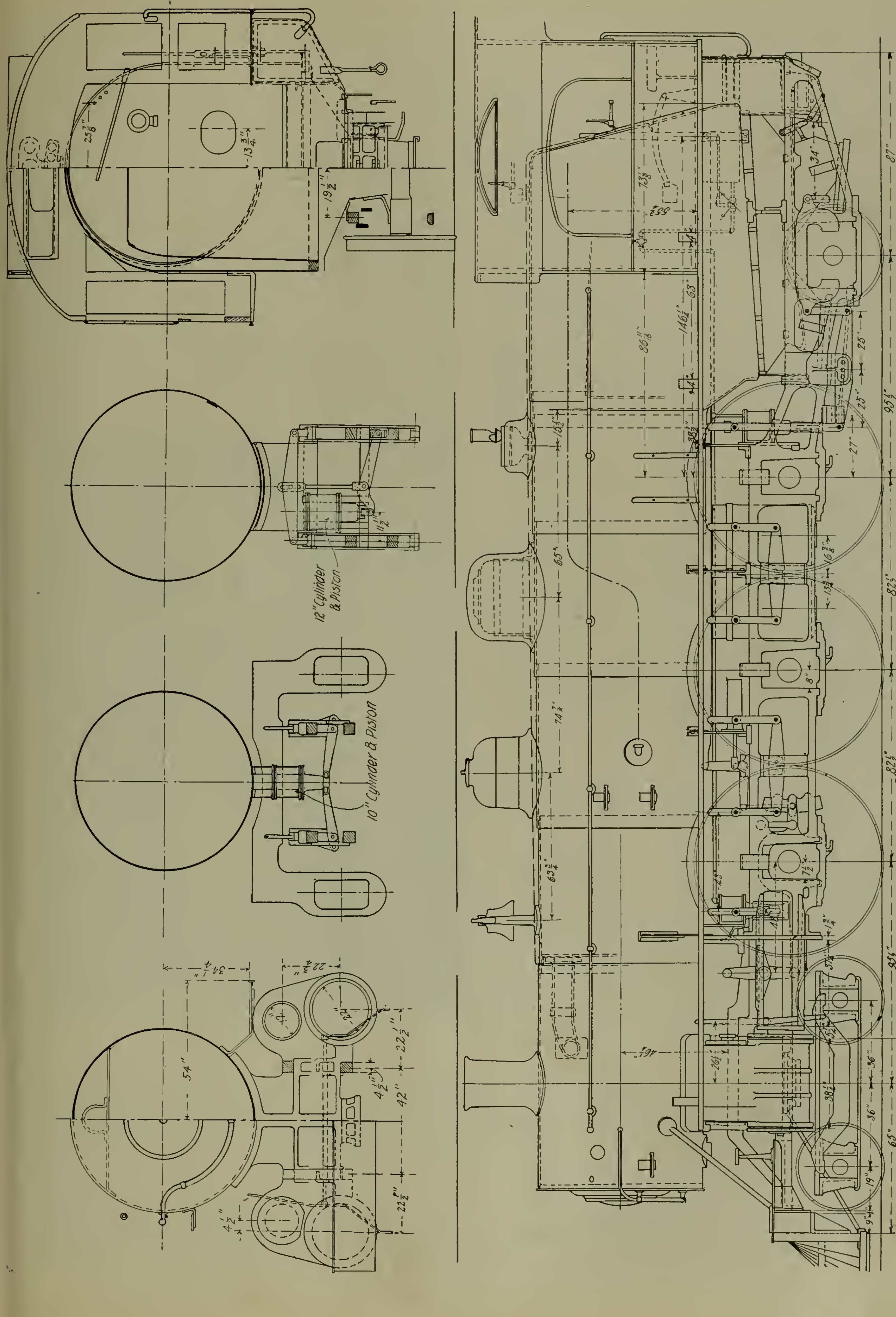
Assuming the mean effective pressure to be 85 per cent of the boiler pressure and determining the tractive effort from the given dimensions of cylinder and



Heavy Passenger Locomotive, Chicago & Alton Railway.



Heavy Passenger Locomotive, Chicago & Alton Railway—Boiler.

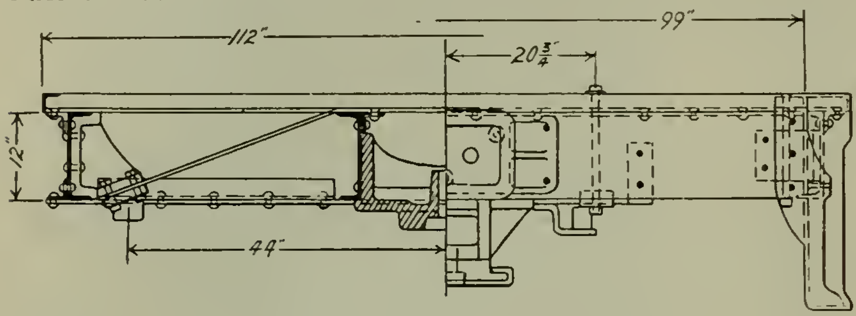


Heavy Passenger Locomotive, Chicago & Alton Railway. Elevation and Section.

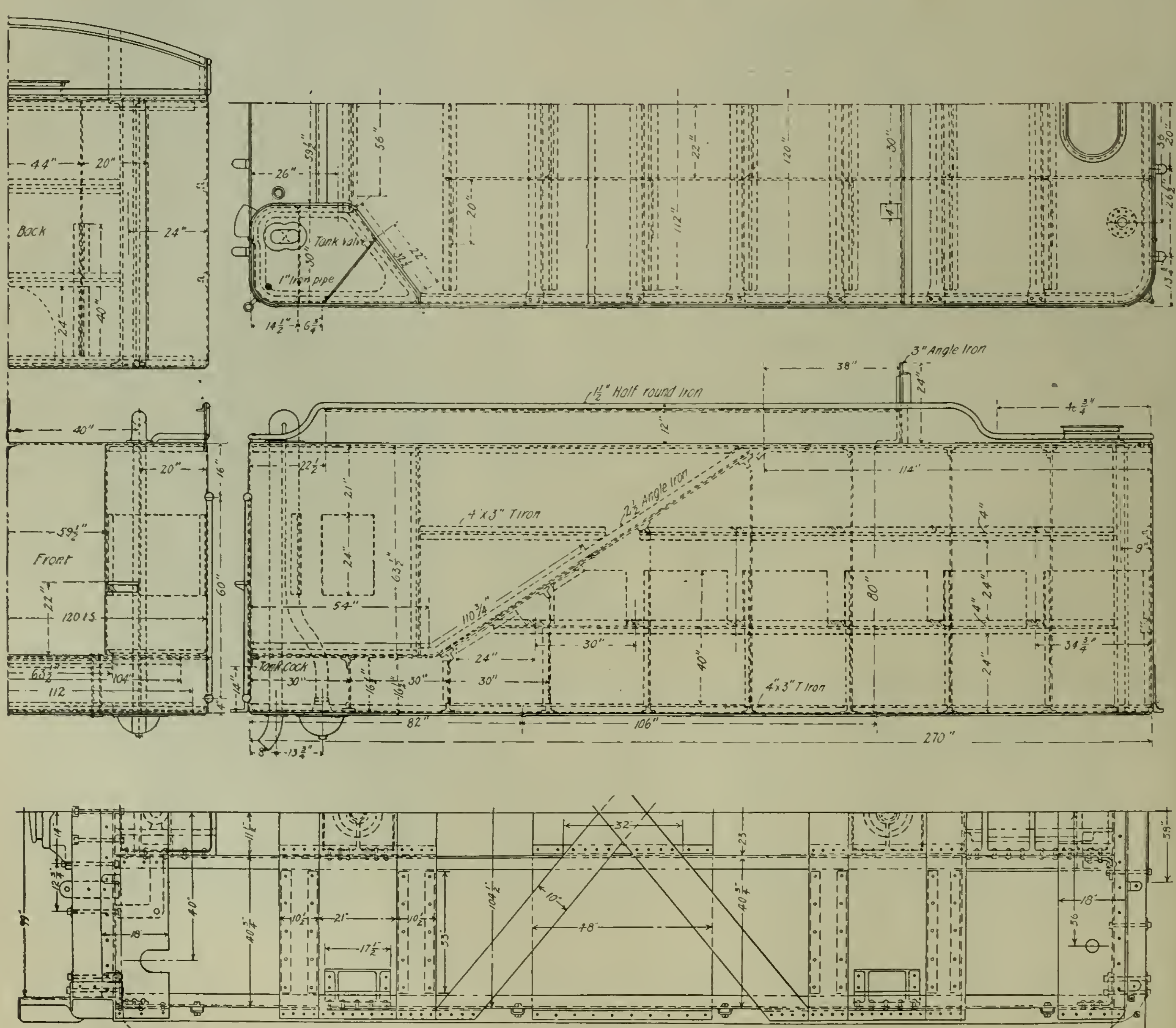
driving wheel, the locomotive with 80-inch driving wheels is capable of exerting a starting power of 31,678 pounds and the locomotive with 73-inch drivers is capable of exerting a starting power of 34,715 pounds. The weight on drivers being 141,700, the ratio of adhesive weight to tractive effort is 4.47 for 80-inch drivers, and 4.08 for 73-inch drivers; the ratio of tractive effort to total heating surface is 7.76 for 80-inch drivers and 7.51 for 73-inch drivers, and the ratio of total heating surface to grate area is 75.5.

The following table presents the general dimensions and further details of construction:

Gage	4 ft. 8½ ins.
Fuel	Bituminous coal



Weight on drivers	141,700
Weight on front truck wheels	36,300
Weight on back truck wheels	41,500
Weight, total	219,500
Wheel base, total, of engine	32 ft. 8 ins.
Wheel base, driving	13 ft. 9 ins.
Wheel base total (engine and tender)	62 ft.
Height, center of boiler above rails	9 ft. 5 ins.
Height of stack above rails	15 ft.
Heating surface, firebox	202 sq. ft.
Heating surface, tubes	3,848 sq. ft.
Firebrick tubes	28 sq. ft.
Heating surface, total	4,078 sq. ft.
Grate area	54 sq. ft.
Drivers, diameter	80 ins. and 73 ins.
Truck wheels, diameter	36 ins. and 33 ins.
Journals, driving axle, size	main 10x12, others 9x12
Journals, truck axle, size	6½x13
Cylinders, diameter	22 ins.
Piston stroke	28 ins.
Valves, kind of	Balanced Piston
Boiler, type of	Straight
Boiler, working steam pressure	220 lbs.
Boiler, thickness of material in barrel	11-16, 23-32, & 3-4 ins.
Boiler, diameter of barrel	70 ins.
Thickness of tube sheets	⅝ ins.
Thickness of crown sheets	⅜ ins.
Crown sheet stayed with Crown Bar 5¼ in. x 6 in.	T section
Firebox, length	108 ins.
Firebox, width	72¼ ins.



Heavy Passenger Locomotive, Chicago & Alton Railway—Details of Tender.

Firebox, depth, front	78⅝
Firebox, depth, back	64⅛ ins.
Firebox material	Steel
Firebox, thickness of side and back sheets	⅜ ins.
Firebox, water space, width	4½ front 3½ sides
Tubes, number	328
Tubes, material	Iron
Tubes, outside diameter	2¼ ins.
Tubes, length over sheets	20 ft.
Smokebox, diameter	10 ins.
Smokebox, length	101 ins.

TENDER.

Type	8-wheel, gravity hopper, water bottom
Tank capacity for water	8,400 gallons
Coal capacity	9 tons
Type of under-frame	Steel channel
Diameter of truck wheels	36 ins.
Diameter and length of axle journals	5½x10 ins.

The Richmond Railroad Club

In response to a circular letter, issued by Mr. W. S. Morris, S. M. P. of the C. & O. Ry.; Mr. R. P. C. Sanderson, S. M. P. of the S. A. L. Ry., and Mr. H. A. Gillis, Gen. Supt. Richmond Works, American Locomotive Company, dated January 1, 1902, a number of railroad men and others met to form a club, to be known as the Richmond Railroad Club.

The meeting was held in Richmond's Chamber of Commerce room, and was called to order by Mr. W. S. Morris, who, after stating the subject of the meeting, called for nominations for a temporary chairman, and Major E. T. D. Myers was elected. After acknowledging the compliment and stating some views on the necessity of such an organization as was proposed, the chairman asked that a temporary secretary be selected, and Mr. F. O. Robinson was chosen.

Mr. James F. Walsh, President of the Richmond Railroad Club.

On motion of Mr. H. A. Gillis, the chair appointed a committee on Constitution and By-Laws, consisting of Messrs. Gillis, T. H. Hix and W. D. Duke.

The secretary then read a number of letters and telegrams received from gentlemen unable to attend the meeting, endorsing the projected club. A letter from the governor of the state was also read, expressing regrets at his inability to attend the meeting.

The chairman then called on President Stevens, of the C. & O., for an address. Mr. Stevens was received with applause, and spoke for a few minutes, expressing his desire to become a charter member and promising to do all he could to help the club, concluding by presenting Col. H. G. Prout, editor of the Railroad Gazette, of New York.

Col. Prout spoke at length on the usefulness of railroad clubs, and commended the formation of such a one in Richmond. He gave some interesting statistics regarding other clubs, pointing out certain weak points, and saying what he thought would be of benefit to the new organization. His remarks were interesting and instructive and were listened to with close attention. He was loudly applauded at the conclusion, and a vote of thanks for the address was unanimously adopted.

Mr. Morris was then called on and gave a short but interesting talk, endorsing the movement, and assuring those present of his hearty co-operation, and promising to do all in his power for the success of the club.

This club has been in existence but little over one year, during which time it has enjoyed quite a successful career. At the beginning of the year 1902, there were 225 gentlemen on the list of members. By January, 1903, this number had increased to 335, an indication of the appreciation of the importance of a club of this nature in the vicinity in which it has been organized. During its short career a number of intering topics have been presented before the club for discussion and some very able papers have been prepared and presented at the meetings. Realizing the broad field to be benefited by an organization of this nature the club has early shown its determination to consider subjects relating to railroad work generally rather than to confine its deliberations to mechanical subjects alone.

Mr. W. S. Morris, previously superintendent of motive power of the Chesapeake & Ohio Railway, now occupying a similar position with the Erie Railroad, was the first president of the club. Mr. Janes F. Walsh, superintendent of motive power of the Chesapeake & Ohio Railway, whose photograph appears herewith, is the second and present president.

Utilizing Air Pump Exhaust

By Mr. Ben Johnson, Superintendent of Machinery, Mexican Central Railway

A Paper Presented Before the Railway Club of Mexico.

SOME years ago a gentleman who was then and is now the head of the mechanical department of an important railway in the middle west, conceived the idea of utilizing the air pump exhaust for heating the feed water. He made some experiments, provided a separator to extract the oil from the exhaust and a three-way cock to enable the engineer to turn the exhaust out of the tender if it threatened to make the tank water too hot for the injectors to work, and finally procured a patent.

The idea was a plausible one and many roads invested in the apparatus to at least the extent of one set. So far as the writer knows, only a few are now in use. It may be worth while to examine the subject, see what the possibilities are, why it has not met with more success, and whether it is worthy of further pursuit.

Some experiments made about two years ago by the inventor of the above described apparatus, but for a different purpose, showed that the maximum consumption of steam of a Westinghouse 9½-inch pump running to its utmost capacity with 195 pounds boiler pressure, is 30 pounds of steam per minute. It is safe to say that the average consumption of steam by the air pumps of heavy freight or passenger engines is not greater than one-half of this, or 15 pounds per minute, or 900 pounds per hour. The amount of heat obtained in this amount of exhaust steam is considerable, and if it can be utilized without too great expense or counterbalancing losses, it is worth doing in this age of fierce competition and close economy.

We may assume that the engine uses 3,000 gallons, or about 25,000 pounds, of water per hour at a temperature of perhaps 60 degrees Fahrenheit. The amount of heat which must be put into this water to convert it from feed water at 60 degrees to steam at 180 pounds pressure is 1170 British Thermal Units per pound, or 29,250,000 B. T. U. per hour. One pound of steam at 10 pounds pressure (assumed pressure of the air pump exhaust in tank) in condensing to water at 60 degrees, gives out 1127 B. T. U. The 900 pounds which we assume to come from the air pump exhaust will, therefore, liberate 900 times 1127 B. T. U., or 1,014,300 B. T. U. This quantity of heat, 1,014,300 B. T. U., is nearly 3½ per cent of 2,925,000 B. T. U., the quantity required for making steam per hour; so the possible saving is 3½ per cent.

If 1,014,300 B. T. U. are put into 25,000 pounds of water, it puts about 41 B. T. U. into each pound of water; or, in other words, raises the temperature 41 degrees, or from 60 degrees to 101 degrees, and that means there is heat enough available in the exhaust to raise the temperature of our feed water to 101 degrees, and effect an economy of 3½ per cent. But, when we fill our tank at a water station we at once begin to use water that has had time to absorb only a trifle of heat and to use all the heat of the exhaust and heat our feed water an average of 41 degrees we must heat as much of it to more than 101 degrees as we may use at less than 101 degrees. But here we meet with the difficulty that ordinary injectors will not with any certainty work water hotter than 101 degrees, so that we must provide means, as the inventor did, of turning the exhaust out of the tank, and do so before the water becomes too hot to work, and just in proportion as we do this we reduce the economy.

As the average temperature of our feed water which will be produced by condensing all our exhaust is the temperature at which we have to turn our steam out of the tank, it is obvious that we lost about half the heat from our exhaust and reduce our economy from 3½ per cent to about 1¾ per cent. This economy is worth having, but against it are to be set the probability of engine failures from getting the tank water too hot and the difficulty of compelling the engineer to use the exhaust. The average engineer, after getting caught once or twice, or hearing of some one being caught with the tank water too hot to feed, and perhaps a dead engine in consequence, will solve the problem by running with the exhaust in the front end all the time.

If it were possible to detect this by the record of performance of an engine the engineer might be compelled to make use of the exhaust; but there are so many things that vary from trip to trip and from one engine to another that affect the economy so much more than the 1¾ per cent, that the performance sheet is useless in this respect.

It will be said that there are injectors that will work water hotter than 100 degrees, which is true; but they will not work it very much hotter, and it is doubtful if they are as satisfactory boiler feeders as the ordinary ones, and while all ordinary injectors will work water up to 100 degrees, and some of them up to 120 degrees, they will do this only when in thoroughly good order, and we all know the difficulty of keeping all our locomotives in perfect condition in every respect at all times.

The advantages to be derived from this device are greater in some localities than in others. In the extreme north, where the feed water is during a large portion of the year at a comparatively very low temperature, and where during a large portion of the year the use of live steam in heaters to keep the feed pipes from freezing is a necessity, the device can doubtless be used profitably, but in the middle United States and farther south, where heaters are not used during a great portion of the year, and where the amount of live steam required for their use is less, it seems doubtful whether there is any economy in their use, all things considered; and this probably accounts for the fact that the device has never been used extensively.

Of course with a steam pump located lower than the bottom of the tank it is possible to feed water nearly up to the boiling point, but the steam pump is an extremely uneconomical device and its use would result in another exhaust nearly equal in magnitude and wastefulness to the air pump exhaust, so that it does not seem advisable to use this alternative, especially as the steam pump would need to be duplicated to provide against possible failure of the steam pump, as when it failed the tank water would probably be too hot to be worked by an injector, and a dead engine would be the most probable result.

All the preceding has been theory; a little actual history may be of value. This history is condensed from the note book of a friend of the present writer, who was for many years employed on a great road noted for the liberal and progressive policy of its management:

1893. "The new device for heating feed water by air pump exhaust applied to engine 711 and worked perfectly."

1898. "New superintendent of motive power. New superintendent wishes to heat the feed water of locomotives by air pump exhaust. Search made for apparatus used in 1893, but it cannot be found, nor any record of why or when it was taken off. New apparatus made and applied to engine 1107, one of the new 4-11-44 class, and after some modifications works perfectly. Engine 1107 sent to mountain division.

1900. "New superintendent of motive power. New superintendent returns from the east. States that on the B. Q. & C. they are using the air pump exhaust to heat feed water, and are effecting an economy of 13 per cent in coal and considerably more than that in boiler repairs. Directs that an engine be fitted with a force pump for boiler feed at once and the air pump exhaust turned into the tank to ascertain the economy resulting. He consents to try a preliminary experiment by turning the exhaust into the tank, feeding by injectors, noting the resulting feed water temperature and resulting economy. He is informed that engine 1107 in service on the mountain division is so equipped, and decides to ascertain the results there.

"Master mechanic mountain division reports that he has no engine on the division with such equipment. Superintendent motive power visits the mountain division personally, inspects engine 1107. Finds apparatus on engine and tender complete, except the hose connecting engine and tender has been removed. Also finds no one who ever noticed that the engine was so equipped, or who knows how, why or when is was discontinued or the hose removed. He directs that the hose be put on and apparatus used.

"Master mechanic reports that the apparatus works all right, except when the engine stands still a while or does switching or light work the tank water gets so hot the injectors will not work and produces embarrassing results. Superintendent motive power says all hands on the mountain division are hopelessly unscientific, and directs that the experiment be made on the valley division. Result of tests on valley division shows that all the air pump exhaust may be turned into the tank without trouble from the oil contained in the exhaust and that in this particular case the tank water will condense practically all the exhaust without becoming hotter than 102 degrees, and that careful observations of feed water temperatures showed an economy of 1.76 per cent from condensing all the air pump exhaust. He takes the matter under advisement and directs that the boiler feed pump be not applied until further notice.

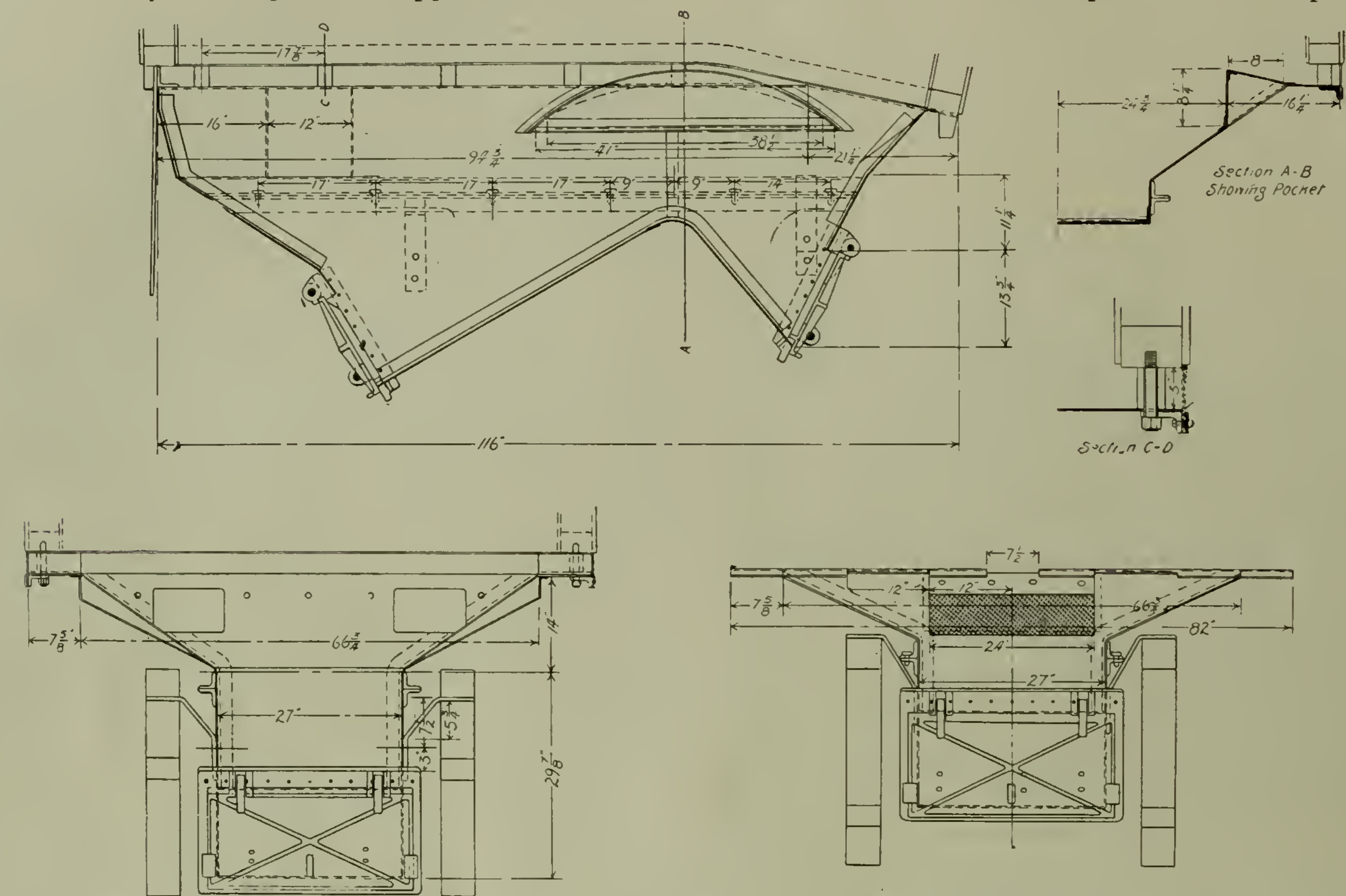
1901. "New vice president and new superintendent motive power. New vice president wants to know why we are not economizing by heating feed water by air pump exhaust; is told that our experiments show a result of only 1¾ per cent economy and great liability to engine failures. He declares that 'our piping must be wrong.' "

Here the narrative and my friend's employment on the road terminated, so that I can give no more details, but I learn that the apparatus is not yet a part of the standard equipment of the road which has tried it so often. I do not know whether any other roads have had a similar experience, or whether any of the Mexican roads have ever sought economy in this particular way, but if some breeze from the north ever blows the idea to Mexico, I hope the facts above presented may be useful to some one.

The steam used by the air pump probably amounts to from 3 to 4 per cent of that used by the locomotive, and I think there are possibilities in the way of reducing this amount. There are many practical difficulties in the way of doing so, but these difficulties are considerably less in a mild climate than in a cold one and some one in Mexico may work it out successfully. The writer's life since coming to Mexico has been too strenuous to attempt it.

Heavy Freight Locomotive, C. B. & Q. Ry.

DUE to an error in the preparation of the last issue of the Railway Master Mechanic, the accompanying line drawing, representing the type of ash pan in service on the heavy freight locomotives recently built for the Chicago, Burlington & Quincy Railway, was omitted from the illustrations showing the details of this type of locomotive. While this ash pan is not of very recent design, it is the standard in use on the C., B. & Q., and due to the rapidity with which it may be emptied, it appears of interest and worthy of mention together with the other details of the class of locomotive above referred to. While the pan has not the capacity of the flat bottom forms, the self-cleaning feature is of sufficient importance to make this design desirable. The pan is operated by a hand lever.



ASH PAN IN SERVICE ON HEAVY FREIGHT LOCOMOTIVE, C. B. & Q. RY., ILLUSTRATED ON PAGE 121 OF THE MARCH ISSUE.

Piston Valves

AT the February meeting of the New York Railroad Club a discussion on the subject of piston valves was opened by a letter from Mr. F. F. Gaines, which we quote as follows: At the present time my suggestion would be to discuss the advantages and disadvantages of the piston valve as compared with the slide valve. I cannot understand why the piston valve has obtained the popularity it now holds, nor do I think that such popularity is justified, or will be continued. In fact, I know of one railroad company who have discontinued the use of the piston valve after a thorough trial and will have nothing but slide valves hereafter. About the only advantage I have ever known of claimed for the piston valve that is substantial is the short ports, giving a less amount of steam in clearance than usually obtained by the slide valve. In the first place, it is very questionable, in my mind, whether this small amount of clearance obtained with the piston valve has all the advantage claimed for it, and I know of one case where a piston valve engine with small clearance had to have the reverse lever quadrant stopped off so that the engine could not be cut back beyond a certain distance on account of the enormous pressure developed in compression. Even granting that this small amount of clearance is desirable, we have offsetting this, the fact that the new type of Wilson's American valve can be so designed as to give exactly as short a port as a piston valve, so that the only particular feature claimed for the piston valve can be accomplished with the balanced slide valve. Against the piston valves can be brought out the fact that they are very expensive to maintain, and that unless the bushings, or castings, are frequently rebored and pistons renewed, there is trouble with the packing ring, and no matter how good a job may be made when the engine is in the shop, it is absolutely certain that the piston valves, before the engine comes in for the next overhauling, shall be in bad shape. From personal experience I think that the piston valve is not as easy on motion work as a slide valve; at least, there is nothing in its favor. Possibly when in absolutely perfect condition there is a little less friction. The average of the piston valve is much higher than the average of slide valve, particularly balanced. Then again, in case of water in the cylinder, the only provision that can be made with the piston valve is to have relief valves in the cylinder heads, or at some other point where the water pressure can be relieved. Theoretically such relief valves cover the situation, but after they have been on the road three or four weeks I doubt very much whether they would open under double the pressure at which they are supposed to lift, while with a slide valve, on account of lifting off the seat, relief is quick and positive.

Observation Sleeping Cars for the Twentieth Century Limited

THE Pullman Company have recently completed, at their Pullman, Ill., shops, four observation sleeping cars for service on the Twentieth Century Limited train of the Lake Shore & Michigan Southern Railway. Of the accompanying illustrations representative of one of these cars, Fig. 1 is the floor plan, showing the general arrangement of the interior, Fig. 2 is a half-tone engraving from a photograph of the exterior of the car, Fig. 3 the interior of the observation room and Fig. 4 a partial view of the interior of the state-room section.

The car is 72 ft. 6 ins. over end sills by 9 ft. 8 ins. over side sills, and 9 ft. between the framing. At the observation end of the car is an observation plaftorm enclosed by a railing, 4 ft. 4 ins. by 9 ft. The observation room is 16 ft. 6 ins. long, having a seating capacity for 13 persons. It is lighted by two center lamps consisting of four-flame Pintsch burners and four electric bulbs and by double electric bulbs along the walls. Between the observation room and the sleeping apartments is a section 4 ft. long devoted to a library, equipped with book cases, table, locker, writing desk and revolving chair. There are six individual staterooms, 6 ft. 10 ins. by 6 ft. 2 ins., opening, through swinging doors, into a passageway extending from the observation room to the opposite end of the car. The staterooms are

FIG. 4—OBSERVATION SLEEPING CAR FOR TWENTIETH CENTURY LIMITED INTERIOR OF OBSERVATION ROOM.

FIG. 3—OBSERVATION SLEEPING CAR FOR TWENTIETH CENTURY LIMITED—INTERIOR OF COMPARTMENTS.

FIG. 1—OBSERVATION CAR FOR TWENTIETH CENTURY LIMITED—FLOOR PLAN.

also connected by swinging doors in the partitions between the rooms. Each room is equipped with standard upper and lower berths, wash basin and dresser, and is lighted by a center lamp consisting of a four-flame Pintsch burner and four electric lamps, and each seat is supplied with an individual electric light. The staterooms are finished in mahogany, English oak and circass walnut. In addition to the staterooms is a drawing-room, finished in prima vera, which has the added convenience of a private dressing-room. This room is fitted with a sofa besides the usual berths.

The car is mounted on Pullman standard six-wheel trucks and painted the standard Pullman color. There are thirteen windows on each side of the car, eight large square windows and five ovals with opalescent glass. It is thoroughly equipped with all modern conveniences, containing all necessary appurtenances required in a car of this kind.

Fig. 2—Observation Sleeping Car for Twentieth Century Limited—Exterior.

Motor Equipment for New York Subway Cars

IN consideration of the important bearing of electric motors upon suburban traffic and the rapidity with which motor cars are being installed to handle interurban passenger traffic, a description of a type of motor for such service appears of interest. The type of motor here illustrated is the motor equipment for the cars of the New York Subway supplied by the Westinghouse Electric & Manufacturing Company. The equipment for the subway cars was divided between the Westinghouse and General Electric companies.

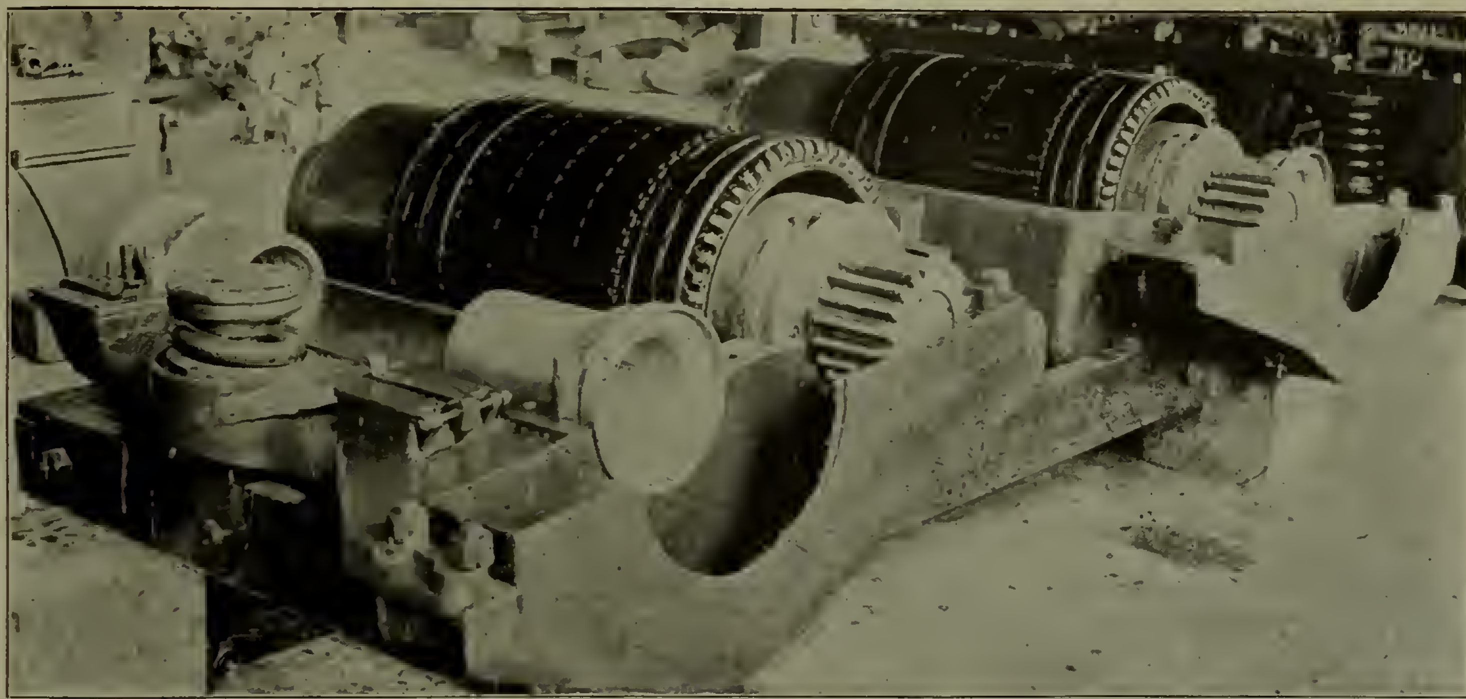
The Westinghouse motors, described herewith, were designed especially for this purpose and were made to fit the particular conditions and requirements involved. One of these requirements, and perhaps the most difficult, made necessary the designing of a motor of large capacity to fit into a limited space. As a result, the present motors are probably of smaller size for their output than any built heretofore.

These motors are of the heavy railway type. They will be supported on the truck by "nose" suspension. The nominal capacity of the motor is 300 amperes at 570 volts, or 200 horse-power, for one hour. With this current and voltage a tractive effort of 4,150 lbs. is developed at the periphery of a 33-inch wheel, at a speed of 19 miles per hour. Although designed for an average voltage of 570, the motor will operate satisfactorily with voltages up to 625. It will carry loads up to 500 amperes without injurious sparking.

The motor has a field frame of cast steel, divided into halves on the line of the centres of armature and axle, and completely surrounding the axle. There are thus no separate axle bearing caps and the number of pieces is consequently reduced to the least number possible for an easily accessible motor. The two halves of the field are held together by 8 bolts and by removing these the top half of the field can be readily lifted off and access gained to the interior for inspection, repairs or the removal of the armature or field coils. When the top field is removed the lower half remains suspended from the axle by stirrups which are permanently attached to the axle bearings.

The four-pole pieces are made of laminated steel punchings held between heavy end plates and secured by rivets. Each pole piece is bolted to the field frame by three bolts. These bolts do not pass through the pole pieces, but terminate in a long nut inside, thus affording a smooth unbroken surface and absolutely rigid pole.

The field coils are made of copper strap wound on edge. All four coils are exactly alike in form and in number of turns. The insulation between turns consists of asbestos and mica, held in place by shellac and baked at a high temperature under heavy pressure so that the coil and insulation make a solid mass. The completed coil is sealed in a curved metal case, from which it is insulated by molded mica made like the V-rings of a commutator. This construction gives a coil which is absolutely fireproof, moisture proof,



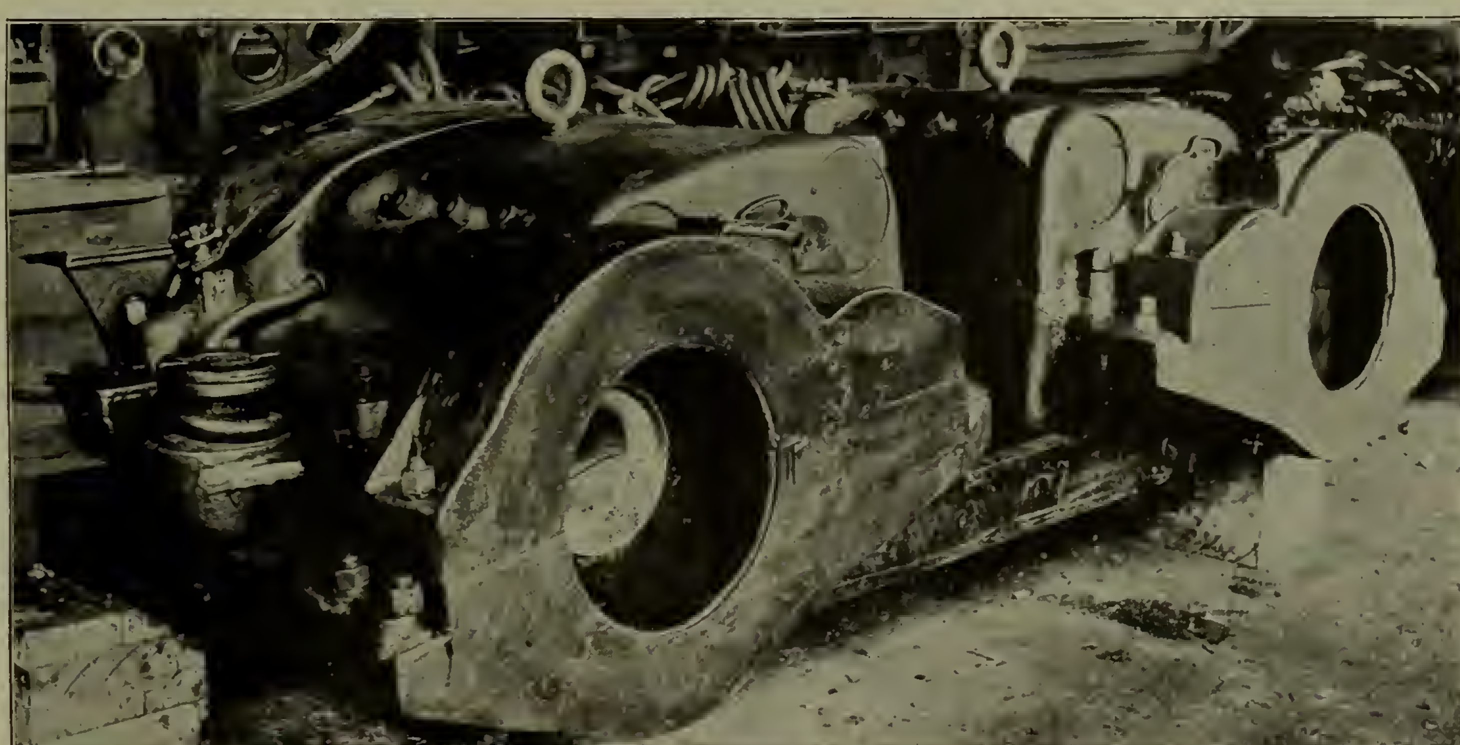
WESTINGHOUSE NO. 86 MOTORS WITH BALDWIN-WESTINGHOUSE SUSPENSION. UPPER FIELDS REMOVED.

and practically indestructible. Each coil is held in place by the metal case or shell, which is securely bolted to the frame.

The armature is 20 inches in diameter and weighs 1,930 lbs. It is of the slotted drum type and is composed of sheet steel punchings assembled on a cast iron spider. The commutator is also carried on the same spider and the shaft may thus be removed and replaced, should this ever become necessary, without disturbing the armature winding or its connection to the commutator. The winding itself is of the two-circuit type and is of ventilated construction. There are 53 slots and 159 coils; i. e., three coils per slot. Each coil consists of a single turn of copper strap. The three coils which rest in each armature slot are formed and insulated before being put in place. They are placed in the slots without bending or hammering and are carefully insulated from each other and from the core. Each conductor is continuous between commutator bars, thus giving minimum resistance and allowing the most effective insulation on all parts of the conductor.

The coils are held in the slots by wedges of special unshrinkable material which will withstand a high degree of heat without injury. This is a valuable feature and gives a construction which is stronger and safer than the use of bands. It also greatly facilitates the removal and replacing of the armature coils.

The armature insulation consists essentially of mica, which extends between turns at all points. The mica is protected by a sufficient amount of fibrous material to insure against deterioriation due to mechanical vibration. This fibrous material is treated with a moisture and oil proof compound. An insulation is thus formed which has fire proof material between turns and between copper and iron at all points, and is therefore capable of withstanding very high temperature without injury.



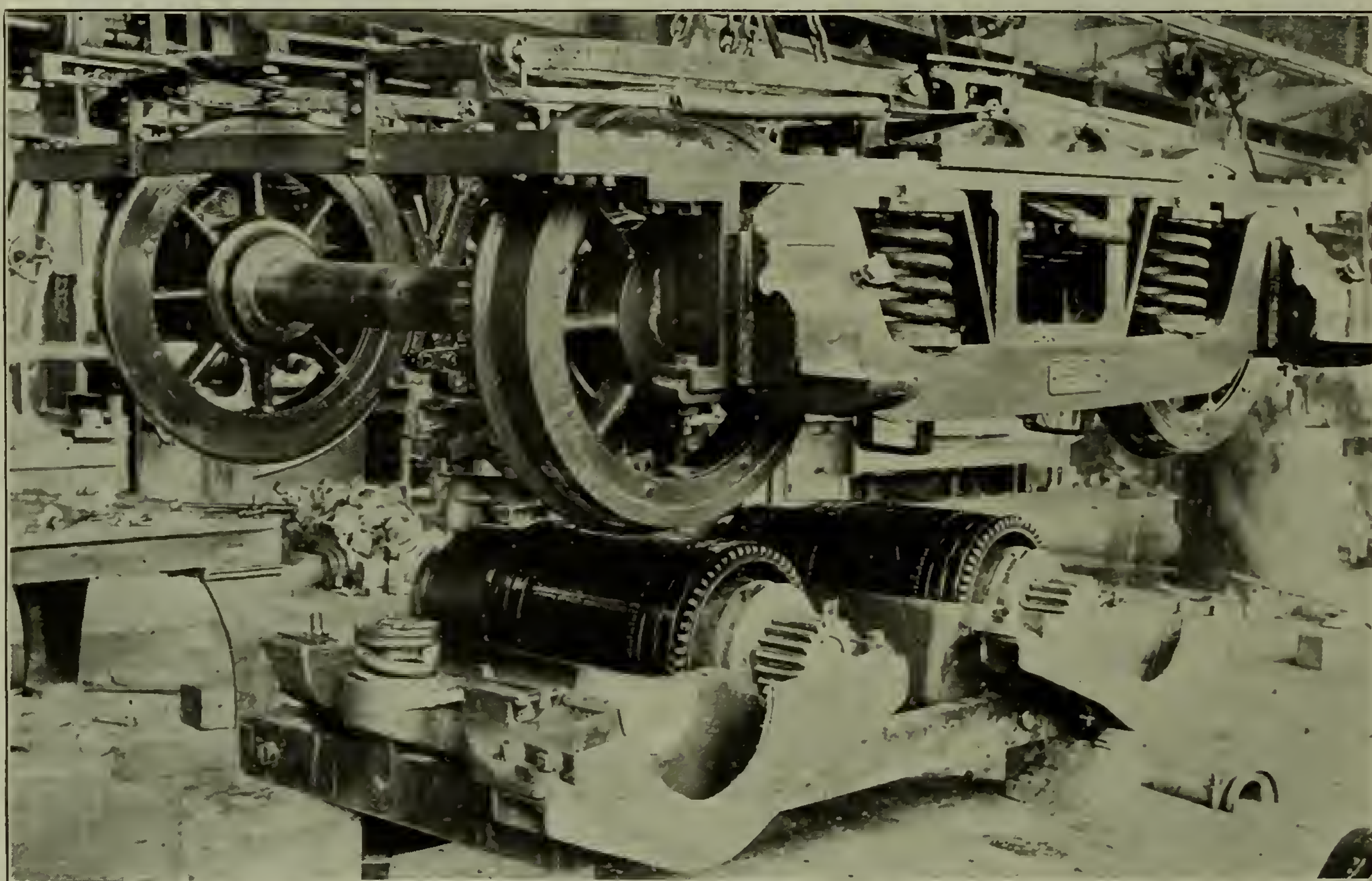
WESTINGHOUSE NO. 86 RAILWAY MOTORS, COMPLETE WITH BALDWIN-WESTINGHOUSE SUSPENSION.

The commutator is composed of 159 rolled and hard drawn copper bars. These bars have solid necks raised above the surface of the commutator, with milled slots into which the armature bars are tightly soldered. The bars are mounted on a cast iron spider and held in place by two steel V-shape rings, one of which serves as an oil guard to thoroughly protect the mica from oil or grease. A low voltage between the commutator bars is secured, decreasing the liability of flashing from any cause. The bars are insulated from each other by sheets of mica of a hardness that insures its wearing at the same rate as copper. The mica separating the bars from the rings is 1-16 inch thick, and the mica ring also separates the bars from the commutator spider. The wearing surface of the commutator is 16 ⅞ inches in diameter, and 9 ⅞ inches long. The bars are of a depth which allows a reduction in diameter of 2 inches.

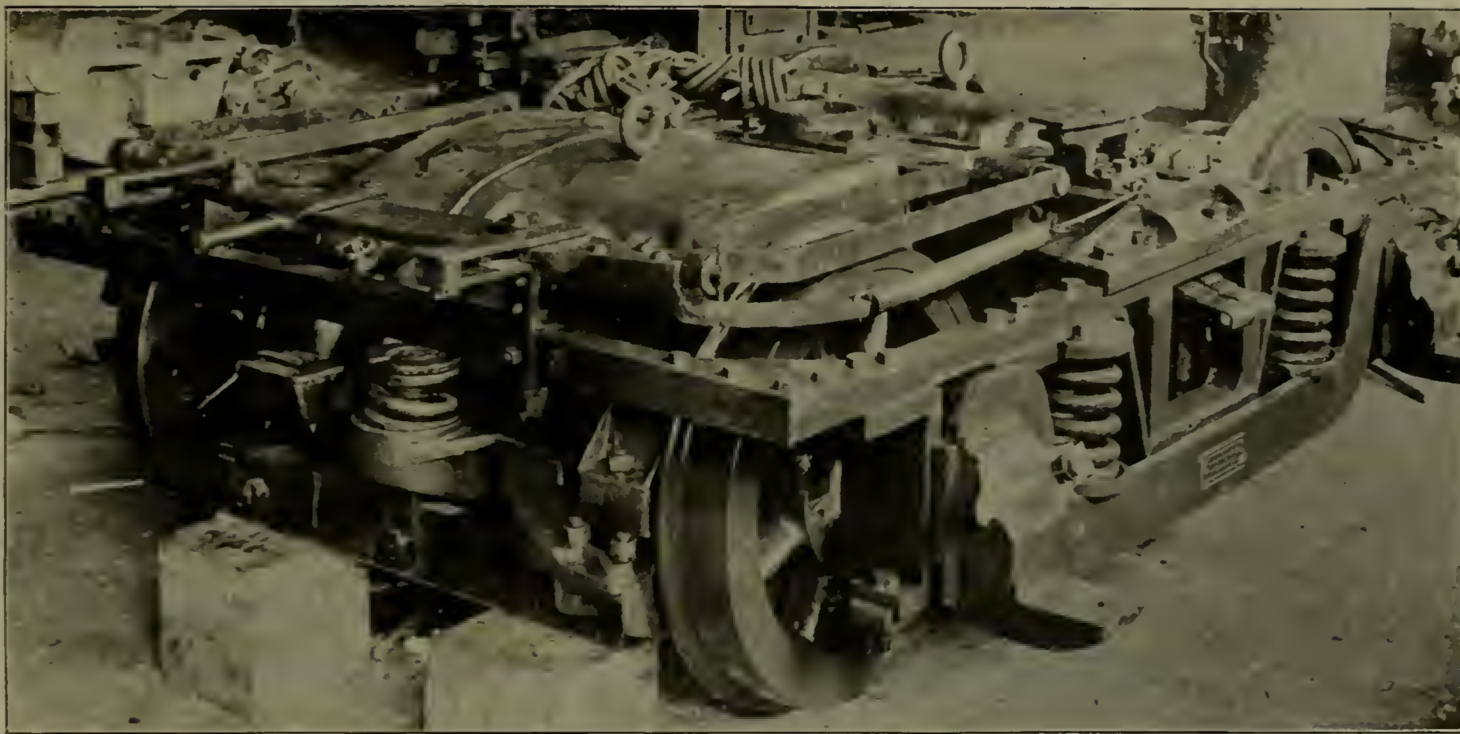
The brush holders consist of two cast brass arms, each secured independently to the commutator end of the upper frame casting by a special vulcabeston headed bolt. The arms and bolts are insulated from the frame by fuller-board and mica bushings and mica. Each arm carries three carbon brushes ⅝ inches by 3 inches in sections. The brushes slide over finished surfaces and each is pressed on the commutator by a spring finger. The tension of these fingers is readily adjustible and the brush holder arm is arranged for radial adjustment to allow for wear of the commutator. Copper clips are bolted to the carbon and these clips are connected by flexible shunts, of ample capacity, to the body of the brush holder, thus relieving the springs from carrying the current. Each brush-holder can easily be removed through the opening above the commutator by loosening a single bolt.

Field and armature leads are of best quality flexible cable, rubber insulated and fire proof. They extend five feet outside the motors and are furnished with detachable connectors. The bottom field lead is brought out of the end of the lower field frame and carried up through a leader on the end of the upper field frame avoiding the necessity of disconnecting this when opening the motor.

Armature and axle bearings are lubricated by oil fed to the journals by waste, in accordance with standard railway practice. The oil boxes are formed so that the waste will pack itself against the journals. The oil box covers are lipped and hinged, and fitted with springs that keep the lids tightly closed or hold them open as desired. Drip boxes are provided to catch all waste oil, so that no oil can get into the motor.



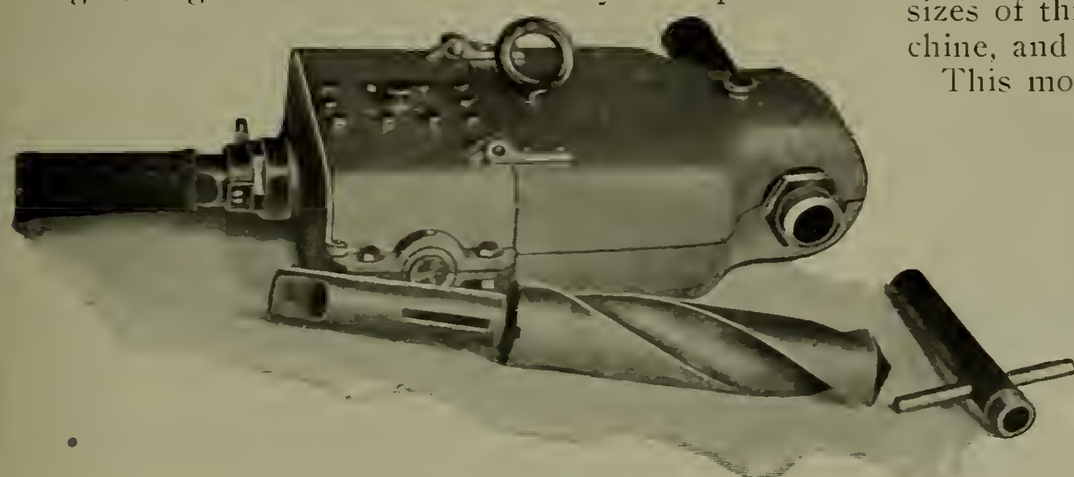
No. 86 Westinghouse Motors and Baldwin Truck, Showing Method of Removing Motors from Truck.



Westinghouse No. 86 Railway Motors Mounted Upon Baldwin Truck.

Reversible Pneumatic Motor

The accompanying illustration represents a reversible pneumatic motor in connection with means to rotate a spindle in which may be fitted different kinds of tools used in the construction of ships, boilers, bridges, engine and other machinery. It possesses many new features which render it very desirable by manufacturers of this class of work.



Reversible Pneumatic Motor.

As will be seen, the spindle is through the extreme end so it can be operated in very close quarters. The casing has a hinged lid by raising which the machinery may be readily inspected, cleaned by air blast and oiled, which insures durability and saving of time. The motor has two oscillating cylinders made of bronze brass, taking air at both ends, and the admission and exhaust are controlled by the oscillation. The trunnions have steel ferules to protect them from wear. In the main frame there are two air chests (one on each side), one for live air, the other for exhaust, and by turning handle half way around the functions of these chests become reversed, thereby reversing the motion and readily controlling the same. By a ¼ turn of handle it stops. The air is admitted and exhausted through the handle which also has an adjustable collar which can be set so that the motor runs but one way only. It has a detachable handle which is used when the drill is suspended or when used for tapping and reaming.

The largest motor of this type at present built, weighs 33 pounds and develops about two H. P. under 90 pounds pressure consuming about 17 cubic feet of free air per minute. The maximum speed of drill spindle is about 200 R. P. M. under 100 pounds pressure in this size. The speed can be controlled by the handle or throttle to suit requirements.

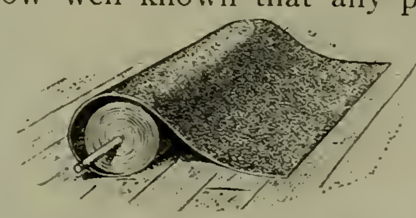
The manufacturers are at present building three sizes of this style, one of which is a wood boring machine, and two sizes central spindle type.

This motor is not in an experimental stage; it has been in actual service over four years, and has given entire satisfaction.

It is believed the end spindle motor fills a long felt want, as it can be used in locomotive fireboxes to expand all the flues in the sheet with self-feeding expanders (which are also manufactured by the same company), drilling door sheets, and holes in flanges of I-beams by setting point of feed sleeve against one flange and the drill in the other as it is very short from point of feed screw to end of socket. It has very few parts. Made by the Helwig Manufacturing Company, St. Paul, Minneapolis, Minnesota, U. S. A.

Asphalt Roofing

One of the reasons for the remarkable durability of Natural Asphalt, and for the comparatively perishable nature of pitch and other coal tar materials, lies in the fact that the oils of the asphalt are not volatile at any natural temperature, and are therefore permanent, while in all materials manufactured from coal tar there are volatile oils which evaporate on exposure to the sun and air, destroying the flexibility and life of the materials. The fact is now well known that any pitch or cement



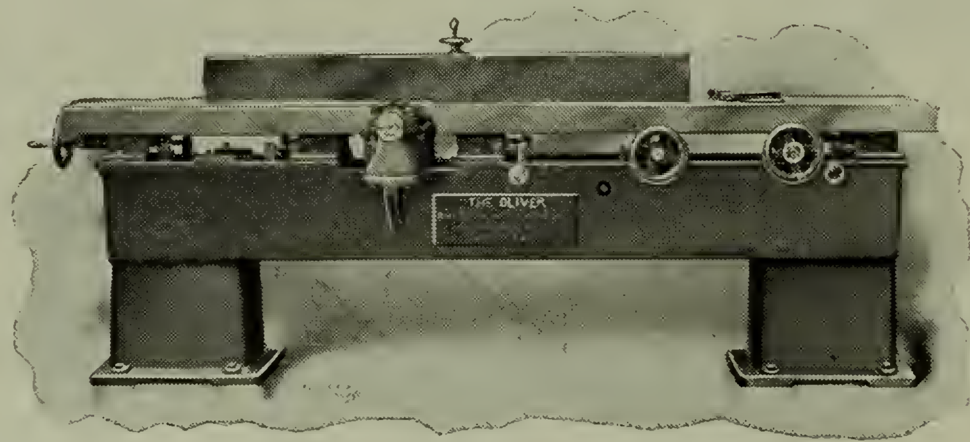
manufactured from coal tar thus gradually deteriorates until, in the course of years, it becomes brittle and crumbles away. Felt saturated with coal tar, in like manner, hardens until it becomes brittle, and finally worthless.

These facts taken in conjunction with the cheapness with which asphalt roofing may be applied, make it an admirable roofing for factories, mills, railroad buildings, warehouses, etc.

All kinds of good asphalt roofing are manufactured by Stowell Manufacturing Company, Jersey City, N. Y.

The Oliver Hand Planer and Jointer

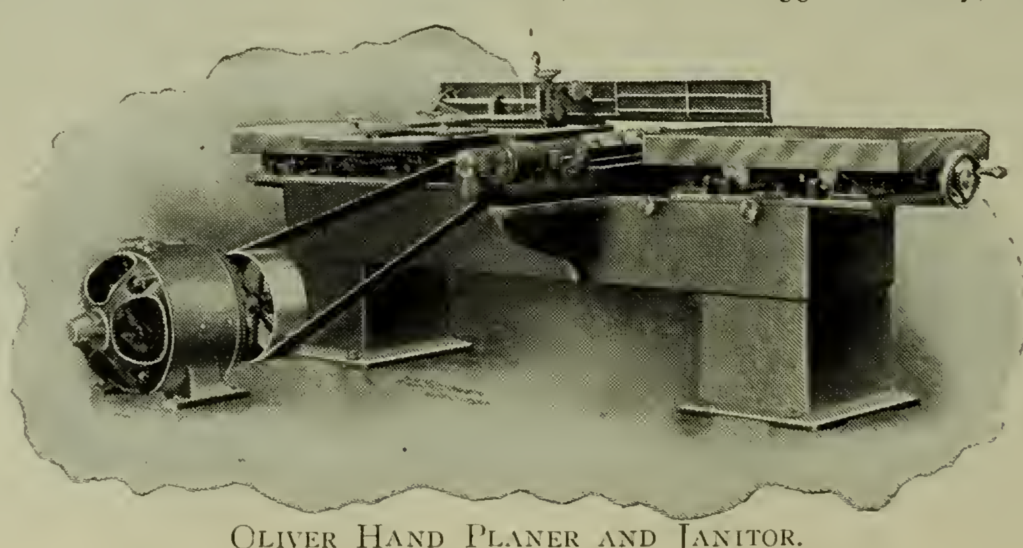
The accompanying illustrations of the Oliver hand planer and jointer, manufactured by the American Machinery Company, Grand Rapids, Mich., make evident at a glance that some very valuable improvements have been made on the machine of this type since it was first placed upon the market. One of the most conspicuous advantages in the present type is the original design. Having two columns, one at either end of the bed, gives the foot room for the workman so much to be desired, and eliminates the danger of slipping upon the bed and causing accidents. The machine has about twice the weight that is ordinarily put in a machine of this kind, contributing to firmness and reducing vibration to the minimum. One of the chief characteristics is the tilting device. The work table is hung in rockers and by simply turning one of the hand wheels the bed may be tilted so that any amount of draft may be planed upon pattern lumber. The enormous advantage of this is easily seen when one realizes that every piece of lumber passing through the patternmaker's hands has to have draft planed upon it.



OLIVER HAND PLANER AND JOINTER.

The work table is 5 feet 4 inches long and is moved backward and forward, when it becomes necessary to remove the knives, by a cut rack and gear. The receiving table is 3 feet 4 inches long on all except 30-inch size, which is 4 feet 2 inches long. It is constructed in the same manner as the work table except that it requires no rockers. The hand wheels for raising, lowering and tilting the work table are conveniently placed on the operating side of the machine. Both of the tables come together over the cylinder, leaving an opening of but 1¾ inches. Both tables are 2 inches wider than the knives, and the receiving table has a groove planed in its side to facilitate rabbeting.

The sliding frames upon which these tables are mounted are carefully fitted in dovetailed ways planed in the bed and held with gib screws, and are easily withdrawn from the yoke, or cylinder, for convenience in sharpening or removing knives. To these sliding frames are bolted the shoes for the adjustment of the work tables, the rockers upon which the work table rests, and also the screws and hand wheels which raise and lower the tables for the depth of cut. The shoes, or wedges, are tongued and grooved to the sliding frame and securely bolted. They also have large flat bearing surfaces and are gibbed by separate gibs running in slots which hold the work table securely to the sliding frame. All surfaces are milled and scraped and will keep the correct plane, or level.



OLIVER HAND PLANER AND JANITOR.

Fire-Proof Windows

In consideration of the danger from fires where any portion of a building is constructed of other than fireproof material and the high rates of insurance under such circumstances, it is essential that window framing should be fireproof as well as its surroundings. Where buildings are situated close together, a fire in one building is apt to spread to neighboring structures through windows unless precautions are taken to obviate the danger. The Smith-Warren Company manufacture a type of fireproof window which has been subjected to crucial tests indicating the value of such devices and showing wherein much property has been saved by the introduction of this precaution against fire.

The Smith system of fireproof windows comprise hollow metal frames and sashes of sheet steel or copper, cast iron or bronze glazed with fireproof glass. They are made in any type that can be made in wood, and all wearing parts are reinforced with copper, brass or steel. All movable sashes, whether sliding or swinging, close automatically at 155 degrees of heat, and are absolutely weather tight.

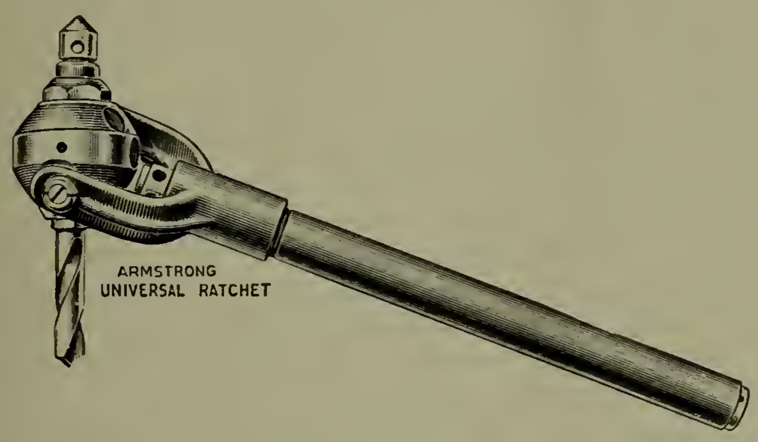
This company manufacture fireproof windows exclusively and have manufacturing plants in eleven different cities. They have recently installed some of the heaviest power presses ever built for working sheet metal for use in manufacturing their windows and they are receiving orders from cities all over the country for windows to be used in the best class of buildings.

The offices of the Smith-Warren Company are 93 Federal St., Boston, Mass., and 253 Broadway, New York.

Universal Ratchet

The many inaccessible places in which it is often necessary to drill holes, especially in repair work, renders the use of a tool by which such work may be conveniently accomplished, exceedingly valuable. The Armstrong universal ratchet has been designed to meet such emergencies and is at the same time an efficient tool for the ordinary work in which ratchet drills are indispensable.

The movement of this device is a new one. Even a vertical motion of the handles will drive the drill. There are no bevel gears, and no ball joint. The bearings are cylindrical. The pawls do not slide lengthwise on the ratchet teeth. The universal quality of the tool is due only to the fact that the axis of the two trunnions on which the handle turns is at an acute angle with the axis of the drill. About two inches of motion of the end of the handle in any direction whatever will drive the drill. Fix the set screw up into one of the three countersinks and you have a rigid handle, as in the common ratchet. In two of these fixed positions the handle stands at an angle out of the way of possible obstructions. In the No. 6 Ratchet there are twelve large teeth in the ratchet and five pawls which engage one at a time. Thus the pawls catch sixty times in a revolution. For this reason the tool cuts about one-seventh faster than the common ratchet, even in ordinary positions, for it takes one stroke of the handle less to make the drill turn once around. The head of the ratchet is only 3 inches across, making it possible to drill a hole 1½ inches from a side obstruction.



Universal Ratchet.

Sectional View. Universal Ratchet.

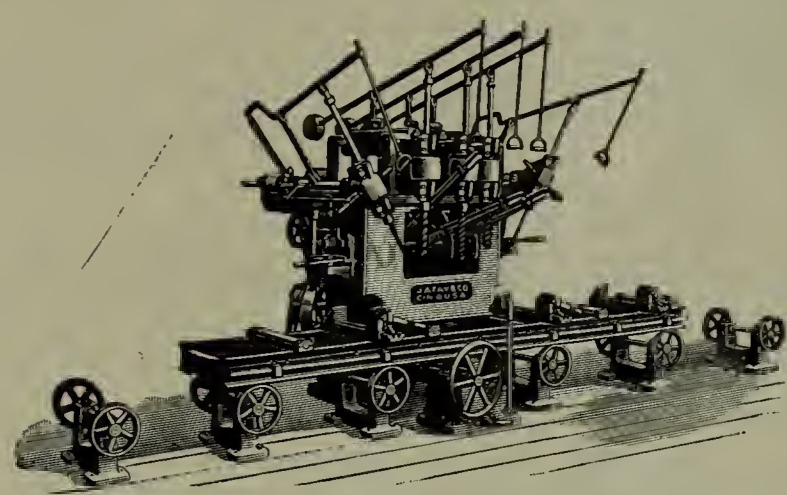
This tool is marketed by the Armstrong Brothers Tool Company, 621 Austin avenue, Chicago.

No. 5 Vertical Car Borer

An improved machine especially adapted for heavy boring in wood in car shops, ship yards and other places where large timbers are worked, is shown herewith. Its makers have spared no time or pains to embody in its construction such new points and improvements as would enable it to successfully meet the most particular requirements of those for whom it was designed, and it is offered to their consideration with the feeling that it will prove of interest. It was patented January 30th and February 6th, 1900.

The capacity of the machine for boring large holes has been greatly increased, and every convenience has been incorporated to make the boring easily and quickly done.

The spindles are of improved construction, the outside boring ones have angular adjustment of 45 degrees inside, and 60 degrees outside. Material 14 inches square can be bored; the spindles will travel 13 inches, and the vertical movement of end spindle frames is 8 inches. The outside spindles can be instantly locked at any angle desired; there is no strain, and short bits can be used with facility.



New Five-Spindle Car Borer.

The table is a steel traveling carriage of any length desired, is provided with necessary stops, and has a device for firmly clamping the stock. It has rack and pinion feed under instant control of operator, and has connections for making fine adjustments.

When desired a stationary table 9¼ feet long, with nine rolls, can be furnished.

A supplemental under boring spindle especially useful for boring coal car sides can be furnished, boring independently or at same time as upper spindle, and short bits can be used to advantage. This improvement will prove very beneficial to all those who make such cars.

The makers, J. A. Fay & Egan Co., West Front street, Cincinnati, Ohio, will furnish those interested with further particulars, cuts and terms, and will send free their new catalogue.

Mr. Edgar N. Smith, formerly Roadmaster on the B. & M. R. Railroad in Nebraska, and previous to that on the N. Y., N. H. & H. and the Boston Elevated, has accepted a position with the Railway Appliances Company, giving his time particularly to the "Q and C-Bonzano Rail Joint."

Personals

Mr. Alex. Stewart, heretofore master mechanic on the Union Pacific Railway, has been appointed assistant superintendent of motive power of the Southern Railway.

Mr. G. A. Bowers has been appointed master mechanic of the Southern Railway, with headquarters at Alexandria, Va.

Mr. H. M. Meason has been appointed roundhouse foreman of the Pennsylvania at Pitcairn, Pa.

Mr. W. E. McFarlane has been appointed road foreman of engines of the Monogahela division of the Pennsylvania.

Mr. H. F. Knight has been appointed master mechanic of the Baltimore & Ohio, at New Castle Junction, Pa., to succeed Henry B. Brown.

Mr. F. N. Hibbetts, heretofore mechanical engineer of the Union Pacific, has been appointed assistant superintendent of motive power and machinery.

Mr. F. P. Roesch has been appointed acting master mechanic of the Chicago & Alton, with headquarters at Slater, Mo., to succeed Mr. G. W. Ball.

Mr. William Niland, heretofore district foreman at Rawlins, has been promoted to master mechanic of the Wyoming Division of the Union Pacific Railway, with headquarters at Cheyenne. Mr. E. M. Tierney has been promoted from district foreman at Lawrence to division foreman at Rawlins.

Mr. C. H. Wilmerding has been appointed consulting engineer of the Chicago, Rock Island & Pacific, in connection with the new shops which the company are to build at East Moline, Ill.

Mr. Allen T. Dexter has been appointed general foreman of the locomotive department at the Collinwood shops of the Lake Shore & Michigan Southern Railway. After serving his apprenticeship as a machinist, Mr. Dexter entered the drafting office, where he has remained until his recent appointment.

Mr. George Gregory has been appointed master mechanic of the Mason City & Fort Dodge Division of the Chicago Great Western with office at Fort Dodge, Iowa.

Mr. C. A. Braun, heretofore master mechanic of the Missouri Pacific at Atchison, Kan., has been transferred to Osawatomie, Kan. Mr. F. G. Dunbar has succeeded Mr. Braun as master mechanic at Atchison, Kan.

Mr. George W. Taylor, heretofore general foreman of the Illinois Central at Clinton, Ill., has been appointed superintendent of shops of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia.

Mr. George B. Fravel, assistant master mechanic of the Pennsylvania Lines at Columbus, O., has been appointed master mechanic of the Chicago Terminal Division, with office at Chicago.

Mr. W. J. Hudson has been appointed road foreman of engines of the Philadelphia terminal division of the Pennsylvania Railroad, and Mr. W. E. McFarlane has been appointed road foreman of engines of the Monongahela division.

Mr. John Turtle has been appointed master mechanic of the Colorado division of the Union Pacific at Denver, Colo. Mr. John Wills, foreman at Council Bluffs, Ia., has been appointed district foreman at Omaha, Neb., and Mr. Z. T. Sprigg has been appointed district foreman at Denver, Colo.

Mr. J. E. Marden, heretofore assistant general foreman of the car department of the Boston & Maine at Fitchburg, Mass., has been appointed general foreman of the car department of the same company at Portland, Me., to succeed Mr. George L. Miller, deceased.

Mr. Thomas Paxton, superintendent of motive power of the Colorado & Southern, has resigned, and Mr. Willis A. George, master mechanic at Denver, Colo., has been appointed acting superintendent of motive power and Mr. J. H. Rathbone has been appointed acting master mechanic at Denver, Colo.

Mr. D. D. Robertson, master mechanic of the Chicago, Rock Island & Pacific at Herington, Kan., has been transferred to Horton, Kan., to succeed Mr. J. B. Kilpatrick, who has been transferred to Cedar Rapids, Ia., to succeed Mr. A. L. Studer, the latter having been recently appointed assistant superintendent of motive power of this company.

Mr. J. H. Manning, who resigned April 1, 1901, as master mechanic of the Union Pacific at Cheyenne, Wyo., has been appointed assistant superintendent of rolling stock of the Canadian Pacific, with office at the Union Pacific in 1875 as an apprentice, and served in various capacities up to master mechanic.

Mr. B. Haskell has resigned as superintendent of motive power of the Pere Marquette, and the position has been abolished, effective on March 15. He has been with the Pere Marquette since January 1, 1900, and was for a number of years superintendent of motive power of the Chicago & West Michigan and Detroit, Lansing & Northern before those roads were consolidated with the Pere Marquette.

The jurisdiction of Mr. O. Owen, master mechanic of the Colorado Springs & Cripple Creek District Railway, has been extended to cover also the electric lines of the company, and he will have charge of the power plants and electrical equipment.

Mr. M. Dunn, heretofore master mechanic of the Pennsylvania lines at Dennison, O., has been transferred to Columbus, O., and Mr. G. F. Butler, master mechanic at Columbus, has been transferred to Indianapolis, Ind. Mr. S. W. Miller, formerly at Indianapolis, has been transferred to Logansport, Ind., to succeed Mr. T. F. Smith, who in turn has been transferred to Dennison, O.

Mr. Wilson H. Reilly, who was for many years a well known railroad man in the Southwest, died at his home in Fort Worth, Tex., on March 11. Mr. Reilly started railroad work in 1868 and was at different times master mechanic of the Texas & Pacific, the Gulf, Colorado & Santa Fe, and superintendent of motive power of the San Antonio & Aransas Pass. Mr. Reilly retired from active service in 1892.

Mr. George W. Taylor, general foreman of the Illinois Central shops at Clinton, Ill., has been appointed superintendent of the Cedar Rapids (Ia.) shops of the Chicago, Rock Island & Pacific.

Mr. W. E. Dunham has been appointed mechanical engineer of the Chicago & Northwestern, with office at Chicago, to succeed Mr. E. B. Thompson, who was recently transferred to Mason City, Ia., as master mechanic.

Mr. William Swanston, who retired as master mechanic of the Pennsylvania Lines at Indianapolis, Ind., on January 1, 1901, died at his home in Indianapolis early this week. Mr. Swanston was born in Glasgow, Scotland, in 1827, and was educated at the Glasgow Mechanics Institute. After coming to this country he entered railway service in 1850 as a machinist for the Little Miami Railroad, and was later made gang foreman in the shops of the same road. From 1866 to 1871 he was master mechanic of the Cincinnati, Sandusky & Cleveland Ry., and from 1871 to 1872 was master mechanic of the B., C. R. & M. Railroad. Following this he was consecutively assistant master mechanic Little Miami Railroad, assistant master mechanic Jeffersonville, Madison & Indianapolis Railroad at Indianapolis, master mechanic of the same road at Jeffersonville, Ind., and from November, 1884, to January 1, 1901, master mechanic of the Pennsylvania Lines at Indianapolis Ind.

Mr. Frank L. Davies, chief clerk motive power and machinery department of the Chicago & Eastern Illinois railroad company and secretary to the superintendent of motive power of that road for the past eight years at Danville, Ill., has been nominated by the Republican party for mayor of Danville. The primary election was held Saturday, March 21, under the Australian system, and Mr. Davies secured the nomination over a wealthy and well known business man of Danville, A. W. Heinley, by a majority of over 400 votes.

Mr. Davies has been employed at railroad work for the past twenty-three years on the Big Four, the Wabash and the C. & E. I. railroads, in the mechanical and transportation departments. He has always been closely associated with the working men among the railroad employes, and it was through their influence and support that he became a candidate. He has always taken an active interest in politics, but has never before sought an office for himself. He is a native of the state of Illinois—born in Freeport about forty-six years ago. It is believed that the Republican nomination in Danville is equivalent to election, as the town and county are largely Republican. Mr. Davies resigned his position on the 15th inst. to make the race for mayor. Mr. C. A. Beck, formerly of the 'Frisco at Cape Girardeau, Mo., succeeds Mr. Davies as chief clerk and secretary to Mr. T. A. Lawes, Supt. M. P. and M. of the C. & E. I. R. R.

Notes of the Month

The Sterlingworth Company has placed orders abroad for 3,500 tons of material for manipulation in their enlarged rolling mill.

Mr. C. C. Murray will be connected with the Railway Appliances Company, with headquarters at Pittsburg, giving his time more particularly to the sale of the Q and C pneumatic tools.

Mr. J. D. Hurley and Mr. A. B. Holmes, formerly connected with the Standard Pneumatic Tool Company, are now associated with the Rand Drill Company in the "Imperial" pneumatic tool department.

Mr. E. E. Silk, who has just resigned from the O. M. Edwards Company, has been appointed secretary and general manager of the Holland Company of New York, Chicago and San Francisco, with headquarters in Chicago.

Rev. J. Wilbur Chapman, D. D., has been secured to speak at the two great auditorium meetings of the Railroad Young Men's Christian Association conference at Topeka, Kansas, Sunday, May 3. Railroad men throughout the country are pleased at the fact that Miss Helen Milier Gould will be at this conference and greet the railroad men as at Philadelphia. Mr. Busch, a representative of the government of Denmark, will represent his country, and it is expected that other foreign delegates will be present. Mr. Busch is a prominent railroad man of Copenhagen.

The Etna & Vesuvius Coal Company are having sixteen flat-bottom gondola cars, with twin hoppers, 80,000 pounds capacity, built at the works of the Pressed Steel Car Company. The Raritan River Railroad Company has ordered six low-side gondola cars, 80,000 pounds capacity, from the same company.

Messrs. Dodge & Day, the modernizing engineers of Philadelphia, have been commissioned by the Ingersol-Sergeant Drill Company to report on variable speed motor equipment for the new Phillipsburg plant, and have been awarded the contract to equip with motor drives a number of the large machine tools.

Mr. John N. Abbott has resigned as vice president and general manager of the "Consolidated Railway Lighting and Equipment Company," 100 Broadway, New York, and has also dissolved his connection with the several subsidiary companies, including the "Consolidated Railway Electric Lighting and Equipment Company."

The National Brake Shoe Company has succeeded to the business and to all the patent rights, titles and interests, including the foundry and manufacturing plant of the Allston Foundry Company, and will continue the manufacture of the "Compo" brake shoe, on an enlarged scale, for steam and electric railway service.

The draughting rooms of the engineering department, Pennsylvania Railroad, in the Union Station, Pittsburg, have recently been fitted throughout with the Nernst lamp. The quality of this illuminant is peculiarly suited to the requirements of draughtsmen, having a perfect downward distribution of light of daylight quality, with an absence of shadow or flicker.

A record in car construction was made by the Standard Steel Car Works at Butler, Pa., on Monday, March 16, when the works turned out 92 finished cars. These cars were of steel underframing with wooden sides and ends. The company has received a large number of rush orders and the endeavor to meet the great demand largely accounts for the record made on this date.

Pratt & Whitney Company have recently added a new building to their small tool department which fully doubles their capacity. Their plant is equipped throughout in the most perfect manner and the company believe that with their facilities for manufacturing tools they can supply them more economically than individual concerns manufacture them in their necessarily limited tool rooms.

The Northern Metallic Packing Company has been incorporated at St. Paul, Minn, capital $50,000, to do a general manufacturing business. Specialties: Northern metallic packing, Curran locomotive chime whistle, and the Fuhrman pneumatic motor and other railroad specialties. Officers are Alfred Munch, president; S. B. Mack, vice president; S. R. Parslow, treasurer, and D. E. Anderson, secretary.

In order to illustrate their stock in hand and the material handled by them the Scully Steel & Iron Company have issued an interesting catalogue of 144 pages containing illustrations of their machine and hand tools together with tables and information relative to boiler making and design.

F. M. Brydges & Sons, Winnipeg, Man., and E. A. Jack, Jr., St. Louis, have been appointed representatives of the Northern Metallic Packing Company, the former as Western Canadian representative, and the latter as the St. Louis representative. Both are well known railroad supply firms, and will sell the Northern Metallic Packing and the Curran Locomotive Whistle in their respective territories.

In connection with the Eleventh International Railroad Young Men's Christian Association Conference at Topeka, Kan., April 30-May 3, inclusive, President Theodore Roosevelt has agreed to lay the corner stone of the Railroad Association Building in Topeka on Friday afternoon, May 1. This new building, costing over $30,000, is to be devoted exclusively to the use of railroad men and is the gift of citizens and the Santa Fe Railway Company.

The Westinghouse Electric & Manufacturing Company has put upon the market a new and improved series of fan motors for use on alternating current circuits. The new designs embody the latest ideas and the accumulated experience of the past years. The design of the motors has been very carefully worked out. The mechanical parts are of a graceful outline and present a pleasing appearance. The iron parts are japanned and the fan blades, guards and oil cups are of polished brass.

Mr. Charles S. Powell, who has been associated with the Westinghouse electric interests since 1893, and who for the past six years has been manager of the Cleveland office of the Westinghouse Electric & Manufacturing Company, has changed the scene of his activities from the United States to Europe. He has been appointed assistant manager of the British Westinghouse Electric & Manufacturing Company, Limited, and has already entered upon the duties of his new position. His headquarters are in the Westinghouse Building, Norfolk street, Strand, London, W. C.

The Columbus Steel Rolling Shutter Co. of Columbus, Ohio, have recently closed a contract with the Lane & Bodley Co., Cincinnati, O., manufacturers of Corliss Engines, to equip their new core ovens, at their foundry with rolling steel shutters. They have also inquiries from several large plants in Pittsburg district in regard to the adoption and method of operating this unique type of door. They have also recently closed an additional contract for several large doors at Fultonham, freight sheds, of Hocking Valley R. R.

The Duff Manufacturing Co., of Pittsburg, Pa., have issued a new catalogue designated as catalogue "D." In this pamphlet is described the construction of their jacks, all parts being clearly itemized and illustrated. Included is a table giving a schedule of dimensions and prices. The company confines their business and efforts to making jacks and have had nearly twenty years' experience in this line. They manufacture track jacks, automatic lowering jacks, car and car box jacks, differential screw jacks, oil well jacks, pipe forcing jacks, automobile jacks, motor armature lifts and traversing jack bases.

The catalogue of the C. W. Hunt Company, West New Brighton, Staten Island, New York, devoted to the subject of industrial railways, covers the subject very thoroughly and gives much interesting information to any one considering the question of handling coal or other materials. A wheelbarrow with a carrying capacity of 250 would have to make eight trips to handle the amount of coal which a charging car carries at one time, namely, 2,000 pounds, and less effort is required to move the car with its ton load than the wheelbarrow with its 250-pound load. The Hunt Company will be pleased to send copies of their catalogue upon request.

The E. J. Ward Company have turned over to the Railway Appliances Company their car vestibule diaphragm business and have withdrawn themselves entirely from that department of railway supplies. The Railway Appliances Company have purchased their entire set of diaphragms, material and machinery and removed the manufacture to Chicago Heights, where they have increased facilities for doing business. The E. J. Ward Company, it will be remembered, have been pioneers in the canvas diaphragm business, making car vestibule diaphragms in all varieties. They have introduced the riveted diaphragm made under their patents, which, together with other forms, have been transferred to the Railway Appliances Company.

The Bishop & Babcock Company, of Cleveland, is equipping its machine shop for electric driving. The group system has been adopted and short lengths of line shafting throughout the shops are driven by Westinghouse induction motors. Seven or eight of the latter, ranging from ten horse-power to forty horsepower, have been purchased and are now in operation, current being temporarily supplied from the plant of the Cleveland Twist Drill Company, which is also equipped with Westinghouse apparatus. The Bishop & Babcock Company, however, is installing a power plant of its own and has recently purchased a 175-kilowatt, two-phase, Westinghouse engine-type alternator, with switchboard complete. George S. Rider & Co. are the engineers for the plant.

The Baltimore Railway Specialty Company, which has been recently chartered under the laws of Delaware, will manufacture the Norwood frictionless center and side bearings and will eventually add other specialties to their products. They are preparing to manufacture their center and side bearings in large quantities by special machinery, which will insure perfect working and all parts interchangeable. Mr. Thomas H. Symington is president of the new company, Mr. J. W. Middendorf is vice president, Mr.

W. Eason Williams is secretary and treasurer, and Mr. T. E. Norwood is mechanical engineer. These officials, with Mr. J. W. Woodland, will compose the board of directors of the company. Its capital stock of $900,000 is divided into $750,000 of common stock and $150,000 of preferred stock.

Messrs. G. S. Wood & Co., Chicago, manufacturers of the "Acme" car vestibule diaphragm have opened an eastern office at 39 Cortlandt street, New York, in charge of Mr. Fred F. Bennett general eastern sales agent of the firm. Mr. Bennett is well known in railroad circles not only through his connection with this company but by reason of his long connection with the railroad press, the American Steel Casting Company and the Chicago Pneumatic Tool Company. These diaphragms have come into very general use and they are claimed to be much more durable than those made of rubber while costing about half as much. Samples and all information may be had and samples seen at above address.

"The Bessemer & Lake Erie R. R. has ordered a chair car, also a 60 ft. baggage car from the Hicks Locomotive & Car Works. The Hicks Locomotive & Car Works has received an order for a Locomotive from the Rodgers-Allison Lumber Co., Vanderbilt, Mich. The Hicks Locomotive & Car Works have received miscellaneous freight car orders from Gold Bar Lumber Co., Gold Bar, Wash., Missouri, Arkansas & Western Railway Co., Union Traction Co. of Indiana, Coal Belt Ry. Co., Fairbanks, Morse Mfg. Co., Central Arizona Ry., Detroit & Mackinac Ry. The Santa Fe Central Ry. has ordered two eight-wheel cabooses from the Hicks Locomotive & Car Works."

The Delaware, Lackawanna & Western R. R. is to equip its entire pasesnger equipment with the new high speed brake and the change will be made as rapidly as practicable. Experiments conducted by officials of the road indicate the superiority of the high speed apparatus over the present type and show that a train can be stopped in a third less time. This road is among the first to place the high speed brake on its equipment, and thus far eight coaches have been fitted with the necessary appliances and eight locomotives recently ordered will be equipped in the same way, the intention being to ultimately fit the entire passenger equipment of the system with the new high speed brake.

The Fuel Oil Power Company, 60 Wall street, New York City, have recently exhibited the Ostergen oil engine, which they are now thoroughly prepared to market. This engine is of the two-cycle type, in which an impulse is given to the piston at each forward movement thereof. It is particularly adapted for employing heavy oils as fuel, such as fuel oil, crude oil or kerosene, gasoline or wood alcohol. In a general way the Ostergren fuel oil engine and apparatus consists merely of an ordinary cylinder, piston, connecting rod, crank shaft, auxiliary air compressor, air tank and an oil tank. This engine may be single or multiple and the consumption of fuel oil therein is only half a gallon per horsepower per day. There being no boilers, tubes, water jackets, etc., its simplicity and cheapness of construction are self-evident.

"Elements of Steam Engineering," by H. W. Spangler, Arthur M. Greene and S. M. Marshall. The text of this volume is devoted to the description of the steam engine and the origin of its power supply, the boiler, together with the accessories necessary to maintain a steam power plant and indicate its efficiency. The work contains but little theoretic matter and no principles of design upon which the form and dimensions of parts are based, being devoted to a consideration of the parts as they exist in present day service, their relation to each other, the several auxiliaries required to maintain economical operation and their bearing upon the final result. Opening the subject matter with boilers, the fuel used under different conditions, boiler details and the several types of boilers found in service, the authors continue with a description of the slide valve steam engine, which serves to introduce the many details of construction and operation, including valve motions and diagrams; methods of indicating and governing and the operation of steam in multiple expansion engines and in turbines. While the greater part of the book is devoted to stationary practice, many interesting details of marine and locomotive practice are introduced. This work may be read to advantage by the student beginning the course in mechanical engineering as well as by those associated with the maintenance and operation of power plants. The text is elucidated by a large number of figures illustrating the parts described. Published by John Wiley & Sons, New York City. Price $3.00.

The Engineering Agency, 1208-9-10-11 Monadnock Block, Chicago, was started in 1893 by Mr. F. A. Peckham, at that time western manager of the "Engineering News." Mr. Peckham found in traveling about the country that he was constantly asked by manufacturers where they could find certain competent help. On the other hand his office was visited every day by those who thought his paper might be able to assist them to positions.

The agency has grown steadily and during the past ten years has secured positions for over 5,000 technical men. The registrations during the past two years have exceeded 3,000, and yet today the agency has difficulty in securing enough competent men to supply all of the demands made upon it by companies that wish high-grade help. It is therefore using the "Want" columns of some 50 leading papers throughout the country. Every person who registers in the Engineering Agency is obliged to give a complete record of his past experience and if the agency thinks that the experience is not satisfactory it refuses to permit the applicant to register; if it does accept the registration fee but finds upon investigating the references that he is not such a man as the agency wishes to recommend, it returns to him promptly the registration fee. The care taken to register only competent men and to recommend always the right man for the right place, together with an experience of ten years with the leading railways, manufacturing and industrial companies, enables the agency to secure positions promptly for almost any high-grade technical man who can furnish a good record and references.

Mr. F. A. Peckham, president of the agency, was for twelve years with the "Engineering News"; Mr. A. B. Gilbert, treasurer, has recently completed over eleven years' work for the same paper, during six of which he was assistant manager; Mr. A. G. Frost, secretary, has been connected with the agency for several years.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

Death of Ex-President Leopold

At the bottom of a letter from a traveling salesman, dated at Montgomery, Ala., March 12, 1903, appears the following note: "Of course you know that Leopold, ex-president of the association, died a few weeks ago."

This is the first intimation of such sad news to reach us. Accepting it as authentic, we note his death herewith.

Mr. W. T. Leopold was elected president of the Master Car and Locomotive Painters' Association at Milwaukee in 1893, having been chosen vice-president the previous year at Detroit, and presided over the Buffalo convention in 1894.

In the thirty-five years of its existence this is, we believe, the fourth death among its presidents, the first being its first president, Joseph Hill of Maine, who died many years ago. In recent years S. E. Kirkpatrick ad Joseph J. Murphy have passed away. Whether J. C. Van Pelt, the third president, is living or not we do not know. And we have not kept track of George O. Widner, M. W. Stines, D. D. Robertson and A. E. Barker, who were among the early presidents.

Wm. T. Leopold.

Mr. Leopold was a talented speaker and no one ever occupied the chair in our deliberations with more signal ability than did he. He also held an office of high rank among the Knights of Pythias in the south, for which he received a liberal salary, and some years since he severed his connection with the Centra of Georgia Railroad at Savannah, with which he had been connected for some years as master painter, and has not of late met with us in annual convention. Nevertheless, his taking away will be deeply mourned by many in our association, among all of whom he was held in high esteem as a man of excellent habits, principles and sterling worth generally.

"Touching Up, or Cutting In"

"Which is the best method to pursue, touching up, or cutting in?"

This is subject No. 3 on the program for our coming convention, and as the writer usually does little talking in meeting he may as well have his say here, without, however, any intention of influencing any others' opinions prior to convention.

The writer believes in pursuing both methods, as the requirements of the case may be, but is at present cutting in the entire equipment of the B. & M., because of a change to a lighter shade of Pullman color, and also for the reason that a majority of the cars need it, having been touched up so much as to become patchy and also stained with smoke, a little of which gets left each year here and there in our poorly lighted shops by the scrubbers, and so gets varnished in "for keeps," the first thing you know, which the sunlight reveals as soon as the car goes out of doors. I do not believe in the pursuit of either method to the disregard of the other. Next year the bulk of our equipment will be touched up; and when we say touched up we do not mean a patch two inches square slopped or daubed with a swipe of a flat brush over a bruise half the size of the little finger nail. If touchers up would only take a pencil or the corner of their brush and just touch over only what requires touching up it would make a much nicer job of it all round, after having properly matched the color.

I believe it to be a bad practice to cut in cars every year. The paint will not wear so well for it, nor be so long lived before burning-off time comes. It is sacrificing durability for some other things, such as avoiding matching the color and being particular in the cleaning; for, be it said, there is a chance to save in cleaning by cutting in the car. All that is needed to be careful about is to have all the gold or lettering and striping scrubbed up bright; the cutting in will take care of the rest. The writer knows of a large system that cuts in its entire equipment annually, but it is contrary to the practice of former times and, probably, the result of piece-work methods and the consequent hustle and bustle that way of doing business produces, which has a price for doing things and it becomes easier to do it than to stop and consider whether it needs it or not. A low piece price cleaning will produce poor work of this character; but its atonement comes along in the shape of a cutting in that hides the sins of the former fellow. Nevertheless, the road has got to "ante up" for all by paying the bills of burning off cars sooner than they ought to be, or else submit to the running of badly crackled up cars.

The writer has an object illustration of the doctrine he is here trying to preach on his own road. Seven years ago fifty coaches were brought on to the road built by the Pullman Company, and were well painted in every sense of the word. Four of these were taken care of at a small shop at a distant point on the system and have been cut in four times. This year we have ordered those cars burned off, they are in such a crackled condition. The balance of forty-six cars have been cared for at the writer's shop and are now going through his shop being cut in, having been cut in but once before, and they are in fair condition, the most of them, though now and then there are exceptions. Of course variation in brands and qualities or varnish used may account for some of this difference in wear, but we think the most of it is to be accounted for by the too-frequent cutting in they have had.

In cutting in cars with one coat of color, of course that color has got to be used fairly thick to cover, and here will be cause for cracking, especially as it is lain over a coating of varnish applied last year, and another coat is usually put over it the next day after the cutting-in color is applied. Whereas, in painting a car thoughout, thin coats of color are used, which tend to more durable results, because thoroughly hard, or dry, when the varnish is applied; and then, of course, more time is had to dry, because the lettering and striping has been done meanwhile.

The fact is, cutting in is a necessary evil to be deferred as long as it is possible to maintain a fairly passable clean and unclouded body color to the equipment. And if some pains are taken in cleaning and touching up, cars ought to go three years before being cut in, so that in the lifetime of the paint of the car they would need to be cut in but two or three times before general burning off or painting occurs.

Of course the Pullman color and other dark shades facilitate the cutting-in process wonderfully, and had they not been adopted long ago this question would never have been raised; for cutting in yellow cars is out of the question.

A New Alliance

Mr. Irving H. Munford, until January 31, 1903, Secretary Hildreth Varnish Co., 32 Broadway, New York, severed his connection with that concern and became, Feb. 1, allied with the Flood & Conklin Co. as traveling salesman. As this information came to us in his own handwriting, under date of Jan. 31, we simply had to believe it, but we should have thought it fiction if we had heard of it otherwise. We had come to regard him as a fixture in the Hildreth company, but as "there is a tide in the affairs of men, which, taken at the Flood, leads on to fortune," we suppose he has taken Shakespeare's hint and loosed his moorings because "omitted, all the voyage of their life is bound in shallows, and in miseries."

This latest accession to the F. & C. staff makes a sort of quadruple alliance of Gilliland, Shields, Kuhn & Munford that will be hard to beat, all having been previously connected with the Hildreth and kindred interests, except Mr. Kuhn, Mr. Munford having quite a trade in the South for the Hildreths. Not saying anything here about the quality of the Hildreth varnishes, they do seem to be graduating good talent in the line of salesmen, judging by our acquaintance with the four mentioned. We wish friend Munford all the success which he will doubtless attain in his new relation.

A Visit to the Barney-Smith Car Works

Editor Railroad Paint Shop:

I am in receipt of a letter from the editor of the paint department of our worthy official organ, the Railway Master Mechanic, and I believe he said it was not to be consigned to the waste basket, but was to be a gentle reminder that the members were to write something for the painting department.

For that reason I am going to write a small description (or try to) of a trip it was my good fortune to have the opportunity of enjoying not long since of a visit to our worthy associate, Mr. D. L. Paulus, of the Barney-Smith Car Company, Dayton, Ohio.

I started at 8:27 o'clock and reached Dayton at noon on the railroad made famous by James Gohen, the very "Big Four." By the way, I had a very agreeable fellow traveler, Mr. Roberts, of Sipe's Japan Oil Company.

I was given a seat in the office and soon Mr. Paulus was there and we started on a tramp through the great works. Through the main avenue were all kinds of air hoists lifting timber right and left. They keep, I am told, a million dollars' worth of timber on hand all the time and turn out twenty-two box cars a day. That is to be done every day; no small task, considering everything. I think, on an average, he has 175 men under him and one assistant. To say he is a busy person is not making the remark very strong.

I was shown some of the latest finishes for interior car construction; for instance, "Matted Cathedral Glass Domes." They had several dining, sleeping and tourist cars in course of construction for the Southern Pacific. The finish and decorations were handsome. The side-deck was stippled and blended with fourteen colors to represent the "Sunset Route."

Also a long line of cars were in course of construction for the New York Central Railroad. They were being finished in dark oak. The finish is of that subdued tone which makes it mellow, soft and restful to the eyes and so much to be admired. For my part, it is the greatest finish that was ever brought out.

The inlaid work at this place is something that the Barney-Smith Car Company can be proud of. It is not surpassed in this or any other country. The painter that does not have an inspector to please has a great load off himself, because the kick that they put up is "something fierce." However that may be, Mr. Paulus can soon put them on the right road.

They have a great plant to do their glass work in, three rooms in all, and every convenience that is conceivable and that would be of any advantage. "Going up, third floor." As Mr. Paulus said, "As high up as we could get it." It is a most complete plant. At the landing is an acid room. Rows of vats all around. The next is his designing and foiling room and the next the mirroring room. A person must see it to appreciate how well they are situated. Three rooms in all on the third floor, away from the dust and all by itself. Some very fine work is executed here. He has a backing for mirrors that stands almost any kind of a fair test and is far ahead of boiled oil and red lead.

I must speak of the scaffolding arrangement that has been installed lately. It is very handy and with it three men can lift a thirty-foot plank very easily. It consists of a plank mounted on an arm that is counterbalanced by a heavy weight which slides up and down a column by cable arrangement. That is one good thing the convention at Boston did, for it was put in after Mr. Paulus arrived at home. The story doesn't end there, either; for another "dauber" learned how to grain sash from the natural wood; that is, very close. So close that "the M. M." was fooled, and was going to make the carpenters take out the awful

A Headlining Comer Stencil, by Mr. Warner Bailey.

crooked piece of wood in the outside vestibule door, when I turned it around and on the inside it was "elm," not yet stained! "The cigars" were on him.

Now I will close, for this thing is "all out of reason." Hoping to hear from the advisory committee soon and its report, that the Chicago convention will be a great success and that I may be permitted to be there. I am,

Yours truly, H. C. HERRON.

[Come again! We feel more like throwing some of our fellows into the waste basket all over for not writing us anything than we do to throw anything else we ever received.—Editor Railroad Paint Shop.]

Notes and Comments

Hon. F. S. Risteen, proprietor of the Copley Square Hotel, Boston, where our last convention was held, died during the first week in March. He had been in failing health, from a form of indigestion, for a year. He was secretary and treasurer of the New England Hotel Association and an ex-state senator.

The best primer for galvanized iron, according to uncle John A. Putz of the Wisconsin Central, is a coat of good finishing varnish; and we are inclined to agree with his opinion, having had a similar experience. F. & C. primer is not bad. Either is better than lead and oil for the purpose. This is the only way it can be successfully painted without stripping it of the galvanizing, which may be done, we should say, with muriatic acid. But galvanized iron should only be used where an iron must be had that will permit of being soldered. Otherwise use unfinished sheet iron, as paint will adhere to it better. Galvanizing is unnecessary with painting.

We have repeatedly urged, officially and otherwise, upon the attention of the pressed steel car people, the need of the proper preparation of pressed steel surfaces to remove all fire scale and then prime the work with a suitable primer before sending it out as the best way to imitate the best method of painting and maintaing steel cars, because there is nothing like being "ahead of the game," and that game is rust. We may be visionary, but it does seem to us that in the case of pressed steel trucks at least it would be perpectly feasible to have a sandblasting apparatus of such character that it would be a short job, after a truck frame was riveted together, to blast it off to a bright, clean surfacer and then, with some kind of a derrick and overhanging trolley system, dip it into a vat of hot priming oil and hoist it up and let her drip and then shove it along by the trolley to the load on a flat car and so on until the car and many cars were loaded with the product. We yet believe it would pay the railroad companies to have this work done at the factory, as the beginning of thorough work in painting steel cars and keeping them painted.

A COMER, BY MR. WARNER BAILEY.

About "harmony in color in finishing and furnishing of the modern railway passenger car," which is subject No. 4 on the official program to be considered at our next meeting, it is but fair to say that the olive greens have served a good purpose for ceilings, but one cannot but reflect whether or not they have had their day and, having had a good run, may now be lain aside as something overdone for something a little more "new," as it were, though "there is nothing new under the sun," according to Solomon (not Solomon Levi). Oak tints, buffs, tans and terra cottas ought to work in well in their various colorings and shadings for ceilings in mahogany finished cars, with old gold and olive tint plushes for seats. But for a red-finished mahogany interior please leave crimson plush out for us as too much of a good thing. We might "paint the town red," but not the cars. Let's have something quiet in design and coloring for interiors.

Speaking of methods and materials for interior finish of passenger cars, etc., which is to be subject No. 1 at our coming Chicago convention, will say, as a starter to the committee, that the writer has lately finished the interior of two cars of mahogany as follows: Two coats Wheeler's Patent Paste Wood Filler No. 7, on all prominent parts; one coat on other parts; each coat, of course, well worked into wood and wiped off as usual. One coat orange shellac, sandpapered lightly. Two coats "Primelac" (without rubbing between coats), rubbed to a dead finish when dry and hard. Oak headlining filled with white paste filler and no shellac, but given one coat "Primelac" and dulled with sandpaper and stenciled, and then second coat "Primelac" and rubbed to dead finish. Think this as economical, durable and practical as any ever done, if not more so.

The heating and ventilating of car and locomotive paint shops can't be done any better, in our judgment, than by the hot air circulation system. Warner Bailey's shop is not at the North Pole, but it's pretty well up that way—at Concord, N. H., the coldest place in winter and about as hot as any in summer. We felt skeptical about it when it was being put in during the building of the shops a few years ago, and so did others. We should not want to put down the terse remark of the president of the road about it at the time—but, say, in the coldest weather that huge shop is as comfortable as a sitting room, and Mr. Bailey, who is quite a botanist, raises flowers at the coldest end, and once had a bunch of bananas!

The Victoria Hotel, Michigan avenue and Jackson boulevard, we understand, has been chosen by the committee as the headquarters of the association at the Chicago convention next September. We are hoping to get an official announcement, with rates, etc., in season for this issue. We remember with pleasure of stopping at this house over night with George Barber and Warner Bailey on the way back from the Milwaukee convention in '93 to a further view of the World's Fair.

Steel wool has lost some of the popularity it once had in the paint shop. It's great stuff to—get into the tender flesh of one's fingers under the nails! Leather gloves of some sort are needed in its use. Still it is no more effective than curled hair, wherever that article has any use. It is good to rub down the first coat of color before applying the second, also ordinary paint coats, and to dull a coat of varnish before applying another over it. It, however, cuts no hard specks down to a level surface in varnish, and the shop would suffer no serious loss and the children would not cry for it if it was banished from use.

Had this department been advised of the resignation of our associate, Mr. John Rattenbury, of the Chicago, Rock Island & Pacific, Nov. 1st last, we should have been much pleased to have published an extended notice of his life and labors on that road, covering a period of many years. His position was unique; he had charge, under the title of Master Car Painter, of all the company's painting of whatever name or nature. As we expected, on his retirement, the duties of his position were divided; that portion pertaining to bridges and buildings going to their respective divisions and those duties relating to car equipment going to the Master Car Builder. George Warlick, his assistant, is foreman of the shop painters at present. Mr. Rattenbury was twice president of the M. C. & L. P. A.—at Baltimore, 1883, and Boston in 1884. We regret deeply his passing from our association, where he has been prominent in its counsels, as we suppose he will not care to pursue the avocation of railway painter any further, but will likely retire to his country seat in Adrian, Mich. We hope, however, once more at least, to shake his friendly hand at our Chicago convention next September.

Mr. R. L. Whitten, formerly connected with Berry Bros., varnishes, etc., Detroit, Mich., and prominent at recent conventions of the M. C. & L. P. A., has severed his connection with that company and is now in the banking and brokerage business in that city under the firm name of R. L. Whitten & Co. When short of funds at the next convention held in Detroit, call on "Dick." Why was Pharoah's daughter like the banker and broker? Because she took in a little prophet from the rushes on the bank.

Mr. J. J. Cuthberson, formerly a member of the M. C. & L. P. A., and still foreman painter of the Grand Trunk shops at Port Huron, Mich., was, with his wife and daughter, seriously injured in the noted wreck on that road some two months ago, we were recently informed. We read that name among the list of injured at the time and remarked the nthat it might be him, but we received no information of same until last night (March 1) from an interview with Mr. R. T. Wallbank, of the Gilden Varnish Company.

Editor Railroad Paint Shop:

After reading your article, or note, in the February number of the Master Mechanic about the tedious wait of several hours you had at the Fitchburg depot, it set me to thinking that possibly in the near future this thing would be overcome. There has been great progress in railroading in all its branches. While today I think the painting department stands on an equal with any other, there yet remains an opening that will surprise us in our old age (if we are fortunate enough to live until that time) both in painting and railroading in general.

It will not surprise me to see all passenger service conducted on elevated roads; cigar-shaped coaches; no trucks, windows, or platforms; no engine cinders, or smoke; no conductors, or brakemen. (This makes you smile.) Coaches will be luxuriously furnished inside; operated, heated and lighted by electricity. The roadbed, or track, will be constructed in a half-hoop shape, with groove in the bottom for safety irons attached to bottom of coach to travel in, avoiding all possible chance for coaches to leave the track; ball-bearings, or something suitable, the whole length of line, each side of track, for body of coach to rest upon and travel easy and avoid friction. Coaches, being cigar-shaped, fit into the gutter-shaped track, and with groove attachments, make it next to impossible for coaches to leave the track.

These coaches will be sent at a tremendous speed, making Boston from Fitchburg (50 miles) in less than 20 minutes, thus enabling us out here to enjoy the N. E. R. R. Club and get home before the cock crows in the morning. These trains will be operated by the station agents wholly; electric machines, manipulated by operators, or station agents. Trains can be stopped at will of operator. Using the wireless telegraph, operators, dispatchers, etc., can talk at pleasure with one another, thereby avoiding all misunderstanding of orders, and incidentally swapping the latest yarns and gossip.

Now comes in one for the painter. (It's a cold day when he gets left.) Coaches of this stamp can be painted by fitting up a side-track with brushes arranged with spring attachments, or, rather, a brush made of bristles thickly set inside a half cylinder, like the aforesaid track, or groove, the coaches run in; and then all that would be required to paint the entire train would be to run the train through this brush, or hoop-arrangement, and the work is done "while you wait," quicker than the time I have spent telling you about it, and some quicker than they want us to do it now.

Another arrangement further down the track. (By the way, this machine I am now thinking about putting into use, in order to keep up with the present times.) This machine will fill the bill on uniform painting, stripping and lettering of passenger and freight equipment. It can be operated by almost any one, in the office, or outside, at the will and pleasure of the operator. There will be one machine each side of the track fitted up with long arms, arranged so that they can be lengthened or shortened to suit the height required, similar to a type-writer, to be operated by electricity. All the painter has got to do is to sit in his office and manipulate the machine, similarly as with the type-writer, and these long arms, with letters attached, will do the work. There's no doubt about it. All lettering will then be of uniform height and all alike. It solves the vexed problem of the uniform stenciling of freight cars and dissolves the committee. Any kind of lettering can be done by changing the type in the machine. This will be done hot, as with the linotype, but no artificial heat will be needed, as speed and consequent friction will heat the old metal enough to melt it into new designs. ("Pat. appld for.") The machine has not been named yet; this is a small matter in comparison with "naming the baby." Perhaps you could suggest an appropriate name for it? Please don't tell the neighbors about this until my rights are secured. Yours truly,

G. W. Lord.

(Note:—Brother Lord must have been "having 'em" pretty bad this week.—Editor Railroad Paint Shop.)

The Car Forenen's Association of Chicago

March Meeting

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, March 11. President Parish presiding.

Among those present were the following:

Bates, Geo. M.	Harris, S. H.	Parish, L. G.
Bickford, Wm.	Hunt, Chas. E.	Phipps, D. L.
Carter, W. A.	James, Chas.	Plummer, A. K.
Cook, Roy J.	Kirby, T. B.	Robinson, John.
Cameron, A.	Krump, M.	Rogerson, E.
Callahan, J. P.	Kroff, F. C.	Shoemaker, C. A.
Cuthbert, J. R.	Kramer, Wm.	Stevens, C. J.
Cardwell, J. R.	Kuhlman, H. V.	Shannan, S.
Cook, J. H.	Kline, Aaron.	Sticken, G. W.
Clark, I. N.	La Rue, H.	Schultz, F. C.
Deans, J.	Morris, T. R.	Stott, D. H.
Dahlgren, P. M.	Mattes, J.	Treptow, A.
Goodnow, T. H.	Nicholson, W. S.	White, P. W.
Grogan, W. J.	Nordquist, Chas.	Wensley, W. H.
Guthenberg, B.	Ostermann, R.	Willcoxson, W. G.
Haig, M. H.	Perry, A. R.	Wessell, W. W.
Heisterman, Wm.	Powell, C. R.	Wirtchoreck, E. H.
Hall, W. B.	Peterson, A. F.	Wolfe, Chas.
Harvey, H. H.	Parker, P.	Warlick, Geo.

President Parish: The first in order will be the reading of the minutes of the previous meeting. At our February meeting we did not approve the minutes of the January meeting on account of their not having been printed. The minutes of the January meeting will now be approved as printed if there are no objections. The minutes of the last meeting have not as yet been printed and we will carry their approval over until the next meeting.

Secretary Kline: The following have made application for membership:

J. Bany, Labor Foreman, S. R. T. Co., Chicago.
J. F. Carter, Car Inspector, I. C. R. R., Centralia, Ill.
A. Cameron, Bill Clerk, C., B. & Q. R. R., Chicago.
Chas. Canniff, Train Master, L. S. & M. S. Ry., Air Line Junction, O.
J. A. Dunham, Foreman, I. C. R. R., Centralia, Ill.
A. G. Delany, Machinist, C., B. & Q. R. R., Chicago.
A. Dempsey, Clerk, S. W. S. Co., Chicago.
W. T. Everett, Foreman, I. C. R. R., Water Valley, Miss.
L. G. Ernst, Car Inspector, I. C. R. R., New Orleans, La.
G. F. Endicott, Draughtsman, S. R. T. Co., Chicago.
E. B. Fish, Chief Clerk, C. B. T. Co., Chicago.
P. J. Fellhauer, Inspector, I. C. R. R., Centralia, Ill.
V. Gustafson, Air Brake Man, S. R. T. Co., Chicago.
Geo. Griffiths, Labor Foreman, C. B. T. Co., Chicago.
H. Hodges, Car Inspector, I. C. R. R., Centralia, Ill.
Chas. Heser, Carpenter, I. C. R. R., Centralia, Ill.
H. Honecker, Inspector, I. C. R. R., Centralia, Ill.
J. F. Hansen, Foreman Steam Fitters, C., B. & Q. R. R., Aurora, Ill.
C. E. Hunt, Coach Inspector, C., B. & Q. R. R., Aurora, Ill.
Louis Koeppen, Car Inspector, C., B. & Q., Chicago.
Fred Lolling, Car Repairer, I. C. R. R., Centralia, Ill.
L. F. Mentemeyer, Car Repairer, I. C. R. R., Centralia, Ill.
Otto Moser, Clerk, S. R. T. Co., Chicago.
Nick May, Stock Clerk, S. R. T. Co., Chicago.
Oscar Peterson, Air Brake Man, S. R. T. Co., Chicago.
H. Pfaff, Foreman, S. R. T. Co., Chicago.
R. S. Rogers, Car Inspector, I. C. R. R., Centralia, Ill.
J. Schroeter, Car Inspector, I. C. R. R., Centralia, Ill.
Fred Schultz, Car Repairer, I. C. R. R., Centralia, Ill.
H. E. Sisson, Carpenter, I. C. R. R., Centralia, Ill.
D. H. Stott, Piecework Inspector, C., B. & Q., Aurora, Ill.
Ben Schaefer, Carpenter, C., B. & Q., Chicago.
R. E. Shoemaker, Car Inspector, E. J. & E., Ingalton, Ill.
John Vistor, Car Inspector, I. C. R. R., Centralia, Ill.
A. W. Wright, Car Inspector, I. C. R. R., Centralia, Ill.
C. W. Wilderman, Car Carpenter, I. C. R. R., Centralia, Ill.
J. B. White, Air Brake Man, S. R. T. Co., Chicago.
C. Yoos, Car Repairer, I. C. R. R., Centralia, Ill.

President Parish: That makes a total of 38 new members this evening. We had 35 at the last meeting, showing a good healthy growth of the association.

We will now open under the head of reports of committees, and will listen to the report of the committee on Proposed Revision of the M. C. B. rules. We will discuss each recommendation separately.

Secretary Kline: The following is the report of the committee: "The President and Members of the Car Foremen's Association of Chicago: Your committee appointed to suggest amendments to the rules of interchange at the March meeting, beg leave to report as follows:

Where no reference is made to rule numbers, no changes have been suggested.

Rule 29, p. 13. Add the following after the word "brakes" in the second line—"also worn out and broken air brake parts, burst or broken train or retaining pipes," making the rule read—"Defective, missing or worn out parts of brakes, also worn-out and broken air brake parts, burst or broken train or retaining pipes, not elsewhere provided for, which have failed under fair usage, except missing material on cars offered in interchange."

Recommendation approved.

Rule 46, p. 15. Cut out the words "Coupler stop, filling block," making the rule read as follows: "Damaged coupler, accompanying damage to either draft timber or its substitute, or end sill."

Rule 48, p. 15. Cut out this entire rule in the event of the above change being adopted.

Rule 51, p. 16. Cut out the words, "Coupler stop, filling block, making the rule read as follows—"Damaged end sill, accompanied by damage to either coupler, coupler pocket or its substitute, draft timber or its substitute, wood or iron buffer block or longitudinal sill."

The above three recommendations were not concurred in by Mr. Stimson and Mr. Bates.

Mr. Bates (C., B. & Q.): The reason that Mr. Stimson and myself did not agree in those recommendations was that the combinations denoting rough usage had stood for a long time and we did not really see any necessity for changing it now, but three of the committee were in favor of making the change.

Mr. Callahan (C., L. S. & E.): Is any part of this committee present that favored this change?

Mr. Treptow (L. S. & M. S.): In making repairs to cars I find a great many coupler stops and filling blocks are really old defects and are not broken in the combination and we recommended to have this part eliminated. Some filling blocks that are used are very weak, only 2½ in. secured by two bolts through the draft timbers and they are usually split and the lower part falls away. Some cast iron coupler stops are badly designed, some are not strong enough to withstand ordinary handling, they are continually broken and on some cars one can hardly find a coupler stop that is not broken. I have in mind a company which also maintains a sort of a tandem pocket. There is a very short spring in the pocket 5½ in. and back of that pocket another follower and spring. You will always find when you have a coupler stop to replace that the pocket is also broken, because when the car gets a jam it drives the coupler pocket against the back spring and in pulling it out bends it the other way. It is not a tandem pocket where double springs are in one pocket. t is some western line that does not enter Chicago and I know we had a good deal of trouble handling those cars. It will only affect companies which have poor lug castings or filling blocks. Those that are strong enough to withstand any kind of service will not be affected by the change.

Mr. Powell (I. C.): I would like to ask what provision is made for patent casting attachments which take the place of the common lug. Does it eliminate a combination in that case as well as with the ordinary light lug casting?

Mr. Treptow: The intention is to eliminate the coupler stop and filling block from the combination. This would include the patent lug casting, or any kind of a lug casting.

Mr. Morris: In order to get it before the members I would make a motion that the recommendation be approved. Carried.

Rule 73, p. 20. Add the following after the words "B end" in the fourth line from the bottom of the page—"In making repairs to journal boxes, journal bearings, brake shoes, etc., show location on repair card by using figures and letters, B end L 1 and 2, and B end R 1 and 2, and the same at A end."

Mr. Heisterman (L. S. & M. S.): In making repairs to brake shoes, journal bearing, box bolts, truck pillar bolts, etc., we show the location on repair cards by using figures and letters, B end L 1 and 2 and B end R 1 and 2, and the same at A end.

Mr. Cardwell (A. C. O. Co.): I would like to know from any of the members of this association if they think that is necessary. I have never had an instance, I think, where repairs were made, where it was absolutely necessary to designate journal bearings or brake shoes, bolts, or anything of that kind.

Mr. Treptow: This was recommended to make it more plain. The car gets home and bears a repair card for a brake shoe applied; if the card only shows A end or B end you cannot tell where it was applied, whereas if it showed A L 1, or A L 2, you would know just where the shoe was applied. It does not merely refer to journal bearings, brake shoes, etc., but to all other parts, to show whether it is on the right side or left side.

Mr. Wensley (C. & E.): It does not seem to me that it is necessary at all. A and B end is all that is necessary. There are only four boxes at each end of the car and if it shows A end or B end you will know where to look for it. The other day a couple of my men made some repairs to a car and they asked me to come out and say which was A end and which was B end. I found the car had two brake staffs and no air brakes, and I must say it was pretty hard to say at which end they did make repairs. There are quite a number of cars where you cannot say which is A end and which is B end even.

Mr. Cardwell: I understood the reason why this was wanted done was in case the owner had a repair card taken from the car where apparently the work was not done—to assist him in locating where the repairs were made, and I wanted to know if anyone had found it so, or had found any repair cards applied to cars where ehe work was not done. I have never had a case of this kind.

Mr. Bates: This change was suggested for this reason. If any one applies a brass to a car at B end and the owner wants to see whether the brass is the proper kind, he has got to look into every box at that end, and to avoid that, if it was stated as we suggest here, he could go right to the box where this brass was put in and thus avoid all this extra work. Another thing—very frequently a road will apply a brass at B end, we will say, but does not say what side. When the car gets home the owner finds a wrong brass, and, of course, when he describes the location of the wrong brass the road that made the repairs says we put that brass in on the other side. If it was obligatory to specify the side on the repair card it would be impossible to avoid the responsibility. The wrong brass would have to be paid for. That is the reason the change was recommended.

Mr. Wensley: It is supposed that all car men are honest. A man that would do work of that kind should not be allowed to work for a railroad company.

President Parish: One thing occurred to me in connection with this question, and that is this: You will frequently find that a car will have five or six brasses applied to the same journal in passing over the road. The first hot box may cause a cut journal, and, as a usual thing, they will continue to put brasses on that journal right along over the road. Now if we received a bill from connecting line charging us for six brasses inside of twenty-four hours, we would have a chance to check it if the cards are made out as Mr. Bates speaks of. I might say for the information of the members that the Lake Shore has worked under this system for about seven years and we have found it of considerable benefit when checking up repairs. It makes very little extra work in making out the card.

Mr. Morris: I would like to hear from some of the repair track foremen as to how many times they find it difficult to locate repairs.

Mr. Kramer (Pennsylvania Co.): It does not take very long to find out where certain repairs have been made. It does not take long for an inspector to determine what brake shoe has been put on, what brass has been put in and what coupler has been put in, and sometimes a good deal of guess work has to be done. Suppose somebody puts in a second-hand coupler. The couplers all look alike and when he goes to check off his repair card he has got to O K it; not ask any questions, because he knows they are honest men. In regard to putting in three or four brasses in one car on a cut journal, I would say this much—I have put in four brasses on a 100-mile run on one journal; because this stops me from putting in a pair of wheels, and I did not want to put in a truck and such things will occur on moving trains. When a fellow has a train on the road he does not want to stop traffic to set out the car. I have done that on several occasions and I will do it over again if I have occasion to do it. Before I will put in a pair of wheels on the road, if I have a car of meat or a carload of merchandise that I want to bring into its destination, or I want to make a meeting point with another train, and it only takes ten or fifteen minutes to put another brass in and run another twenty miles, I will do it over again. I have had that experience. About mentioning the ends and side where repairs are made, I do not agree to that. I would not do it as far as I am concerned. An inspector goes along and he makes his repairs and the party puts on their repair card. It has all got to be done in a hurry. It takes lots of time to write out all those little items. It is easy enough to be said here, but when I get a train of 40 cars coming from a connecting line they have got to be inspected in a hurry.

Mr. Rogerson: I would like to ask which side of the car is the right side and which is the left. I think that the cars will have to be stencilled right and left side.

Mr. Treptow: Replying to Mr. Rogerson I will say suppose that you stand looking towards the end of the car. If it is the end where the brake staff is, the right hand side is B R 1 and 2, and on the left side is B L 1 and 2, and at A end it would be the same.

Mr. Guthenberg (C., M. & St. P.): I think it would be a very good idea to have that stated. We had a case on our repair track the other day where there were two repair cards on a car for one brass, each applied at B end. In order to find those brasses we had to jack up four boxes—all the boxes at that end, and we found both brasses were applied to the same journal. Before we could O K the cards we certainly had to make sure, and I think if that was stated on the card it would have saved all the work.

President Parish: In that case would you O K both the cards?

Mr. Guthenberg: No, sir, I would not.

Mr. La Rue: This committee realizes, I think, the duties of a car inspector and when you add anything to it, for my part I think there are two sides to the question. Of course, when your committee signs a report it is open for discussion and this matter has come up. Now while it seems on one side to add to the duties of the car inspector, does the end justify the means and time that it takes? It is not only, in thinking the question over, to attempt to facilitate the location of the repairs, as to stop the correspondence in regard to the location of those repairs. I think there is where most of the trouble is. Your repair cards go in O K'd from the different divisions of the line, on some car. Then the car clerk handling that case comes back and wants to know if these were all on the same journal, in the case of brasses. Now there is where the whole point hinges. Will a moment's work and a moment's time stop that correspondence that means trouble and time on every car, taking the clerk that sends it out, the inspector that has to look back over his records to hunt that up and all those things. That is my view on that question.

Mr. Wensley: I move you that the recommendation to show right and left side be cut out.

Mr. Treptow: I do not admit that it takes much time to mark the cards A and B 1 and 2. It really takes work off the inspector instead of putting work on him. When he takes a repair card off a car which shows just where the repairs were made he can tell right where to go instead of looking around every box or brake shoe to see where repairs were made. The extra time it takes to put on L 1 or 2. etc., does not amount to anything.

The motion to reject the recommendation was lost by a rising vote.

"There has been some comment made with reference to the rate per hour for labor, as set forth in Rule 91, not being adequate for work on steel cars. Your committee has no recommendation to make in this respect, except to call attention to this fact."

Rule 104, P. 37. With reference to labor charges for couplers with stem attachments, your committee recommends that the words "Coupler pocket, coupler pocket rivets," be eliminated; also that there be added after the word "coupler, with pocket attachment," the following: "Coupler springs, one or more follower plates, one or two coupler stops, coupler pocket, coupler pocket rivets, renewing or replacing any or all at the same end of car at same time, three hours labor," so that the item will read as follows: "Coupler with stem attachments, coupler springs, one or more follower plates, American continuous draft key, American continuous draft rod, one or two coupler stops, two hours' labor." "Coupler with pocket attachments, coupler springs, one or more follower plates, one or two coupler stops, coupler pocket, coupler pocket rivets, renewing or replacing any or all, at same end of car at same time, three hours' labor."

Mr. Bates: The idea of making that recommendation is that there seems to be some confliction in interpreting this part of the rule. For instance, it says here, "Coupler with stem attachments," then it mentions pockets and rivets. Everyone knows that a stem coupler has no pocket or rivets and we thought it best to cut it out in that place and put it below the items which reads "Coupler with pocket attachments," so it would be clear to all that when you applied a spring or pocket or rivets to a pocket coupler you could charge three hours. If you applied a follower or anything in connection with a stem coupler, it would only be two hours. I know that a number of roads have been charging two hours when they applied a follower plate to a pocket coupler when the proper labor charge is three hours. Putting in that change would make it clear to all so that a proper charge can be made.

Recommendation adopted.

Rule 108, p. 40. Add the following clause: "Nor for applying material in connection with the application of all other parts, when the allowance made in Rule 104 for one, is sufficient to cover both, and the additional item involves no extra labor, and in cases of similar nature," making the rule read as follows: "No additional labor to be charged for renewing head blocks or buffer blocks if end sill is renewed or replaced, nor for applying material in connection with the application of all other parts, when the allowance in Rule 104 for one is sufficient to cover both and the additional item involves no extra labor, and in cases of similar nature."

Mr. Bates: That recommendation was brought about by the fact that some roads will double up on the labor charge. For instance, if they apply a draft timber and coupler at the same end they would charge six hours for the draft timber and two hours for the coupler, while it actually did not consume any extra time for the coupler because it had to be taken down anyway. Since that recommendation was made there has been an arbitration decision bearing on this. A road applied one draft timber and deadwood and coupler and they made a charge for the reason that the rules did not provide for it. The decision states: "The last paragraph of Section 22 of Rule 5, Rules of 1901, reads: 'No additional labor shall be charged for applying material in connection with the application of all other parts when the allowance made in Section 21 for one is sufficient to cover both, and the additional item involves no extra labor, and any cases of similar nature.' The above paragraph does not appear in the Rules for 1900. Inasmuch as the bill was rendered by the C. & S. Ry. Co. against the A., T. & S. F. Ry. Co. in good faith, under the Rules of 1900, which were operative at the time the damage occurred, it is the opinion of the committee that the C. & S. Ry. Co. should be sustained in its charge."

If anyone applies a draft timber and coupler at the same end I do not think that any more than six hours' labor ought to be charged, and unless we have something in the rules there is nothing to stop them from doing it. There are numerous other cases where the same thing can be done and there is no reason why some such provision cannot be made in the rules. It appeared in the 1901 rules, and I do not know why it was omitted from the 1902 rules, but at any rate it is a fact that it is not in the rules, and it ought to be.

Mr. Wensley: I would like to ask Mr. Bates if he applies a deadwood for fun. I have always charged eight hours for putting on a draft timber and deadwood. Why does he make an exception of the deadwood?

Mr. Bates: I made no exceptions—at least I would not take any exception to a deadwood applied in connection with a draft timber, but I would take exception to labor for applying a coupler which was applied in connection with a draft timber.

Mr. Kroff (P., F. W. & C.): It seems to me that the draft timber and coupler would form a combination and the owner would not be chargeable for it, anyway. I do not see where that would hold.

Mr. Bates: For the information of Mr. Kroff I will say that there was a defect card involved in this case.

Mr. Wensley: Suppose a coupler was pulled out and a draft timber and deadwood broken. How would you handle that?

Mr. Bates: If the draft timber and deadwood were broken all the charge you could make would be eight hours.

Mr. Harvey (C., B. & Q.): It strikes me that the recommendation is a good one, as there are no doubt some roads that are doubling up on the labor charge when they should not, and I would move that we concur in the recommendation of the committee.

Mr. Guthenberg: Supposing I would make repairs, on defect card, applying a draft timber and coupler. Do you think there should be some labor charge allowed for the coupler—that is, in getting the parts together, and if two hours should not be allowed, at least one hour, that would make it seven hours for the coupler and draft timber.

Recommendation adopted.

Rule 109, p. 41. The committee wishes to call attention to the schedule of prices with reference to release valves removed and replaced, each 2 cents. This seems to be an error for the reason that on page 42, the same item appears with a charge of 4 cents. The committee is of the opinion that the first mentioned should read "Release Valve Rods," and would request that the attention of the M. C. B. Association be called to this matter, and if it is found to be a mistake they hope it will be corrected.

Mr. Bates: In the key to the schedule of prices it reads: "Release valves removed and replaced, each 2 cents." The word "each" is after the words "removed and replaced" and for that reason we thought it an error in print. On the other side it reads "release valve removed and replaced, 4 cents." That is certainly a confliction. I think all that is necessary is to simply let the report go to the Arbitration Committee, and if they see that a mistake has been made they will rectify it.

Rule 119, p. 48. Add the following clause: "In the case of steel body bolsters of destroyed cars being returned, 75 per cent of the cost when new must be allowed for all such bolsters returned with trucks, provided that bolsters are in good condition."

Mr. Bates: That recommendation was suggested by one of the members and he gave as a reason, that on his road they had a whole lot of patent body bolsters that they had accumulated from destroyed cars, and they had no way of getting rid of them, and he thought by having a clause in the rules they could be sent back to the owners and given credit for them, which is all right so far as I can see. It may be that the road destroying a car equipped with a certain kind of bolster cannot use that kind of bolster, while at the same time they are too valuable to throw in the scrap. We thought the recommendation was all right and that there ought to be some provision made so the bolsters could be returned to the owner.

Mr. La Rue: I think the recommendation is all right as far as it goes, but I do not think it goes quite far enough. This recommendation would compel the owner to receive this body bolster. I do not think that is right, and compels it to receive it at the cost price. How will the cost price be decided, at the time car was built or at the time the bolster is received? It seems to me that that clause there will work a hardship for some.

Mr. Bates: I think the recommendation is very plain. The cost of the body bolster is the market price at time of purchase, and if the bolster is still in good condition when removed—it must be in good condition—a good second-hand bolster worth 75 per cent of its value when new ought to be given credit for that amount. I do not see that there is anything wrong with that.

Mr. La Rue: I think it resolves itself into this. It compels the owner to receive the bolster if it is returned. Now, if a party finds that the body bolster under a certain class of his cars are defective in some way, some especial form of weakness, and they discontinue those bolsters, they have no use for them. Now, then, when that bolster is returned they will not want to take it at 75 per cent of its original price. The price of bolsters now is a great deal more than four years ago, and four years hence they may be a great deal cheaper or they may be a great deal higher. I do not feel like adding my vote to that.

Mr. Kramer: If the body bolsters are to be returned, why not have the draft timbers, end sills and other good parts of the car to be returned?

Mr. Kroff: I think Rule 111 would cover that point. The depreciation ought to be figured at 6 per cent, which would include the bolster. My impression is that in returning the body bolster that the rule would have to be changed somewhat. I think the depreciation for the body of the car would cover the body bolster.

Mr. Goodnow (L. S. & M. S.): In regard to the return of these bolsters I will say that we have had a number of cases where they have been returned, but the matter was taken up with the car owner first to get authority to return them. I do not think we have had a single case where they were not taken back, and at their full market value when returning them.

Mr. La Rue: I think Mr. Goodnow's suggestion is all right, and that is what I am in favor of. I am not in favor of incorporating that in the rules, that the car owner is to be compelled to receive the body bolster. You could say the same thing of the draft rigging, if it had patent draft rigging. I do not think we ought to open the door for anything of this kind. I think if the matter is taken up with the car owner, and if agreeable to them it could be settled that way without incorporating it in the rules.

Mr. Bates: I hardly think you can compare the body bolster and draft rigging of a car, for the reason that the body bolsters of these various types made of metal, very seldom break while the draft rigging does. If we destroy some other fellow's car that has a patent draft rigging we can most always find some use for it on that fellow's car, but you cannot with the body bolster, and I think it no more than fair to return them. We have the privilege of returning the air brake, along with the brake beams and all that sort of material, and I do not see any harm in extending it to the body bolster.

Mr. La Rue: Take the case of a 40,000 lb. capacity car. There are very few 40,000 lb. capacity cars built at the present time, and Mr. Bates says there are very few of those metal body bolsters broken. As a general thing, in a wreck it is the 40,000 lb. capacity car that goes to pieces. If we are compelled to receive 40,000 lb. capacity metal bolsters back some companies would have bolsters piled up all around that they would have no use for.

Mr. Bates: I do not think there are very many cars floating around the country of that type with an expensive bolster on it. These patented bolsters are usually on high capacity cars, 60, 80 and 100,000 capacity cars.

President Parish: I will say that we have been returning a great many body bolsters to the owners and there are none so far but what have allowed the full value. We have very little use for odd bolsters.

Mr. Bates: I would like to make an amendment that the word "patented" be included in that to make it more clear, making it read: "In the case of patented steel body bolsters," etc.

Recommendation adopted as amended.

The above report as adopted is signed by Messrs. George M. Bates, chairman, A. Treptow, O. M. Stimson, H. La Rue, Theo. Blohm.

Minority report presented by Messrs. La Rue and Stimson:

Change Rule 35, p. 14, as follows: "Insert after word "except" in fourth line, words "side doors and." Also add a new paragraph as follows: "Side doors returned to owners in good condition free of expense to be credited to road returning them at M. C. B. prices." With the above change, Rule 35 would read as follows: "Locks, grain doors and all inside or concealed parts of cars missing or damaged under fair usage, and failure or loss under fair usage of any part of the body of the car except side doors, and as provided for in Rules 39 and 84. Side doors returned to owners in good condition free of expense to be credited to road returning them at M. C. B. prices."

Mr. Wensley: I would like to ask if anyone refuses to accept one of their own doors if offered to them.

Mr. Kramer: I am not in favor of it. Side doors will fall off cars and the receiving road should not be held responsible for same when they are put back inside in the cars, regardless of condition. In my opinion they should be accepted.

Mr. Hall (Mather S. C. Co.): I am particularly interested in this proposed change, inasmuch as I was instrumental in bringing it before the committee. It has been our experience there has been considerable misuse in connection with the replacement of lost side doors, and it occurs to me that it is the intention of the Association, so far as possible, to eliminate any opportunity for abuses in renewing the different parts of the cars. The present rules make the owner responsible for doors missing under fair usage. I venture to say that our experience is the same as every railroad in the country, that we have never received a repair card stub for replacing a door on account of missing, that was marked "no bill." In other words, I have failed to find one case of a door being missing through unfair usage, and the object in proposing this change was, if possible, to make it a little more necessary that the roads take care of the doors that fall off cars. I would like very much to see some such rule as that put in force.

Mr. Wensley: In regard to that side door question, we have a class of car that is pretty hard to keep the doors on, and any road handling any of those cars, if the doors fall off and are cut in two, if they throw them in the car we accept them every time. If a door falls off and is lost they can put a new one on and charge us for it. If they do not put a door on and the car comes home with the door gone, they become responsible for it.

Mr. Krump (Wabash): What would you do if you had a foreign car with a patented side door that comes to you with a door gone? You are supposed to be the owner under the per diem rules and nobody wants to keep a car longer than he can help it. You have got a car with a patent door lost. You cannot load the car home without a door and you haven't got the material to make a new one and have to send to the owner for it. What will you do in such a case of a door missing?

Mr. Kramer: There are some other conditions in regard to side doors being damaged or lost. We handle a good many cars loaded with grain coming from connecting lines. They are going to the elevators. Some big high furniture cars and common cars where the door posts and sides are bulged out. When they come to the elevators the elevator men cannot open the doors, consequently they will go to work and take a crow bar and break such doors open in order to open the doorway. Now, is it reasonable for a railway company to pay for such damaged door after it has been thrown to one side and not put back into the car again? Suppose these doors are found a few days afterwards, and are picked up and sent to the owner. Should a railway company be responsible for such damaged door? I do not think they ought to be because the car itself was defective when it was loaded. The door post and braces are not strong enough to resist the lading; the sides are bulged out to such an extent. Everybody sees those things every day. The elevator men are compelled to do it every day. They are compelled to pry doors off and take them off, and we all know what those people will do. They will throw them on the ground and leave them there if the railroad company has no inspector there to look after this work.

Mr. Hall: Mr. Kramer has explained one of the abuses of doors on cars. He has admitted that frequently doors are pried off with a crow bar or any other means found convenient to open the door and when that door is lost the company handling the car makes scarcely any effort to locate it, and the consequence is the car owner is charged for a new door. As a matter of fact, if proper care had been taken of the door that was lost the owner would not be compelled to suffer that expense. The object in making such a change as is proposed is to eliminate the abuses of charging for doors missing through unfair usage.

Mr. Kramer: How can these abuses be overcome? The men at the elevators, when they cannot open side doors on account of sides of cars being bulged out on account of weak side posts and door posts, they will go to work and pry the side doors off with bars.

Mr. Harvey: I move that we do not concur in this minority report. It seems to me this is going to work quite a hardship on a majority of the roads to get at some few dishonest people. If a side door is raked off a car by unfair usage, in nine times out of ten there will be marks on the door stop or sheathing, and when the car gets home the owner will know by the repair cards if he is being charged for door. If so he can take it up with the party doing the work and refuse to pay the bill. There are a great many cars that have doors with shoes only on the bottom and a wooden slide at the top, the door being notched out to fit under slide. You can pick those doors up all over the yard. We have to hunt up doors and put them on the cars ourselves or run the cars to shop and pay per diem while we are making the repairs, and in these days when the yards are so badly congested it takes several days to get a car switched to and from repair tracks, so there is not much money in making side doors at $3.50 apiece. I do not think it is the proper thing to change this rule and open up something that is working all right now. As far as returning the doors to the owners, I think that is done right along. I do not think there is a road in Chicago but what will take the doors back and cancel their requests for cards. I know all our connecting lines, without exception, take the doors and cancel requests. I think the rule is all right as it is.

Mr. La Rue: I expect I am partly responsible for that clause in there. It was brought to me and I looked it over and I was of the opinion it would be a good thing to discuss whether we adopted it or not, and I think so yet. I think sometimes a little discussion in a meeting of this kind will save lots of money. It calls attention to abuses, neglects, and such as that. That was more my reason for incorporating it in this report than anything else, but when you vote be careful that you understand the reading.

The recommendation was not accepted.

Mr. Harvey: There is one change that was called to my attention to-day in Rule 104, page 37, the article just above that of coupler with stem attachments. "Coupler stops, one or two replaced at same end of car, two hours." In view of the two sections regarding the renewal of couplers the section regarding coupler stops should be cut entirely, because in the section below it gives you authority to charge for three hours in the case of a pocket coupler, and two hours in the case of a stem coupler, while in this section it only gives you two hours in either case. It is superfluous and should be cut out, and I would make that as a motion.

Motion adopted.

President Parish: We have gotten along pretty well with the changes in the rules and we will now take up Subject No. 3 and pass Subject No. 2 for our next meeting.

Subject No. 3. Is a road justified in refusing its own car, which has been wrecked by a connecting line, but is safe to handle, the delivering line offering to furnish defect card for all defects?

Mr. Wensley: I do not understand how a man can refuse his own car.

Mr. Bates: As I understand this question, there is a road in this town that does refuse its own car, even if the road doing the damage agrees to furnish defect card. They say we either ought to make repairs or take the matter up with the owner for disposition of the car. It's a kind of a funny procedure to me, nevertheless it is a fact.

President Parish: I hardly think it is necessary to make it a matter of record, that it is necessary for a road to accept its own car.

Mr. Bates: I think we ought to go on record because the road that I refer to is represented here and no doubt they will read the proceedings and they ought to see what we think about it.

Mr. Wensley: I would make the motion that it is the sense of this meeting that a railroad company damaging a car and handling the same on defect card, the owner of the car should receive it without question, providing the car is safe to run.

Carried.

Meeting adjourned.

The Car Foremen's Association of Scranton

March Meeting

On Saturday evening, March 14, the above Association held its regular monthly meeting in the Railroad Y. M. C. A. Hall, Scranton, Pa., President R. B. Rasbridge in the chair.

The following is list of new members received:

George Fleming, Car Inspector, P. & R. R. R.
Amos Heacock, Car Repairer, P. & R. R. R.
Robert Morton, Foreman, D., L. & W. R. R.
H. A. Knipe, Assistant to General Manager, W. & N. B. R. R.
Fred W. Zimmerman, Draughtsman, D., L. & W. R. R.
W. G. Hoffmann, Painter Foreman, C. R. R. of N. J.
Chas. H. Taylor, V. P. Smilie Coupler Co.
Thos. M. Hill, Chief Carpenter, W. & N. B. R. R.
Philip W. Fraley, Car Repairer, D., L. & W. R. R.
Matthias H. Siegel, Foreman Car Inspector, C. R. R. of N. J. and P. R. R.
John F. Werntz, Car Inspector, P. & R. R. R.
Wyatt Carr, General Air Brake Inspector, O. & W. R. R.
Jacob Kline, Joint Car Inspector, C. R. R. of N. J., D., L. & W.
J. P. Reardon, Car Inspector, P. R. R.
H. N. Demarest, General Car Inspector, P. R. R. (P. &. Division), and N. C. R. R.
James Bulger, Car Inspector, P. & R. R. R.
Frederick Sweitzer, Car Inspector, P. & R. R. R.
Samuel Longbottom, Car Inspector, P. & R. R. R.
John H. Wolf, Car Repairer, P. & R. R. R.
H. H. Shepard, Superintendent, D., L. & W. R. R.
S. D. Townsend, General Manager, W. & N. B. R. R.
Alfred Breniser, Foreman Inspector, C. R. R. of N. J.
Harry Nixon, Freight Clerk, D., L. & W. R. R.
Levi Hummel, Car Inspector, P. & R. R. R.
C. H. Kelly, Storekeeper, D., L. &. W. R. R.
Thos. B. Keavin, Car Builder, Lehigh Valley R. R.

Mr. Rasbridge: The first order of business having been attended to we will now proceed with our first subject for discussion, which is "Comparative Efficiency of M. C. B. Couplers."

Mr. Bundy: This is a subject that seems to me the car inspectors who are out among the cars all the time would be able to give some information on. We have in use a great number of different makes of couplers, and what we want to find out is what coupler is giving us the most trouble. I do not believe anyone is better able to give this information than the car inspectors, and I would like to hear from them on this question.

Mr. Rasbridge: I wish to say that we would be pleased to hear from any member present on this or any other subject. I wish you would all feel at liberty to get up and express your opinions in regard to these subjects. That is the only way we can get benefit from it. No doubt all of us feel reluctant at times to express our views before the association. Let us drop that, and feel that we are mutually interested in these matters, and are here for the benefit we can derive from each other's opinions.

Mr. Fritts: Do I understand that this subject is intended to show what couplers are giving the best service?

Mr. Rasbridge: According to our by-laws and constitution we are not here to recommend any particular device or any particular design. It is not necessary to make mention of names, etc. We can refer to couplers in a general way.

Mr. Canfield: If I may be permitted to make a suggestion on this subject, I think it is a rather doubtful one to discuss. It is hard to discuss from the fact that we would not dare to come out and give the names of the various couplers. As Mr. Bundy says, the car inspectors are in better position to tell us of the various weak parts of couplers than what a great many railroad men are. For instance the guard arm needs strengthening. We have a great many couplers with weak guard arms; others with weak shanks; and we find that the coupler with 5x7 shank is very much better than the other, because it is wider; it supports the guard arm, and it also adds to the strength of the shank. Another point that could be brought out is, is it necessary to increase the lugs of the couplers to save them pulling apart, causing trains to part? Is it necessary to strengthen the knuckle pin, etc.? If you wish to enter into the discussion, I merely offer these as suggestions.

Mr. Streicher: I endorse in general the sentiments expressed by Mr. Canfield. It is indeed a delicate subject to talk on by officers of a company in subordinate positions. It is almost impossible to touch on the question without hurting the personal and commercial interest of somebody. You cannot mention defects without mentioning names. You cannot condemn anything on general principles; and in view of the fact, I move that the subject be dropped, and that our ex-president, Mr. Canfield, be given the floor to address the association. A good many of us have come here tonight with the expectation of being benefited by his words of advice, as they no doubt will be, as we have been benefited so many times by his expressions in this association.

Mr. Hall: I second the motion.

Carried.

Mr. Canfield: Mr. President and Gentlemen:—It gives me a great deal of pleasure to be with you this evening to give you a short talk. I think you have on your program that I shall give you a talk on what the future of the Car Foremen's Association should be.

In the first place it should be one grand success, and it goes without saying that it will. I see no reason why it should not. The men represented in this association are in better position to give advice to their superior officers on the action of any and all car devices put into use than anybody else. They can give unbiased opinions and the very best advice their superior officers can get.

I hope to see this association grow, and it is strongly so indicated by the number of applicants received into membership tonight. The association started with a only a membership of fifty-one. If my memory serves me right we have now nearly 300. Our growth is something phenomenal.

To make this association a success it will be necessary for you to select good live subjects, and have good snapping discussions, aiming to say what you have to say right to the point in as few words as possible, and say what you know of a subject without any prejudice at all, giving your honest, candid opinion, so that if another man has a different opinion from you you can learn something from him and he can learn something from you.

Take for instance our discussion on trains parting. I do not think this subject has been more thoroughly discussed by any other club in the country. The reason for it is that it was discussed by men who see the trains part, and see the actual causes of it; not by men who have been told of it.

The success of our association, as said before, depends upon good, snapping discussions, and upon honest differences of opinions honestly expressed in the meeting. Do not criticize any member of the association after you have left the room. Any differences of opinion you may have discuss them right on the floor, and let everyone enter into the discussion who knows anything at all about it. Do not hesitate about talking. Let everybody speak up. Do not come to the meeting to hear two or three talk a great deal because the others won't talk, and afterwards go away saying that you could not say anything because they occupied the floor all the time. That will make your association go backwards. I sat here this evening and heard your president plead with you to get up and say something on the subject that has just been closed. You should not have to be called upon in that way. I think you ought to feel perfectly at liberty to express your honest opinion frankly without embarrassment. That is the secret of the success of your association. With other clubs, take for instance the Western Railway Club, every member of the club will have something to say on the subject at issue. At the Master Carbuilders' Association every member has something to say. You will have to drill yourselves into talking.

The future success of your organization rests upon each and every one of you; on the officers as well as the members. The officers cannot run this club without the assistance of the members; neither can the members run it without the co-operation of the officers. You have got to get together in a brotherly way in the discussion of each subject. If you do the organization is bound to succeed; it is bound to continue to grow. Your minutes will be read all over the country, because there is no body of men more able to discuss the subjects you are bringing up than yourselves.

I would suggest that you take one subject that will occupy the greater part of the evening, with perhaps a few special topical discussions, not to exceed one or two. This will give you more time to discuss the more live ones.

I know of a subject up for an organization to discuss before another year rolls around that may result in some railroads having to spend a great deal of money if they follow out the recommendations of that organization. I now refer to the subject of collarless journals versus collar journals. It is up to an organization of this kind to put before these men their actual experience with the different kinds, etc. Prior to my coming east I was very much opposed to the collarless journals. I have changed my mind since coming here. I find on some roads that it is necessary to use collarless journals. These are points you can bring out.

Another subject that is coming up before the same association I refer to is the question of the high-speed brake applied to passenger equipment. That is something your airbrake men can enter into, and you can all join in. It is something that you have all got to look into by and by, for it is coming, and you should be prepared to make the best recommendations you can as to how it should be applied. I mention these matters to help your committee on subjects. There are many subjects up for discussion that have not been discussed freely enough, from the fact that the members are reluctant about talking. You want to work out that feeling. There are none of us who know much more than the rest. It is all in our training. To get your knowledge is why we meet together in an association of this kind.

I thank you for this opportunity for saying a few words to you tonight. In conclusion I will say that I felt very deeply the remarks made in regard to my resignation. I hope to be a member with you right along. I want to hold my membership because I have a fatherly interest in the association. Gentlemen, I thank you.

Mr. Rasbridge: I wish to say for the benefit of Mr. Canfield that the remarks made before his resignation was accepted were general; regrets were expressed by all the members of the association. We all feel, as Mr. Canfield has said, that his interests are fatherly. We all feel that he is the father of the association; and from the efforts he has put forth and the encouragement he has given us he is certainly interested and truly anxious for this organization to prove a success. I cannot recall similar associations that have met with the response that this association has. We have grown and grown rapidly. It is certainly very gratifying that Mr. Canfield did not sever his connection with the association and he will still give us advice and counsel. There is no reason why this association should not grow. I think we have a standing. Officials on different railroads are watching closely our development, and remark that we have made the proper start to continue; we are bound to succeed; which is a great deal of encouragement to me. Before our last election Mr. Canfield did not desire to serve the association as president. No doubt he had in view at that time his severance with railroad matters, but we prevailed on him as a committee to accept. Furthermore, I assured him my efforts would be untiring to assist him in all manner possible if he would only accept the presidency. With the pressure that was brought to bear he finally accepted. I know that he is very anxious to see the association prosper. His advice is timely; we should heed it. Let us profit by it, and do not let us lose sight of the fact that the advice is from one who has been in position to dictate what is beneficial to the successful operation of a railroad in connection with the department that this association represents. Let us appreciate the interest he has shown. The only way to make a success of anything, as the old saying goes, "Let everyone put his shoulder to the wheel." It has been my aim and object since the institution of this organization to get a liberal response from the members. It occurs to me that a man can get up and say at least a few words. If you cannot say a great deal you can, as the old Methodist said, "Say amen to what has been said," thereby showing your appreciation of what has been done. We do not expect every man here to be a lawyer or an orator and get up and make a spread-eagle speech. We have connected with this association outside of railroad officials, subordinates in the way of car repairers, inspectors, etc. They come in daily contact with most subjects we have up for discussion, and their opinions would be of benefit. That is the object of the association. We want to benefit ourselves, and naturally the benefit will revert to the companies who employ us. I hope Mr. Canfield can be with us very often. It is an encouragement to me and I think to every member of the organization, and something we must not lose sight of, and that Mr. Canfield is the only master car builder connected with the association, or was at the time he connected himself with it. Let us show our appreciation by furthering the interest of the association. Let us all take an active part and do not wait one on the other.

As Mr. Canfield said, if you take exception to anyone's opinion let us discuss it right here in the meeting and not outside. If we do these things we are going to be benefited, and the object of the association will be reached. If we do not, eventually we are going to prove a failure.

If any other member has any other remarks to make on this subject we would be pleased to hear from him at this time. If not we will revert back to the second subject: "Are buffer castings a benefit to the life of freight cars?"

Mr. Stuckie: I think they are, providing they are not cast iron, which I think is simply a dead weight, and tends to break the end sills. If made of lighter material or malleable iron I think they are of great benefit, except on modern equipment, which has heavier draft gear and needs no buffer.

Mr. Wm. Miller (Erie): Concerning the question as to whether or not buffer castings are of benefit to the life of a car, I wish to state that I am very much in favor of buffer castings, especially in connection with the older type of cars of wooden construction.

I have noticed that cars properly equipped with this appliance give us comparatively little trouble from broken couplers, broken springs, broken or loose coupler stops, or coupler stop bolts; whereas, with cars on which couplers and their attachments have to take all the punishment incidental to the handling of long and heavy trains, which naturally followed the introduction of the heavy type of engines of today, breakage of these parts is quite frequent. In fact I consider myself safe in saying that over fifty per cent of the repairs required by that class of equipment today is due to the failure of couplers, coupler stops, draft timbers, bolts, and the longitudinal sills, caused by the excessive pressure to which these parts are subjected when handled by these heavy engines in the yards and on the grades of this section of the country.

If we stop to look into the matter carefully we must see that buffer castings are today a necessity as concerns our older equipment.

I have heard some men say that buffer castings are the cause of a good many broken end sills. It is true that we do find quite a few cars with end sills broken and bearing evidence of having been caused by heavy blows or pressure against buffer castings. Nevertheless, when we stop to consider the force that was necessary to cause the defect we cannot help but admit that the force that caused this damage to tht end sill would have undoubtedly caused more extensive damage had it been spent wholly on the couplers and their attachments.

After years of close observation I am strongly convinced that the life of center sills is dependent to great extent on the efficiency and proper design of buffer castings. In saying this I refer, of course, to the cars of wooden construction, having the center line of draft below the center line of center sills.

The life of the draft beams or draw gear on some of our modern cars, however, especially those having the latest designs of friction draw gear, does, in my opinion, not depend so much on buffer castings; but judging from the fact that we do find quite a number of our modern steel cars with end frames bent out of shape, caused by coupler bracket striking the end sill, it would appear to me that a suitable buffer even on these cars would not be out of place.

Although my experience with the latest designs of friction draw gears has been as yet rather limited, judging from the report of the committee appointed at the Master Car Builders' convention of 1900, with instructions to report on the requirements of modern draft gear to meet modern conditions, spring capactiy, sizes and strength of parts, etc., I am strongly inclined to believe that friction draw gears will, to a great extent, if not entirely, avoid the necessity of buffer castings to protect the end structure of cars from damage or injury due to the requirements of the service of the present day.

But, if we stop to consider that there are about one million if not more, of the old style of cars in service, and that many of them are good yet for ten years' service, if not longer, I think we cannot put ourselves on record as advocating the discontinuance of the use of the buffer casting, which we know has given good service when applied in accordance with the "Master Car Builders' Standard or Recommended Practice."

Mr. Bundy: I think the remarks of Mr. Miller are to the point. I do not think that there is any question but what they are beneficial to the life of a car. Of course if they are set so that they will receive the shock just before the shock is taken up in the spring it throws the strain on the center line of sills and relieves the draft timbers of the shock; and if so, it is a great saving to the draft timbers. In a great many instances I find that the buffer casting is smashed into the deadwood, and it is necessary to remove the deadwood. In a general way, I think the buffer castings are of benefit to the life of freight cars.

Mr. Canfield: I think this is a very good subject for discussion, and while I know some roads are taking off buffers, or not continuing their use, I wish to agree with Mr. Miller. I think they are a good thing unless you have some other device to take their place. I think it does its best work in cases where you are using heavy pushers, where you have a flat car or a low-side gondola, so as to get the thrust in line with the sill. If you had no buffers, the thrust being below the sill, it would be very apt to break the car in two. As to spring buffers, mechanical men throughout the country differ on them. Some seem to think that they cause too much of a rebound and very often would snap a train in two. While they would surely be a good thing to the car to which applied—that is, they would save the framing of that car—they might be injurious in the rebound, parting trains. I think in case of using a friction draft gear, where the spring capacity is raised from 20,000 lbs. to (as in the case of the single spring capacity) to 125,000 lbs., and in some instances, 150,000 lbs., the friction gear is sufficiently strong to stand all of the shocks that the car is going to get. Then again, it is a question in my mind as to whether a solid bumper is the proper thing on steel construction or not. It may be too rigid. I have known cases where steel cars equipped with spring buffers had the end sill hammered entirely out of shape directly behind the buffers, which would indicate that that part of the car (up to date at least) is not constructed to stand a great deal of pounding; but as a great many people are going to friction gears in steel construction and heavier capacity cars, it is probable the buffers will be eliminated.

Mr. Streicher:—I do not think I can add much to the subject. Personally according to my experience I am opposed to the application of buffers to modern equipment, for the simple reason that, as Mr. Canfield has stated, the modern draft gear is supposed to take all of the strains. It is rather strange that the Western people, who at one time called the buffer the "mankiller" are at the present time advocates of same. The buffer, when we used link and pin, was no doubt a deadly instrument on a car, and while some people advance the idea that with the introduction of M. C. B. standard coupler, all danger has been eliminated. I differ on that point, for the reason that anyone who has had experience with coupling up of trains, will substantiate the fact that in numerous instances the men have to go between cars if the couplers do not lock, and have to take a bar and pound the knuckle or shove the coupler to one side so they will close, and considering that, the same element of danger exists that was the principal cause of removing the old style couplers. With buffers the breakages of end sills have not been less on cars with old style single spring draft rigging, for the reason that the spring is not sufficiently strong to take the force of impact, and the ends of the sills break right on the inside face of the buffer. Some steel cars have also developed the fact, that end sills, particularly pressed steel end sills, are not strong enough in their form and construction to withstand the bumping. Last year I looked over a large number of cars on foreign roads, and remarked to the party that was with me at the time that seven out of ten end sills were bent inwards, which proved to me that either the buffers were too long or the draft rigging was too weak. With the modern draft rigging, which we are looking for, and which will be developed, I am opposed to the application of the buffer.

Mr. Rasbridge: I think on modern equipment with steel construction you do away with the draft timbers and the draft comes right in center line of car, and there will be no necessity for the buffer. I think this is something that can be avoided. The intent of the designers of draft gear is to have the fraction draft gear take care of the buffing strain just as well as the pulling strain.

Mr. Fuss: It is probable when they went into the heavy equipment, that they took into consideration the fact that the old equipment would be more or less damaged on account of the heavy equipment. There are a number of types of cars that have no draft timbers. The draft rigging is placed between the center sills. We have a few such cars on our line, and I must say that we have no failures as far as the smashing of center sills by check castings is concerned, where we have no bumpers, they are standing it well.

Mr. Fritts: I am not much of a friend of the buffer. As Messrs. Canfield and Streicher have said, with our modern equipment that is being constructed, equipped with modern draft gear, I do not see that they are of any use at all. Even on our old equipment it is a question in my mind if they are a benefit. I notice a great many broken end sills which are undoubtedly caused by the malleable or cast-iron bumper. When you break an end sill you weaken the longitudinal sills. I believe that a large percentage of the longitudinal sills broken today is on account of the end sill being broken first. I noticed some time ago on some cars being coupled on a curve they were buffing the cars pretty hard. The buffers on the inside of the curve struck; those on the outside were some distance apart. There is a great force in a case of this kind concentrated on a small area of the car, and something is bound to give. I believe a car would receive less damage that was without buffers. As our old equipment is going out of existence I believe that the use of buffers should be discontinued as fast as the roads can get rid of them.

What I was trying to get at was that the buffer blocks are the cause of numerous broken end sills, and when an end sill is broken it certainly weakens, or has a tendency to weaken, the longitudinal sills. There is nothing left to support the ends of the sills, and the draft gear being below the center line of sill will bear them down and break them off over the body of the transom. This would not happen if the end sill was sound and in good condition, which would support the ends of the longitudinal sills. I have noticed a great many cases where longitudinal sills are broken; in fact, a large percentage of them show to have end sills broken. There is nothing else to break the end sill but the buffer, and I believe that a great many of them are broken while coupling on a curve, the whole shock of the train and engine being on one point. This has a tendency when you come to pull on the draw sills to break them off over the body of the transom.

Taking into consideration the interest of the money expended on buffers, and weight hauling them over the line, together with the other damages they undoubtedly cause to car, I believe it would more than offset damage that would occur to draft timbers if cars were not so equipped.

Mr. Knuth: I agree with what Mr. Fritts says. The only time I see the necessity for them is in coupling a train. When the coupling breaks it saves the end of the car. Otherwise I do not think they are of much importance.

Mr. Canfield: I think Mr. Fritts has put up a very good argument. He states that after the end sill becomes broken and the buffer has been hammered into the wood, it threw entirely too much strain on the draft timbers, and the draft or longitudinal sills were broken. I thing that before it got to the point of breaking the end sill we would have had the weakening of the longitudinal sills and draft timbers as well. In the old style cars I believe it saves a lot of sills, because the shock comes on the buffer block before it strikes the drawhead hard enough to give the draw timbers much shock. I believe in the new style equipment where we have the double spring that it takes the shock off, that is the buffer blocks are set far enough apart so that they won't strike too hard before they get the full strength of the spring. If in setting the buffer blocks you follows the recommendations of the Master Car Builders' Association and their drawings you will find that the buffer blocks will come together just before the spring becomes solid. That has been very carefully studied out. and if these recommendations are followed out in that line you can rest assured there will be no trouble.

Mr. Rasbridge: You probably remember the 5- to 16-ton coal jimmies with three link and hook, the 20- and 25-ton cars with common draw heads and link and wood plate bumpers, how they arrived at the shop—bumpers practically of no service when crushed and draft timbers subject to both pulling and buffing strains, which was below the center line of draft. The introduction of coupler with horn relieved the draft timbers to a great extent and we had improved conditions.

Mr. Rasbridge: One condition we had with the old wooden buffer was securing it to the end sill with four bolts. At that time we had one carrier bolt. After we got the automatic coupler it was necessary to have two carrier bolts, and we had four bumper bolt holes and two carrier bolt holes in close proximity, and the percentage of sill failures was greatly increased. By the use of malleable or cast-iron bumpers it was reduced. Water got into the holes bored for the bumper bolts, and the looser the bolts got by pounding the more water collected in there and weakened the end sill by decay. When a big heavy engine comes in contact with our light cars something has got to give away. Of course the draft timber gets the most strain now, and the way we are putting in draft springs at the present time they certainly ought to be able to stand it. I do not know whether it is any worse on the draft timber than it was on the end sills. At least I can not see it in that light. Do not loose sight of the coupler horn designed to relieve the draft timbers to a certain extent.

Mr. A. Hangen: I think that the buffer block is of good use, providing they are set a good distance apart, to strike the spring when it is compressed. Surely the strain that would be on the buffer block must be on the draft timbers if there are no buffer blocks on.

Mr. Streicher: To substantiate my claim I would refer you to engine tank end sills, where in the majority of cases they have a large cast-iron pocket casting to receive the so-called short-shank couplers that are inserted with a 2½-inch pin. When you come to examine the number of breakages of tank end sills you will find that they invariably crack right close to the edge of these cost-iron pockets. This badly injures the end sill, and my experience and observations have convinced me that the buffer, in that respect alone, regardless of any other reason, should not be applied to modern equipment. I wish to bring out the point that the bumper should not be applied to any equipment at the present time; and as the old cars do not cut any figure, and I believe throughout the country draft riggings are being designed that are supposed to take all the strains, I can see no practical reason that should induce railroad companies to go to the expense of applying an implement that is of no benefit, but a detriment to the car, inasmuch as it increases the number of broken end sills.

Mr. Hall: That is all right as far as the new equipment is concerned, but we have a lot of the old equipment that we have to look out for. We have to wait until the companies we are connected with do away with it or until they wear out. No railroad company can afford to throw away the old equipment at the present time. They are doing all in their power to get heavier equipment, and we have to put up with the lighter equipment until such times as we can see our way clear to get the heavier cars.

Mr. Wilson: I do not know, but I think the end sills should have buffer plates. Our folks do not use them at all, and I would like to ask for information if any other roads have trouble with center sills broken by not having buffer plates on. I now refer to modern equipment.

Mr. Rasbridge: The next subject on the program is "Responsibility for broken draft timbers in connection with coupler and knuckle missing." The matter is now open for discussion.

Mr. Harris: I can give my views in a very few words, and that is to determine if the coupler is not broken in connection with the draft timbers, in which case it is chargeable to the owner. It has been our practice to ascertain when coupler is missing whether or not it is broken before billing.

Mr. Rasbridge: We have a decision that a missing knuckle is considered broken. A missing coupler is labor only, and it has been the practice on our line to try to ascertain if the coupler was broken; locate it, and if it is not convenient to apply, we substitute a second one, in which case we make no charge for the application; but if we apply two draft timbers we would bill for nine hours, which would naturally cover the application of the coupler.

Mr. Bundy: If a car comes to shop with two draft timbers broken and coupler and knuckle missing you would have to determine whether or not knuckle and coupler were broken before you could render bill for any part of the repairs. If the coupler and knuckle are located and found to be in good, serviceable condition, a charge for broken draft timbers would be proper.

Mr. Rasbridge: We always considered the responsibility rested with us to determine whether or not they were broken.

Mr. Miller: The rules say, draft timber and coupler or knuckle broken simultaneously at the same end of the car constitutes rough usage. It is, however, possible for a coupler or knuckle to get lost from a car that had a broken draft timber at the same end under fair usage. For instance, in handling a car at one end of our division we break a draft timber; we consider the car safe to go to the shop for repairs, say a distance of thirty miles, and we let it go. If after that by ordinary handling of this car the drawbar pocket rivets or bolts get broken, or some other part fails, causing the drawbar to pull out and become lost on the line, not as a result of the defective timber, do you think that we should be compelled to stand the expense for the cost of repairs? I think it is not the intention that we should. On the contrary, under such conditions I consider the owner of car responsible for the cost of repair.

Mr. Rasbridge: In that case it would all depend upon the conditions at your point of interchange. For instance, if the interchange point was at Wilkesbarre and the damage occurred at Scranton, all the inspector at Wilkesbarre could do would be to take conditions as they are. It is the condition of the car when offered in interchange that counts, and you have a combination of defects that determines the case.

Mr. Miller: I take it for granted that this subject is a question of billing, and that it is intended to get an expression of opinion from the members of this association as to whether or not car owners are responsible for renewal of couplers and knuckles, or both, in connection with broken draft timbers under the conditions I stated. If a car was offered me in interchange in such condition—that is, with draft timbers broken and coupler or knuckle gone—I would certainly demand a defect card to cover the defect before I would accept the car.

Mr. Harris: The car could not be offered in interchange if the coupler was missing. That does not enter into the question, as I understand it. It is a case of repairs and billing.

Mr. Bundy: As I understand it, if you break a coupler, for instance, and you haul it some distance, and the draft timbers break, the road handling the car would be responsible for the entire damage. If you made repairs to the car when the coupler broke, you could bill owners for it; but failing to do so and hauling the car, afterwards breaking the draft timbers, you would be liable for the entire damage, as I understand it. On our line when a coupler and knuckle is missing on account of draft timbers broken, we do not bill the owner unless coupler is known to be all right and in serviceable condition.

Mr. Miller: We do frequently find cases of broken draft timbers where the fracture shows plainly that the defect has existed for months and has never affected the coupler. On account of the breaking of a tail pin, coupler pocket bolts or rivets the coupler is liable to get pulled out and lost on the road. The condition of the draft timbers play no part whatever in the development of this defect. In such case I think the road which handles this car and has to make repairs should be allowed to bill for the replacement of the broken timbers, old defects, if in its opinion the timber is unfit for further service.

Mr. Rasbridge: If you receive a car on your line with broken end sill, old defect; you consider it safe to run, you accept the responsibility; the receiving road is the judge, and if you accept the end sill, upon returning the car having a longitudinal sill broken, the combination is there, and the receiving road can refuse it according to the rules. In the first place, you should not have accepted the car with broken end sill. If it was not safe to run, you would be justified in refusing it, or you could have applied the end sill before it did any additional damage.

Mr. Streicher: The way I understand the question is, responsibility of draft timbers in connection with knuckles and couplers missing. I think the rules are very clear on that point, and the interpretation you give is clear. Take it for granted that you lose a coupler on a foreign car on your own road and lose the knuckle, too; the fact of this material being missing is a chance for your draft timbers to be damaged. The road handling the car at the time is responsible for the damage accruing. I would refer you to Rules 39, 61 and 84 and Arbitration Case 484. The way I look at this thing, we are supposed to be fair and square to each other and guided by rulings of the arbitration committee.

Mr. Rasbridge: Rule 35 says the owners are responsible for the loss under fair usage. When the rules were revised, you will remember, we had quite a time over them. It was claimed that the rules conflicted, which placed us in this position: If you offered a car in interchange, the receiving road can demand defect card for missing material; if you repair the car, you can bill the owner. The idea of that was to impose a penalty on the delivering roads to protect the car owners. For instance, a car from the east may go west and missing material, car owner's defect, will continue to go on and on, until the car becomes unserviceable. The idea was to impose a penalty so that this missing material would be applied or carded, and naturally any delivering road would rather apply the material and bill for it than issue defect card. We have decisions from the arbitration committee in regard to couplers when coupler head has been broken off and knuckle missing. Very often the head is broken off and missing, and the knuckle is supposed to be there, and locking pin or whatever you have in good condition.

Mr. Kennett: It is my understanding that unless you can positively locate the missing material, you could not hill the owners for the hroken draft timhers.

Mr. Rasbridge: I think the burden of the proof rests with the road having the car in its possession and making repairs to show the conditions.

Mr. Harris: The rules plainly state that a broken coupler and draft timher is a combination denoting rough usage when they occur at one and the same time on the same end of car, and if the coupler is missing and you know it is intact, although you do not replace the same coupler, you can bill the owners for the draft timbers.

Mr. Bundy: If you locate the coupler, and it is all right, the draft timbers can be charged to the owner, but the coupler might be lost off on the road some 40 or 50 miles away from the shop; in that case, you would have to determine whether or not the coupler was broken, before billing the owners.

Mr. Harris: Our custom in that respect is, if a car comes in with chains attached, to ascertain whether or not the knuckle and coupler missing was in broken condition.

Mr. Miller: I think the point to be brought out is, whether or not we can charge car owners for draft timbers when a coupler or knuckle has to be replaced on account missing at the same end of car. We can charge two hours' labor for applying coupler in case of coupler missing, but cannot charge for material. In case of coupler missing in connection with broken draft timber, I think we are entitled to bill for the coupler or knuckle is O. K.

Mr. Rashridge: I think it is the sense of the meeting that repairs to draft timbers in connection with missing coupler would be an owner's defect, but we must take into consideration the conditions at the interchange point. At some points we prefer to make our own repairs. If conditions are such that we can accept cars very often, we take cars and make repairs. We have had decisions here that inspectors on various roads have taken up with me in regard to the sense of our meeting, saying they would be justified in accepting a car under those conditions. Very often conditions are different at one place than another. However, I do not think any road would accept a car with coupler missing, unless there was some arrangement between them. Quite often our connections would give us a coupler and waive the labor charge of applying. I think it would be well to have this thing summed up in the form of a motion; that is, say what the sense of the meeting is in regard to this matter.

Mr. Miller: I move you that it is the sense of this meeting that car owners are chargeable for the replacement of broken draft timbers in connection with missing couplers or knuckles when road handling the car has determined that the coupler or knuckle was not broken.

Mr. Rice: I second that motion.

Motion carried.

Mr. Rashhridge: Our next subject is, "Do we give our apprentice boys the encouragement we should?"

Mr. Streicher: In car shops as a rule we fail to find that the practice of taking on regular apprentices is in vogue. Carmen are generally made on their merits. The work is very heavy and hard, and boys are out of place, for the simple reason that they have not the physical strength to stand the exposure and hard labor required. Carmen are generally taken from the ranks of the laborers, or handy men who show adaptability for handling the saw, hatchet, chisel, wrench, etc., and it is on their own merits that they are advanced in due time. Now, do not understand me as referring to skilled wood workmen. That is an entirely different matter. Take, for instance, cabinetmakers. I consider it necessary that a young man should receive proper training. I do not think it is necessary to go back to the old-fashioned apprenticeship, for the simple reason that it takes away too much time from the young man. He has to serve three or four years for very small pay, say starting with 50 cents, and at the end of the fourth year will perhaps be making $1.50. A skilled wood workman can advance himself today by going to an industrial school, and in six months or a year he can learn to handle tools to more perfection than in the shop, where perhaps from two to four months of each year are spent in labor which has practically nothing to do with the development of his individual skill. I do not want to be understood as saying that apprentices are out of place altogether, but I do say that the old time-honored method of taking a boy into a shop, employing him for four or more years at a small salary, is out of place, and a young man cannot afford it. For general rough car repair work a man adapted for the work can in a year or a year and a half come up to the standard of requirements. I have known laborers who have met expectations in less time than that, and they are just as good car repairers as men who have spent half their life on it.

Mr. Bundy: I agree with Mr. Streicher as far as car repairers are concerned, but we have other departments, such as the paint department, machine shop, blacksmith shop, etc. I think in the paint, machine and blacksmith shops the apprentice boy can be worked to good advantage. We have to a large extent to depend upon our apprentice boys for our future foremen. Take a boy and start him in when he is young, and by changing from one machine to another he soon becomes proficient in the machine shop work, and by the time he grows up to be a man he will make you a good foreman, if he is made of the right kind of material. I do not think we give them the ecouragement we should.

Mr. Burnett: We use apprentice hoys in our car shop and in the paint shop, and we find them very advantageous. We do not simply teach them to be cabinetmakers or painters, but in the first place we try to select them with the view of having boys of sufficient education and intelligence to learn all branches of the trade they select. For instance, a boy leaving the car building trade gets a period of office work sufficient to give him an insight into the systems of records; also such details as taking wheel numbers, etc. We also encourage them to study drawing at home, and give them to understand that we require good conduct of them while off duty as well as on duty. In other words, we aim to give a boy such a training that if he has the inclination and is naturally adapted to the calling, he is qualified to become a good foreman.

Mr. McKenna: I do not agree with the gentleman on my right, that we have so much advanced in the last twenty-five years, that we are so much smarter than our forefathers, that we can make today good mechanics in one year and one and a half years that twenty-five years ago it took five and six years to make. We are advanced, there is no question about it; but I do not think there is any branch of mechanics that we can't start a hoy in, and after a year's training put him to work where he can hold his own with older mechanics in production of quantity and quality of work. I do not think a boy, after having served only that length of time as an apprentice, has the right, in justice to the other older mechanical men, to attempt to put himself on the same basis as them under any circumstances. I agree with the gentleman who just spoke that it is impractical to put an apprentice out in the repair yard repairing heavy freight cars, but there are some departments in a car shop where he can be worked to advantage. We look to them as our future mechanics. We calculate to train them up into our various methods of doing work, molding them to our own ideas. Of course, they broaden out with the proper amount of study. The amount of encouragement the apprentice is entitled to is largely dependent upon himself. I have seen apprentice boys working in the shop who had certainly missed their calling, and it makes no difference as regards the length of time they are there, they would never make mechanics. Take the proper kind of a boy at the proper age, who shows a disposition to take hold and try to learn, with the proper amount of study in draughting or whatever may be necessary in that branch, I thing he is entitled to the greatest consideration and encouragement from his foreman. We all know that in most departments the foremen have their time taken up pretty well in the general run of their work, and it is difficult for them to devote a great deal of their personal attention to this matter. However, they should devote as much as possible; they should make it a point to place that boy in among mechanics of a superior grade, working next to them, issuing instructions to those men to assist the boys in every way possible, to instruct them in the proper handling of tools, being careful of the quality of their work, etc. If this is done, at the end of the apprenticeship term you have mechanics that any foreman could have reason to be proud of. They are men trained up to the foreman's own ideas, and by that time, no doubt, the boy will have broadened out by coming in contact with other people. I am heartily in favor of encouraging the apprentice boys in certain departments.

Mr. Meekins: I heartily agree with Mr. McKenna's views. I have handled apprenticed boys for the past twenty-five years in their first year of apprenticeship, and I think have turned out some of the best mechanics in the country. There are five of them acting as foremen at the present time, and two as master mechanics. I do not think you can encourarge them too much. If you find a hoy has any mechanical abilities about him at all, encourage him all you can. If you do this, at the end of a few years you are going to have some good mechanics. Regarding the pattern-makers' trade. It takes a good mechanic to do this work. First-class pattern-makers are scarce. You can put carpenters on doing this work, but they cannot tell how they are going to take the pattern out of the mold. He has to have some knowledge of the molder's trade as well as the pattern-maker's. Therefore, I say you cannot give the boys too much encouragement.

Mr. Rasbridge: I think we have not confined ourselves to the subject. We have gone more into the necessity or advisability of employing apprentice. The question is, do we give them the encouragement we should? We have found out that it is a necessity, and I think a benefit, to have apprentice boys. Most of our mechanics are those who have served apprenticeships; however, some of our best mechanics never served an apprenticeship. I served four years, and I think it was a benefit to me. I had opportunities during that time, but my judgment told me I had better continue it. I think from the fact that the apprentice boy is bound, to a certain extent, to do certain work and study, attending night school if possible, and is held responsible for his conduct away from work just as well as at work, I do not think we can give them too much encouragement. When we stop and consider the service rendered, the matter of wages is a nominal figure. A great deal depends upon the ability of the boy and his own actions. I think it is the rule the country over, if he is diligent and anxious to learn, improves his time, and so on, he is taken care of, and given proper encouragement. So many people thing the boy is liable to get a swelled head. We are getting away from that idea. There was a time, I remember well, when a man could not be employed unless he could present an indenture stating that he had served his apprenticeship. Today he is taken on his merits. If no one else has anything to say on the subject, we will proceed to the next subject, which is, "As car foremen what do we consider an up-to-date repair yard?"

Mr. Bundy: In view of the lateness of the hour, I move you that this subject be deferred for our next meeting. We could not handle the subject and do it justice this evening.

Motion carried.

Mr. Harris: I move you we adjourn to meet in R. R. Y. M. C. A. Hall the second Saturday evening in April, subject to the call of the secretary.

R. W. Burnett,
Secretary.

The Car Foremen's Association of Cleveland

March Meeting

Minutes of meeting of Car Foremen's Association of Cleveland, O., held at the Kennard, March 19, 1903.

Meeting opened at 8 p. m., President Berg presiding, among those present being the following:

A. Berg, W. Battenhause, J. C. Dennerle, W. J. Frey, H. B. Frischmutt, W. Gonnerman, H. B. Ingersoll, W. Korell, W. Kraage, Geo. Lynch, J. McCabe, A. T. St. Cyr, C. Schneider.

President Berg: The first in order will be the reading of minutes of previous meeting, which have been printed in the Railway Master Mechanic. If there are no objections offered, they will stand approved.

Mr. McCabe: I would call attention to decision 3 of the changes recommended in the M. C. B. Rules, regarding missing side doors. Personally I am not in favor of the action taken by this association, particularly to the second sentence, reading, "Empty cars may be accepted with missing side doors on M. C. B. defect cards, providing such cars are on their way home." Suppose the Lake Shore delivers a car to the Big Four with side door missing, and we issue defect card. It is a southern car on its way home, so far as we know, and no bad order cards to govern train men. The car distributor orders four cars set out at Shelby, say, for grain. There is no reason why the train men would not set out that particular car; still it could not be used for the shipment intended. I do not think we should go on record as recommending the running of box cars with side doors missing. We have experimented with that feature here at Cleveland, and found that the cars got confiscated for loading later on.

Mr. Berg: Don't you think we should recommend something similar and change the wording?

Mr. McCabe: I was not here at the last meeting, and have no suggestions to make as to what should be substituted, but think this association should change that some way.

Mr. Gonnerman: I suggested that change in the rules, but see now that it is wrong and should be stricken out of the minutes. The association made a mistake in adopting it.

Mr. Berg: If there are no further comments, the minutes will stand approved as printed, with the exception that recommendation No. 3, referring to missing side doors, be eliminated.

Are there any committees to report?

Mr. McCabe: In regard to the committee on banquet, the chairman of that committee has not called a meeting as yet, and I see he is not here tonight; therefore would ask for more time. Will try and make it my business to see Mr. Taylor, with the view of getting the committee together and taking some action.

Mr. Lynch: I move the date of the banquet be postponed and the committee given more time, they to report at the April meeting.

Motion seconded and carried.

Following application for membership was received:

H. B. Frischmutt, Car Clerk, L. S. & M. S. Ry., Cleveland, O.

Mr. Berg: Deferred business. Under that head we will take up the suggested changes in the Rules laid over from last meeting. "Damage to either coupler stop or filling block should be omitted from the combinations denoting unfair usage."

Mr. Gonnerman: You very seldom see a filling block or jaw casting broken on 80,000 lbs. capacity cars; it is only on the older cars. I would suggest that the words "coupler stop or filling block" be left out of the combinations, as per Rules 46, 48 and 51.

Mr. Berg: Are not those parts sometimes damaged on the newer equipment?

Mr. Gonnerman: The cases are very rare.

Mr. Frey: I am in favor of omitting those items.

Mr. St. Cyr: With the limited experience I have had I found quite a few of the 60,000 lbs. capacity cars with jaw castings broken, as well as filling block, and also on 30,000 and 40,000 lbs. capacity cars, in connection with coupler. The rule may apply on some cars and not on others.

Mr. Ingersoll (Ashtabula): I have seen practically all classes of cars with coupler stop or filling block broken, together with coupler. Evidently cars are not handled quite as roughly west as they are our way.

Mr. Lynch: It is all right, and will work both ways. Those older cars will soon be out of service. Some roads are getting rid of them as fast as possible, consistent with their needs.

Mr. Battenhause: I would be in favor of eliminating those items.

Mr. McCabe: I would be in favor of cutting them out in case where a wooden block constitutes the coupler stop; that is all. Where it is cast iron or malleable, would not.

Mr. Berg: You got ahead of me on that; that is just what I wanted to say.

Mr. St. Cyr: The wooden blocks on Lake Shore cars are all pretty well out of existence, but a large number of other cars still have them. Even on steel cars those jaws are sometimes bent and couplers broken, as strong as they are.

On putting the question to a vote, it was decided not to recommend change in rules eliminating the words "coupler stop or filling block" from the combinations denoting unfair usage.

It was subsequently made the unanimous sense of the meeting that where a wooden block forms the coupler stop it should be eliminated from the combinations, as prescribed by Rules 46, 48 and 51.

Mr. Gonnerman: Another one. In Rules 47 and 49 I would suggest leaving out the item "Draft timber," for the reason that when coupler pocket or spindle breaks it is bound to break the draft timbers at the same time. When coupler pocket breaks, coupler pulls out and breaks the draft timbers, thus forming a combination. I would consider that ordinary handling.

Mr. Frey: I would object making a change of that kind. Leave it as it is.

Mr. St. Cyr: I am of the same opinion. It is as fair for one as for another.

Mr. McCabe: That's right; you have to draw the line somewhere.

Mr. St. Cyr: Yes, sir. The line is already drawn, and I think we had better leave it alone.

After some further discussion it was decided not to recommend the change suggested in this instance.

Mr. Gonnerman: What should be the limit in regard to hollow tread wheel? Rule 12 makes the owning company responsible for hollow tread, but does not say how much before wheel is condemnable.

Mr. St. Cyr: That has to be governed by the chill of the wheel. The inspector should use his own judgment.

Mr. McCabe: That has been my experience. The inspector has to use his own judgment.

Mr. Berg: Wood or iron buffer block in Rule 50 forms a combination in connection with end sill. Would deadwood or head block, together with end sill, constitute a combination?

Mr. McCabe: No, sir. A buffer block is a buffer block, and nothing else. I will stand pat on that.

It was so understood, after which meeting adjourned until Thursday, April 16.

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ON another page of this issue we publish a set of instructions for locating steam blows in tandem compound locomotives, developed by Mr. Frank Roesch, now master mechanic of the Chicago & Alton Railway, at Slater, Mo., when he was road foreman of engines of the Colorado & Southern Railway. In presenting this paper we acknowledge the courtesy of Mr. Thomas Paxton, under whose jurisdiction it was prepared.

In consideration of the mystery which is believed by some engineers to exist with regard to blows on the compound locomotive, instructions for the location of such defects appear very appropriate. Steam leaks may be regarded as one of the greatest causes of the enmity toward the compound locomotive, for if allowed to exist will consume no small amount of coal and water. It is therefore believed that a diagnosis of a subject so important in the operation of compound locomotives will be highly appreciated by both operating officials and those immediately associated with the actual care of the locomotive engine.

ON many recent locomotives one notes that between the engine and tender there is a chafing casting placed on the tender which is supplied with an interior, heavy coil spring, the object of which is, of course, to avoid the effects of slack between the engine and tender, due to wearing of the draw bar pin holes. Apparently this is a very good idea, but in practice it develops several features so bad as to render the wedge method of taking up this slack much more preferable. In the first place the spring does not really minimize the disagreeable effects of the slack to a great extent. In the second place, such a device develops into a most annoying and time wasting contrivance when an engine leaves the rail, for in such case the engine or tender invariably get "slewed" with regard to each other; the first operation tending to replacement involves cutting loose the engine from the tender and in such case this spring buffer is impossible to get at and to disconnect, while without such disconnection the draw bar pins are very difficult to get out.

But the worst feature of this buffer develops while the locomotive is pulling a train with a certain effort and a speed varying with the peculiarities of the engine. That is to say, that with any particular locomotive there is a certain speed and development of tractive effort at which the varying discordant factors to smooth working fall into unison, or so nearly so that the pull on the drawbar is not a steady one, but rather a series of jerks of varying intensities. This arises from the four strong and four weak points of the stroke, the effect of the counterbalance, the effect of compression in the cylinders due to too short a cut off, etc., all of which tend to somewhat counterbalance each other at certain speeds, but which, as already stated, at some particular state of speed and effort tend to culminate in their disturbing effects. Where a spring is used in the chafing iron, particularly where this type of buffer is used in connection with a spring tender draft rigging, this jerking of the drawbar instead of a steady pull gets the tender into the violent corresponding longitudinal agitation, or pitching, which is so often noticed at certain speeds. With a dynamometer car immediately following a 21 x 28 inch cylinder locomotive, with 62 inch drivers (tractive effort, 36,700 lbs.), measurement of the effect of this pitching at its most marked manifestation (in this case generally at and around speeds of 35 to 40 m. p. h.) showed a blow of from 18,000 to 20,000 lbs. over and above the line of actual tractive effort being developed, falling on the draft rigging four times each revolution of the driving wheels. This effect could be noted in gradually decreasing extent ten or twelve cars back. The effect of this pounding upon the follower stops of the leading cars and upon the draft arrangements of the tender itself can be readily imagined and accounts particularly for the rapidity with which nuts connected with tender draft arrangements work off.

IN consideration of the frequent accidents in which railway employes, and passengers also, are injured, it appears expedient that the greatest care be exercised in the maintenance of departments of surgery among railways. This subject was treated in an interesting and able manner at the April meeting of the St. Louis Railway Club by Dr. H. C. Fairbrother, of East St. Louis, Ill., who compared the inadequate and inefficient facilities for attending those injured in accidents of some years ago, with the systematic methods now in existence on many of the roads. That such a department deserves the closest attention and should be thoroughly systematized is immediately realized when we consider the number who derive benefit therefrom.

In the selection of a surgeon to control such a department a man of ability should be chosen, given full charge and any assistance rendered should be done under his jurisdiction. Not only is the selection of a competent surgeon necessary, but the requisite facilities should be provided for caring for the injured and for performing necessary operations under desirable surroundings.

Railway surgery is worthy of a more dignified consideration than that usually accorded thereto. It covers a wide and scientific field, amounting to more than the mere amputation of fingers and limbs. The benefits derived therefrom affect several classes. The benefits are first to the injured persons, whether employes or passengers; second, to the railroad companies, from a business standpoint as well as from the standpoint of humanity, as it is to the companies' interests to have injured persons restored to life and usefulness as soon as possible; third, the public, which suffers by having injured thrust upon them, if adequate facilities are not provided for their care; fourth, the medical profession is benefited by having the best class of surgeons prepared for this class of work and the incompetent ones kept out of the way; fifth, the surgeons appointed for such work are benefited by being trained along certain lines and by being given opportunities of broadening themselves by travel, attending conventions of learned surgeons, etc.

MR. FREDERICK A. DELANO.

GENERAL MANAGER OF THE CHICAGO, BURLINGTON AND QUINCY RAILWAY.

Mr. Delano was born September 10, 1863, at Hong Kong, China. He is a graduate of Harvard University, and entered railway service in 1885 as machinist apprentice in the Aurora shops of the Chicago, Burlington & Quincy Railway, with which road he has held consecutively the positions of inspector, assistant to second vice president, superintendent of freight terminals at Chicago and superintendent of motive power, having been appointed general manager in July, 1901. Mr. Delano's appointment is one of the pleasing instances of the selection of a motive power official to fill the responsible position of general manager.

Continuing, Dr. Fairbrother indicated the number of instances in which a competent surgeon might render valuable assistance to the company which he represents; by making prompt and accurate reports of results of accidents; by preparing data for legal and claim departments, which may be used to prevent illegal claims and injustice; by aiding in sanitary work, in the proper heating and ventilation of cars, by requiring pure water to be supplied to passenger cars, in quarantine service, in packing corpses for shipment, by giving instruction to employes in first aid to the injured, and in a number of instances constantly occurring.

THE following statistics from the Boston & Maine Railroad indicate some of the items which increase the expense of operating a railroad: During the year just ended this road purchased 61 locomotives at a cost of $811,-50. If purchased at the prices prevailing in 1899 they would have cost $683,261. This shows an increase in cost of $128,-289, or about 20 per cent.

During the six months ended March 1 the railroad purchased 59,271 tons of locomotive coal, paying therefor $2,747,-211.32. In 1899 the same quantity would have cost $1,890,700, showing an increased cost of $856,-511.33—54 per cent.

The price of steel rail in 1902 advanced 52 per cent over that of 1899, so that while $427,000 was paid for 14,000 tons of steel rail in 1902, this same quantity would have cost in 1899 but $280,000, showing an increase of $147,000.

Spikes in 1902 cost 50 per cent more than they would have cost at 1899 prices; that is, in 1902, 10,000 kegs cost $48,000, which in 1899 would have cost $32,000, showing an increase of $16,000.

In 1902, 53,400 gallons of signal oil cost the railroad $19,224, while in 1899 this same quantity would have cost but $10,-680, showing an increase of $8,544—80 per cent.

Iron bridge material has advanced 50 per cent in the last five years, so that while 1,700 tons were purchased in 1902 at a cost of $127,500, in 1897 the same quantity would have cost but $85,000. This shows an increased cost of $42,500.

The Location of Steam Blows In Tandem Compound Locomotives

By F. P. Roesch

THE illustrations presented herewith show sections through steam chests, valves and cylinders with valves in various positions for testing same.

It will be noticed that high pressure valve "A" is central or internal admission, while low pressure valve "B" is external or end admission. Also notice that ports "C" and "D" leading from high pressure steam chest "E" to cylinder "F" are crossed. Both valves "A" and "B," cylinder packings and piston packing sleeve "G" can be tested on each side of engine by simply moving reverse lever. To make tests place engine on quarter on side to be tested and proceed in manner designated in the following paragraphs:

Testing High Pressure Valve

Figure 1.

Engine on top quarter. Reverse lever in center of quadrant. Starting valve closed as in Fig. 7. This places both valves "A" and "B" in central position covering all ports on side to be tested.

By opening throttle steam is admitted to high pressure steam chest "E," as shown by bright red coloring.

If steam now flows from either cylinder cock "H" or "I," the high pressure valve "A" is blowing.

Testing Low Pressure Valve

Figure 2.

Engine on top quarter. Reverse lever on center as in Fig. 1. Starting valve "S" open as in Fig. 6.

Remove by pass valve marked "M" in Fig. 6, but replace valve cap, which is not shown, as it is bolted to under side of starting valve. This allows steam to flow through by-pass from high pressure steam chest "E," through starting valve ports "N" and "O" and past exhaust edges "X" and "Y" of high pressure valve "A," into low pressure steam chest "P."

If steam now blows from both low pressure cylinder cocks "K" and "L" the low pressure valve "B" is leaking.

Testing High Pressure Cylinder Packing

Figure 3.

Engine on top quarter. Starting valve closed as in Fig. 7. Reverse lever in back motion.

This admits steam from high pressure steam chest "E" through steam port "D," to front end of high pressure cylinder "F."

If steam now blows from back high pressure cylinder cock "H" the high pressure piston packing is blowing.

Testing Low Pressure Cylinder Packing

Figure 4.

Engine on top quarter. Starting valve open as in Fig. 6. Reverse lever in back motion.

This allows steam to flow through starting valve into low pressure steam chest "P," thence through front low pressure steam port "R" to front end of low pressure cylinder "J."

If any steam shows at back low pressure cylinder cock "K," the low pressure piston packing is blowing.

Always test low pressure piston packing in this position.

Testing Piston Packing Sleeve Between Cylinders

Figure 5.

Engine on top quarter. Starting valve closed as in Fig. 7. Reverse lever in forward motion.

This admits steam from high pressure steam chest "E," through steam port "C" to back end of high pressure cylinder "F" only.

If steam now flows from front low pressure cylinder cock "L," the piston sleeve "G" is worn and leaking.

Starting Valve in Position for Working Simple

Figure 6.

Fig. 6 shows section through high pressure valve, chest and starting valve. By-pass valve "M" removed but having valve cap replaced. For working simple starting valve lever "T" should be vertical, which places valve "S" in forward position, opening both ports "N" and "O."

For Fig. 2 test. Starting valve "S" in position as shown in Fig. 6, but having high pressure valve "A" on center. By-pass valve "M" removed. For Fig. 4 test, valves "A" and "S" in position, as shown in Fig. 6, but having by-pass valve "M" replaced.

Starting Valve in Position for Working Compound

Figure 7

Fig. 7—Same section as Fig. 6. Both by-pass valves in place. Lever "T" in back position so valve "S" covers port "O."

For Fig. 1 test, starting valve "S" as in Fig. 7, H. P. valve "A" on center.

For Fig. 3 test—Valves "A" and "S" in position as shown in Fig. 7.

For Fig. 5 test—Valve "S" as in Fig. 7, H. P. valve "A" in forward motion.

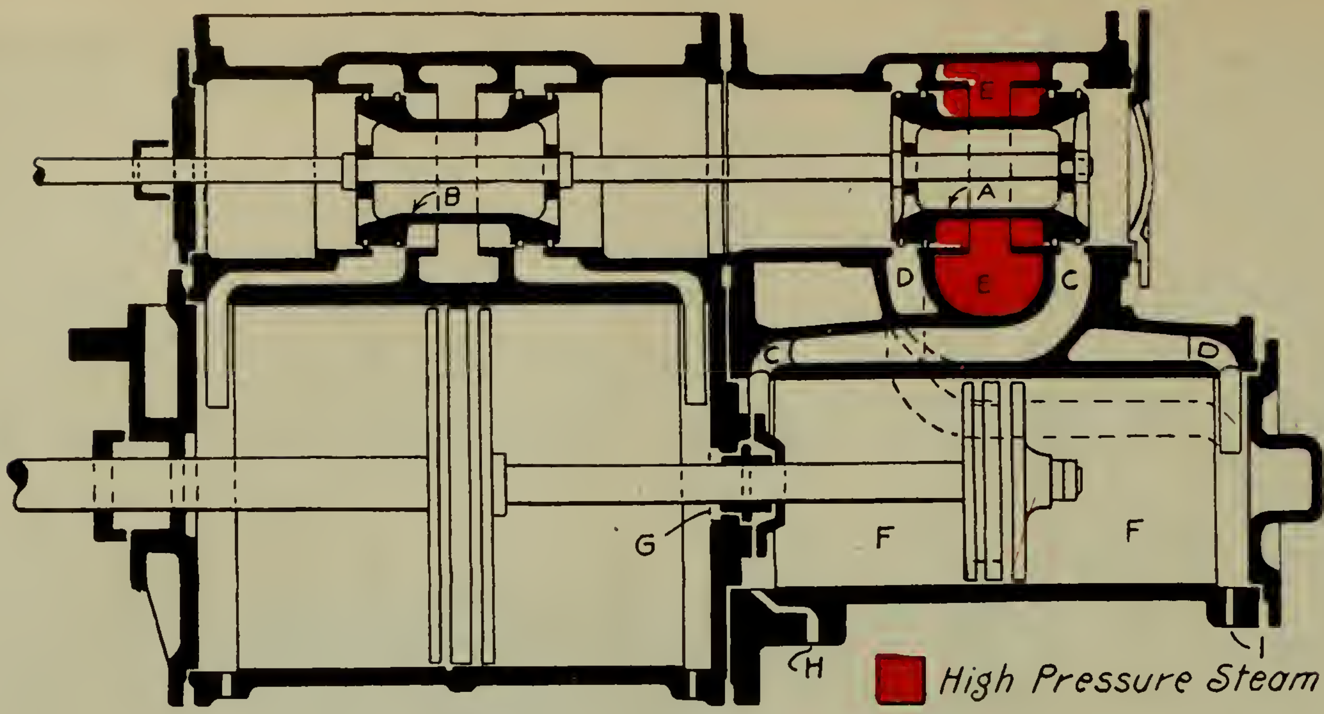


Fig. 1—Testing High Pressure Valve.

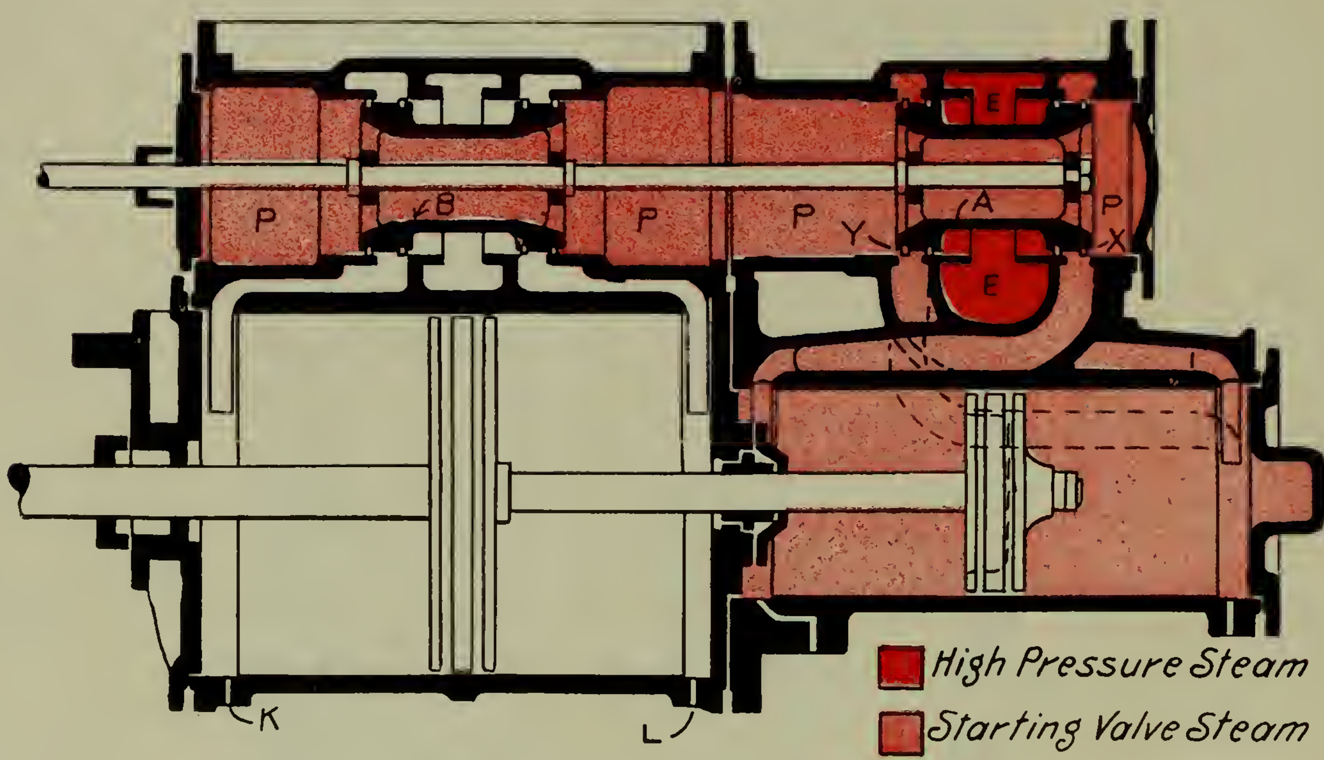


Fig. 2—Testing Low Pressure Valve.

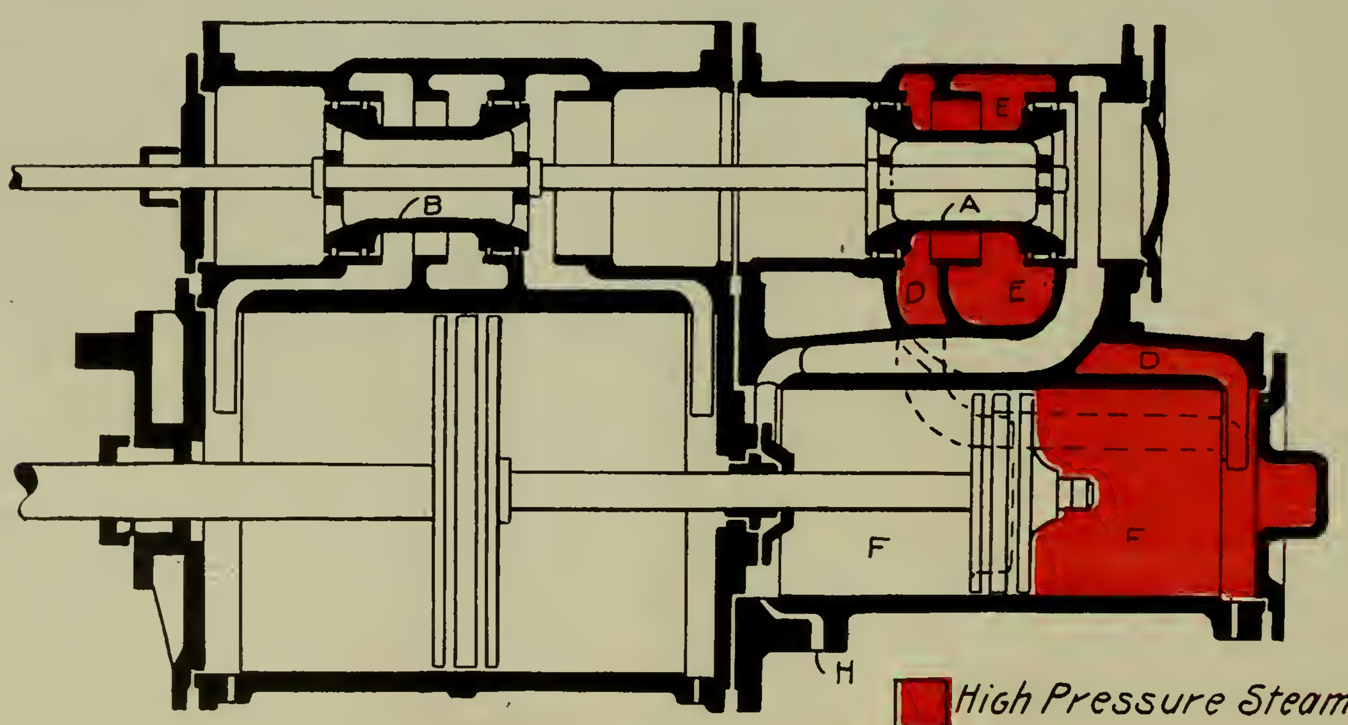


Fig. 3—Testing High Pressure Cylinder Packing.

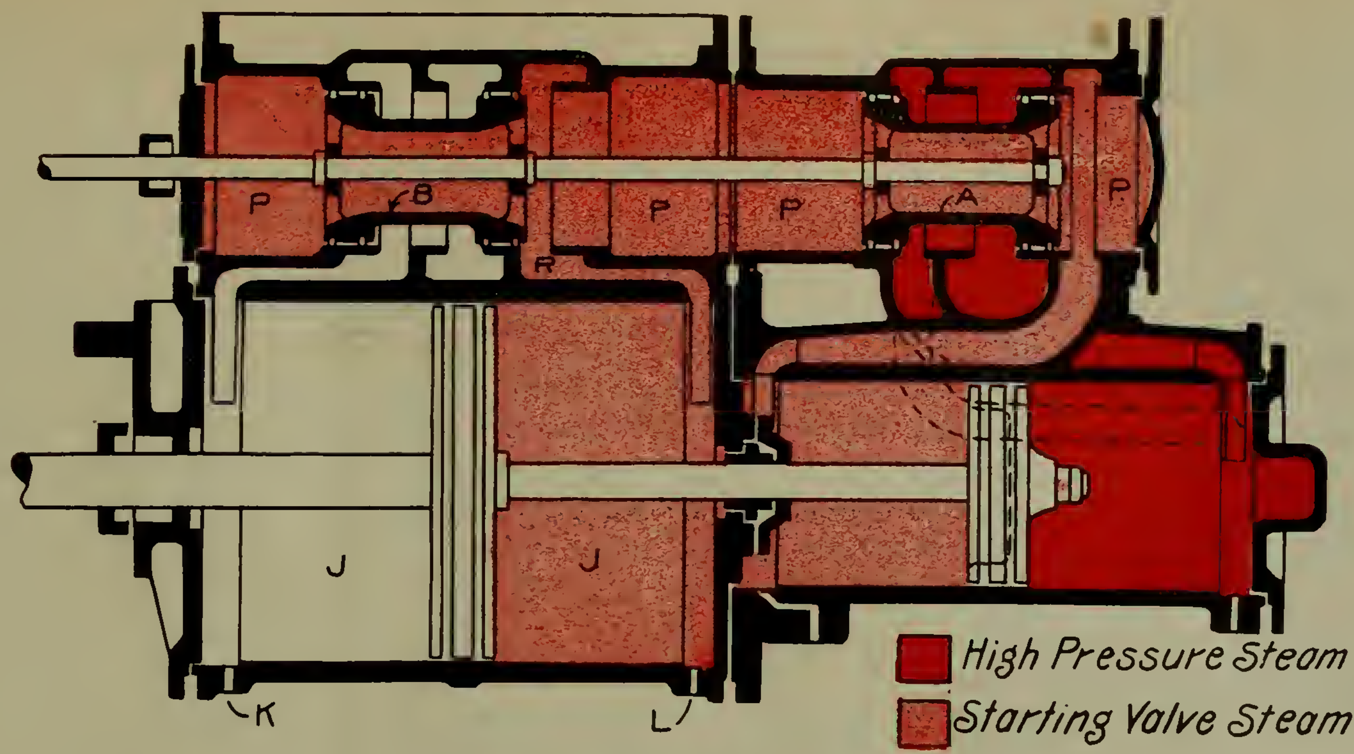


FIG. 4—TESTING LOW PRESSURE CYLINDER PACKING.

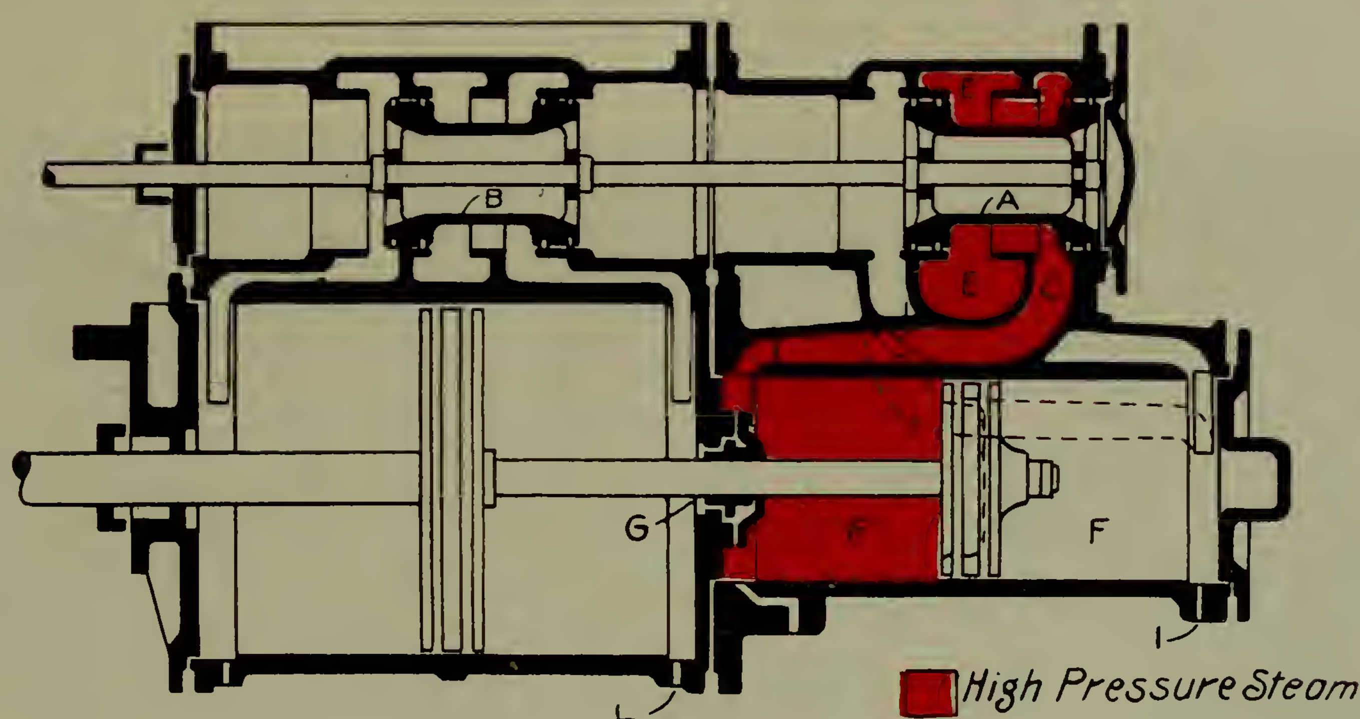
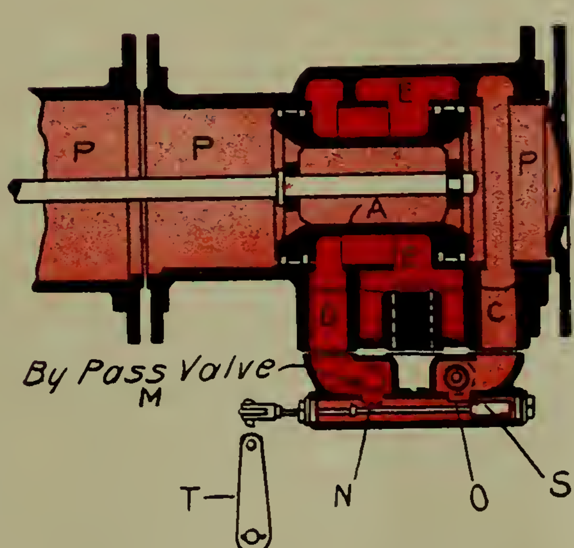
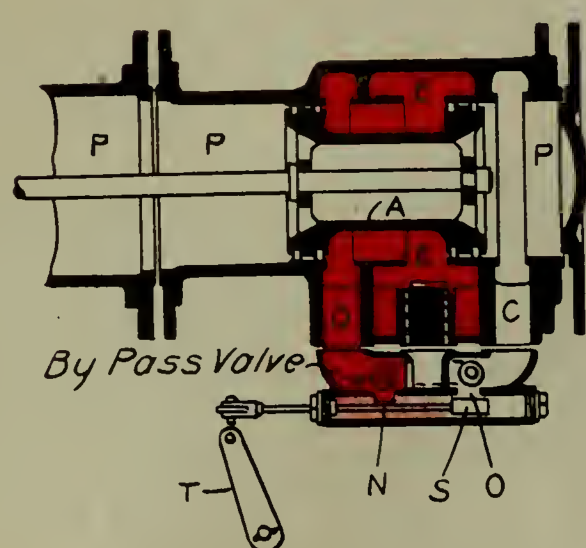


FIG. 5—TESTING PISTON PACKING SLEEVE BETWEEN CYLINDERS.



Starting Valve in Position for Working Simple.



Starting Valve in Position for Working Compound.

FIG. 6 STARTING VALVE. FIG. 7.

Topeka Shops of the Atchison, Topeka & Santa Fe Railway

Power House

(Continued from Page 163.)

AN important feature in the arrangement of the new shops is the introduction of electrical power for the operation of the entire plant. The tendency toward electrical distribution and the concentration of power in one point is becoming quite popular, offering as it does, economical maintenance and facilitating the operation of machines and the handling of material. The direct current system is installed, supplying power for the operation of machinery in all buildings, the operation of the transfer tables in the car department, and for lighting the yards and buildings.

The location of the power house is as nearly central as governing circumstances would permit. The building is constructed of brick, upon foundations of concrete mixed in the proportion of one part of cement, two parts of sand and three parts of stone. The roof trusses are of steel, supporting Ludowici tile roof. The outside walls are 13 inches thick and the wall between the boiler and engine rooms is 18 inches thick to the height of the side walls, being 13 inches thick above this point. The building is 176 feet long by 57 feet 4½ inches wide, divided into two sections, the boiler and engine rooms respectively. The inside dimensions of the boiler room are 101 feet by 52 feet, and inside of engine room 70 feet 6 inches by 52 feet. Clear height from floor to roof trusses is 26 feet 1½ inches.

The floors of the boiler and engine rooms are on the ground level. They are of cement over a concrete foundation. The interior of the boiler room is whitewashed, having no further finish. The interior of the engine room is finished in white enamel paint brick, with white bath room tile to a height of 6 feet. The ceiling is finished in matched pine wood with hard oil finish. The boiler room is ventilated by a monitor in the roof extending the length of the boiler room and in the roof above the engine room are star ventilators.

Steam is supplied by six boilers of the wide firebox, locomotive type, designed to burn slack coal for fuel. The boilers are divided into two batteries with three boilers to the battery and each battery is supplied with an independent header. The boilers operate under 150 lbs. pressure, one of the number being designed to maintain a pressure of 250 lbs. for testing service, and when so operated is disconnected from the remaining boilers of the battery to prevent equalization of pressure. On account of the high pressure, this boiler is fed by an injector when used for testing, the details of connection of which are shown in the illustration of pipe connections, Fig. 11. Provision is made for the addition of one boiler to each battery when the conditions of service demand it, space for an additional boiler being left at both the north and south ends of the boiler room. The boilers are rated at 200 horse power each. The design of the high pressure boiler is similar to the design of the others with the exception of thickness of sheets, which is necessarily greater in the high pressure boiler. The crown sheet is stayed with crown stays, the crown braces being of T shape and the back head and front flue sheet are braced with rod braces. There are 156 charcoal iron tubes 3 inches outside diameter, 18 feet long over flue sheets. The design of low pressure boilers is shown in an accompanying line drawing.

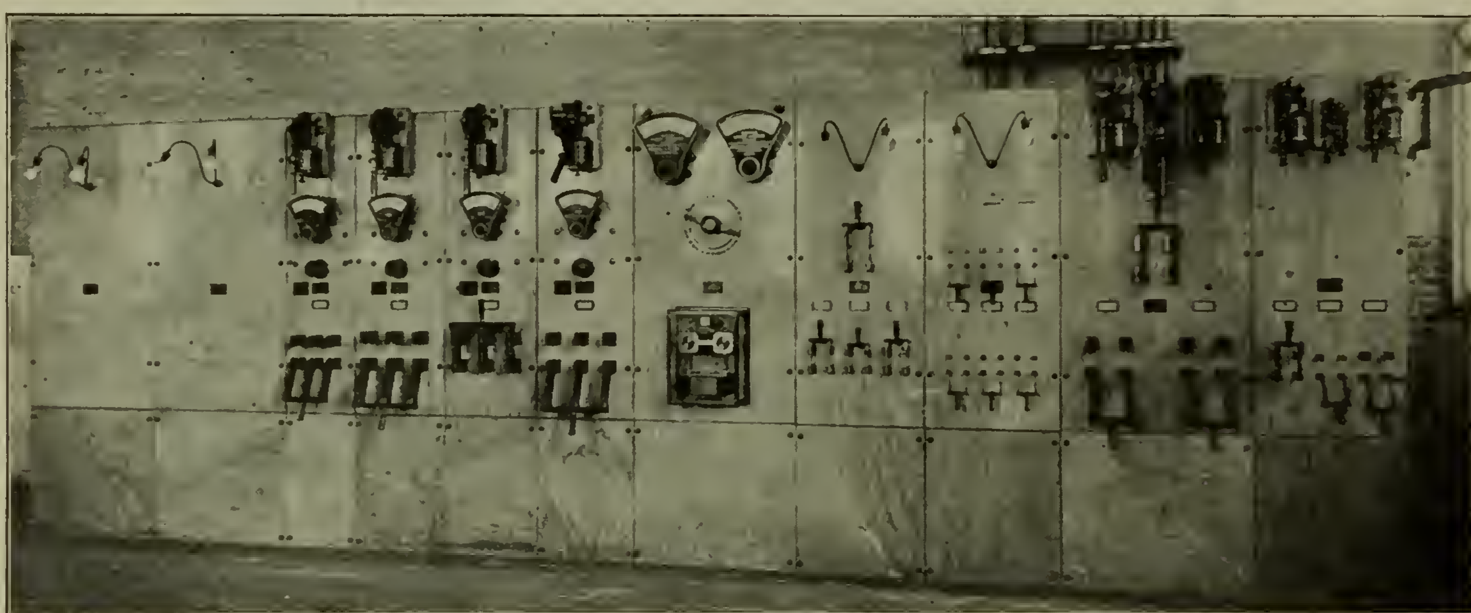


FIG. 1—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—SWITCHBOARD.

Expansion of the boiler is provided for by the design of cast iron saddle supporting the front end. This support is shown in detail in an accompanying illustration. The saddle casting is supported upon a second casting, two sets of rollers being interposed between them to facilitate the movement due to expansion and the joint sand pocketed.

As the water used for boiler feed contains a large per cent of lime, it was necessary to install a water softening plant to purify the feed water before supplying it to the boilers. It is treated, by the Tweedale System, in two wooden tanks 16 ft. in diameter by 14 ft., situated immediately west of the power house as shown in the illustration on page 163 of our April issue. The two tanks may be used independently or together and each has a capacity of 2,500 gallons.

Twenty-one thousand gallons is treated in each tank and in order that water may be measured as it is admitted a gauge board is attached to the outside of the tank so arranged as to indicate to the attendant the number of feet of water admitted, it having been

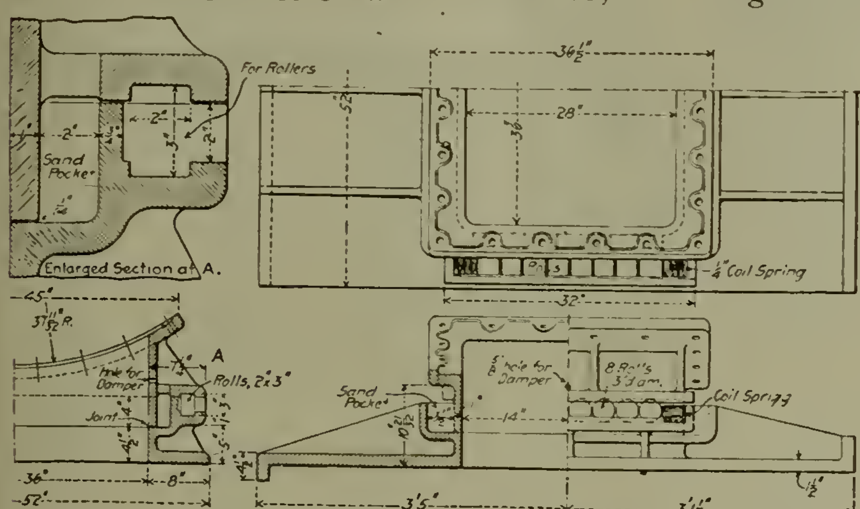


Fig. 2—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Detail of Saddle Casting.

previously determined that one foot of water in the tank equals 1,872 gallons. While the tank is being filled 19 quarts of 35 degree (Beaume) solution of hydrate of sodium is introduced. When the proper amount of water has been admitted and the supply valve closed, the contents of the tank is agitated by an aerator for thirty minutes, when 14 quarts of a 25 degree (Beaume) solution of sulphate alumina are added, the agitation being continued for 20 minutes more. At the end of this time the contents of the tank is allowed to settled. After having settled for two hours, the treated water is ready for service.

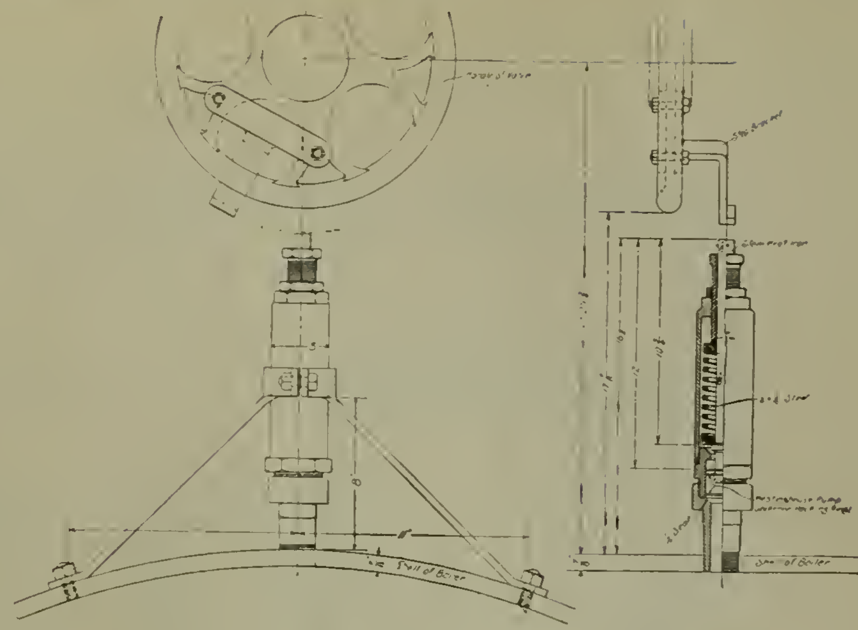


Fig. 3—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Precautionary Valve for 250-Lbs. Pressure Boiler.

Sediment is not allowed to accumulate in the bottom of the tanks to a greater depth than 6 inches. Boilers using this treated water should be blown off at least twice every 24 hours, lowering the water in glass each time about 1 inch. Any soft sludge is thus blown out to the sewer. The cost of chemicals used in this process is found to be about 2 77-100 cents per 1,000 gallons.

When the high pressure boiler is used for testing purposes, as indicated above, it is disconnected from the remaining boilers of the battery by a steam valve. In order that no one may open this valve carelessly or ignorantly while the boiler is under high pressure Mr. F. H. Adams, engineer of shop extension, has designed an ingenous device to secure the valve hand wheel in position, automatically. A stop bracket is bolted to the hand wheel and a wrought iron rod is arranged to raise automatically and intercept the movement of the bracket, when the pressure in the boiler rises above 150 lbs. To raise the intercepting rod is the duty of a specially designed valve. The details of this valve are shown in Fig. 3. Within the casing is a spring compressed to 4 13-16 in. to balance 150 lbs. boiler pressure. Any excess pressure will unseat the valve at the lower end of the intercepting rod, compressing the spring still further, at the same time raising the rod. In order that the spring may not be subjected to an unnecessary strain a second seat is instituted which

Fig. 4—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Generating Units.

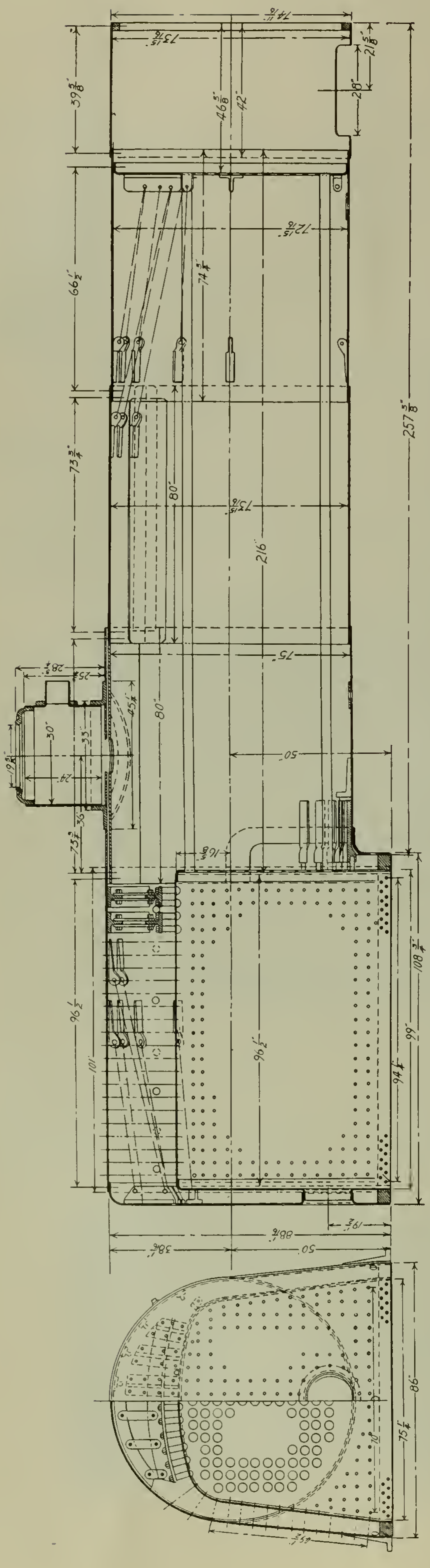


Fig. 5—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—150-Lbs. Pressure Boiler.

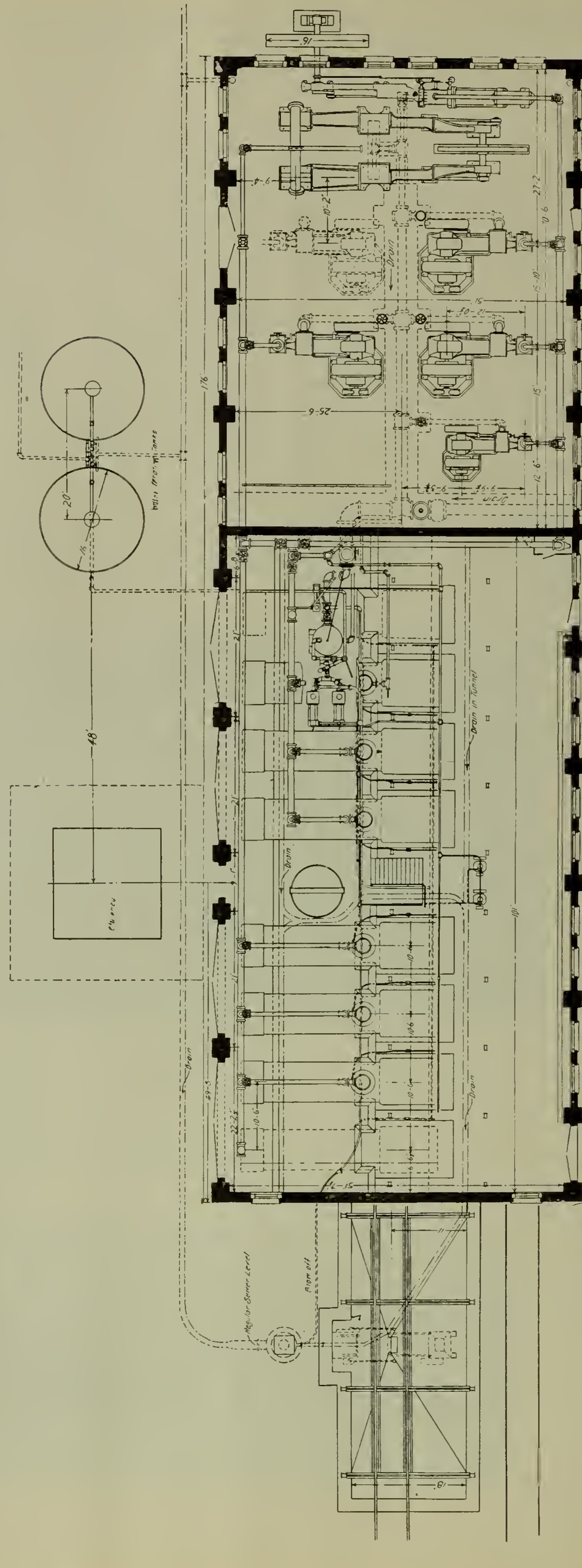


Fig. 6—Topeka Shops of the Atchison, Topeka & Santa Fe Railway— Plan of Power House.

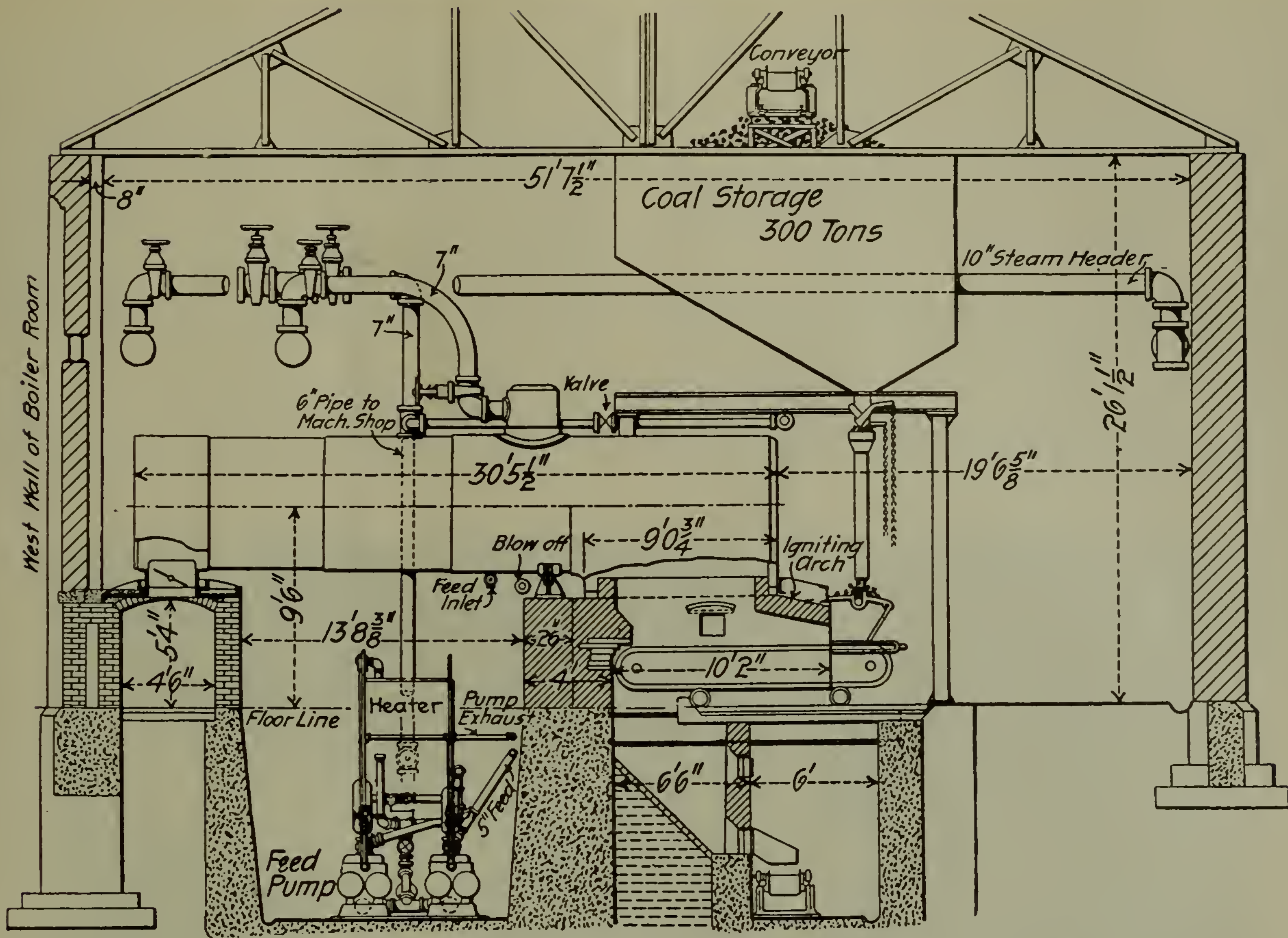


Fig. 7—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Transverse Section of Boiler House

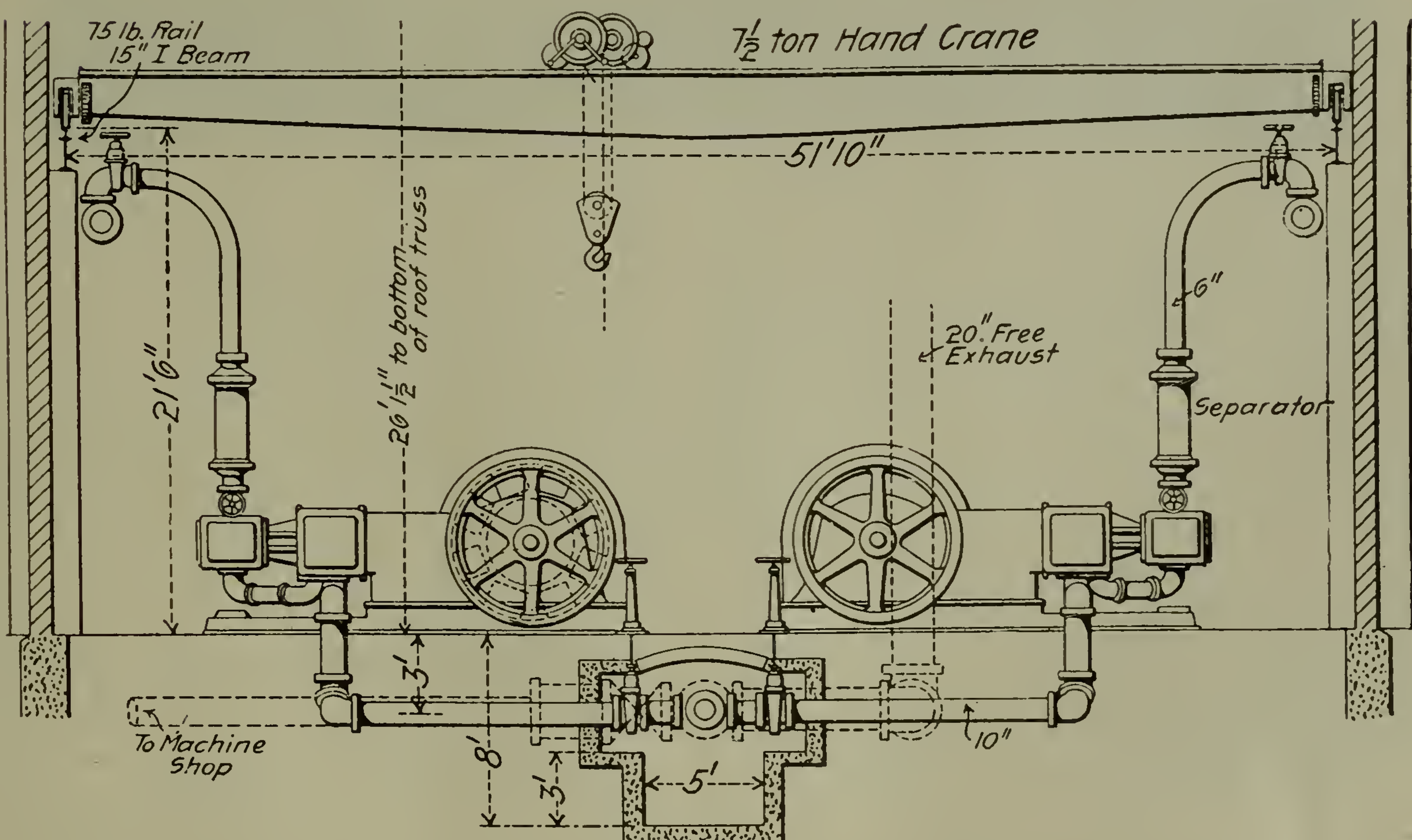


Fig. 8—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Transverse Section of Engine Room.

stops the further motion of the rod. In order that steam may not leak past the valve while changing its position, a piston packed with Westinghouse pump governor packing rings, is fitted within the sleeve in which it travels. When boiler pressure does not exceed 150 lbs. and the interceping rod is in its normal position, the stop bracket clears the top of the rod 1-64 in.

The boilers are automatically stoked by traveling link grates furnished by the Green Engineering Company. The free width of each stoker over the traveling links is 5 ft. 3 ins. and the effective grate area is 47½ sq. ft. The grates are maintained upon substantial frames supported by four wheels, resting on permanent tracks, to facilitate the removal of grates when repairs are necessary. The weight of each grate and frame is about 18,300 lbs. The grates are operated at a very slow rate of speed by a chain of gears which receive their motion from a shaft above, transmitted through an eccentric rod to a lever operating a ratchet connected to one of the wheels. The speed of the grates is regulated by adjusting the length of the lever, thereby changing the travel of the ratchet. The shaft is driven by a six-horsepower steam engine, a second engine of the same power being installed as a relay. The installation of a steam engine in this capacity appeared more satisfactory than an electric motor, in order that the grates may be operated at times when the generators are not in operation, for instance before the engines are started for the day.

While the cost of the installation of this type of grate is greater than that of the ordinary grate, this grate may be operated economically as it burns fuel more economically than the plain grate and operates automatically requiring little attention, either in feeding or disposing of the ash. Fuel is fed automatically to the front end of the grate and is carried slowly to the rear end by which time it has been thoroughly consumed and is dumped as ash at the rear end. The movement of the links among themselves as the chain passes over the rear drum makes the grate practically self cleaning, insuring freedom from clogging of clinkers, etc.

The position of the chimney with relation to the boilers and the building is shown in the accompanying plan. The chmney is erected on a foundation of concrete, the square base being of building brick and the circular portion of Custodis brick. It is 160 ft. high and 90 ins. in diameter.

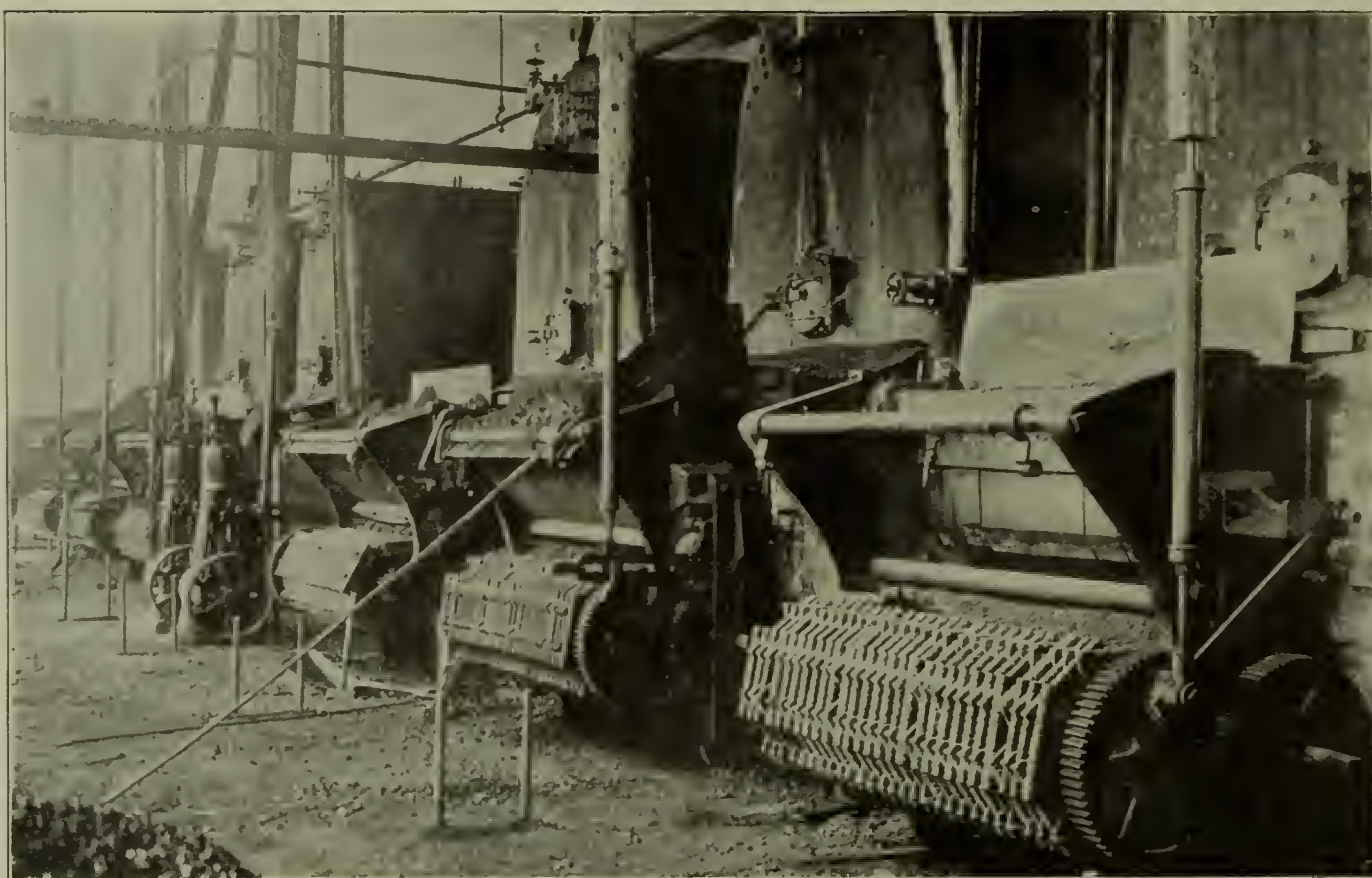


Fig. 9—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Mechanical Stoker.

Fuel is handled auomatically from the time it is delivered in coal cars on the tracks at the power house until it is finally dumped into cars as ash to be disposed of as circumstances direct. This is accomplished by the operation of a link belt conveyor system, furnished by the Link Belt Machinery Company. There are 360 lineal feet of belt conveyor, operating over 130 ft. horizontal centers and 41 ft. vertical centers, material being handled in pivoted buckets. The accompanying plan and section of the power house show a concrete lined pit 18 ft. by 46 ft. and 14 ft. deep, immediately south of the building, constructed to facilitate this system of coal handling. The system is served by two standard gauge tracks, one track being situated east of the pit, the second supported immediately over the pit on I beams, elevated 5 ft. above grade. Coal cars are delivered to the track immediately over the pit and dump their loads to a coal hopper immediately below. The two tracks are connected by a switch (shown in general plan of plant, page 160 of our April number), thus enabling the car which brought in the coal supply, to be switched to the track on which it may be loaded from the ash hopper. The ash hoppers are supported on trestle work in the vertical line in which the conveyors travel. Ash is dumped from the conveyors into the hoppers whence they fall by gravity into the cars.

Discharge from the coal hopper passes through an unloader, and also a crusher to be used at such times that lump coal may be supplied instead of slack. Passing from this point to the link belt conveyors, the coal is conveyed to a point above the boilers and dumped into the coal storage hoppers of 300 tons capacity, from which it passes through vertical chutes by gravity to the hoppers in immediate connection with the grates. The mechanism controlling the supply of coal from overhead hoppers is operated by a chain in easy reach of firemen. The coal crusher and unloader is driven by a 15-horse power electric motor and the belt conveyor mechanism is driven by a 7½-horse power electric motor.

Continuing from the position above the boilers, the conveyors pass down and through a tunnel beneath the boilers. Beneath each grate is an ash pit with an inclined bottom leading the ash to such a position that it will fall by gravity, when released, or can conveniently be raked into the conveyors by which it is carried to a point above the ash hopper outside of the building and dumped therein.

Beneath the barrels of the boilers is a pit 10 ft. deep the walls of which are formed by the boiler foundations. In this pit are situated feed water pumps, feed water heater and receiver for condensed steam, and pressure pump and accumulator supplying pressure for the riveting plant in the boiler and tank shop. There are two feed pumps of the Fairbank-Morse type of fire pump, 10 ins. by 6 ins. by 12 ins. duplex, having a delivery pressure of 150 lbs., capable of handling hot water. Feed water is heated by a Colles open type heater having a capacity of 30,000 lbs. per hour at a temperature of 200 degrees Fahrenheit. A duplex pump, having a capacity of 80 gallons per minute serves the accumulator. The accumulator furnishes a pressure of 1500 lbs. per square inch. This pit is connected at a point opposite the stack with the tunnel through which the conveyor passes, beneath the fireboxes of the boilers.

The tunnels under engine room and the one running across to machine shop have a slight fall toward a point just back of the middle of the switch board. At this point is an arched door through the foundation of the partition wall dividing the engine and boiler room. This door communicates with the basement where feed pumps and heater is located. Beginning at this door, an open floor gutter leads along west side of basement to a point just south of accumulator. Another similar gutter leads from south end of basement, joins the first at accumulator, crosses over through arched door and runs south through coal tunnel and across outside coal hopper pit where it enters an 8 in-sewer pipe communicating with a brick lined blow off well 22 ft. deep and 4 ft. in diameter, whence it is discharged to the sewer. The sewer being but 3 ft. 9 ins. below the surface, water from the well is raised to the level of the sewer by an ejector situated in the bottom of the well operated by boiler blow off. Drainage and blow off connections are shown in the accompanying plan of the power house.

All water of condensation is returned to boilers by Holly gravity return system number 3. The engine room headers are bled to low pressure side of suction tee and boiler room headers are bled into high pressure side of suction tee, by which steam of nearly boiler pressure is connected with the receiver. The connection with the boiler header maintains nearly boiler pressure at the receiver and helps to draw in the drainage connected with the receiver. The receiver is placed at the lowest point of the system to be drained. Steam pressure raises the condensed steam and water vapor to the separator which is situated 30 ft. above water level in boiler, where it is condensed by encountering a cool surface. From this point the water falls by gravity to the boiler, the weight of water column being sufficient to overcome the difference in pressure existing between boiler pressure and pressure in the loop formed by the system of pipes. The patents of

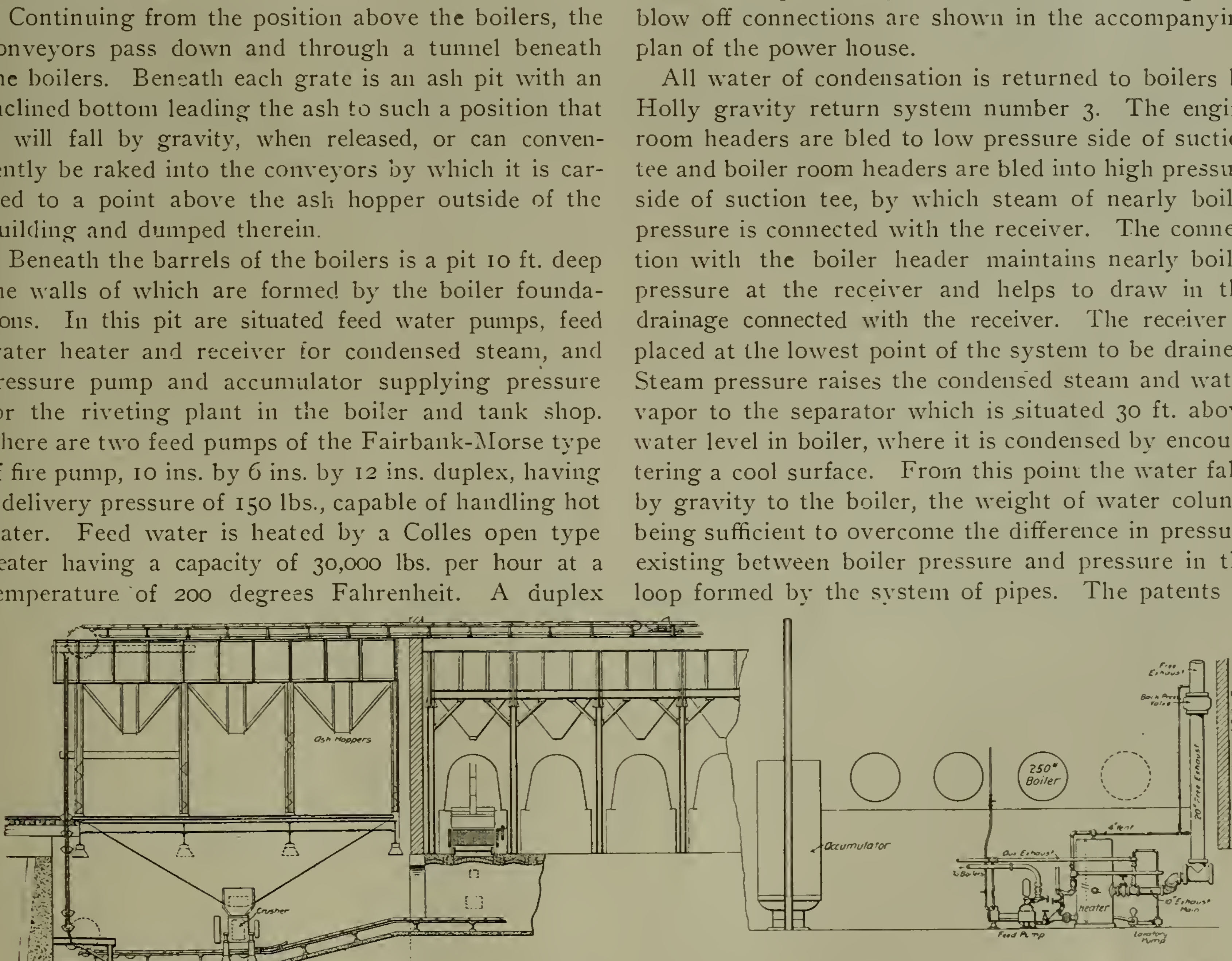


Fig. 10—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Longitudinal Section of Boiler Room and Coal Hopper Pit, Showing Coal and Ash Handling Mechanism, Position of Accumulator, Feed Pump Heater, Etc.

the Holly system are owned by Westinghouse, Church, Kerr & Co.

There are installed four horizontal compound Ball engines directly connected to General Electric Multipolar dynamos. Three of the four units are for the maintenance of power for the operation of the plant under the usual conditions of service, while the fourth and smaller unit is for supplying power for lights at night and for light power at such times as it may be unnecessary to operate the larger machines. The large engines develop 325 horse power at 200 revolutions per minute and are connected to 200 K. W. generators. The cylinders are 16 ins. and 25 ins. in diameter by 18-in. stroke. The smaller engine maintains 120 horse power at 270 revolutions per minute and is connected to a 75 K. W. generator. Its cylinders are 10 ins. and 16 ins. in diameter by 14-in. stroke. It is intended to install a fifth unit of the same dimensions and capacity as one of the larger three, the foundations having been erected for this larger machine.

Two air compressors have been installed in this power house to supply the necessary compressed air for the locomotive and part of car department. One of these is a Rand duplex air compressor having twin steam cylinders 20 in. by 48 in. and compressed air cylniders 16 in. and 28 by 48 in. The second air compressor is the product of the ingenuity of the shop management. An Allis engine, 20 ins. by 48 ins., which was out of commission, was arranged to operate an Ingersoll-Sargent compressor 18¼ ins. by 48 ins., by supplying the engine with an extended piston rod and placing the compressor tandem. The fly wheel of the Ingersoll-Sargent compressor is placed outside of the building, the shaft extending through the wall.

The engine room is served by a 7½ ton traveling hand crane built by the Whiting Foundry Equipment Company.

The switch board shown in the accompanying illustration, Fig. 1, is of blue Vermont marble 23 ft.

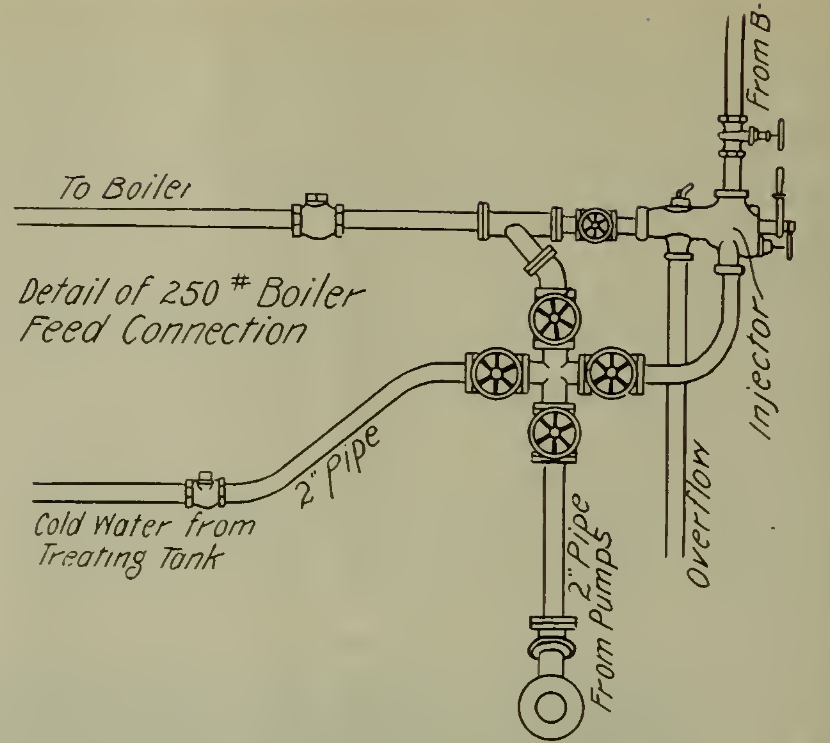


FIG. 11—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—FEED CONNECTION OF 250-LBS. PRESSURE BOILER, USED WHEN HIGH PRESSURE IS IN SERVICE.

long by 7½ ft. high. It consists of the following panels: 4 generator panels, 1 load panel, 2 feeder panels for lighting, 2 feeder panels for power and 2 panels for steam, air and water guages and a clock. On each of the three panels for large generators are the following: 1 rheostat; 1 800-ampere, 3-pole, single-throw knife switch; 1 800-ampere, single pole automatic circuit breaker; 1 1,200-ampere indicating ammeter; 1 lamp bracket.

On panel for small generator, 1 rheostat; 1 300-ampere, 3-pole, single throw knife switch; 1 300-ampere, single-pole, automatic circuit braker; 1 500-ampere indicating ammeter; 1 lamp bracket.

On load panel: 1 indicating ammeter, scale 0 to 4,000 amperes; 1 recording wattmeter, current capacity 4,000 amperes; 1 indicating voltmeter, scale 0 to 300 volts; 1 voltmeter switch; 1 lamp bracket.

On one-power feeder panel: 1 1,000-ampere, two-

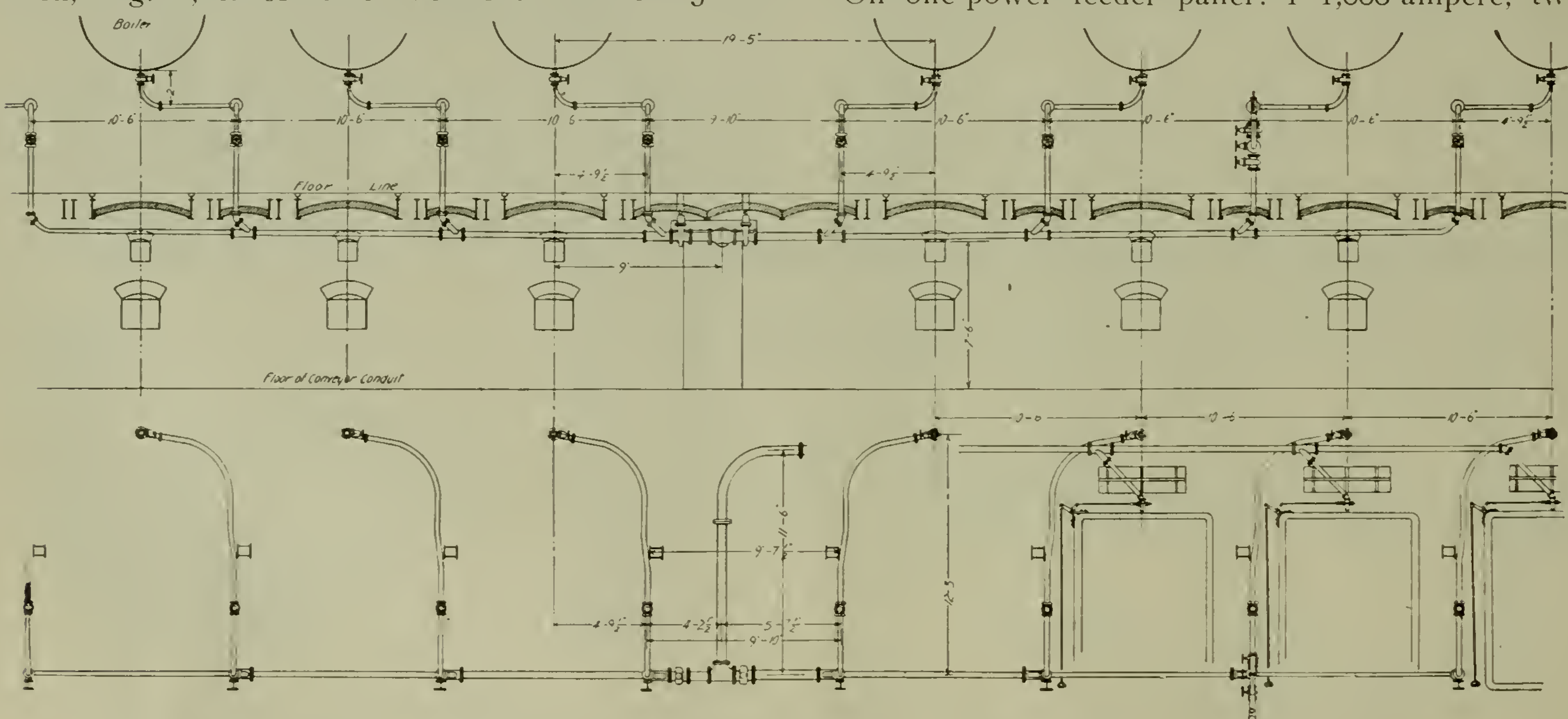


FIG. 12—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—POWER HOUSE FEED AND BLOW-OFF PIPING.

pole, single through knife switch; 1 1,000-ampere, single-pole, automatic circuit breaker; 1 400-ampere, two-pole, single-throw knife switch; 1 200-ampere, two-pole, single-throw knife switch; 1 400-ampere, single-pole, automatic circuit breaker; 1 200-ampere, single-pole, automatic circuit breaker; 1 lamp bracket.

On the second motor feeder panel: 1 800-ampere, two-pole, single-throw knife switch; 1 800-ampere, single-pole automatic circuit breaker; 1 200-ampere, two-pole, single-throw knife switch; 1 100-ampere, two-pole, single-throw knife switch; 1 200-ampere, single-pole, automatic circuit breaker; 1 100-ampere, single-pole, automatic circuit breaker; 1 lamp bracket.

On one lighting feed panel: 1 300-ampere, two-pole, single-throw knife switch; 2 200-ampere, two-pole, single-throw knife switch; 1 100-ampere, two-pole, single-throw knife swithch; 1 lamp bracket.

On the second lighting panel: 6 50-ampere, two-pole, single-throw knife switches; 1 ground detector; I lamp bracket.

Mounted on swinging bracket on end of the switch board is one differential volumeter, scale 0 to 300, with provision for connection to each generator and main bus bars.

On the two panels for gauges the folowing are mounted. 1 Seth Thomas eight-day clock; 1 steam gauge for "West steam line," 0 to 300; 1 steam gauge for "East steam line," 0 to 300; 1 steam gauge for "Test steam line," 0 to 500; 1 back pressure gauge, "Exhaust steam line," vacuum to 20+; 1 air gauge, "Air line," 0 to 200; 1 water gauge, "Water line," 0 to 200; 1 hydraulic gauge, "Hydraulic line," 0 to 3,000. This outfit was furnished by the American Steam Gauge & Valve Mfg. Co. They all have 8½-in. dials and are mounted in heavy deep brass cases nickel plated, with back connections.

The feeders to the blacksmith shop and to the locomotive and boiler shop are lead covered cables. For the blacksmith shop one 300,000 circular mills for power supply and one number 6 cable for lighting. The power supply cables for the locomotive and boiler shop are three 300,000 circular mills for power, one 300,000 circular mills for crane service and one number 000 for lighting. The lines to the locomotive shop are through a tunnel and to blacksmith shop through a conduit. All other distribution is by means of pole lines. The pole line distributing tower is shown on page 163 of the April issue.

Construction of buildings will be considered in the next issue.

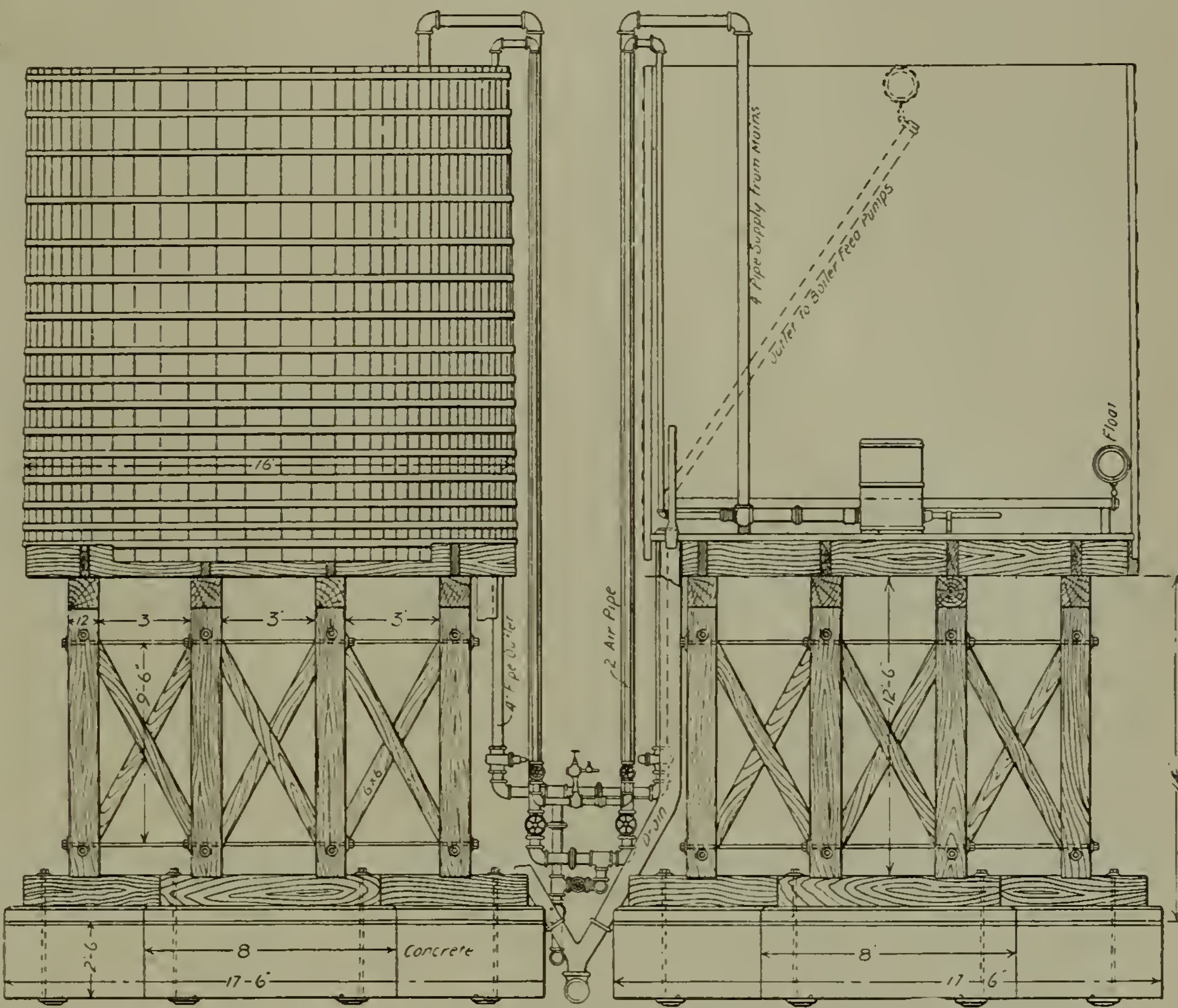


Fig. 13—Topeka Shops of the Atchison, Topeka & Sante Fe Railway -Feed Water Treating Tank.

Circular Oil Furnaces

THE substitution of oil for coal, or coke, as fuel in blacksmith shop furnaces is attracting worthy attention. The points of consideration are the relative cost of the respective fuels and efficiency and rapidity with which the work may be turned out. In designing a furnace, it should be so arranged as to aid perfect combustion and be of such form as to get the highest efficiency out of the heat produced.

An oil furnace interesting because of its novel form and the success which is obtained therewith, has been designed by Mr. F. J. Jones, master blacksmith of the Baring Cross shops of the St. Louis, Iron Mountain & Southern Railway. The interior of this furnace is made cylindrical, such form being arranged to facilitate circulation of the flame and to cause perfect combustion. The burners enter the furnace at one side, directing the flame across the chord of the arc formed by the circular wall. The flame naturally follows the direction given it by the circuiar wall and continues to circulate effectively, the force of the circulating flame tending to induce the original jet in an upward direction so that the flame follows the wall continuously.

In order that the flame may circulate freely about the material placed within the furnace, several fire brick bridges are arranged transversely within the bottom of the furnace. By placing material upon these bridges a clear space is obtained between the material to be heated and the bottom of the furnace, thus permitting perfect circulation and placing the material in position to derive full benefit of the heat from the flame.

As well as heating material to be formed on the bulldozer served by this furnace, it is also used for case hardening and annealing.

A small furnace in this shop has been arranged with a similar interior, for light work. Both furnaces use Beaumont oil for fuel from which very gratifying results are derived. It is believed by the gentlemen above mentioned that oil is the "only fuel" for furnaces.

Contrary to the usual practice of contracting the ends of burners, they are expanded in order to produce a greater spraying effect. In the larger furnace the burner consists of a ½-in. pipe for discharging oil, surrounded by a 4-in. pipe discharging air, both pipes being expanded at the ends, thus delivering a spray of air and oil instead of a solid stream of oil surrounded by air.

On a welding furnace, Mr. Jones has arranged to pass the oil pipe around the outside of furnace in such a position that heat from furnace will raise temperature of oil before being discharged at the burner, believing that so heating oil will aid generation of gas from the oil, thus giving more nearly perfect combustion.

The Central Railway Club

By Harry D. Vought, Secretary

THE Central Railway Club, which meets at Buffalo in the months of January, March, May, September and November, is the oldest member of the steadily widening circle of railroad clubs in this country, and of which the New York Club is the father. The history of these two organizations is so closely interwoven and their earlier relations may be said to have been so interdependent, that it is rather difficult to speak of one without mentioning the other; certainly among those who were then active in both and still identified with them to allude to one is to prompt a kindly thought of the other.

Mr. George W. West, President of the Central Railway Club.

In undertaking to sketch the life of the Central club, knowledge of how it sprang into existence and how it has developed from the weakling that it was first, as a mere inspection club, to a sturdy, flourishing and influential body, naturally prompts a retrospective consideration of some matters of history that are worthy of preservation. It serves, too, to show why and how there first came to be a need of organization among the railroad men for clubs of this character and what has justified encouragement of their maintenance.

Nearly forty years ago the transportation of fast freight from the seaboard to Chicago and extreme western points had been begun by the organization of what afterwards became known as the Red, White and Blue Lines. The work of putting this freight through, either east or west, at a rapid pace, was rather slow at first, and can be best illustrated by stating that between Boston and Buffalo alone (a distance of say 500 miles), there were no less than nine different sets of inspectors under as many superintendents of transportation or car masters, as against one in 1903.

The first meeting of the master car builders in this connection was held at the West Albany car shops of the New York Central railroad, in July, 1864. Messrs. Jones, Wood, Davis, Johnson, Steel, Hoyt and Torrence, of what is to-day the New York Central & Hudson River Railroad, were in attendance; also W. E. Chamberlain, of the Albany & Western Railroad, together with the master car builder of the New York & Harlem Railroad, the latter being no less a person than the late Leander Garey, who for a period of nearly twenty-three years thereafter served as an untiring worker in improving the arrangements for a most thorough system of interchange of freight cars between connecting lines. From

1864 to 1886 he was master car builder of the New York & Harlem road, and general superintendent of the car department of the New York Central & Hudson River Railroad system. He also enjoyed during that time the distinction of founding, in the winter of 1872, the Master Car Builders' Club at New York, now known as the New York Railroad Club, the first and premier body of its kind.

Mr. Garey was elected secretary of the National Association of Master Car Builders in 1869, serving until his election as president, at Cincinnati, in June, 1874. He was successively elected for a period of eleven terms, retiring in 1885 and leaving active railroad service in the spring of 1886. After a short illness he died at Hartsdale, N. Y., on November 24, 1886. After the Master Car Builders' Association had been in existence a few years Mr. Garey saw from his official position on the Vanderbilt lines, the great necessity of master car builders in the middle west and east, getting together oftener than their annual meeting in June. He then decided upon calling the car builders on other roads to meet in Buffalo. Beginning in the fall of 1873 and for a period of more than twelve years thereafter, meetings were held at Buffalo at least every other month and very frequently in some years every month for a period of four or five months in succession.

Although the efforts of Mr. Garey and his associate master car builders were ceaseless and untiring to perfect a system of joint inspection at interchange points, and agree upon a standard set of rules governing the interchange of freight cars, it was not until after fifteen years of work in this direction that the Pennsylvania could be induced to join the association.

At the Philadelphia convention, held at the Continental hotel in June, 1882, an adjournment was taken until October of the same year, when the general body met at the International Hotel, Niagara Falls. The new joint interchange rules were ratified by all the principal lines, including the Pennsylvania, which sent as its representative Mr. John W. Cloud, and since that time each road has had a vote and a voice in the proceedings of the rule convention each year, on a basis of one vote for each 1,000 cars owned or the major part thereof; the support of the organization being assured by a contribution based upon a charge of $5 per vote and paid by the railroad companies direct.

In this connection it is of interest to recall that from 1873 to 1883 Mr. Daniel M. Brady, of New York, now president of the Brady Brass Company, was chief clerk of the car department of the New York Central & Hudson River Railroad, and incidentally secretary of the interchange meetings held each year from 1874 to 1883 to regulate the rules governing the interchange of cars. For six successive years, 1878 to 1883, he was secretary of the national meetings on this question.

Thirty years ago the New York Central system owned about 15,000 cars; to-day it has more than 63,000 cars, but the rules governing the interchange of cars were so firmly and closely knit in 1883, that the railroads are to-day working under practically the same system as that established by Mr. Garey. Buffalo, in 1873, had a population of 145,000; to-day it is nearly half a million.

Among the gentlemen occupying the position of master car builder on the various roads and who were most constant in their attendance at the Buffalo meetings, which, by the way, were uniformly held at the Tifft House (which has just been torn down), or the New York Central shops at East Buffalo, were: F. D. Adams, of the Boston & Albany, now retired and living in Buffalo; W. E. Chamberlain, of the Boston & Albany; A. Gleason, of the Old Colony; J. W. Marden, of the Fitchburg; Enos Varney, of the Fitchburg; J. M. Foss, of the Central Vermont; R. C. Blackall, of the Delaware & Hudson; David Hoyt, of the New York Central; William Johnson, of the New York Central; C. E. Benton, of the Canada Southern; John Orton, of the Canada Southern; Robt. Potts, of the Canada Southern; R. Miller, of the Michigan Central; John Kirby, of the Lake Shore; Milton Wilder, of the Erie; F. M. Wilder, of the Erie; A. C. Robson, of the Lake Shore; Allan Vail, of the Western New York & Pennsylvania; William McWood, of the Grand Trunk; R. V. Coon, of the Troy & Boston; C. W. Demarest, of the Northern Central.

The outcome of these meetings was the establishment of the Central Railway Club as a permanent organization at Buffalo, and it can be safely said that these gatherings which culminated in the formation of the club have contributed more to the economical dispatch of freight traffic throughout America by reason of a perfected system of joint inspection and interchange than any other known cause.

One of the first, if not the first president of the club, after it was formally organized upon the basis that it has ever since been conducted, was Eugene Chamberlain, now a resident of New York city, and previously for a long period master car builder of the New York Central at Buffalo, and so much did he accomplish in enthusing activity among the members and advancing the best interests and growth of the club, that he was thrice honored with election to the office. His successors have been Arthur M. Waitt, late with the New York Central and the Lake Share; Samuel Higgins, now superintendent of machinery on the Southern; John S. Lentz, superintendent of the Lehigh Valley's car department; Herman F. Ball, superintendent of motive power on the Lake Shore; E. D. Bronner, superintendent of motive power on the Michigan Central; E. A. Miller, master mechanic of the Nickel Plate; George W. West, superintendent of motive power on the New York, Ontario & Western, and J. R. Petrie.

Mr. West was called to the presidency in 1901.

There was a general desire among the members to honor him with a second term at the close of his very successful and zealous administration, but the constitution and by-laws unfortunately, at that time, prohibited a man succeeding himself in the presiding office. When another year rolled around, however, they did not hesitate to avail themselves of the opportunity to compliment Mr. West and reward him for the good that he had accomplished for the club and he became the unanimous choice of the club for the presidency at the annual meeting last January. Mr. West has shown himself pre-eminently a working president—one who gives time, thought and attention to the welfare of an organization in every branch of its work, who puts life into its work, who inspires members to take an active interest in its affairs, and who knows how, at the same time, to maintain peace and harmony among the brethren. There had been a tendency toward retrogression, but immediately upon Mr. West assuming office this so effectually disappeared that the club is showing its old time strength, prosperity and progressiveness under the stimulus of his personality, singleness of purpose and unselfish devotion to whatever is best calculated to promote the attainment of the highest and best along the line of usefulness and valuable results. The standard of the club's work has already been noticeable, elevated and advanced, and this means much for its future improvement and reputation.

The material or supply side of this story would not be complete if mention were not made of the fact that thirty years ago cast iron wheels of the M. C. B. type weighed on average 450 pounds each and sold in some cases as high as $36 each; the M. C. B. standard brass weighed nine pounds and the cost of the Hopkins self-fitting lead lined patterns was on average about 32 cents a pound.

That Buffalo and Pittsburg are central railway points and the Mecca of all railway and iron men, is best attested by the fact that there is probably in these two cities more prosperity in the field of transportation and manufacture, proportionately, than any other two cities in the world. That they are both fertile fields for the establishment and successful conduct of railway clubs goes without saying, and with ordinary care these associations should be continuously successful.

Railroad Shop Tools

By Charles H. Fitch

II

BUILDING construction and steam power plants are essentials to a locomotive plant, but they will not be considered in these articles, as it would be a very loose and elastic definition of the term "shop tools" to make it wide enough to include them, and we are obliged to limit our subject. The product and the immediate means for making and maintaining it will cover all that we can attempt. But although we can divide the matter by disregarding power transmission at a definite point, and ignoring structures whose chief but not always remembered function is to admit light, while retaining warmth and shedding water, we cannot separate from shop tools those whose brains they empower and whose hands they sometimes supplant—namely, the men.

Nor can we fail to consider the inter-relations of shop tools, their encroachments upon one another and the whole combination of appliances, moving or static, which enables us to consider a shop equipment as one comprehensive machine operated by an organization of men.

Maybe we do not think of the shop as one machine; if so, so much the worse for our shop. And maybe we do not think of our organization as one body in tune. I want to get to the materialism of our subject, the steel and gears of it, as rapidly as possible, but I want above all in these articles to root out some ideas that will be of value to master mechanics. Ideas and inventions are many, but the patent office has a great silent majority, not so great as the cemetery, but there remains an enormous number of inventions unutilized, unapplied, and for some reason not considered worth while. It may be thought a far cry from the tuning fork to the harmony of machines, but it does not seem far to me from the long-haired virtuoso at the piano and his shorter-haired brother at the boring mill. There is a quality of lubricant that is not bought by the barrel nor fed to the bearings; it has the body of manliness and the feel of courtesy. It has got to be good stuff, is economical at a high price, a high-grade product, finer than American millions, finer than American watches, the secret of most that we have to boast about in American superiority—that is, the American shopman.

It is a shame to a naturally modest man to praise him to the face, else I would like to name some of the managers and foremen who have helped me in my inquiries. We are all the while hearing in art of the works of the old masters. In the power of the modern machine shop we have something greater than the atelier, a power which is drawing to our shores many of the treasures of foreign art, and will ere long enable us to create a better art of our own. The machine shop utilities with their benefit and influence are themselves an art, the work of the new masters.

I would not have it thought that a few courtesies have beguiled me into flattering words. I speak of facts. The fact remains that we have a great deal that is coarse, crass and unintelligent to deal with, and that there remain unfair spots in administration as there are hard spots that interfere with the turning of work in the wheel lathe. But a man who has been going about machine shops for thirty years knows that there are facts of moral atmosphere as well as machine improvement, that present-day shops are head and shoulders over the old shops. When I first came west the first shop I struck (not a railroad shop) was one babel of profanity from morning till night; intemperance and scamping tricks were usual, and the prevailing idea seemed to be to curse the work through somehow. It was a big shop, too. I do not need to go to that shop to-day to testify that no such conditions prevail. I know that it is clean-mouthed, that the curses have given place to quiet and effective thought. I know that the best man is not the biggest drinker, kept because brains were so scarce that even an intoxicated brain could not be let go. I know that temperance is the invariable rule and that there is more gentleness and higher intelligence in every rank of work from manager to helper. I know these things without going to verify them because I know the old conditions would not be tolerated in any American shop. I know that this shop, now much bigger than before, is "right down in front" with modern shop tools and system, and is itself one of the largest producers of labor-saving machine tools for railroad shops. The rest follows. Not more surely does freedom (under constitutional law) follow the flag, than do good morals follow improvements in shop tools.

The railroad machine shops are great leaders in the south and west. They are the most important factor, furnish the chief reason for existence of most of the western machine tool works and in discipline and system of management take a leaf from the order of the great railroad systems to which they belong and contribute its practical values and methods to the benefit of general shop practice.

It is no small achievement to keep such organizations "in tune" and harmony, working with the highest efficiency, and the difficulty of the task is increased by the fact that the work is largely repair work, always abounding in variations and exceptions which interfere with efficiency and make the problem of work very different from that which obtains in a manufacturing system for new machinery. Nowhere else is such incessant care and vigilance necessary. The general public, riding at ease, little realizes what is necessary in locomotive repairs, that the triple valves must be so often ground to a nice fit lest the air brakes should refuse to work, or that every run in ordinary course a man must go inside the firebox and caulk the ends of the tubes, an incident of the thorough going over and inspection which must be made at every trip. "They are very exacting about these things now," remarked a brake repair man. "If the brakes are not in perfect working order, and if the triple valves will not hold gauged pressures with the minimum loss in a specified time, then the engine cannot go out." Thirty years ago we hardly knew what an air brake was. Westinghouse had a little shop at Pittsburg, hardly as big as this room. He was poor then and his ideas were not much though of."

It is proverbial that the man without music in his soul is ripe for "treasons, stratagems and broils," which in shop practice are covered by one word—"strikes." Charles Dudley Warner in "My Summer in a Garden" at one place advises a "cast-iron back with a hinge in it" as a suitable tool, and at another indulges a fancy of music and refreshment at the end of every hard-hoed row. One of our railroads has even been ridiculed as a "Pinafore" administration. The admiral, it will be recollected, was "very careful of his men," but this insinuation of molly-coddling vanishes before a record of dividends and great work thoroughly done. I recently visited the shops of an entirely different system. There were no melodies to be heard, either ragtime or classical, but there was an atmosphere of harmony and good-fellowship which could be felt, and one of the skilled men said to me: "We all pull together here like a band of brothers." He was a young man, and the enthusiasm of youth had not worn off. "We know we will get fair treatment,, and are encouraged to do our best." The spirit of this shop is the spirit of its master mechanic. But some may ask: Was the shop practice most efficient? Was the discipline good? Emphatically yes. There were more ingenious devices to the same floor space than in any other railroad shop I have visited, and some of them were doing remarkably effective work. The zeal to break records was shown by the fact that they had already broken some rather massive tools in the effort to use the new tool steel to the limit of advantage.

I make no apology for introducing this matter under railroad shop tools, because it is impossible to get an understanding of our shops without it. The adage, "Speak softly and carry a big stick; you will go far," has recently been quoted with approval by our strenuous president. The "new masters" may do this; it may be necessary with men who are not educated in fairmindedness, but the best practice by and with the best men is to make no pretense, but to show with strong necessary rule, a good heart and a fair mind in encouragement of all brains in the service.

The early settlers who had to plant maize with a flintlock in one hand looking for Indians had to pursue agriculture under difficulties, and the works manager who has to carry a gun looking for labor troubles is at similar disadvantage. It is encouraging to believe that intelligence will overcome all such threats. Intelligence has other uses than the device of mechanism. It provides reasonableness which is necessary for the harmonious working of shops, and with which we will be able to make more improvements in the machine tools themselves

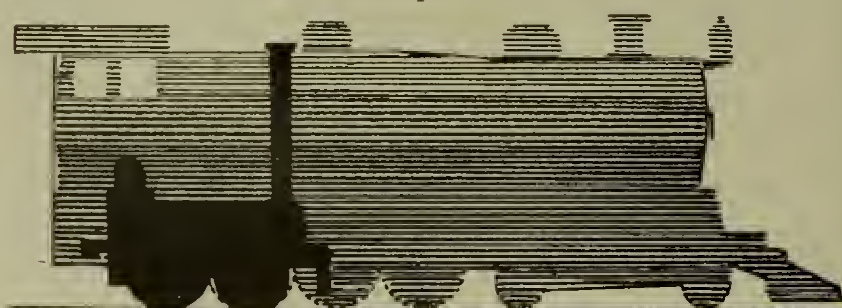
The importance of this can be realized by looking back to peon labor, the labor of the brutal man requiring the urgency and restraint of force to maintain the simplest continuous work. Fine tools are not possible with such men, and while harsh measures can control them their work is low grade. There is something like tempering steel in men, a critical point between force and intelligence. That critical point was once thought to be the limit of work, but we have found that we can go beyond it securely and produce better results. The critical point with men comes when they are tempered to such fiber that they are too shrewd to be safely governed by force and too stupid to be allowed to govern themselves by intelligence. In the future government by intelligence will prevail and improved shop tools will strengthen it.

In 1881 I was at the Dickson Locomotive works looking for data and improvements in shop tools. A foreman there said: "In 1870 we had fewer tools and about three times as many men in the shops to do the same work." Here we are in 1903. Vastly more and better tools, more shops, better men. I venture to state my belief that if we could measure off an average man from the shops of 1870 against the average man of the shops of to-day we would find the latter heavier, larger and better built and nourished in body, and with a distinctly heavier and better organized brain.

It is extremely difficult for a man harrassed by a multitude of executive details to use inventive thought in the development of new plans. The effort is postponed by the tired brain because its docket is full and it is not large enough to reach out with new ambitions. Invention, which for our purpose is typified by the railroad shop tool, is accomplished inevitably by a growth in the weight of human brains. They go together.

It is thought which makes its way in giving form to steel, and the provision of ways of thought, the excitation of effort for improvement bringing latent brain power into play is of no small value in practical management. The American shop which is not designed with a view of expansion in floor space would fail in the first usual consideration, and any provision of system which encourages inventions such as cause two blades of grass to grow in the place of one, or one foot of floor space to serve the utility of two, is equally practical.

I was recently present at a little industrial senate of the foremen and heads of departments of a railroad shop, holding its regular weekly meeting to adjust and settle points coming up from time to time, keeping the master mechanic fully advised and all departments working together as a whole. Such meetings may not be essential to the management of a shop. Some large shops are managed through systems of report without any such formal conventions, but conventions have certainly been the Anglo-Saxon habit from the earliest historic records of village communities and tribal government down to the present day conventions of trade societies and the legislative work of state and nations. It may be argued that this method in management is not economical, that much time is lost, and many superfluous laws and rules are made, that councils are weak and hesitant in action—the saying is that "councils of war never fight," that a few men do the thinking in all such associations, and we must still look to the individual will and authority of a strong executive for good practical results. Still, conventions are prudential, they check off errors of judgment, and promote harmony. Even the man who does the thinking is a powerless philosopher by himself. He needs to come into convention to put his thought to use and



THE GROWTH OF THE LOCOMOTIVE.

keep it in touch with his environment. It is a psychological fact that thought tends to harmony and agreement. The only thing which appears to the contrary in discussions and arguments is not thought, but feeling which gives rise to prejudices. Whether the process be carried on in a jury room or a tool room decisions are reached, and practical progress is made by dissolving solid prejudices in liquid thought.

Another matter of comment in such meetings of foremen is that each foreman is to some extent taken into a committee of the whole in discussion of details of other departments than his own. This is a useful feature in the machinery of shop government because new and good ideas do not always come from the man most used to a given work, to whom certain practices have become as the laws of the Medes and Persians which alter not, and who believes that he knows all about it. He may for years have been looking at a thing and seeing just that *absolute* thing. A man used to different things does not accept it without making comparisons. He sticks a "why" into it as a lathe operator puts the nose of a tool into steel, and a new form is the result.

The great shops which are built on each division of every large railroad system are not primarily essential to the work done in them. They are economic expedients put in to save money by centralization of work just as a central power plant is put in instead of a number of small steam plants.

The work of repair which they do using heavy tools and doing the work upon numbers of engines running into the hundreds under one roof is also done with very light portable tools in small repair shops and upon single engines. The great shop is therefore in its inception a venture of economy.

We have spoken of the locomotive as a unit. A good idea of the growth in size and weight of what we call a locomotive is afforded by the sketch herewith presented in which the outline of the first locomotive made at the Baldwin Works is shown in silhoutte against the outline in shadow of one of a few numbers beyond the twenty-thousandth produced at the same works. Old Ironsides against a modern decapod. We notice that the size of drivers is little changed, being 54 inches in diameter in Old Ironsides and 55 inches in the decapod, although drivers of much larger diameter (up to 80 inches) are used on modern passenger engines. The equipment of the machine has grown in complexity as well as in size. Complexity costs money, and to pay for it substantial advantages ought to be gained. We emphasize the contrast between these locomotives because statistics show that it takes a few more men for a year on average to build the modern locomotive than the ancient one, as well it might even with great gain in shop economy. We see that while much labor has been saved by use of improved shop tools, it has gone into elaboration of details introduced to obtain greater safety, convenience and efficiency, and into the much greater weight. Old Ironsides was contracted at $4,000, but Baldwin finally got only $3,500 for it. Judging from the present cost of farm traction engines it might now cost about $1,200. In 1880 the average usual weight of an engine and tender was considered to be 45 net tons and the materials entering into it were 32 per cent cast iron, 18 per cent bar and hammered iron, 9 per cent boiler iron or steel (about one-fifth of which was in the firebox), 8½ per cent steel tires, slides, springs, etc., 7 per cent wheels, 7 per cent wood for cab, tender and lagging, 5 per cent axles and connecting rods, 4 per cent flues, 3½ per cent tank iron, 2 per cent lead, tin, copper, smoke pipe, glass and fittings, 1½ per cent bolts and rivets, 1½ per cent cast and sheet brass, and 1 per cent sheet iron. Passenger engines have now reached a maximum of 110 net tons for total weight, and while we have not statistics at hand there is no doubt a larger proportion of this weight in the boiler steel, staybolts, rivets and flues, and especially in the material of the fire box, and relatively less in the machinery and fittings. All this increase adds to the task of maintenance. The indispensable air brakes for example create a new department of work, and a separate repair shop, and every additional improvement of this kind makes the machine more vulnerable and depreciable, and in fact makes necessary the centralization of repair work in great shops equipped with facilities for doing a great variety of work on a large scale, and with storehouses for interchangeable repair parts.

The shop tools for the work are repair tools, but they are for repairs on a larger scale than in any other line except shipbuilding, and repairs of such frequency and uniformity that they can be executed in an effective manufacturing system unexampled in other work of machine repairs.

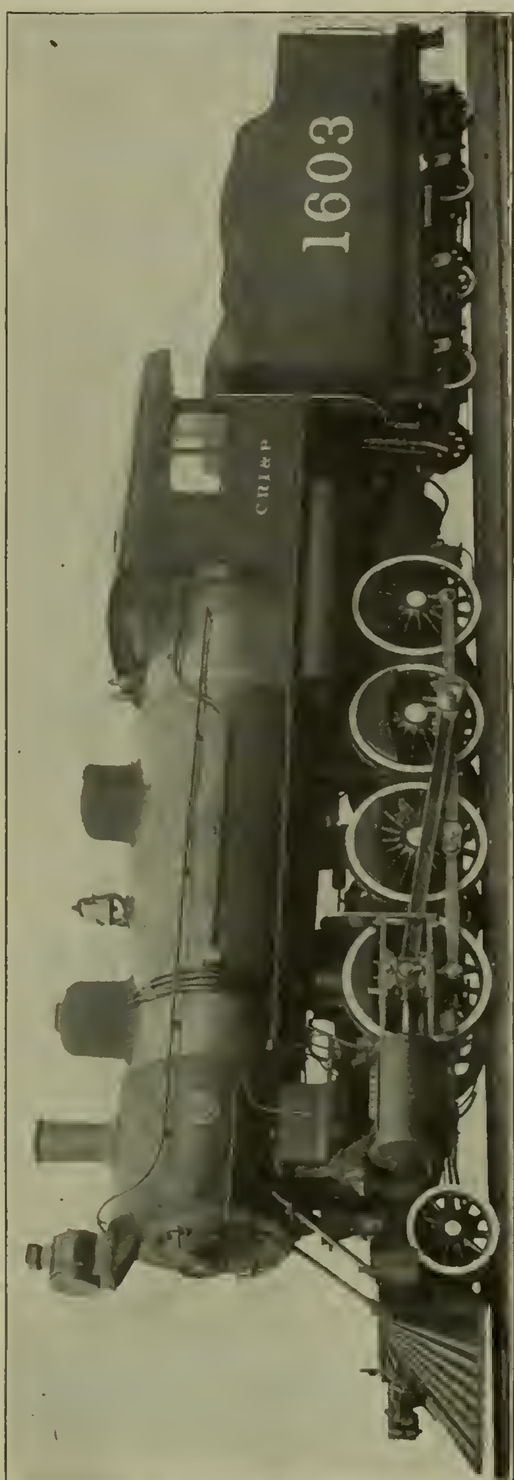
Freight Locomotive--Chicago, Rock Island & Pacific Railway

THE accompanying illustrations represent a type of 2-8-0 freight locomotive recently built by the Brooks Works of the American Locomotive Company for the Chicago, Rock Island & Pacific Railway, designed to operate under 200 lbs. boiler pressure and burn bituminous coal within a wide fire-box. The boiler is of the radial stayed extended wagon top type, having three rows of sling stays; the back sheet and front flue sheet are braced with plate braces; there are 383 charcoal iron tubes arranged with 2 29-32 inches pitch, 2 inches in diameter and 15 feet 6 inches long over tube sheets; there are two rows of sling braces at throat sheet. The boiler is mounted upon the frames by means of suitable projections of the mud ring. In consideration of the height of boiler above rail, the safety valves are placed upon a low, auxiliary dome. The length of nigger head and consequent distance of upper portion of steam pipes from flue sheet permit the diapragm to be sloped at an angle which allows a more direct flow of the gases after leaving the end of the flues than usual. This is a very desirable feature, for the position of the diaphragm when too near the flue sheet and when in a nearly vertical position interferes with the passage of gases to an extent which cause them to react from the diaphragm against the flue sheet, necessitating increased strength of exhaust and indirectly affecting the back pressure in the cylinder, consequent upon the reduction in the diameter of exhaust nozzle.

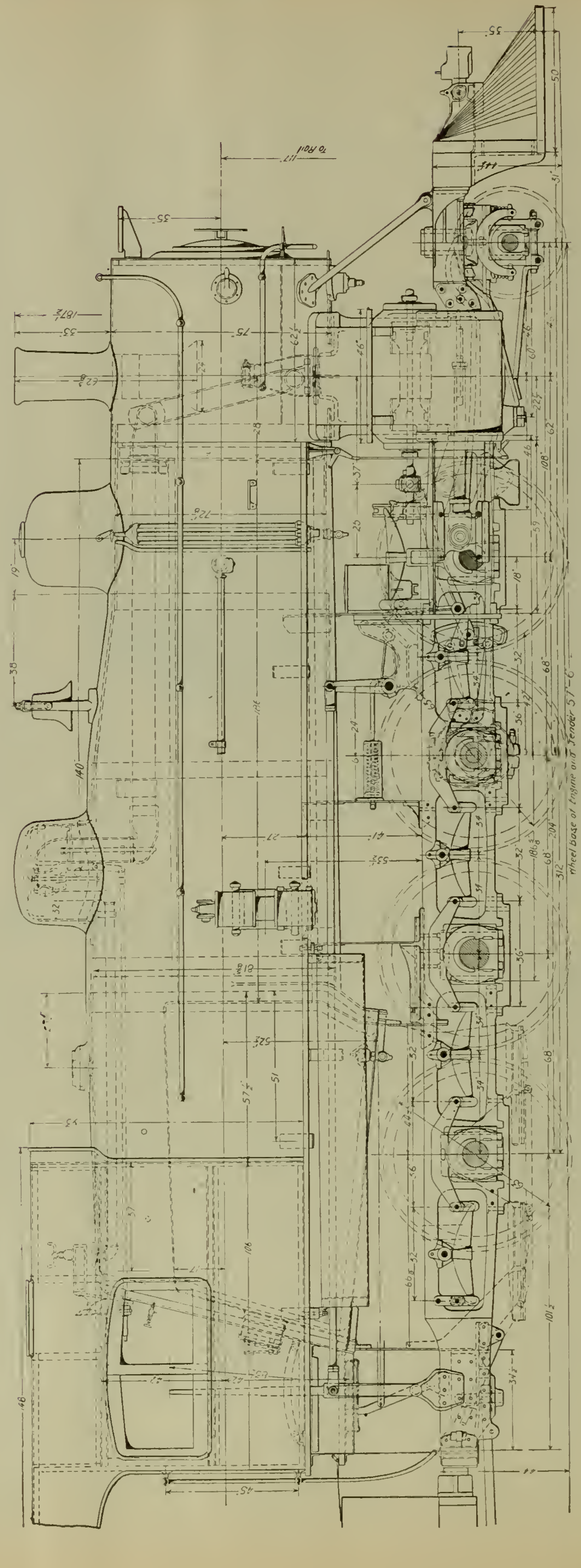
Cast steel is used very generously in the motion work. By reference to the side elevation and sectional view, it will be seen that the lifting shaft stand, yoke knee and support of motion bar hanger are all combined in a single casting.

In order that the reverse lever handle may be placed in a convenient position within the cab, a novel design of lever foot has been introduced. This design is clearly shown in the side and rear elevations, by reference to which it will be seen that the lower portion of the lever, which is of cast steel, is so arranged as to give an offset between the reach rod and handle of the lever.

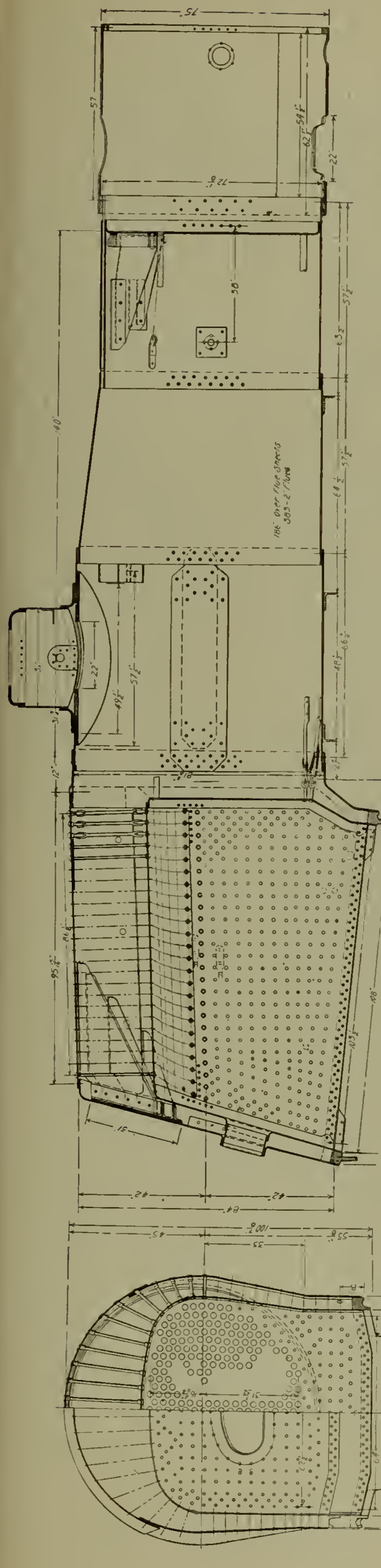
The front end of the forward equalizer, instead of hanging within a tail yoke on the Bissell pin below



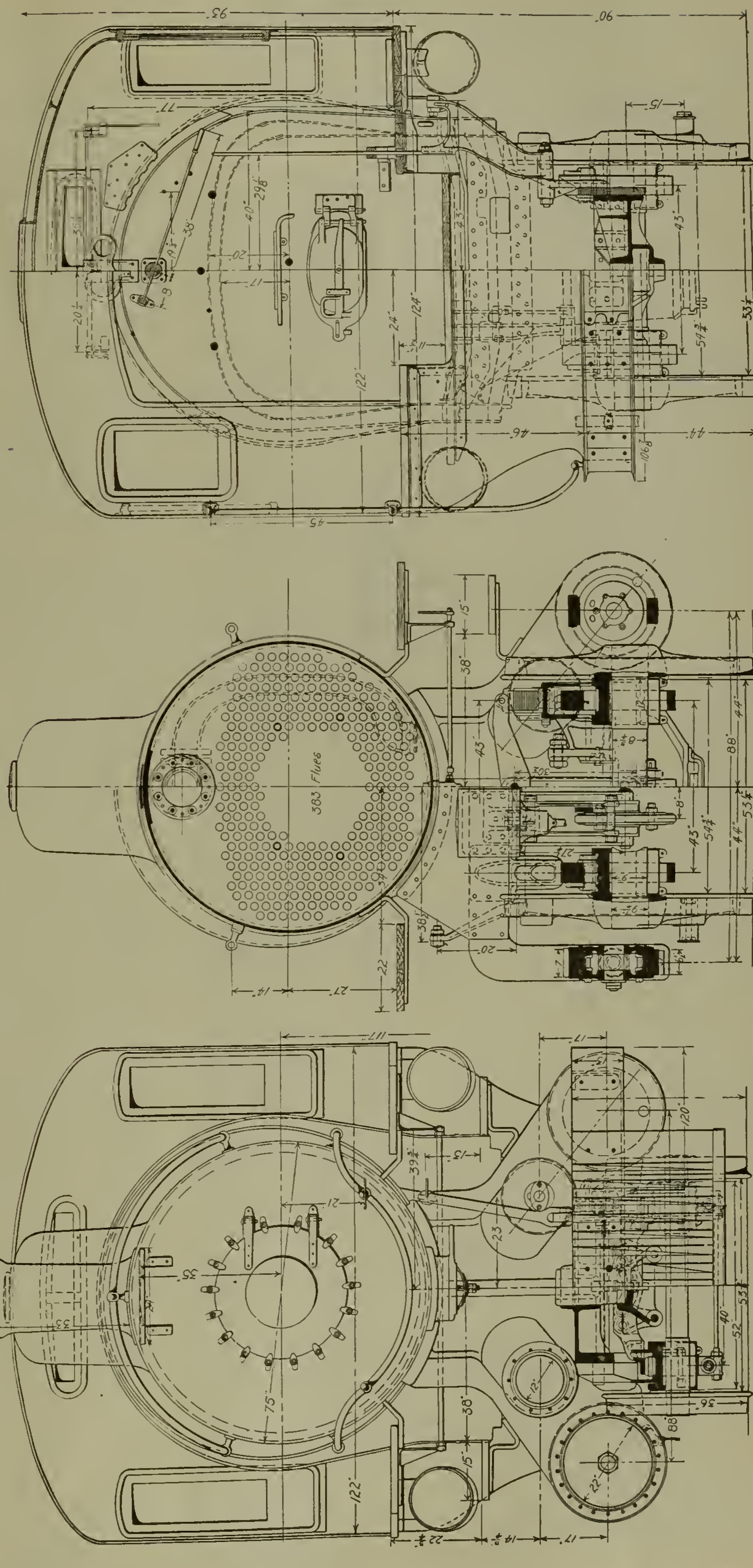
Freight Locomotive, Chicago, Rock Island & Pacific Railway.



Freight Locomotive, Chicago, Rock Island & Pacific Railway—Elevation.



FREIGHT LOCOMOTIVE, CHICAGO, ROCK ISLAND & PACIFIC RAILWAY—BOILER.



FREIGHT LOCOMOTIVE, CHICAGO, ROCK ISLAND & PACIFIC RAILWAY—END ELEVATION AND SECTIONS.

the swing casting, as is the usual practice, is here made to enter the center casting above the swing casting and rest on top of the center pin. The lower end of the arch brace terminates in a pin connection instead of being bolted to the frame by a solid foot. Another feature altered by the height of boiler is the arrangement of the headlight, which here rests upon brackets attached to the front end.

The locomotive is equipped with a Westinghouse 9½-in. air pump on right side of boiler and Westinghouse air brake equipment for tender and train. American outside equalized brakes are supplied to all drivers.

Assuming the mean effective pressure to be 85 per cent of the boiler pressure and determining the tractive effort from given dimensions of cylinders and driving wheels the locomotive is capable of exerting a starting power of 39,180 lbs. The weight on drivers being 182,000 lbs., the ratio of adhesive weight to tractive effort is 4.64; the ratio of tractive effort to total heating surface is 12, and the ratio of total heating surface to grate area is 65.28.

The following table presents the general dimensions and further details of construction:

GENERAL DIMENSIONS.

Gauge	4 ft. 8½ in.
Fuel	Bituminous Coal
Weight in working order	202,500 lbs.
Weight on drivers	182,000 lbs.
Weight Engine and Tender in working order	347,500 lbs.
Wheel Base, Driving	17 ft. 0 in.
Wheel Base, Rigid	17 ft. 0 in.
Wheel Base, Total	26 ft. 0 in.
Wheel Base, Total, Engine and Tender	57 ft. 6 in.

CYLINDERS.

Diam. of Cylinders	22 in.
Stroke of Piston	30 in.
Horizontal thickness of Piston	7 in.
Diam. of Piston Rod	4 in.
Kind of Piston Packing	Snap Rings
Kind of Piston Rod Packing	Metallic
Size of Steam Ports	2 in. x 29 in.
Size of Exhaust Ports	65 sq. in.
Size of Bridges	3⅜ in.

VALVES.

Kind of Valves	Piston
Greatest Travel of Valves	5 13-16 in.
Outside Lap of Valves	1 in.
Inside Lap of Valves	0 in.
Lead of Valves in full gear	—3-32 in.
Kind of Valve Stem Packing	Railway Company's
Transmission Bar	With

WHEELS, ETC.

No. of Driving Wheels	8
Diam. of Driving Wheels outside of Tire	63 in.
Mat'l of Driving Wheel, Centers	Cast Steel
Thickness of Tire	3½ in.
Tire held by	Shrinkage
Driving Box Material	Cast Steel
Diam. and Length of Driving Journals	10 & 9 in. dia. x 12 in.
Diam. and Length of Main Crank Pin Journals	7 in. dia. x 7 in.
Diam. and Length of Side Rod Crank Pin Journals	7½ in. dia. x 5 in.
Section of Rods, Main, I Side	Double Fish Belly
Engine Truck, kind	Radial & Swing
Engine Truck, journals	6 in. dia. x 12 in.
Diam. of Engine Truck Wheels	36 in.
Kind of Engine Truck Wheels	McKee-Fuller

BOILER.

Style	Radial Stayed Extended Wagon Top
Outside diam. of first ring	72⅛ in.
Working Pressure	200 lbs.
Mat'l of barrel and outside of fire box	Carnegie
Thickness of plates in barrel and outside of fire box	¾, 25-32, 13-16, 9-16, ½, ¾, ½ in.
Horizontal Seams	Sextuple butt
Circumferential Seams	Double
Fire Box, length	108 in.
Fire Box, width	68 in.
Fire Box, depth, Front	75½ in., Back 61½ in.
Fire Box, material	Carbon Acid Steel
Fire Box plates, thickness	sides ⅜, back ⅜, crown ⅜, tube sheet ⅝
Fire Box, Water Space	front 4 in., sides 4 in., back 4 in.
Fire Box, Crown Staying	1 in.
Fire Box, Stay Bolts	1 in.
Tubes, material and gauge	Charcoal Iron, No. 11 B. W. G.
Tubes, number	383
Tubes, diam	2 in.
Tubes, length over tube sheets	15 ft. 6 in.
Heating surface, tubes	3087 sq. ft.
Heating surface, fire box	177 sq. ft.
Heating surface, total	3264 sq. ft.
Grate surface	50 sq. ft.
Grate, Style	Rocking
Ash Pan, Style	Hopper
Exhaust Pipes	Single
Exhaust Nozzles	5½ in. dia.
Smoke Stack, inside diameter	16¾ in.-15 in.
Smoke Stack, top above rail	15 ft. 7½ in.
Boiler supplied by	2 No. 11 Simplex

TENDER.

Style	8 Wheel
Weight, empty	57,220 lbs.
Wheels, number	8
Wheels, diam	33 in.
Journals, diam. and length	5½ in. dia. x 10 in.
Wheel Base	18 ft. 0 in.
Tender Frame	13-in. Channels
Tender Trucks	Brooks
Water Capacity	7,000 U. S. gallons
Coal Capacity	15 tons.

Brake—Westinghouse automatic air brake equipment for tender and train service with 9½-in. pump on right-hand side. American outside equalized brakes on all drivers.

April Meeting of the St. Louis Railway Club

FRIDAY evening, April 10, the club was called to order by President John J. Baulch at the Mercantile Club, St. Louis. Before the presentation of the papers of the evening a communication was read from H. P. Barnard, the recipient of the St. Louis Railway Club scholarship at Purdue University, and a communication from President M. E. Stone, of Purdue University, in which he included a report of Mr. Barnard's work during his first semester, complimenting the young gentleman's pursuance of his course, a report which proved very gratifying to the members of the St. Louis Railway Club. Another gratifying report was made by President Baulch, in which he spoke of the progress being made by the young gentleman who was educated by the club at Blee's Military Academy. This young man is now engaged in railroad work and is progressing in a manner creditable to himself and those responsible for his educational training. The first subject of the evening was presented by Dr. H. C. Fairbrother, who, in a most interesting manner, set forth the advantages to the railroads, the employees and the public by the maintenance of efficient surgical departments among railroads. Following the remarks of Dr. Fairbrother, President Baulch presented an able and instructive paper describing St. Louis Terminals up-to-date, showing the growth of terminals in St. Louis and East St. Louis, and touching upon the facilities for handling both freight and passenger traffic at the coming World's Fair.

At the conclusion of Mr. Baulch's paper, reports were presented by the several officers of the club. At this meeting the annual election of officers took place the ballot resulting as follows: President John J. Baulch, traffic manager, Interstate Car Transfer Company; first vice president, J. W. Luttrell, superintendent of motive power, Missouri Pacific Railway; second vice president, W. M. Prawl, manager of the Central Car Service department of St. Louis; third vice president, B. W. Frauenthal, manager of Bureau of Information, Union station, St. Louis; secretary, E. A. Chenery, superintendent of telegraph, Terminal Railroad Association of St. Louis; treasurer, S. G. Scarritt, vice president of the Scarritt-Comstock Furniture Company. The following gentlemen were elected members of the executive committee: E. S. Marshall, president of the Republic Railway Appliance Company; and Charles Waughop, chief joint car inspector Terminal Railroad Association of St. Louis. At the close of the meeting an enjoyable lunch was served to the members and guests present.

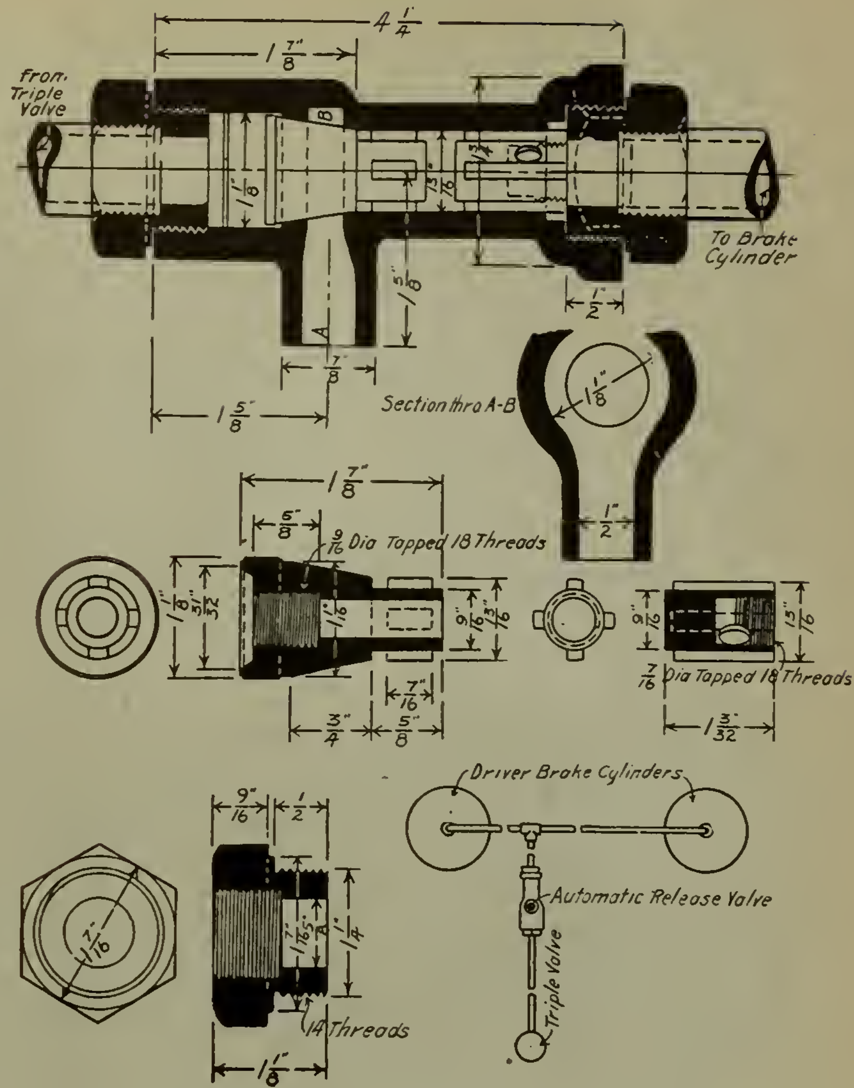
Automatic Release for Driver Brake Cylinders

THE accompanying line drawing illustrates an automatic release valve, the object of which is primarily to obtain a quick release of the brakes without having to resort to the straight air equipment. With this device all the automatic features of the air brake are retained and no additional parts, save the valve, are required.

As shown in drawing the device is placed on the pipe leading from triple valve to brake cylinders. When the brakes are being applied the air passes through the valve direct to the brake cylinders and when they are being released the air is exhausted direct to the atmosphere instead of the triple exhaust. The brakes can be released in from four to five seconds, or, retarded to any desired extent at the will of the engineer.

The device has been in operation on the Grand Trunk Railway System for over a year, and the results have been so satisfactory that it is now applied to all of that company's switching power.

The device is simple in construction and costs practically nothing to apply and maintain.



AUTOMATIC RELEASE FOR DRIVER BRAKE CYLINDERS.

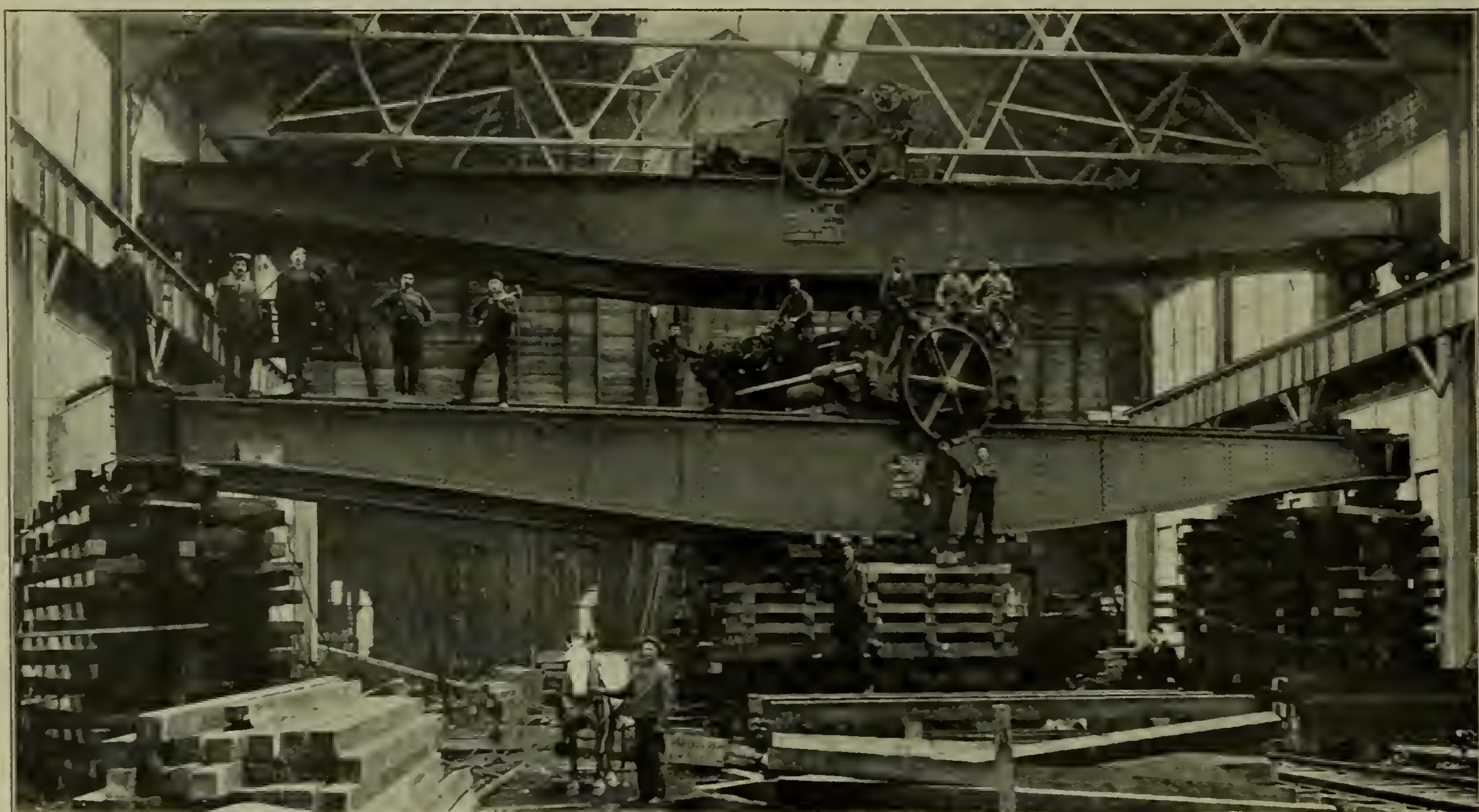
In addition to its use on locomotives it would form a valuable feature on street cars equipped with air brakes, where a quick release of the brakes is desirable.

The device is patented, and is the invention of J. Farrar, of the motive power department, Grand Trunk railway, Montreal.

An English company has recently delivered to the North Eastern Railway "the largest train of high capacity bogie mineral wagons that have ever traveled in the United Kingdom." It consisted of 25 steel cars, each with a capacity of 40 tons of coal, and weighing only 16 tons. The train when fully loaded would carry 1,000 tons of coal, the tare weight being only 400 tons, and the total length of the train was only 975 feet, exclusive of engine and brake van. While the British railways are busily explaining that, on account of the opposition of shippers, they cannot use cars of high capacity, they are gradually building such cars and putting them into the company's own use.

Elevation of Traveling Cranes at the Fort Wayne Shop

ILLUSTRATED herewith is a novel method of elevating heavy cranes into position upon their supporting girders. The cranes referred to have been recently put into commission to serve the machine and erecting floors of the Fort Wayne Shops of the Pennsylvania Lines West of Pittsburg. The work of elevating them was undertaken and successfully accomplished by Mr. W. H. Roney, a civil and contracting engineer of Chicago, to whom we are indebted for the accompanying illustrations. Rather than go to the expense of purchasing necessary tackle equipment for swinging the cranes, it was decided to raise them with jacks, sufficient timber being on hand to supply the necessary blocking.



Elevation of Traveling Cranes with Jacks, at the Fort Wayne Shops of the Pennsylvania Lines.

The crane girders were run into the shop on flat cars and left standing in such a position that they were parallel with the length of the shop. In order to remove the girders from the car a pile of blocking was arranged near the car at such height that skids could be supported on the blocking and car respectively, and each girder was slid individually from the car to the pile of blocking. The individual girders were then jacked up and placed on a temporary wooden carriage resting upon the original blocking, in which position they were assembled. The parts of the motor trolley were then assembled and placed in position upon the girders forming the traveler.

Beneath the temporary wooden carriage a wrought iron ring, 12 ft. 10 ins. in diameter, was placed, several iron plates being arranged upon the ring, and well greased, so that the carriage might be partially revolved to such a position that when elevated, the corners of the crane would just clear the runway girders.

In this position, blocking was arranged under each end of the crane and by means of jacks and the continual addition of blocks, the crane was elevated to a height sufficient to reach the runway girders. During the elevation of the crane the center pile of blocking, shown in accompanying illustrations, was built up as the elevation of the crane permitted. Upon reaching the height of runway girders, the weight of the crane was again allowed to rest upon the center pile of blocking and the crane then revolved to a position in which it could be lowered upon the trucks. When the weight of the crane was finally placed upon the trucks it was found that the elasticity in the blocking was such that it was necessary to jack up the crane a distance of 12 ins. in order to remove the blocking.

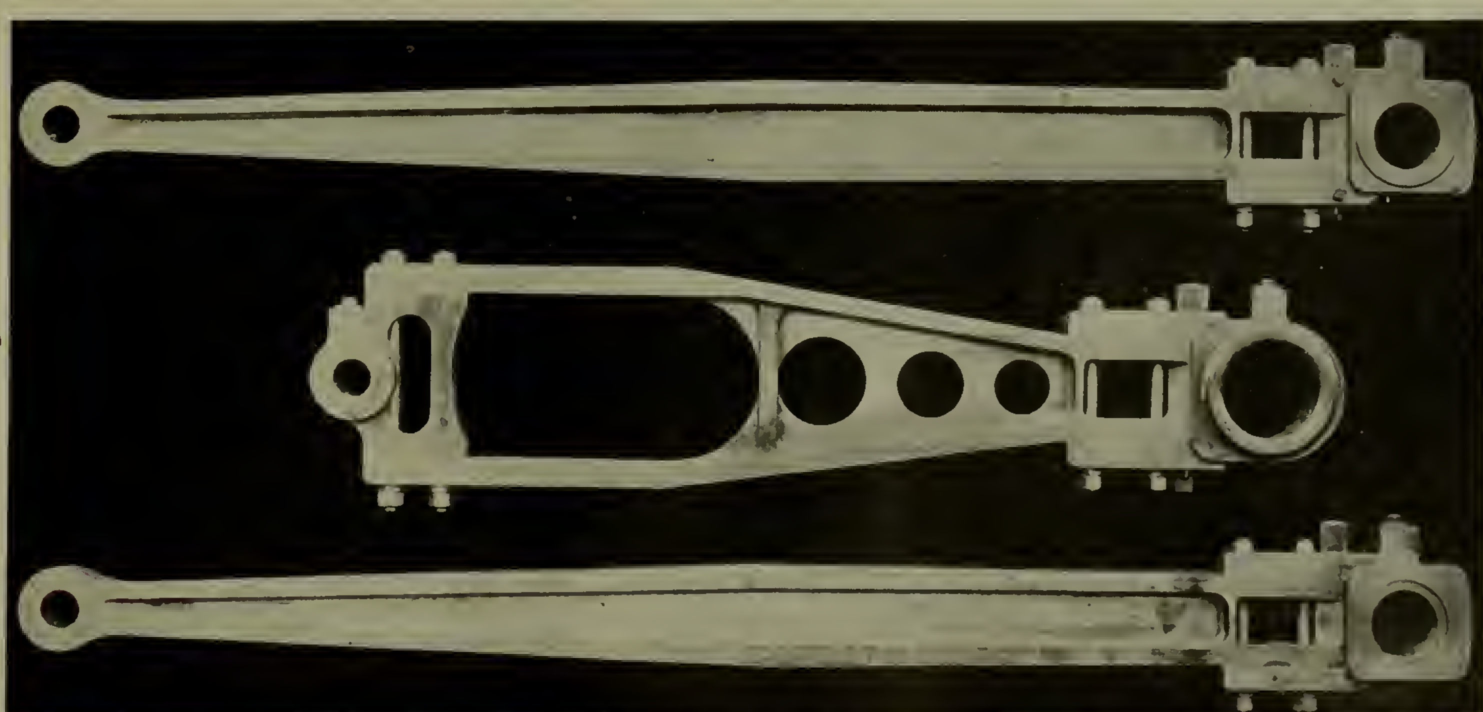
The cranes were manufactured by the Morgan Engineering Co., Alliance, Ohio. Each crane has a lifting capacity of 75 tons and is supplied with two auxiliary lifts of 10 tons each. The weight of each crane is 126 tons; distance between centers of runway is 76 ft.; there are five motors on the motor trolley, the limit of travel of which is such that material may be lifted at a point 8 ft. from either wall.

Elevation of Traveling Cranes with Jacks, at the Fort Wayne Shops of the Pennsylvania Lines.

Heavy English Locomotive

THERE appeared on page 136 of our March issue a description of a heavy 0-10-0 tank locomotive designed by Mr. James Holden, locomotive superintendent of the Great Eastern Railway (England); through whose courtesy we are now enabled to present an illustration of the locomotive, together with further details of construction.

This engine has been designed to give an accelerated service on the suburban system of the Great Eastern Railway, particularly between Liverpool street and Enfield. This portion of the line is 10½ miles long, with sixteen stations. It has hitherto been worked by engines which are capable of attaining a speed of 20 miles an hour, 30 seconds from the start, with a train of fifteen coaches, equal to a gross load of about 200 tons. Owing to the rapid growth of the



Heavy English Locomotive — Main Rods. The Inside Rod is Designed with Two Arms in Order to Clear the Forward Axle.

Heavy English Locomotive—Jointed, Trailing Side Rod, Permitting Lateral Motion of Rear Drivers.

population in this district in recent years, it has been necessary to take some extra steps to deal with the traffic. Some years ago the coaches were widened, with the result that each train had an increased carrying capacity of nearly 21 per cent. Difficulties, however, still arise, to meet which the heavy tank engine has been designed. The ten wheels coupled engine will have a very high acceleration, which will enable it to pull a 50 per cent increased load and attain a speed of 30 miles an hour at 30 seconds from starting, saving about ten minutes on the journey and thus allowing a more frequent service of trains.

Among the interesting features of this locomotive is the design of inside main rod and trailing side rods. The inside main rod is designed with two arms in order to clear the forward axle, one arm passing above this axle and one below. At the cylinder end the two arms are connected to a block which forms the cross head connection. In order to obviate an excessively long rigid wheel base the driving boxes of the rear drivers are allowed lateral movement against the shoes, and to allow for this movement the trailing side rods are jointed, as shown in accompanying illustrations. No trouble has been experienced from hot brasses caused by the movement permitted in this rod.

The principal dimensions of the engine are as follows:

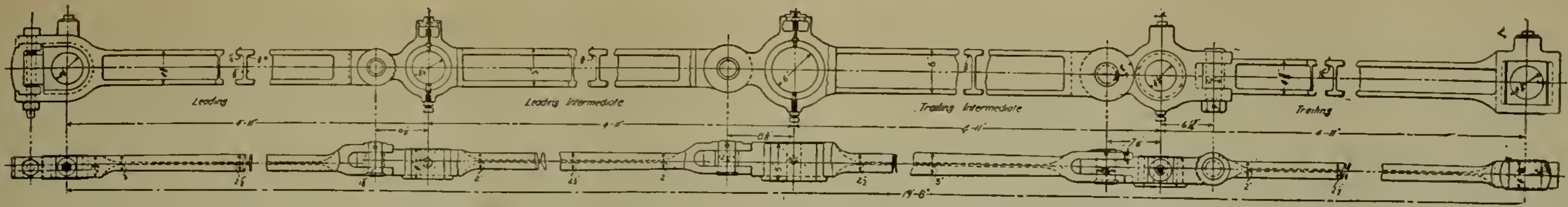
BOILER.

Length of barrel	15 ft. 6¼ in.
Length between tube plates	15 ft. 10⅞ in.
Mean inside diameter	5 ft. 3 in.
Working pressure, 200 lbs. per square inch	
395 steel tubes, external diameter	1¾ in.

FIREBOX SHELL

Width outside	7 ft. 9½ in.
Length outside	6 ft. 9½ in.

Heavy English Locomotive Designed for High Acceleration in Suburban Service.



HEAVY ENGLISH LOCOMOTIVE—SIDE RODS.

INSIDE FIREBOX.

Copple, plates	⅝-in. thick
Length inside	6 ft. 0 in.
Width inside	7 ft. 0 in.
Bronze stays	1-in. diam.

HEATING SURFACE.

External heating surface of tubes	2,878.3 sq. ft.
External heating surface of firebox	131.7 sq. ft.
Heating surface, total	3,010.0 sq. ft.
Grate Area	42.0 sq. ft.

CYLINDERS.

Three high pressure, two outside frames and one between frames on center line of engine.

Diameter	18½ in.
Length of Stroke	24 in.
Centers of outside cylinders	6 ft. 8½ in.

WHEELS.

Ten, all coupled.

Diameter	4 ft. 6 in.
Wheel base, equally divided	19 ft. 8 in.
Length over buffers	37 ft. 9 in.
Total weight in working order	156,500 lbs.
Adhesive weight	156,500 lbs.
Mean Tractive Effort (Mean Effective Pressure taken at 80 per cent of Boiler Pressure)	36,507 lbs.
Adhesion at 500 lbs. per ton	39,125 lbs.

Leaky Flues

BECAUSE of the frequency with which leaky flues occur in locomotive boilers and the consequent interest in any investigation of its cause, which might lead to the reduction of such defects, the following remarks of Mr. C. W. Cunningham, master mechanic of the Chicago, Rock Island & Pacific Railway, before the Iowa Railway Club, appear worthy of repetition:

Our engines have been increased in size almost double to what they were a few years ago, necessitating longer fire-boxes and longer flues in order to get the required amount of heating surface. The steam pressure has been increased from 40 to 50 per cent, which causes the strain on the flues to be much more severe. There has been no particular change or provision made for the increased steam pressure as far as the flues are concerned. A great many roads are still using the same gauge of flues, and practically the same kind of material as was used years ago in small engines that carried a steam pressure of 125 to 150 lbs.

I think the additional length of flues in large engines, without any support only at flue sheets, has something to do with flues leaking in fire-box, for the reason that the constant vibration caused by the jar of the engine while running has a tendency to loosen the flues in back sheet. The question then arises, why they do not loosen at both ends, or in other words, the front end as well as the fire-box end. This, I think, can be easily accounted for. As a rule they are secured in front end by expanding them in sheet without the use of a copper shim or ferrel, it is often the case, however, that a shim of sheet iron is used, which is practically the same as expanding the flue in the sheet, as with the shim, it would be considered that they would be as secure with it as without. Also the temperature in front being more uniform, the flue is not so liable to loosen in sheet, whereas the flues in fire-box end are secured with a copper ferrel between it and the sheet. The copper being a great deal softer than the iron, the vibration has a tendency to cause them to loosen. When this occurs, I believe that with the high steam pressure engines the back flue sheet is sprung outward, causing the beads on the flues to straighten out to some extent. By examining engines after they have been cooled down in round house, I have found the outer edge of the beads to be 1-16 to ⅛ of an inch from sheet, and in some cases will exceed this near center of sheet. Of course, this is more noticeable on flues that have been expanded a few times, but not so much but what they would be considered in fair condition. I am of the opinion, that if sufficient stay rods were placed in boilers of large engines between flue sheets to support them and take a large per cent of the pulling strain off the flues, it would lessen the trouble to a great extent, not only would it assist in keeping flues tight, but would avoid a great many pieced flues in giving way in weld, which causes trouble as well as flues leaking. A center support or rest for the long flues would be beneficial also.

Will further state that flues are often caused to leak by firemen not being particular in keeping coal in front end of fire-box in order to keep a bright fire there at all times, which would prevent the cold air from coming in contact with the flues. A poor fireman, or one that does not realize the importance of this matter, can cause a great deal of trouble, as our engines of late years have been worked to their full capacity and it does not require but a very short time for the fire to die down in the front end of box, thereby allowing the cold air to come in contact with the flues which makes them contract and leak. In fact, I believe it frequently occurs where brick arches and poor fuel are used the fire-box will fill up near arch and the result is that fire is banked at this point and will therefore become dead in front end of box for lack of fuel.

We can also attribute some of this trouble to round house men as well as firemen. If hostlers and fire knockers are allowed to use the blower to its full capacity in knocking the fire out of engines after arrival it will cause the flues to leak quickly as anything I know of. For instance, an engine arrives at terminal with flues dry and from all appearance in good condition before fire is knocked out, and is found to be leaking after being put in house, you can figure nine cases out of ten that the leaky flues are caused by the blower. To a great extent, the knocking of a fire is detrimental to the flues, therefore there cannot be too much care exercised in doing this work.

Poor workmanship on flues by boilermakers cause trouble also. The flues will start leaking shortly after an engine leaves her terminal after being worked on. This is generally caused by flues being calked only and not expanded in sheet. This is a matter that must be followed up closely as it can cause much trouble on all classes of engines.

Improved Drill Chuck

THE use of high speed tool steel in connection with drill presses and air motors is facilitated by a type of drill chuck recently designed. As represented in the accompanying illustration, this chuck consists of a sleeve into one end of which is screwed the shank and at the other end is the mechanism for holding the tool rigidly in position. The interior of the sleeve is threaded for nearly its entire length and a plug similarly threaded operates therein. This plug offers a bearing surface to the upper end of the tool, holding it solidly against the work. This plug is supplied with a slot, by engaging which it may be revolved and its position changed within the sleeve as the tool is worn away. Within the lower end of the sleeve is fitted a bushing which guides the tool, the inside diameter of the bushing being made to fit the tool closely and the bushing being changed to correspond with each size of tool applied to the chuck. A slot is milled diametrically across the lower end of the sleeve, including a portion of the bushing. The chuck jaws are so formed that a lug attached to each jaw fits within this slot keeping both the jaws and bushing from turning. As the jaws clamp the tool, the tool in turn is held rigidly in position. The jaws are tapered towards their lower ends and pressure is applied to them by a nut, the interior of a portion of which is given a similar taper. The nut is applied to the lower end of the sleeve by a corresponding thread on the outside of the sleeve. As the exterior of the nut is turned cylindrical in form, a slot is milled thereon in which to engage a spanner wrench when the nut is applied or removed.

The tool used in connection with this chuck is merely a flat bar of high speed tool steel, the edges of which are ground to form arcs of a true circle, backed off for clearance, and on one end of which are ground two lips similar to the cutting edges of a twist drill.

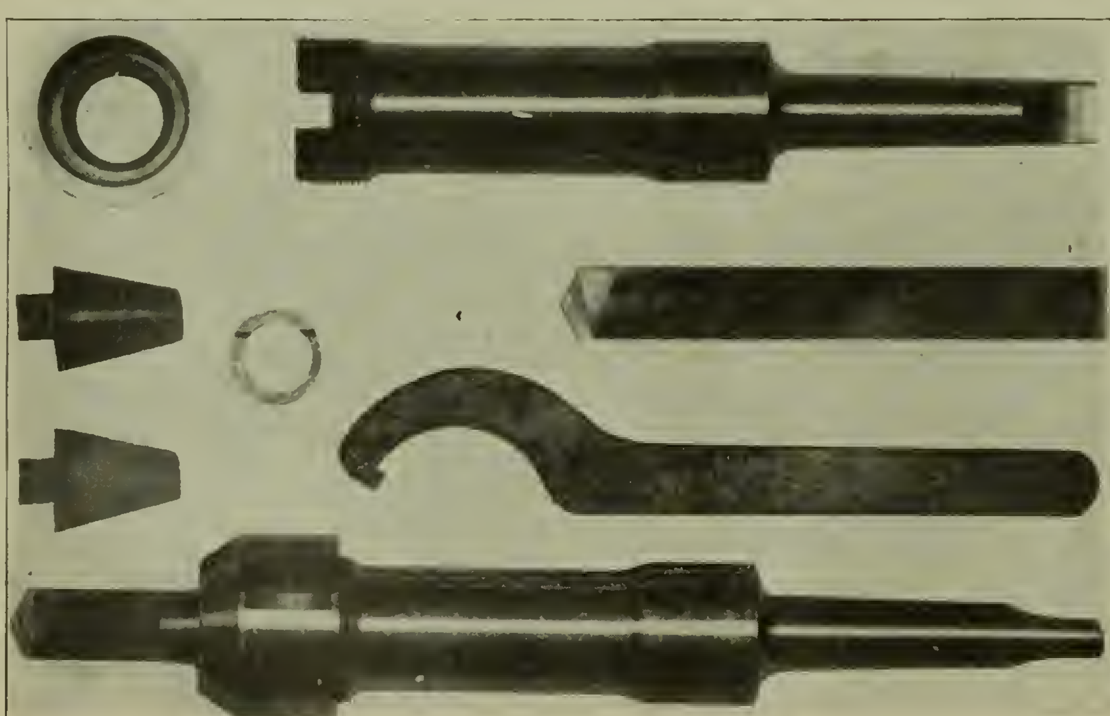
A desirable feature of this device is the fact that the length of tool exposed to twisting strains may be governed be the length of tool necessary to penetrate the given thickness of work and the length of the tool may be readily varied as desired without the necessity of exchanging the actual tool. By varying the position of the plug above referred to within the sleeve, the greater part of the tool may be encased within the sleeve or extended beyond the jaws as necessity requires.

The shank of the chuck is made to fit the spindle of the drill press without the necessity of a socket and is made in standard Morse tapers. With the exception of the jaws, the entire chuck is made of hard axle steel. The jaws are made of tool steel and tempered. Different sizes of this chuck are made for different sizes of drill press and small chucks are made to be used in connection with air motors. The tools used in chucks for latter purposes vary in size from 5/8 in. to 1 1/8 in., standard sizes.

With a 1 1/4 in drill of high speed tool of the form herein described a speed of 230 revolutions may be successfully maintained, while a twist drill of ordinary tool steel, of same diameter, is operated at speed of about 70 revolutions per minute.

As an indication of the material through which this tool will work successfully, a piece of unannealed tool steel was successfully drilled with a tool of high speed tool steel when a twist drill of ordinary tool steel failed.

By actual observation in a prominent railroad shop in Chicago a tool of this type, made of Sanderson



Patent Pending. IMPROVED DRILL CHUCK.

steel, drilled ten 1-inch holes through a cast iron cylinder head 1¼ in. thick in 25 minutes, including the time necessary to center the holes.

This chuck is manufactured and marketed by the George R. Rich Manufacturing Co., 171 South Canal St., Chicago, Ill.

Personals

Mr. R. P. Leavitt has been apointed electrical superintendent of the Albany & Hudson R. R., with office at Albany, N. Y.

Mr. C. H. Anderson has been appointed master mechanic of the Union Terminal Ry. at Sioux City, Ia., to succeed Mr. W. O. Taylor.

Mr. F. Rummey has been appointed master mechanic of the Ohio division of the Erie Railroad, with office at Meadville, Pa., to succeed Mr. Willard Kells, resigned.

Mr. F. G. Holman has resigned as joint foreman of the Rio Grande Southern and the Denver & Rio Grande railroads at Durango, Colo., and has been succeeded by Mr. C. H. Bean.

Mr. John McNeill, Topeka, Kan., has been appointed road foreman of engines of the Santa Fe coast lines, with headquarters at Los Angeles, Cal.

Mr. John T. Griffin has been appointed road foreman of engines on the Birmingham division of the Southern with headquarters in Birmingham, Ala.

Mr. S. T. Park has been apponted master mechanic of the Illinois Central road at Centralia, Ill., to succeed Mr. J. H. Pollard, resigned.

Mr. G. C. Smith has been appointed master mechanic of the Maryland & Pennsylvania Railroad, with office at Baltimore, Md.

Mr. J. B. Ward has been appointed road foreman of engines of the Cleveland, Akron & Columbus Rd., with headquarters at Akron, O.

Mr. Max Toltz, who recently resigned as mechanical engineer of the Great Northern, has been appointed assistant to the superintendent of rolling stock of the Canadian Pacific at Montreal, Que., with the title of consulting engineer.

Mr. J. D. Keiley has been appointed assistant electrical engineer of the New York Central & Hudson River, with office at New York. Mr. E. L. Broome has been appointed assistant steam engineer, with headquarters at New York.

Mr. David Patterson, heretofore master mechanic of the Denver & Rio Grande at Salida, Colo., has been transferred to Burnham, Denver, Colo., as master mechanic of the First division.

Mr. W. C. Parsons has been appointed superintendent of motive power of the El Paso & Northeastern System, with headquarters at Alamogordo, N. M., to succeed Mr. H. W. Ridgway, resigned.

Mr. W. T. Hudson has been appointed road foreman of engines of the Philadelphia terminal division of the Pennsylvania Railroad, and Mr. W. E. McFarlane has been appointed road foreman of engines of the Monongahela division.

The office of Mr. A. W. Harned, superintendent of motive power of the Chicago Short Line Railway Co., has been removed from Akron, O., to the Schofield Building, Cleveland, O.

Mr. P. Hayden, who was for a number of years master mechanic of the Baltimore & Ohio at Piedmont, W. Va., has been appointed master mechanic of the Morgantown & Kingwood road, with headquarters at Morgantown, W. Va.

Mr. G. W. Rigney, hertofore car foreman of the Baltimore & Ohio Railroad at Garrett, Ind., has been transfered to Zanesville, O., to succeed Mr. H. A. Beaumont, promoted. Mr. F. C. Scott has been appointed general foreman at Newark, O.

Mr. G. W. Tompkins has been appointed master mechanic of the Kanawha & Michigan Railroad at Charleston, W. Va., to succeed Mr. T. M. Downing, who resigned to accept a similar position on the St. Louis, Memphis & Southeastern Railroad.

Mr. Willard Kells has been appointed assistant master car builder of the Union Tank Line Co., with office at No. 26 Broadway, New York. Mr. C. A. Smith, consulting engineer of this company, has resigned.

Mr. T. M. Downing has been appointed master mechanic of the St. Louis, Memphis & Southeastern and St. Louis & Gulf, with headquarters at Cape Girardeau, Mo., to succeed W. B. Warren, resigned.

Mr. George Dickinson has been appointed master mechanic of the St. Louis, Iron Mountain & Southern, with office at Argenta, Baring Cross, Ark., to succeed A. Harrity, resigned.

Mr. John F. Pfeiffer, formerly chief draughtsman of the Brooks Locomotive Works, has been appointed foreman of the locomotive erecting shop of the Atchison, Topeka & Santa Fe at Topeka, Kan.

Mr. J. G. Myers has been appointed superintendent of the motive power and car department of the Nevada-California-Oregon and Sierra Valley railways, with headquarters at Reno, Nev., to succeed Mr. G. W. Tompkins, resigned.

Mr. C. Skinner, who was formerly master mechanic of the Chicago & Alton, has been appointed superintendent of shops and terminals of the Peoria & Eastern division of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Indianapolis, Ind.

Mr. J. B. Kilpatrick, master mechanic of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia., has been appointed assistant superintendent of motive power, with headquarters at Chicago, to succeed Mr. A. L. Studer, resigned.

Mr. E. L. Gibbs has been appointed road foreman of engines of the St. Louis & San Francisco System, with headquarters at Sherman, Tex. Mr. Gibbs' jurisdiction will extend from Oklahoma City, Okla., to Brady, Tex.

Mr. B. Haskell, superintendent of motive power of the Pere Marquette, has resigned, and the position has been abolished. Mr. Haskell was superintendent of motive power of the Chicago & West Michigan and the Detroit, Lansing & Northern before their absorption by the Pere Marquette, and has been with the latter road since February 1, 1900.

Mr. F. S. Scott, who has been foreman of the Baltimore & Ohio roundhouse at Newark, O., for some time, has been promoted to general foreman of the shops at that place, and Mr. George Moriarity has been appointed foreman of the roundhouse to succeed Mr. Scott.

Mr. R. M. Crosby, heretofore general shop foreman of the Chicago Great Western, has been appointed master mechanic of the Oelwein, Ia., terminal, and will have charge of the shops, round house and car yards. Mr. J. E. Chisholm has been appointed general shop foreman at Oelwein, Ia., to succeed Mr. Crosby.

Mr. R. H. Barber, chief clerk to mechanical superintendent F. R. Risteen of the Atchison, Topeka & Santa Fe, has been appointed clerk to mechanical superintendent G. R. Joughins of the Santa Fe coast lines. He succeeds Andrew Park, resigned.

Mr. Charles Tozer has resigned as general works foreman of the Mexican Central Ry. at Orizaba, Mex., and has been succeeded by Mr. H. Stanislaus, with the title of general works foreman and Westinghouse air-brake inspector. Mr. Cedar Lucas has been appointed assistant air brake inspector, also with headquarters at Orizaba.

Mr. J. M. Shackford, for many years mechanical engineer of the Chicago & Alton and lately with the American Supply Company, has been appointed supervising engineer by the United Railways of Yucatan for an extensive system of shop erection and track extension. Mr. Shackford sails from New York early in April to take charge of his new duties.

Mr. Thomas Paxton, who recently resigned as superintendent of motive power of the Colorado & Southern Railway, has been appointed master mechanic in charge of the central division of the St. Louis & San Francisco Railway, with headquarters at Fort Smith, Arkansas.

Mr. George F. Wilson, late superintendent of motive power of the Chicago, Rock Island & Pacific, has been appointed purchasing agent of the Delaware, Lackawanna & Western, with headquarters at New York, to succeed Mr. W. H. Whalen, who has resigned to accept a position with the Peerless Rubber Company.

Mr. H. E. Passmore, heretofore superintendent of motive power of the Detroit Southern, has been appointed master mechanic of the Western division of the Toledo & Ohio Central, with headquarters at Kenton, O., in place of Mr. J. C. Homer, who has been appointed superintendent of motive power of the Detroit Southern, with headquarters at Springfield, O., to succeed Mr. Passmore.

Mr. J. D. Gurganus, assistant superintendent of car equipment of the Mobile & Ohio Railroad, has resigned, to enter other business, and the office held by him has been abolished. Mr. J. E. Enright, master mechanic at Whistler, Ala., has had his jurisdiction extended to cover the car departments at Whistler and Mobile, Ala.

Mr. R. H. Parks has been apopinted manager of the car shops of the Merchants' Despatch Transportation Co., with office at Despatch, N. Y. The position of superintendent of the car department, held by Mr. J. W. Musson, who has been appointed agent of the company, with office at Despatch, N. Y., has been abolished.

Mr. A. M. Waitt has resigned as superintendent of motive power and rolling stock of the New York Central & Hundson River. Mr. Waitt has held this position since April, 1899, and from October, 1889, to April, 1899, was connected with the Lake Shore & Michigan Southern as assistant general master car builder and general master car builder.

Mr. W. K. Christie, master mechanic of the Pere Marquette, has been placed in charge of maintenance of equipment of the entire line, with office at Saginaw, Mich., and the office of superintendent of motice power is abolished. Mr. S. A. Chamberlain, master mechanic of the Grand Rapids district at Ionia, Mich., has been assigned to other duties, and the office has been abolished.

Mr. A. L. Studer, assistant superintendent of motive power of the Chicago, Rock Island & Pacific, has been appointed superintendent of motive power of the Colorado & Southern, with office at Denver, Colo. Mr. W. A. George, who has been acting superintendent of motive power, has resumed his former position as division master mechanic.

Mr. Henry B. Brown, heretofore divison master mechanic of the Baltimore & Ohio, has been appointed division master mechanic of the Erie at Cleveland, O., to succeed Mr. Frank Johnson, assigned to other duties. Mr. T. Rummey, general inspector of machinery at Meadville, Pa., has been appointed division master mechanic at that place, to succeed Mr. Willard Kells, resigned.

Mr. George DeVilbiss, heretofore general foreman of the Wabash shops at Peru, Ind., has been appointed master mechanic of the Cleveland, Lorain & Wheeling, with headquarters at Lorain, O. Mr. J. N. Robertson, general foreman of the Wabash at Toledo, O., has been transferred to Peru, Ind., and Mr. James Flynn has been appointed general foreman at Toledo to succeed him.

Mr. T. H. Manning, formerly master mechanic of the Union Pacific at Cheyenne, Wyo., has been appointed assistant superintendent of rolling stock of the Canadian Pacific, in charge of the lines west of Winnipeg, Man., with headquarters at Winnipeg. Mr. Manning entered the service of the Union Pacific in 1875, and after serving an apprenticeship in the machine shop was consecutively machinist, gang foreman and general foreman to 1890, when he was appointed master mechanic at Omaha. In 1898 he was transferred to Cheyenne as master mechanic and held that position until April 1, 1901, when he resigned.

Notes of the Month

Mr. Thomas P. Egan, president of J. A. Fay & Egan Company, Cincinnati, Ohio, manufacturers of wood working machinery, will be one of the visitors at New Orleans, at the National Association of Manufacturers' meeting, April 14 and 15.

Mr. Egan was the organizer and first president of this association, and of course he takes great pride in having this distinction, as this body of men is the most influential in this country.

The Helwig Manufacturing Company, St. Paul, Minn., have added to their line of reversible pneumatic motors a No. 2 end spindle for metal work; also a wood boring motor, end spindle, both reversible. They are receiving many rush orders for these and their other sizes, and increasing demand for their pneumatic stay-bolt clippenr and bolt and rivet clippers.

The Columbus Steel Rolling Shutter Company have recently received orders to supply steel rolling doors and shutters for the following establishments: Flaherty & Co., warehouse, Dayton, Ohio, 23 openings; Lane & Bodley Co., core ovens, Cleveland, Ohio, 2 openings; Hocking Valley Railway, freight sheds, Fultonham, Ohio, 7 openings; Fredrick Jaeger, warehouse, Columbus, Ohio, 8 openings; Webster Tomlinson, architect, for E. A. Cook warehouse, Chicago, Ill., 1 opening; Nashville, Chattanooga & St. Louis railway, Nashville, Tenn., 1 opening; C. P. Finley, manufacturers agent, warehouse of Mutual Realty Company, St. Louis, Mo., 16 openings.

The Stanley Electric Manufacturing Company has sold to the Indianapolis, Columbus & Southern Railway Company the following appartus: Forty-eight type No. 402 railway motors, one 500 K. W. revolving field generator, one 300 K. W. rotary converter, three 110 K. W. and three 150 K. W. transformers and the necessary switch-board apparatus.

The new officers of the Stanley Electric Manufacturing Company of Pittsfield, Mass., elected at the recent meeting of the board of directors, are as follows: President, W. Murray Crane, Pittsfield, Mass.; first vice president, Dr. F. A. C. Perrine, Pittsfield, Mass.; second vice president, M. D. Barr, New York, N. Y.; third vice president, S. N. Hammill, New York, N. Y.; treasurer, W. W. Gamwell, Pittsfield, Mass.; assistant treasurer, R. S. Murray, Pittsfield, Mass.; secretary, W. S. Wentover, New York, N. Y.; assistant secretary, A. G. Davis, New York, N. Y.

The San Francisco & San Joaquin Coal Company, of San Francisco, has decided to install machinery for the briquetting of coal dust, the high price of coal in California rendering this profitable. The briquetting presses will be driven by electric motors arranged to give any desired speed from 20 R. P. M. to 550 R. P. M. in about 15 steps. Two 40-horsepower 500-volt direct-current motors have recently been purchased for this purpose from the Westinghouse Electric & Manufacturing Company, together with speed controlling rheostats designed to vary the speed of the motors within the above limits. The controllers will allow the motors to be opereated continuously at any of the speeds.

The Nernst Lamp Company, of Pittsburg, Pa., are to open an office in the National Life Building, Chicago. on April 1. The large number of alternating current circuits and plants in the Chicago district have helped to increase the demand for Nernst lamps beyond the point where a local office can be dispensed with. A stock sufficiently large to promptly supply the trade and consumers will be carried. The rapidly increasing popularity of this lamp promises to be an important factor in the illuminating field, as is evidenced by the number of large contracts recently placed for its installation in important buildings and manufacturing plants.

Messrs. Dodge & Day, modernizing engineers, have been commissioned to report on motor equipment for the Firth-Sterling Steel Company of Pittsburg.

The Dake pneumatic chain hoist consists of a Dake reversing air motor directly connected to a Standard chain block. Two pendant hand chains control the motor valve, to which is also attached a lever to operate the valve stem on the oil cup, giving automatic lubrication to motor only when hoist is being used. The worm and worm wheel of steel and phosphor bronze are enclosed in an oil-tight case and all parts of the hoist are of sufficient strength to sustain a load of twice their rated capacity. Where a compact or reliable steam or air motor is desired the Dake motor is adaptable, especialy from changing hand to power cranes, for motors on overhead traveling cranes and for all forms of hoisting machinery. Dake motors and pneumatic chain hoist are handled by the Holland Company, Chicago and San Francisco.

"Railroad Construction," by W. L. Webb, C. E., now appearing in its second edition, has been reduced to pocket size and bound in morocco to facilitate its use in field work. The entire work was recast at the same time, thoroughly revised and much new material added. The original text has now been almost doubled by the addition of several chapters on structure, train resistance and rolling stock, also several chapters giving the fundamental principles of the economics of railroad location. The aim in the preparation of this book being to produce a text book for students in engineering institutions, the subject matter has been cut down to that which may properly be required of students in the time usually allotted to railroad work in a civil engineering curriculum. The aim has been to teach the principles and to guide the students into proper methods of investigation. Published by John Wiley & Sons, New York City. Price, $5.00.

The Empire State-Idaho Mining & Developing Company, of Spokane, Washington, has purchased of the Westinghouse Electric & Manufacturing Company three motors for driving concentrating mill machinery and a large air compressor in the Coeur d'Alenes. These motors will be supplied with power from the 2,300-volt secondary circuits of the Washington Water Power Company of Spokane, whose 50,000-volt transmission line is now extending into the Coeur d'Alenes in Northern Idaho, a distance of approximately 90 miles.

There are two 150 H. P. three-phase 2,300-volt 580 R. P. M. type "S" induction motors to be supplied; one for driving the air compressor of the Empire State mine at Wardner, Idaho, the other to operate the Sweeney concentrating mill a short distance from Wardner. The third motor will be of the Synchronous type, 240 H. P., 2,30 volts, three-phase, 514 R. P. M., and will drive the concentrating mill of the Tiger-Poorman mines at Burke, Idaho.

These motors will be placed in operation about June 1, 1903.

The Sterlingworth Company have expended during the past four months some fifty-five to sixty thousand dollars in improvements to their rolling mill department, consisting of gas converters, a 100-ton gas furnace, 800 additional horse power Berry boilers, and 1,200-horse power Corliss rolling mill engine, and a full equipment of steel rolls for the manufacture of angles, I beams and channels up to 15 inches. They have also completed plans for additions to their malleable department, increasing its present capacity some 5,000 tons per annum.

Notice is hereby given that the co-partnership heretofore existing between the undersigned under the firm name of G. S. Wood & Co. has been dissolved by mutual consent, and the Acme Supply Co. has succeeded to all the business of said firm, and will continue said business at 100 Lake street, Chicago, under the management of the undersigned. Acme Supply Co. will collect all accounts owing to G. S. Wood & Co. and pay all the debts of said firm.

Harry H. Schroyer,
Guilford S. Wood,
Stanley Woodworth.

Mr. A. M. Baird has been appointed to represent the Falls Hollow Staybolt Co., in Topeka, Kansas, and vicinity. Mr. Baird was formerly boiler maker at Santa Fe shops, Topeka, and has been in the employ of several of the leading Western railroads, in the capacity of foreman boiler maker. He is the inventor of several compressed air tools among them the celebrated Baird staybolt nipper.

Mr. W. V. Turner, air-brake inspector, and Mr. Geo. R. Henderson, superintendent of motive power of the Santa Fe System, have patented an air-brake device, which makes it possible to recharge air brakes on a train while the brakes are set. The advantages claimed for it are stated as follows:

"It will do away with the creeping due to the leakage of the train line. It maintains a uniform pressure on all of the reservoirs on the train, thus preventing the possibility of a train breaking in two. It allows the brakes to be recharged while set, thus making it utterly impossible for a train on a grade to start and run away while the brakes are being reset. The best brakes now in use have to be recharged every few minutes. The Henderson-Turner brake can be set on a train and the train will remain on the grade for a month if desired. In addition to the advantages of safety, the new brake is very economical, employing but two-thirds as much air as the best brakes now in use and allowing a great seving in pumps." The system is covered by sixteen patents.

The extent to which the railway companies are going in the effort to secure pure water for their locomotive boilers is evidenced by the size of some recent orders. The Kennicott water softener has been adopted as standard by the Union Pacific, which road has just placed an order for twenty-five additional plants, to be furnished complete, two a month. The smallest individual capacity is to be 10,000 gallons per hour. This is the third order from this road. It will be remembered that the Kennicott Water Softener Co. has recently taken an order for nine plants for the Pittsburg & Lake Erie road, the order being placed after a thorough investigation of the system, made by the Pittsburg Testing Laboratory. A second order for two plants for the Burlington system has also recently been received.

The National Malleable Iron Brake Jaw and Dead Lever Guide

The National malleable iron brake jaw and dead lever guide are shown in the accompanying illustrations, Fig. 1 illustrating the brake jaw and Fig. 2 the dead lever guide. The principal feature of them, which is common to both is

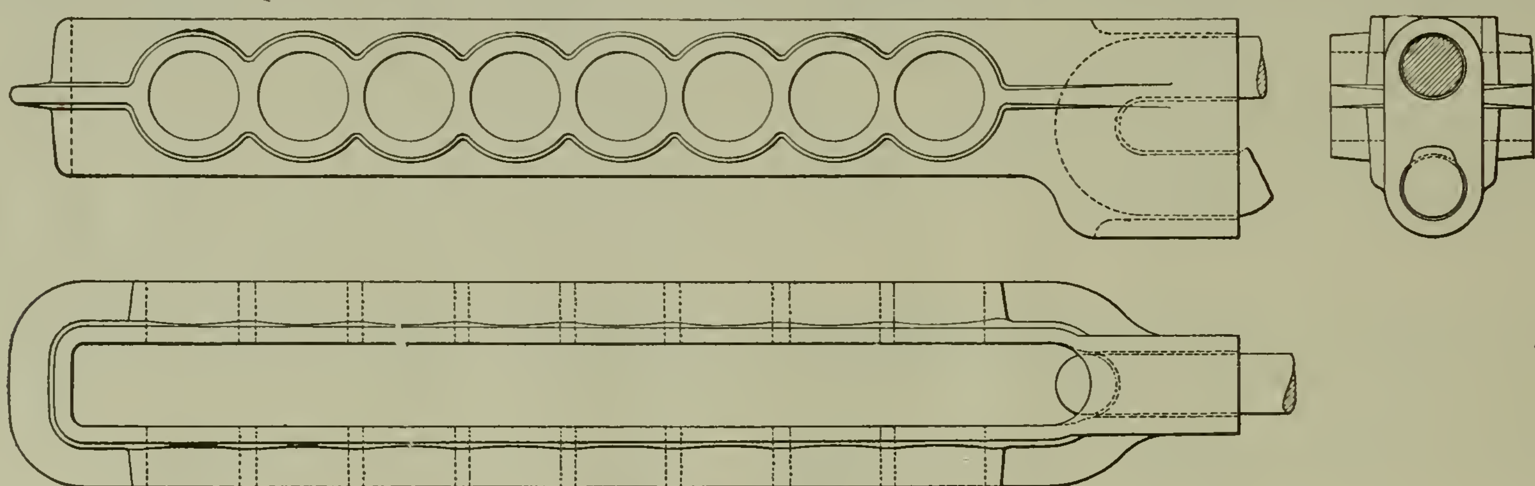


Fig. 2—National Dead Lever Guide.

the method of attaching the rod. This is done without welding, which is necessary where a forged rod or guide is used. A connection is thus insured which is absolutely reliable under all circumstances; and welding being absolutely dispensed with, the danger of accident from imperfect welding is avoided, the rod does not require upsetting to form a head, and it is not necessary to drill for connecting pin holes. Thus not only is a substantial saving in time and labor effected, but greater safety is attained.

The application of the rod to the jaw is very simple. The jaw is slipped on to the rod through one of the two parallel holes in the end of the casting, then the end of the rod is bent into the form of a pot hook over a mandrel and slipped through the other parallel hole. The end is then slightly bent over to prevent the jaw slipping back. That the jaw is sufficiently strong and can absolutely be relied on will be seen from the following report of test made at the Rose Polytechnic Institute:

"The jaw was fitted with a ¾-inch rod, and with the stub end of a lever fitted in the end between the jaw. It

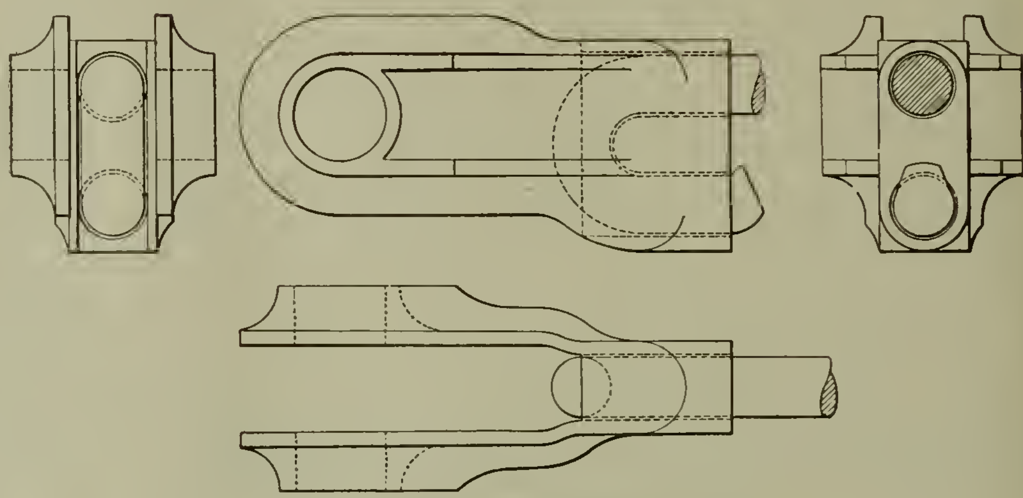


Fig. 1—National Brake Jaw.

was then put in a Rhiele testing machine and the pulling strain applied. The iron rod broke at 22,500 pounds. A bar of crucible steel was then applied instead of the ¾-inch iron and the jaw again submitted to the pulling of the machine. This crucible steel broke at 35,100 pounds strain, and we were unable to find anything sufficiently strong to hold the jaw to the breaking point of the casting.

"At the conclusion of the test the jaw was apparently in good condition with the exception that the holes for the pin were slightly elongated, but not sufficiently so to cause any difficulty in removing the pin."

These jaws and dead lever guides have been in service for five years and a broken one has never been reported, although there are at the present time over one hundred thousand in use. Many railroads and private car lines in all sections are now using these jaws. The jaws and guides can be furnished for ¾-inch, ⅞-inch and 1-inch rods, and the jaws with either one or two connecting pin holes. Prices, and any further information will gladly be furnished on application by the National Malleable Castings Company, by whom these devices are manufactured.

The Central R. R. of New Jersey has opened a school of rules at Somerville, N. J., for the purpose of instructing its employes in the new operating rules which have been adopted. The rules have been perfected by officials of the company after much study and experiment, and engineers, conductors, brakemen, telegraph operators and all other employes engaged in the operation of trains have been ordered to the school for a course of instruction.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

"The Copper Sheathed Car"

According to the program devised by the Advisory Committee of the Master Car and Locomotive Painters Association at their meeting in Cleveland, Feb. 21st, the above heading is subject No. 8 on the list for consideration at the coming convention in Chicago, September next. We are informed that a leading Master Painter is assigned to write a paper upon it, which may be expected to be an interesting one, full of facts and figures as viewed from the car painters' standpoint. Possibly there may be some discussion from the very few who have had any experience with and observation of this kind of a car, after the paper is read; but we fancy little else than the paper will need to be offered. Probably some of the extravagant statements and claims set forth in a booklet not long ago issued by the promoters of this scheme will receive thorough attention and be largely discounted, as it is open to criticism. However, the exploiters of anything meritorious or otherwise here in glowing Yankeeland are apt to put on a roseate hue to printed matter issues in its promulgation, and this booklet is no exception to the rule. Catalogues are made expecting that large discounts are to be deducted from the prices, if not from the descriptions of the articles portrayed. It's a way we have. "They all do it." So too much attention should not be given to claims of would-be customers by critics, but a candid examination of the facts adduced by experience should be honestly and calmly made.

This way of finishing the exterior of a passenger coach was devised a number of years ago on the New York, New Haven & Hartford Railroad by Mr. W. P. Appleyard, M. C. B., as we understand it. Though sheet copper had been used for a similar purpose on buildings for years before, its use in place of paint and varnish as an exterior covering for wooden cars was entirely new and, we believe, patented; and whatever effect it may have upon the painting trade, and however viewed by painters and varnish makers, its conception and execution is a clever piece of mechanical skill and reflects no small degree of credit upon its inventor. It will be opposed, of course—so has everything in this world that has a menacing look against any one's interests; but it is a case of "the survival of the fittest" in all things, and this will doubtless prove no exception. There is a company formed with abundance of capital to push this thing to the front, we are told, which has a factory in "the Nutmeg State" for turning out the plated lumber for car building in a skillful manner, putting the metal on "skin-tight."

Some may ask, why has not more than two cars of this character been put upon the New Haven road, where it originated, in the years since its invention? Probably for the reason that few if any new cars have been added to its equipment; and possibly a thorough trial of this experiment was wanted before going farther with it. We cannot answer this question positively; but to such inquirers we may now say that we have recently been told that some one hundred and thirty-four cars of passenger equipment have been ordered by a certain road, not a thousand miles away, to be finished in this way, and are being, or are to be, built by three different car-building concerns in this country, so it would seem that the experimental stage is passed, or else somebody is making a tremendous leap in the dark. We hear also that some seven hundred cars of this character have been ordered for the new subway service in New York City, which will be covered with copper below the windows, this being about all that can be so covered, as the top part of car is to be about all sash and glass. Besides all this, we understand that the Erie Railroad has about forty of these cars and the Boston & Maine has twenty (by lease of Fitchburg Railroad) and there may be "more back towns to hear from."

So, from these figures at least, it will be seen that our Advisory Committee did not have an idle dream when Subject No. 8 was devised but, as ever, is wide awake to passing events and is "looking to its laurels." It begins to loom up as "a living issue." However, it is not a matter to be treated with prejudice on account of any prospective inroads it may make into the painting business, but it must be met with candor on its merits, the same as anything else that comes to the railroads bidding for their business. If it has superior merit in it, it cannot be frowned down, but will succeed as everything else has succeeded that has met a cold reception in this world. Some of the cool calculation of Dr. Gamaliel in the Bible (Acts 5:39) respecting the then innovation of the Christian religion is good to put into practice with all new things that are forcing themselves upon our attention. Whatever has merit in it will succeed in the long run; and what has not will come to naught, whatever we may say pro or con. So it is of no use to become over-exercised in the matter, lest we give a good thing a lot of free advertising!

It has been a good many years since cars were painted and varnished and doubtless they will continue to be so finished many years more. But the cost of this work has been vastly reduced in the last twenty-five years, largely through the instrumentality of the Master Car and Locomotive Painters' Association and its annual convention and its official organs, the trade press. Time will tell whether copper cars are a success or not, as it will also render a just verdict on the steel car.

A Visit to the Boston & Albany Shops

Calling on our associate Wm. E. Hibbard at Allston recently we found him busy putting the B. & A. equipment in shape for the season's business. He has his quota of men so arranged as to put out 35 cars of passenger equipment per month and thus complete it during the year. This is better than rushing it through in less time with a large force, not only in the quality of work done but in keeping good men at work, instead of laying them off two or three months in the year, until they get sick of it and go elsewhere and a new gang has to be broken in annually, to the detriment of the work and the great annoyance of the foreman. Mr. Nye still remains as assistant, taking care of the clerical end of the piece-work, which usually involves much work of this kind, yet they avoid much detail that is in vogue at most shops and so "bunch" the work together here as to make it simpler and better. Bro. Hibbard is pleased with piece-work and says he would not like to return to day work. And so are the work-men, we are told.

One thing we observed here we wish specially to note; they were painting the interior mahogany ceilings of the "Mann," or round-top passage cars right over with white paint, or nearly so—just a tint off—in order to lighten up this dark, gloomy kind of a car. Mr. Hibbard says he first gives them a coat of flat paint and then one with sufficient varnish for rather more than an egg-shell gloss and does not varnish them at all. A modest stencilled border is run along either side at the base of the roof, and thus a pleasing effect is produced. We should say also that the mahogany bands that interest side panels crosswise of car and two running lengthwise are left the natural wood color. This serves as a breaking up of the monotony of so large a field and has a decorative effect. Perhaps this is a good way to treat this unpopular kind of a car, of which the B. & M. has about a hundred.

Twenty-five first-class new coaches, ten of them with wide vestibules, are being delivered to the Boston & Albany by the Osgood Bradley & Sons Company, car builders, Worcester, Mass. We had the pleasure of inspecting some of them. They are fine cars, made to New York Central standards, the lessee of the B. & A., and are lettered "New York Central and Hudson River," and are finished with mahogany on the interior, relieved by inlaid work, and with tastily painted wooden ceilings, those in the vestibule cars being light olive green, decorated with gold stenciling, and those in the straight coaches are the N. Y. C. standard tint—nearly white—with the same gilt decoration. All in all they are a fine addition to the excellent equipment of this princely road.

By the way, all B. & A. cars, as fast as painted are made to conform to N. Y. C. standards. Other cars while in good order are cleaned and varnished, remaining lettered "Boston & Albany," etc., but Mr. Hibbard expects that another year will see the whole B. & A. equipment lettered to "New York Central and Hudson River." And then the stranger in the big Boston Southern Terminal, especially if just getting over "a night's lark," will rub his eyes and wonder whether he is in the Grand Central Depot, New York, or where he is! Those who have had this feeling can sympathize.

Some years ago the New York Central, with good reason, left off the word "Railroad" after "Hudson River" on the much-covered letter-boards of its equipment. They might go still farther and convert that "AND" into a character "&" with equally good judgment, inasmuch as it is already on their baggage cars with the initials "N. Y. C. & H. R.," also on locomotive tenders. However, a saving of four letters per car on a thousand or more cars counts up, to say nothing of the better apeparance. We commend this for what it is worth to Messrs. Brazier and Butts, having lately gone through with this on the Boston "AND" Maine, by orders of the Master Car Builder, Mr. J. T. Chamberlain, who said that it made him "tired" to look at it.

Hotel Arrangements, 1903

Below will be found the hotel terms for our coming convention in Chicago. To make it authoritative we publish the hotel people's letter to Mr. Gohen in full, also the latter's letter to us, as it contains items of general interest; among other things, giving us the whereabouts of two ex-presidents —J. C. VanPelt and Geo. O. Widner—in response to inquiry in our last issue:

Indianapolis, Ind., April 8, 1903.

Editor Railroad Paint Shop:

I thought I had forwarded the arrangement for hotel at Chicago, but when the "M. M." arrived I found it "nit." I enclose you the letter and you would better advise all those intending to be at the convention to secure rooms as early as possible, as all the Chicago hotels are going to be crowded in September. I wrote for a cut of the house but haven't received it. May get it later.

Sorry to hear of Leopold's death; bright fellow and too young to go.

J. C. Van Pelt is still alive and I think employed by the C. H. & D. at Cincinnati or by the L. & N. at Covington, Ky.

Geo. O. Widner is living in St. Louis and is representing the Gould Coupler Co. I see him occasionally at St. Louis.

Yours truly,

J. A. GOHEN.

Chicago, Feb. 26, 1903.

Mr. J. A. Gohen, Chairman Hotel Committee, Master Car and Locomotive Painters' Association, Indianapolis, Ind.

Dear Sir: In reply to your letter of the 24th we have to say that for the entertainment of your convention in Chicago, September 8th to 11th, we have the following to offer:

In view of your making the Victoria your headquarters during your stay here, we will provide for you our Ladies' Ordinary, for a convention hall, gratis.

For the delegates, their wives, etc., who may be in attendance, we will make a rate as low as $3 per day on the American plan. For extra accommodations, viz., rooms with bath, etc., an additional charge will be made.

We will be able to care cvomfortably for at least 200, and perhaps more, and assure you in advance that we will leave nothing undone to make their stay with us both comfortable and entirely satisfactory.

Hoping that this proposition will meet with your acceptance and that we may have an early reply, we are,

Very truly, yours,

VICTORIA HOTEL COMPANY,

Frank Upman, Sec.

Design by W. H. Schoettlin.

The Care of Car Plate Glass

That glass will rust would seem to the uninitiated a subject of amusement rather than a credible statement of fact, yet such seems to be the case. Happening in a certain railroad car paint shop not long ago the foreman painter was confronted with the problem of how to get some lights of crystal plate glass apart that had become so welded together by some process of other as to be well nigh inseparable. In vain did he try to pry them apart with a putty knife without breaking the glass, having broken several by the most painstaking efforts in attempting to run the knife between them. The plate glass people who furnished it were appealed to by letter in the matter and they sent a representative to look into it, and his statement was that it had become rusted by sitting together in a box in a dark, damp closet, and advised that it be opened up, spread out and that the glass closet, which was built against a brick wall, be properly warmed and ventilated; that glass, if the lights are to rest close together, should be kept in a warm, dry place. This seemed reasonable, and the closet doors were left open during the day and numerous holes were bored to let in the warm, dry air for the night, with no farther trouble.

Those who have had occasion to unpack plate glass as it is imported have noticed how water proof the boxes have been made with tarred paper so as to keep out the salt water and avoid this trouble.

This is all news to this writer who fortunately has never had the care of glass in his paint shop, which is rather a rare exception to the rule that makes most railway master car painters the custodians of the car glass. We therefore make mention of this for the benefit of others, who may not have had this experience, as it may be of some service to them in a similar time of trouble. Perhaps others have been up against this problem and can give us their experience for these columns as to whether the foregoing is correct or not.

P. B. & W. New Shops at Wilmington, Del.

"The Pennsylvania Railroad Company is building a $52,000 paint shop and a $7,000 paint storehouse at Wilmington, Del."

Seeing the above in "The Western Painter" we clipped it out and sent it to our fellow associate and vice-president, "Charley" Cook, at Wilmington and asked him if the good news was so, and he replies "Yes," and gives us, of course, a very interesting letter. He started it March 10th, but due to unavoidable delay was unable to finish it until April 1st.

Though we have the promise, when completed, of a thorough description of these shops, we take the liberty of making the following extract from Mr. Cook's interesting letter, for which, we trust, he will pardon us:

The clipping refers to the new shops of the P., B. & W. R. R. (please note the change from "P., W. & B. R. R.," this change having been made, I think, last October when the Baltimore & Potomac and the Philadelphia, Wilmington & Baltimore were consolidated, and it is now known as the Philadelphia, Baltimore & Washington; Wilmington retiring involuntarily) which are being built just on the edge of the city limits. They are to be pretty fine shops, some twenty-three buildings in all. You see, the company is moving all the departments to the one plant, the new elevated tracks making it necessary to tear down some of the present buildings. The new car paint shop will be 160x180 ft. and will accommodate twenty-two cars. I am not able as yet to give you details as to interior arrangements, such as heating, ventilating, etc., but will do so later on. The work on the new shops is being pushed rapidly forward and it is possible we may occupy them in the fall. It will be a thoroughly modern and up-to-date plant in all respects and I shall take great pleasure in giving you a much fuller description when we get there. While Wilmington has been dropped from the name of the road her importance as a P. R. R. point has considerably developed. For instance, there are the new and larger shops, the elevated tracks, a new and much larger passenger station and the removal from Broad Street Station, Philadelphia to Wilmington of the offices of the General Superintendent, Superintendent M. P. and Chief Engineer.

"Cutting In" Versus "Touching Up"

Editor, Railroad Paint Shop:

Anent the article in last issue of the Railway Master Mechanic, entitled "Touching up and cutting in," wherein the writer deprecates the cutting in of passenger cars every year, I am led to wonder what method of cleaning and kind of cleaning materials are used on his road at terminal points? It can hardly be denied that the touching up and revarnishing as practised ten years ago has become obsolete in most large railroad shops, whatever the practice may be in the smaller ones, and cutting in is now the rule; and this is due entirely to the use of oil cleaners. I do not mean to assert that oil cleaners are in themselves injurious to paint and varnish, but owing to the greater facilities these cleaners afford in keeping the equipment clean and bright, and the general practice adopted of more frequent cleaning of the equipment at terminals, the varnish coats are worn off in much less time than formerly, and a few months after leaving the shop there is not enough varnish left to protect the body color, which becomes so badly stained and faded, that touching up means the whole car instead of a few spots here and there; and the time taken to match the color, and touch up all that should be touched up, is actually longer than it takes to cut in the car. Prior to the use of the various cleaners now on the market, the life of varnish was from twelve to eighteen months; and cars shopped for repairs were expected to and would, as a rule, stand a good cleaning down with soap and water, and a pretty close rubbing with pulverized pumice stone and water before touching up and revarnishing, without danger of affecting the body color. But now, cars that have received the average terminal cleaning treatment for six months are badly in need of revarnishing, and at the end of twelve months are more likely to need repainting, than cutting in, leaving the touching up and varnishing entirely out of consideration. Yours,

F. S. Ball.

Altoona, Pa.

Elasticity

In paint and varnish lingo, elasticity is its life. It is that ability to give and take and that power to come and go which evidences its vitality. When that begins to pass away dissolution dates its work. When it has passed, death reigns supreme; and when the elixir of life is found to return the aged man, with his rigid limbs, to the elastic step of youth, doubtless something will be discovered to restore old paint and varnish on a car to its former elasticity. But until that golden age of discovery dawns, it behooves every master painter to put into his painted surfaces all the elasticity possible with the time at his disposal, for that is its adhesion and vitality—its ability to expand and contract with the wood and the weather, and thus avoid those innumerable cracks and fissures that are the bane of every painter's life. Nevertheless there must be that degree of gradation and homogeneity from wood to finish under and among these various coatings so that they will "hang together," as Ben Franklin was reminded when he signed the Declaration of Independence, or, to use his famous reply, they will "hang separately" later on when cracking and peeling is the result.

Now, pure linseed oil is the life and elasticity of all paint and varnish. Do not be afraid of it. If properly used there will be no trouble. The only thing to be afraid of is cutting the measure of time too short for the measure of oil. Time is required and given unstintedly to ripen many good things that we eat and wear; why be stingy with it in that which we do to feast our eyes upon? That which ripens speedily decays quickly, whether fruit, flowers, paint or varnish. The impatient boy mutters imprecations as he in early autumn shuts his teeth upon the winter pear; but if he will wait a few months he will smile as the sweetness tickles his palate from its mellow pulp. Hardly more impatient is the average mechanical officer of today with his foreman painter because cars do not ripen faster and drop out of his shop from day to day. If he only could be taught kindly to wait until a durable job could be done with slow-drying elastic coatings and have each coat ripe before the next is put on, and have the whole ripen well together before being put into service, he would feel as comfortable as the aforesaid boy with the ripe winter pear.

But then this is a swift age in everything. There is nothing "slow" about us, either in morals or mechanics. We must have results right off. We are willing to wait, but we want things done "while we wait." We buy our whistle; we must have it; but we "pay dear for it." We pay in time, but "time is money." You can have "quick-process" lead, but it is not like the "old Dutch process." You can have qaick-process leather, but it's not like the old oak-tanned article. Old wine is better than new wine made at short notice, etc., etc.

Notes and Comment

Perhaps it is hardly necessary to explain that the stencils by Mr. Warner Bailey in our April issue were Corner stencils and not "Comer." There were various other jumbles of type that we feel like apologizing for, but we leave them to the good sense and patience of our readers to adjust, hoping that there will be no more.

Mr. I. H. Munford was vice-president of the Hildreth Varnish Company at the time he severed his connection with that concern Jan. 31, 1903. In our April issue we inadvertently stated that he was secretary at that time. He had been secretary for years and was promoted to the office of vice-president two or more years ago.

Mr. W. H. Truman, formerly with the Southern Railway at Columbia, S. C., took charge April 1st of the painting for the Carolina & North Western Railway, heretofore a narrow gauge road, but since Feb. 23 a standard gauge. There are only 131 miles of a main line at present, with 10 miles more nearly completed. He will have supervision over all painting connected with the road. His address in Chester, S. C., Box 193. The equipment of course is small, having so recently changed its gauge, but will doubtless grow with the development and prosperity of the road.

We thought that we had tested about all the varnish removers there are out, but one agent who called on us lately has got things down to a more definite basis than we have. He says that there are forty-eight on the market! But the agent for the latter "goes us one better" than we ever expected in the line of pleasant smelling removes; he recommends it for the pocket handkerchief! But the following from the List of Patents in "The Master Painter" for March can hardly be recommended for the handkerchief.

Compound for Removing Paint and Varnish from Woodwork. By O. P. Catherman, Mifflinburg, Pa. This takes the bun. Here is what it is made from—hold your noses: Clear cow dung, 31 lbs.; clear horse manure, 2 lbs.; chicken manure, 2 lbs; human feces, 1 lb.; quicklime, half pound; concentrated lye, one pound; rye flour paste, quarter pound; water, one quart.

At the last minute before going to press with the April issue we sent in a cut clipped from the Railroad Car Journal (Sept. 1895) of the late Mr. Leopold, not having any photograph of him; and, we think, under the circumstances, all will agree, who know him, that a fair likeness of him was produced. We were glad to be able to thus do honor to his memory, and especially as we had no photo of a member on hand for our monthly "Portrait Gallery." And to date (April 15) none has come to hand for this issue. What's the matter with "our boys" to whom we have written?

Jordan & Christie's brush factory at Malden, Mass., was destroyed by fire on the night of April 9th, together with all of its stock and contents, but was fully insured. This is the concern that supplies the B. & M. with most of its brushes for all purposes. Their store is 36 Merchants Row, Boston.

The point that Mr. F. S. Ball makes in his article in another column on "cutting In vs. Touching Up," is a good one, as might be expected from him. All the terminal cleaning the cars get on the system on which the writer is employed, whose article he reviews, is with the time-honord, long-handld brush and water, hence the troubles do not exist which he enumerates. It is well to look at these things from all stand-points. That is what our association is for, and we invite a preliminary discussion of any subject in these columns; it will whet the appetite for that which is to come at the convention.

A new departure was made in the April meeting of the N. E. R. R. Club. It was held in the rooms of the Electrical and Engineering Department of the Massachusetts Institute of Technology, instead of at Pierce Hall, with a lecture by Prof. Wm. L. Puffer on "The Use of Polyphase Appartus in Railway Power Distribution,' illustrated with all the apparatus in use there, including stereopticon. The Laboratory of the Department was open for visitation during the evening.

We have lately ridden in a new "Soo Line" sleeper, the "Anamoose," on the St. Paul and Boston run that demonstrates the truth of what friend Herron says in our April issue, in his "Visit to the Barney-Smith Car Works," that these people know how to make a good looking car, for it was lately made there. Outside it is perfectly plain Tuscan red, with only the name of the road on the letter board—"Minneapolis, St. Paul & Sault Ste. Marie," and the name and number of car below belt-rail; but on the inside it is richly finished in Mahogany with inlaid work, "Matted Cathedral lass Domes," etc.

"The Burbank & Ryder Varnish Co. has incorporated at New Bedford, Mass., with a capital of $50,000. Incorporators: C. G. Burbank, N. W. Bingham, Jr., and M. S. Ryder."

The above from "The Western Painter," Chicago, for March, is news to us. We have known Mr. Burbank 30 years, or more, as a varnish maker in Charleston, Mass.; and have in former years used much of his product, and met him on the street in Boston recently and had quite a chat with him, but the above was not mentioned.

The Car Foremen's Association of Chicago

April Meeting

The regular meeting of The Car Foremen's Association of Chicago was held in Room 209, Masonic Temple, Chicago, Wednesday, April 8th, at 8:00 o'clock p. m.

In the absence of President Parish, Mr. J. R. Cardwell was chosen as President pro tem.

Among those present were the following:

Bates, G. M.	Briden, J.	Blohm, Theo.
Clark, I. N.	Cuthbert, J. R.	Cameron, A.
Cardwell, J. R.	Dempsey, Alvin.	Delany, A. G.
Erken, Geo.	Guthenberg, B.	Joseph, H. A.
Jones, R. R.	Johnson, A. G.	Johnson, A. F.
Johnson, Axel.	Kramer, Wm.	Kirby, T. B.
Kline, Aaron.	Kroff, F. C.	Kuhlman, H. V.
Kent, E. R.	Lockrey, J. F.	Mileham, C. M.
Morris, T. R.	Nordquist, Chas.	Powell, C. R.
Perry, A. R.	Plummer, A. K.	Richardson, Wm.
Senger, J. W.	Tabler, M. H.	Wensley, W. H.
White, P. W.	Willcoxson, W. G.	Williams, Thos.
Woodman, Geo.	Widner, J.	

Mr. Cardwell: The first in order will be the reading of the minutes of the previous meeting. As they have been printed in the Railway Master Mechanic and I presume each of you have read them, if there are no objections, they will be approved as printed. Are there any reports of committees?

Secretary Kline: I have here a report of the nominating committee. First I would like to read a letter which has been received from Mr. Evans, our vice-president:

Minneapolis, March 9, 1903.

The Car Foremen's Association of Chicago, Le Grand Parish, President.

Dear Sir:—Having accepted the position of master mechanic for the Twin City Rapid Transit Company, with headquarters at Minneapolis, and realizing that the best interest of the Association requires that a resident of Chicago to fill the more important offices, I herewith tender my resignation as vice-president of the Association.

I assure you I regret very much the necessity for this action, as my relations with the members have been very agreeable, and attending the meetings has afforded me a very pleasant, instructive and profitable experience.

The above action will also apply as Chairman of the Committee on Subjects, in the work of which I was very much interested and which promised good results.

I assure you I will continue my membership in the Association and will be pleased to render any assistance that I can at this distance.

Wishing the Association every success, and especially so during the term of your administration, and with kindest regards to the members, I am pleased to remain,

Yours truly,

W. H. Evans.

This letter was presented to the Board of Directors at a meeting held recently and Mr. Evans' resignation was accepted and a committee appointed to present nominees to fill the vacancy. This committee has reported as follows:

The Car Foremen's Association of Chicago:

Your committee to present nominees for the position of vice-president of The Car Foremen's Association of Chicago, in place of W. H. Evans, who has resigned, beg to present the following names: Mr. Geo. M. Bates and Mr. H. La Rue.

Signed T. R. Morris,
C. M. Mileham,
J. W. Senger,
J. R. Cardwell.

Mr. Bates: I wish to say that I respectfully decline, so far as I am concerned. I do not care to be considered a candidate at all.

Secretary Kline: In the event of either of the two candidates declining to run, the committee have presented a substitute, Mr. H. H. Harvey.

Mr. Cardwell: The nominees are Mr. H. La Rue and Mr. H. H. Harvey.

Upon the ballots being counted, Mr. La Rue was declared elected.

Secretary Kline: The following have made application for membership:

Edgar A. Anderson, Clerk, Mich. Cent. R. R., Detroit, Mich.
Thos. Bennett, Car Inspector, I. C. R. R., Paducah, Ky.
T. M. Baughan, General Foreman, I. C. R. R., Paducah, Ky.
C. D. Brenneman, Car Inspector, Ill. So. Ry., Sparta, Ill.
Wm. N. Connor, Car Foreman, I. C. R. R., Chicago.
Jno. L. Crawford, Asst. Foreman, I. C. R. R., Chicago.
W. A. Carter, Coach Inspector, I. C. R. R., Paducah, Ky.
Frank De Briae, Chief Clerk, C. T. T. R. R., East Chicago, Ind.
Ale. Drazba, Car Inspector, C. M. & St. P. Ry., Chicago.
J. H. Greenburg, Inspector, Wabash R. R., Adrian, Mich.
J. A. Giesler, Air Brake Foreman, I. C. R. R., Chicago.
S. J. Humphrey, Foreman, I. C. R. R., Louisville, Ky.
V. R. Holt, Special Apprentice, C. M. & St. P., Dubuque, Ia.
Edwin R. Kent, Railway Supplies, Chicago.
Jno. McGurk, Foreman Car Dept., I. C. R. R., Louisville, Ky.
Steve Pusskowski, Car Repairer, C. M. & St. P., Chicago.
H. C. Pearce, Gang Foreman, I. C. R. R., Chicago.
Reace Stevens, Gang Foreman, I. C. R. R., Chicago.
Martin Schaub, Car Foreman, C. T. T. R. R., Hammond, Ind.
T. W. Spring, Car Inspector, S. W. S. C. L., Chicago.

Mr. Cardwell: This makes 20 more new members added to our list. If we keep on at the rate we have been going the past few months we will soon reach the thousand mark.

Secretary Kline: I have a proposed amendment to the Constitution and By-Laws which it is desired be read at this meeting:

Article IV, Sec. 1. Add after the word "President", "first", and after "Vice-President", "Second Vice-President", making the Section read: "The officers of this Association shall be as follows: President, First Vice-President, Second Vice-President, Secretary, Treasurer and Board of Directors."

Section 2. Make same change as above so it will read: "The President, First Vice-President, Second Vice-President, Secretary and Treasurer shall be elected by the Association in the following manner, etc."

Article V, Paragraph 2. Add the word "first" before "Vice-President", making the paragraph read: "First Vice-President. The First Vice-President shall assume the duties and authority of the President in the absence of the latter."

Add a new paragraph to read as follows: "Second Vice-President. The Second Vice-President shall assume the duties and authority of the President in the absence of both the President and First Vice-President."

Article II of the By-Laws, change to read as follows: "In the absence of the President, First Vice-President and Second Vice-President, a presiding officer pro tem shall be chosen by the members present."

Mr. Cardwell: The rules provide that any proposed amendment to the Constitution must be read at a regular meeting one month before it is voted on. The amendment that has just been read will be voted on at the May meeting.

This brings us to the regular program of the evening, a copy of which I presume all of you have. The first subject is, "A case in dispute. A receives B's car from C, badly damaged, with D's defect cards covering part of defects. Car not fit to load but safe to handle. Car belongs home via A's line. Car not having home route cards on how should A handle it?"

Mr. Bates (C. B. & Q.): There seems to be only one way to handle it, in my opinion, and that is to follow out Rule 123, which says, "A car which is safe to run, but unsafe to load on account of serious damage caused by wreck or accident, shall be reported to the owners for appraisement and disposition, and disposed of as provided in Rule 122, if the owner so elects." Rule 122 says that a car that is unsafe to load on account of general worn-out condition, the line that has possession of the car should procure home route cards, and it seems to me in this case, the party doing this damage should have taken the matter up with the owner for disposition and procured home route cards, if the owner wished the car sent home.

Mr. Cardwell: It seemed car belonged to B, received from A, damaged in a wreck and carded for only part of the defects.

Mr. Bates: I understand that, but it seems to me that D is the party that should have taken the matter up with the owner. D is the party that carded the car and he is the one that should have taken the matter up and got disposition from the owner and no doubt the owner would have furnished home route cards had the matter been taken up with him.

Mr. Wensley (C. & E.): We have two such cars on our line at the present time. We have simply asked for home route cards so we can send them home.

Mr. Morris (C. M. & St. P.): I would like to state a few things in regard to this case that does not appear on this program. In the first place the car was accepted by A and taken to a point about 500 miles away, which was the point at which the car was received from the line that got it from the owner. When it got there, this other line, the fifth line, refused to take the car in the condition it was, and I do not know how it was finally disposed of, anyway the car was on A's hands. As I understand it and as it came to the Committee on Subjects, A, located in Chicago, wanted to know what to do with the car delivered to him by C. We all know that in Chicago cars are accepted pending disposition of them. They are held. It would not be right to make A send to B, who is a thousand miles off and ask for home route cards. C was equally innocent, except that he had no right, in my opinion, to accept the car from D in the condition it was. C having accepted the car, in the first place, should have demanded a defect card from D, who damaged it, but instead of doing so, hauled the car to Chicago and gave it to A, who had to haul it west to the fifth road that does not appear here. There is a per diem question that comes in here that complicates this still more, otherwise there would not have been any particular objection in holding the car here until A could get home route cards. He did not do that but sent the car forward. I think what should have been done was for A to return the car to C, inasmuch as they had failed to comply with the M. C. B. Rules and protect himself in accepting the car in the first place from D.

Mr. Kramer (Penna. Co.): If this would be a case of mine, I would have returned the car to C, or the party from whom I received it. I would not have demanded defect card and sent it empty 500 miles over our line in that condition. I would have returned it to C.

Mr. Cardwell: A, I suppose, is guilty of an error in hauling the car 500 miles in that condition, but now the question comes up what to do with the car after he has hauled it that 500 miles, whether to return it back to C or hold it for home route cards and pay per diem.

Mr. Kramer: A received the car and he is responsible for the per diem. He did not reject it. He accepted it and hauled it over his line. He probably thought the car was all right to go home; maybe he overlooked the defect card, at any rate he considered that it was all right to be delivered to B.

Mr. Morris: The question is, what should A have done with the car at Chicago. He got the car from C here in this condition. Should A have held the car and got home route cards, or rejected it and sent it back and left it for C to get the home route cards?

Mr. Bates: It seems to me that A ought to have refused the car until properly home carded. In that event he would not have been responsible for any per diem on the car while on his line. The rules provide that when a car is sent home under home route cards, per diem or mileage is cut out. It seems to me A should have refused to accept the car until properly home carded.

Mr Morris: I move you that it is the sense of this meeting that A should have returned the car to C and not accepted it until it was covered by proper home route cards.

Carried.

Mr. Cardwell: Subject No. 2 is, "While A's car is in the possession of a switching road, a pair of loose wheels are discovered. The switching road has no record of this defect when car was received. Is the switching road justified in rendering a bill against owners for repairs, car not having been derailed? No joint evidence card furnished.

Mr. Wharton (C. & N. W.): A switching road, as I understand from this, found a pair of loose wheels after they had the car in their possession some time, which were not discovered when they received the car, so that it is quite likely the wheels got loose while it was being switched around. I have had three cases in my yard recently where loose wheels have been discovered after the cars had been switched around some, and in one case the car got off the track after the wheels became loose, and it is quite likely this wheel in question got loose while in the possession of the switching road, therefore, I think the owner should be billed for it.

Mr. Powell (I. C.): That may be all right so far as the equitable side of the case is concerned, but technically speaking and according to the rules, would the switching road be justified in rendering bill without furnishing joint evidence card showing that the wheels were loose when they received the car. Of course the Master Car Builders' Association has decided in their rules what a switching road can bill for, but they have not made any mention of wheel defects in this nature. Is it a fact that a wheel can become so loose in handling by a switching road that it will make it properly chargeable to the owner, though not in accordance with the M .C. B. Rules? Of course, as a matter of equity, a switching road could bill for any repairs for which the owner would naturally be responsible to a railroad, but for the reason that the Master Car Builders' Association has prescribed certain items that a switching road can repair and bill the owner for, and have not made any mention of loose wheels, I do not believe a switching road is justified in rendering bill against the owner of the car in this case.

Mr. Kroff (Penna. Co.): I think a switching road would be justified in rendering bill. It is an owner's defect and if we adopt anything like that in Chicago we will have to send men all over the country to put in loose wheels found on switching roads. It is an owner's defect, the same as worn-out wheels.

Mr. Powell: I would like to call Mr. Kroff's attention to some things a switching road can and cannot do. If you deliver a car to a switching road with a broken draft timber, it is an owner's defect, but if a switching road delivers a car to you in that condition they are compelled to give a defect card. The question of owner's defect does not enter into the question at all, except for the items specified in the rules.

Mr. Bates: I do not quite agree with Mr. Powell on this question. It is a well-known fact that draft timbers become broken sometimes by a little hard hitting, while a wheel will work loose on account of improper fit, and in view of the fact that switching roads are allowed to render bill direct against car owners for numerous items I think it no more than fair to allow them to bill in case they find loose wheels, because wheels get loose sometimes and run for months before they are discovered, and I think it is drawing the line pretty close to say that a switching road cannot remove a loose wheel and charge the owner for it, because just as soon as you do that they would refuse a car, if discovered in that condition at an interchange point. They would be justified in holding the car and in these days no one wants their cars delayed, and I think it is fair to allow a switching road to bill for loose wheels.

Mr. Morris: I should think this would simmer down to what a switching road is allowed to charge the owner for according to the M. C. B. Rules. The Arbitration Committee, in deciding such questions, always go according to a strict interpretation of the rules and I do not think there is anything in them that will allow a switching road to charge the owner for loose wheels, without joint evidence card. It may not be fair, as Mr. Bates says, but I do not think that should enter into the question. The switching road might notify the owner of the car and have a man go over and look at the wheels and then get permission to charge for the loose wheels, but if bill is made without any of this preliminary I think the owner would be justified in throwing it out.

Mr. Cardwell: I think the idea is to settle this question strictly in accordance with the rules, not what we think is equity in the matter. If the rules are wrong or if there is something lacking here is a good opportunity to make a recommendation for a change.

Mr. Morris: There is one other point. The wheels might have been loose, as Mr. Bates says, for some time and not discovered by the inspectors of the switching road. That is something they have to stand for. If there are defects on a car they do not make record if they are unquestionably responsible to the owner, or connecting line as the case may be.

Mr. Wensley: I find that the switching roads at Chicago make the repairs and get the joint evidence card signed afterwards. I was asked the other day to sign a joint evidence card and when I went over to look at the car I found that it had been repaired several weeks before. I think they are justified in billing the owner and furnishing joint evidence card afterwards.

Mr. Powell: I believe I have stated before that the majority of joint evidence cards that are issued, the inspector who signs the card never sees the defects, merely takes it for granted that the receiving line is honest in his statement and therefore signs the joint evidence, but as a matter of fact, technically speaking, according to the rules, a loose wheel should be inspected and see that the defects actually existed as is shown by the joint evidence card. If the inspector of the receiving line had no record of the loose wheels, he could not procure joint evidence with any degree of pretense of working under the M. C. B. Rules.

Mr. Cardwell: The case comes down to a technicality under the rules. Has a switching road the right to charge the owners for a pair of loose wheels that have apparently become loose while being handled by them?

Mr. Jones: In this case I do not think they have. In the first place they did not detect the wheels when they first received the car.

Mr. Kroff: If they had any record of the loose wheels, who would be responsible, the switching road? You could not sign a joint evidence if the switching road received the car and had no record of the loose wheel how could the switching road sign joint evidence for loose wheels. That would throw the burden on the switching road. I think the switching road would be perfectly right to charge for the wheels.

Mr. Mileham (S. W. S. C. L.): I think that the matter could be settled amicably personally. I do not think there is anything in the rules to justify the switching road to bill for the loose wheels.

Mr. Morris: I would like to ask what action was taken by the switching road; how the thing came to a head. Was the bill deliberately made or was the matter brought to the owner's attention first?

Mr. Powell: I can explain the case as I submitted the question. It was submitted for our future guidance. In passing upon charges of a switching road we find a number of cases that involved technical points. In this case nothing was said to the owner of the car, that the wheel was loose. The owner had no notice other than receipt of the bill and repair card stub charging for change of wheels. I do not remember whether any charge was made for difference in value between new and second-hand wheels, or whether charge was for labor only. It was simply that the switching road got the owner's car in his possession and when he received the car had no loose wheels, and after car had been in his possession several days he discovered loose wheels. They changed them and made bill, and said nothing to the owner; did not call the owner's attention to the defect so that he could investigate and see whether the car had been derailed or met with any unfair usage. The bill was paid without question being raised, but there was some little discussion between the parties interested as to whether it was a proper charge or not. We always appreciate the opinions of The Car Foremen's Association and, therefore, submitted the case to get a ruling for our future guidance.

Mr. Morris: I would move that according to a strict construction of the M. C. B. Rules, a switching road does not have the right to render a bill for changing a loose wheel that becomes loose while in its possession; that the proper course to pursue would be for the switching road to take the matter up with the owner, presenting the facts exactly as they are, and ask for authority to make bill.

Carried.

Subject No. 3.—A applies standard M. C. B. 60,000 lb. axle with $4\frac{1}{4}$ x 8 inch journals to B's car, making wrong repairs, and issues defect card covering same. When car is received home, B makes proper repairs, applying new standard axle and bills A for the difference in value between the new axle applied and the second-hand axle removed. Should not charge be for labor of changing wheels only.

Mr. Powell: I am willing to open the discussion on this question, and in order that there may be some points explained that are not properly stated in the question as it appears in print. This is a case where an owner uses an odd sized axle and $4\frac{1}{4}$ x $7\frac{1}{2}$ inch journal. It is not an M. C. B. standard. Wrong repairs were made to the car and when it is received home, the owner makes repairs to his own car; in other words, he applies new axle standard to car and removes an M. C. B. standard. He allows second-hand credit for the M. C. B. axle, that is, he renders charge for the difference between the new axle applied and the second-hand M. C. B. standard axle removed, plus $1.50 labor charge. The M. C. B. Rules make it obligatory upon him to give credit for a second-hand M. C. B. axle. The owner has cars equipped with M. C. B. standard axle so that the axle he removes is serviceable to him on his own cars or foreign cars using an M. C. B. standard axle. He is charging for a betterment to his own car; in other words, he gets the benefit of a new axle and charges the party who cards the car for the wrong repairs, for a betterment. The Arbitration Committee has decided that where there is no damage on the M. C. B. parts removed, no charge is to be made by the owner for betterment. Of course, that would not hold true for repairs made by an intermediate road, but in this case the repairs were made by the owner. I think the charge should be confined to the labor, as a matter of equity and according to the rules.

Mr. Bates: I agree with Mr. Powell that the owner has no right to charge for any betterment on his car, even though he has a defect card. Case 558 is similar and I think would apply in this particular case. This was a case of car being equipped with 36-inch wheels, and it was on a foreign line, and while on this line it became necessary to remove one pair of these 36-inch wheels and as the road having the car in its possession had no 36-inch wheels they applied 33-inch and furnished their defect card. The owner in making proper repairs, charged, of course, for the new 36-inch wheels and gave credit for the second-hand 33-inch wheels, and the Arbitration Committee decided that this charge was not right. They said all the owner could charge would be the difference in value of one pair of second-hand 36-inch wheels and 33-inch wheels and the labor of making the change, and I think, in this particular case, all that can be charged is $1.50 for labor for changing axle.

Mr. Mileham: I would like to ask what caused the wrong repairs? The journals were the same size and the axle the same size.

Mr. Powell: I would say that the car was a 60,000-lb. capacity car and the axle applied by the party making wrong repairs was an M. C. B. standard $4\frac{1}{4}$ x 8 inch journal. The axle standard to the car was a $4\frac{1}{4}$ x $7\frac{1}{2}$ inch journal. The car was stenciled 60,000-lb. capacity.

Mr. Mileham: According to that it was not an M. C. B. axle that was removed. In my opinion, the party is justified in billing the new axle and giving credit for scrap.

Mr. Kroff: I think that the owner ought to charge labor only for removing standard M. C. B. axle and putting in one standard to the car.

Mr. Cardwell: If you were an intermediate road making repairs to a foreign car, would you charge him for the labor only.

Mr. Kroff: If you are going to stand technically to the rules, as we have been saying tonight, I do not see how you are going to get out. The rules say plainly that labor only can be charged for removing an M. C. B. axle.

Mr. Cardwell: The car is carded for one wrong axle and when this axle is removed on this defect card and a new axle applied, you think the charge should be for labor only?

Mr. Kroff: In that case the owner would not have any right to make any charge for betterment to his car.

Mr. Morris: I do not think there is much to say in addition to what has been said. It seems to me a very clear case and a rather one-sided one. The owner of the car got a standard M. C. B. axle, 60,000-lbs. capacity and he can use it in his own car if he has any of that capacity, and if he hadn't any, he could use it in somebody else's car one time or another. I do not think there is any question but that the charge should be for labor only.

Mr. Mileham: It seems to me that would work a hardship for a private line that had no 60,000-lb. cars. I believe that the party was justified in billing the way he did.

Mr. Morris: I think anybody that runs a $4\frac{1}{4}$ x $7\frac{1}{2}$ inch journal ought to stand some hardship. There is another side to it that has not been touched upon and it is this: The Master Car Builders have provided a standard for 60,000-lb. cars. We have all been troubled one time or another with odd material, odd parts on cars, and there is no reason for it. The M. C. B. specifications are plain enough and a majority of the roads, and a very large majority, have M. C. B. material, and if anybody gets a notion that certain ideas of his own are better than the M. C. B. standards he ought to be willing to pay for it, and I think the rules ought to be made so that a penalty would be attached to any such thing as that. They should not be allowed to run odd material. It puts us to a great deal of trouble and expense to get the right material to make repairs, as we have all had cases where we got cars with wrong material under load, and perhaps perishable freight, and found it very difficult to get the car repaired so it could be forwarded, and I think, as I said, that there ought to be a penalty attached to any odd material in that way.

Mr. Bates: I would like to call attention to Rule 87 which says "If car owner elects on account of improper repairs to remove M. C. B. standard axles, suitable to the capacity of the car, he shall allow credit for second-hand axles, if they are in good order." That goes to show that the owner cannot scrap the axle and this decision that I have quoted prevents any one from charging for betterments on his car and it seems to me that the case is very plain that the owner should not make charge for any more than labor.

Mr. Cardwell: It seems, as Mr. Morris says, there ought to be some penalty attached where uniformity of standards is interfered with, as we want to preserve it as much as possible.

Mr. Bates: I would move that it is the sense of this meeting that in this case the owner should only be allowed to charge for labor for making the change of axles.

Carried.

Subject No. 4.—B removes a pair of wheels with a 3 5-16 inch journal from a 40,000-lb. capacity car belonging to A, account worn flange wheel, and renders bill against owner. What credit should be given for the axle removed?

Mr. Bates: As I read this case, the party B would be obliged to allow credit for second-hand axle. Rule 23 gives the minimum dimensions for journals for 40,000-lb. capacity car, which is $3\frac{1}{4}$ inches. his axle had journals that were 1-16 inch greater than that and it does not seem right for B to try to scrap the axle because it is not down to the limit.

Mr. Cardwell: Is there not another rule that has some bearing on that.

Mr. Powell: There is one rule that says that when second-hand axles are applied under conditions which make them chargeable to the owners, the diameters of such axles should not be less than $\frac{1}{8}$ inch above the limit dimensions given in Rule 23. In the case in question, by removing the axle, the party making repairs has an axle on hand that is not suitable to apply to a foreign car, under the rules. He does not want to apply it to a foreign car and makes wrong repairs, and he does not want to apply it to his own car, and the result is the axle is worth only scrap value to him. The question is, who should pay for the axle, the owner of the car or the party making repairs? I think the owner of the car should be responsible for the axle because it is only a question of time when it will be worn to the limit and it would then be required to be removed as scrap. If anybody applies the axle when it is not chargeable to the owner they would have to issue a defect card if the axle was not $\frac{1}{8}$ inch above the limits prescribed in Rule 23. I do not believe there is anything in the rules that would make the party making repairs responsible for the axle.

Mr. Bates: I do not quite agree with Mr. Powell in regard to this case. Rule 72 says that when second-hand axles are applied under conditions which make them chargeable to the owners, the diameters of such axles applied should not be less than $\frac{1}{8}$ inch above the limit dimensions given in Rule 23, but if you apply a pair of wheels where you remove a second-hand axle and make no charge, there is nothing in these rules to prevent you from using that axle. It only refers to where you are going to charge the owner for the axle you apply. In that case the axle must be $\frac{1}{8}$ inch above the minimum dimensions set forth in Rule 23.

Mr. Kroff: This Rule 23 plainly gives you the limits to work by, therefore, I think the road ought to allow second-hand credit for the axle removed as it is not down to the limit.

Mr. Powell: I would like to ask Mr. Kroff what he would do with that axle if he removed it. Is he going to apply it to his own car or to a foreign car?

Mr. Kroff: I am the judge of that. I can either take it and have another pair of wheels pressed on or allow credit for second hand and put it back under any 40,000-lb. capacity car where I am not going to make any charge for the axle, but under the rules I cannot condemn it and charge it to the owner.

Mr. Jones: In this case I do not think the axle is scrap until it is down below the limit. It is 1-16-in. above the limit as prescribed in the rules. I do not think it is right to scrap the axle on that account.

Mr. Wensley: I would have to give credit for second hand because it is not down below the limit.

Mr. Mileham: Taking the rules into consideration I do not see any other way out than to give second hand credit for the axle.

Mr. Bates: I move you that it is the sense of this meeting that credit should be given for second hand axle in this case.

Carried.

Subject No. 5. A delivers to B a car belonging to C, loaded with lumber and having one end post broken. B returns car empty with two additional end posts broken at the same end. A demands defect card for the three broken posts. Is this correct?

Mr. Wensley: I have had quite a number of cases where I got cars with one end post broken and break two additional posts and I simply have to card for the entire damage. I do not think there is any question in that case at all.

Mr. Bates: This seems to be a case of delivering a foreign car, loaded with lumber, to B, with one end post broken, for a local switch point. Now B's record, as I understand the case, shows that one end post was broken. It is a well known fact that in handling cars for local switching, loaded with lumber, the cars are not going to get any better, but are going to get worse in spite of the best of care. Of course some years ago the practice around Chicago was if you delivered a car to another line in defective condition, the receiving card, if it was a switch car, would handle it and give it back with additional defects and the car would be accepted without question. The same thing applied to cars delivered in straight transfer business. If the car was defective the receiving road would make transfer and send the car back home and if it had any additional defects the delivering line would not ask for any defect cards. Now since these rules were adopted, I think they were adopted in 1896, that is, what we call the Chicago Agreement, some roads take the stand that when you deliver a car to another line having defects, it is their place to make repairs and avoid further damage and failing to do so they are responsible for all the damage. Take this case, a car loaded with lumber. I would like to have any one say how the receiving road could put in an end post while the car was under load, and it does not seem right on the one hand to ask for defect card for the three end posts. I think the road that returned this car ought to card for the additional damage that was done, but I do not believe they ought to card for damage that existed when they received the car from A. Now I have looked up Arbitration Decisions on this point and I only was able to find one case that I considered a parallel case which was Case 531. This case shows that a foreign car was delivered to the P. & P. U. Ry. at Peoria and it had two center sills broken, and in handling the car to the P. & P. U. freight house, there was a lot of other damage done, which in connection with the two center sills formed a combination, so of course the P. & P. U. took the stand they were at liberty to bill for the whole damage and finally the case was presented to the Arbitration Committee. I will read the decision for the benefit of the members. "The Peoria and Pekin Union Ry. accepted Norfolk & Western car 863 from the L. E. & W. Ry., with two broken draw sills, only. After moving car to freight house and to repair track they discovered end sill, end post and girt broken. The evidence shows the two draw sills were broken when car was offered, and owners should accept charge for cost of repairs to draw sills. But the Peoria & Pekin Union Ry. does not show that the broken end sill, end post and girt were not the result of unfair usage—that is, it failed to put this car in safe hauling condition before moving it and thus becomes responsible for the additional damage. The two draft sills cannot be broken so as to render the car unsafe to handle and have the end sill, girt and post intact, or in other words, not damaged. The opinion of the committee is that the Peoria & Pekin Union Ry. is responsible for the subsequent damage to the car." That is what I claim in this case here—that B is only responsible for the additional damage, which is the two end posts. If you will refer to page 15 of our present M. C. B. Rules it tsays: "Combinations of defects which denote unfair usage if caused at one and the same time and at the same end of car." In this case it plainly shows that the damage did not occur simultaneously. One end post was broken when the car was delivered to B and while B handled the car two more posts were broken so that it is pretty clear that the damage was not simultaneous. Technically speaking I think B should not furnish card for anything, for the reason that car was defective when he received it from A, but if it was my case I would furnish card for the additional defects, but would not card for the end post that was broken when I received the car.

Mr. Wensley: I would like to see that argument go through but I am afraid it would not work. I might get a car here from the C. & N. W. and hold record of a broken end sill, and run the car down on our road a few miles and in doing so break two draft timbers and give the car to some other line. I would get a request to furnish defect card for two draft timbers and an end sill broken and if I told them I had received the car from the C. & N. W. with a broken end sill I do not think this road would accept it. The same way if I get a car with a broken end post and break two more we certainly become responsible for the whole three.

Mr. Bates: In reply to Mr. Wensley I wish to say that the case he quoted is entirely different for the reason that he receives the car from one road and delivers it to some other road. If the car in question was handled the same as in your case why then B would be responsible. In the case we are considering the car goes from A to B and from B back to A again. The case Mr. Wensley quotes is not parallel to this at all.

Mr. Kroff: I agree with Mr. Bates. I think he has explained that very thoroughly. I am about of the same opinion in regard to these posts.

Mr. Wensley: I would like to ask Mr. Kroff in case I had one of his cars with one end post broken and broke two more, would he ask for card for two end posts or three. Two end posts is owners defects and he would have to stand for all the damage.

Mr. Kroff: Mr. Bates stated if the case were his he would be willing to furnish defect card for the two end posts which he broke on the ground that a combination existed when he returned the car.

Mr. Bates: This is an unusual case. The car had additional damage which formed a combination and part of it existed when B got the car and it seems to me folly to ask B for card for something that A had done. If B furnished his defect card for two posts A could charge those two to B and charge only one to the owner. I do not see that A is out anything. I believe that is the proper way to handle it.

Mr. Cardwell: There is a combination to be considered here or there is supposed to be a combination. From one of the arbitration cases which makes a penalty for not repairing defects any additional defects occuring from the combination, as in this case, is it possible to split up the combination and still make delivering road responsible for a part of it?

Mr. Bates: I stated in the case which I read that the arbitration committee decided that the company handling the car should be held responsible for the additional defects and that is just what I contend should be done in this case.

Mr. Jones: I do not see where A is out anything. If he delivered the car with broken end post it is an owner's defect. Two end posts would form a combination in connection with the one that had been broken. If the one post had not been broken perhaps the other two would not have been broken and I do not think A ought to ask for a card.

Mr. Bates: I want to call attention to another fact. I had a case myself here some time ago where another road delivered us a foreign car with two end posts, end brace, end slats and an end plate broken, these being all owner's defects. The car was loaded with lumber and in handling the car we broke one corner post. It is almost impossible to handle a car without doing some additional damage. This road wanted us to card for the entire damage. About 70 per cent of the damage had been done by the road delivering the car to us and I think it would be an injustice to ask any road to pay for a case like that simply because they broke one post and in view of the fact that it is utterly impossible to make repairs before you get the load out of the car. We all know that a railroad company is not going to transfer a carload of lumber which is only going to be hauled seven or eight blocks. I think the delivering company ought to be thankful that the car was not refused and they ought to take the car back without a word. If we are going to decide that B should card for all these defects it is going to change things a good deal and we do not want to do anything that will tend to make any trouble or delay the interchange of cars. We want to settle it in the best way and the way that will be most equitable to all parties concerned.

Mr. Wharton: I do not think any request should be made for more than the two end posts. If the car was delivered with one broken end post and two other end posts were broken afterwards I thing all that B should be held responsible for is the two end posts which he broke.

Mr. Kroff: I would like to ask Mr. Wharton what he would do if the home of that car was not in Chicago—whether he would accept a car in that condition?

Mr. Wharton: This I consider an owner's defect. They may be merely cracked at the belt rail or pushed out at the top. It depends a great deal on the nature of the car, whether it is a stock car or a box car for home loading without being repaired.

Secretary Kline: There is another point in connection with this case. When A gets the car back from B he delivers it to C with the three broken end posts and he has got to furnish C a defect card for the posts. Where is A going to go for his protection?

Mr. Bates: As I said, I think B should furnish A with his defect card for the two end posts which he broke and let A settle the matter with the owner the best way he sees fit, because A broke one end post and he ought not to ask some one else to pay for what he did. I would move you that it is the sense of this meeting that B should furnish defect card for the additional damage which was caused to the car while in his possession.

Motion lost.

Mr. Wensley: I would move you that it is the sense of this meeting that B should furnish his defect for the three end posts.

Motion carried.

Meeting adjourned.

The Car Foremen's Association of Scranton

April Meeting

On Saturday evening, April 11th, the Car Foremen's Association of Scranton held its regular monthly meeting in the R. R. Y. M. C. A. Hall, Scranton, Pa., President R. B. Rasbridge in the chair. Present 67. The minutes of the previous meeting were approved as published in the Railway Master Mechanic.

Mr. Rasbridge: We will now enter upon the discussion of our first subject, which is: "A delivers to B one of B's cars, loaded, with two center sills broken. It is necessary for the car to be transferred. Who should stand the expense of the transfer?"

Mr. Rockwell: That subject was proposed by myself and Mr. Bundy after the adjournment of our last meeting, and it was brought about in this way: Some of our connections have delivered our cars home with for instance two broken center sills, loaded, and we refused them on the ground that they were unsafe for movement over our line, and referred them to rule No. 2 of the Master Car Builders' Rules. We asked them to transfer the car and deliver it to us empty, which we thought was the proper course to pursue. In some cases our connections would try to hold the matter off in various ways and fight it out. Sometimes we would give in and sometimes the delivering road would. There has been a case of us receiving a car on conditions, but there seems to be a general misunderstanding with our connecting lines in handling a case of this kind.

Mr. Rasbridge: This is a subject we will remember was brought before the Master Car Builders' Association last June. As I understand it, there is an arrangement, called the Buffalo Agreement, which refers to all roads that enter Buffalo, and I also think applies to Chicago. If a car is offered to a connection with defects which the receiving road considers unsafe for movement, they cannot refuse the car, but are obliged to accept it, transfer the load, and return the car empty to the delivering road.

Last year there was an attempt made to incorporate this in the rules, which was general on the part of the roads in the west, but the eastern roads objected to it. If my memory serves me right my understanding at that time was that this arrangement would be continued for another year. It had not yet been in force long enough to demonstrate just to what extent it would be of benefit, and it was decided the matter be deferred for another year, and we would have a report at the next Master Car Builders' convention, at which time it would come up for final discussion. There is no question but what the case referred to here, the receiving road shall be the judge. If the car should be offered with two center sills broken off, it is not safe to accept. Car should not be accepted, and under no conditions can the delivering road compel you to accept it, whether loaded or empty in accordance with present rules.

This is a matter that would be of interest to have discussed and get the views of the different members because this is a question that will for a certainty come up at our next Master Car Builders' convention.

Mr. Fritts: I see Mr. J. H. Banker is here, the chief joint inspector at Binghamton, whose opinion I think would be very enlightening to all of us. As one member I would like to hear from him.

Mr. Banker: Will say I am running cars with two center sills broken, providing they are not broken dangerously. Often when they are broken over the body bolster I run them, and when broken slightly between end sill and body bolster I run them also, but if broken dangerously between end sill and body bolster I will have load transferred, the delivering road paying for the cost of transfer.

Mr. Rasbridge: Do you make any exception to cars with center fillers?

Mr. Banker: Very often I have them transferred, but if not damaged too badly I will run them. A great deal depends on the construction of car, its condition, also destination car is loaded for.

Mr. Fuss: I really do not see how there can be any question raised in regard to the car. According to the proposition before us, this car is to be transferred, which is prima facie evidence that the car is unsafe to run. I do not see any reason why the receiving company should pay for the transferring of load on any car where the damage occurred on the delivering company's line, even though it was the receiving company's car.

Mr. Kinney: If the sills were broken and the car is not safe to run, I am of the opinion that it should be refused, but if it is an old defect and the car is perfectly safe, I do not see any reason why a question should be raised. In this particular case I would say that the delivering company should stand the expense of transfer—that is in accordance with the present rules.

Mr. Canfield: When I came here tonight I said that I would not have anything to say, but some of the remarks made brought to my mind a few points. I note it has been stated that at the last Master Car Builders' convention there was a proposition that the receiving road should stand the expense of transfer. That is true. At the last convention there came from the west a proposition that the receiving road should accept car and load, and if it did not want to run the car they should transfer the load and return car empty to the delivering line, transferring it at their own expense. This was defeated.

I understood your president to say that this rule was in effect at Buffalo, and they were to work it another year before taking a final vote on it. There was a final vote taken on it at the last meeting and the feasure was defeated, and there is no such rule now in effect at Buffalo. The rule at Buffalo is that the receiving road shall accept the car if safe to move, and if they decide that it is not safe to move beyond the receiving point, they shall make transfer themselves, billing the delivering road for the cost of same. The two propositions are different. One proposition from the west states that the receiving road shall make transfer and stand expense; the Buffalo proposition is that the receiving road shall make transfer and bill delivering road for cost of same, and they have regular rules—that is, set prices for transferring different commodities at so much per ton. For instance, if there is some heavy machinery to be transferred and it is necessary to bring into use a steam derrick, they bill for the cost of the derrick; in fact, the total cost of transfer.

I do know at the next convention, to be held at Mackinac, there will be a recommendation again from the Western Railway Club, at Chicago, that the receiving road shall take car and transfer it at its own expense. There will also be presented a recommendation from the Central Railway Club that the receiving road shall accept car, and if in such defective condition that they do not want to run same, they are to make transfer and bill the delivering road. So it is sure to be put before the association at the next meeting in two different forms. I have in my own mind how the vote will go. In the first place, it seems unfair to me, to ask a receiving road to accept a car that the delivering road damaged, make transfer and stand the expense themselves. The Master Car Builders' rules are laid down on fair lines, and they try to be fair in everything they do.

Mr. Rasbridge: My understanding at that time was that a special arrangement at Chicago, which provided for the acceptance of cars by the receiving road and transfer made in case they did not consider the car safe to run, and it met with opposition in general from eastern roads. The understanding then was that the matter would be left over for another year, to see how it worked out. Such was my undrstanding of the matter, and I understood that applied in what was termed the Buffalo agreement.

Mr. Canfield: You are in error there. Pardon me for putting it that way, but it is just as I explained. I helped to make the Buffalo agreement, and I operated under it for three years. The receiving road must accept the car if safe to move, and if necessary, or if they elect to transfer it, they shall do it and bill the delivering road for the expense. The party doing the damage is responsible for the transfer.

The matter of the Buffalo arangement was not referred to at the last Master Car Builders' convention. If you will read the proceedings carefully you will observe that it is a flat proposition introduced by Mr. Rhodes, of the C., B. & Q., that the receiving road should accept the car or the freight. If you do not want to run it, transfer same at your own expense. That rule is in effect at Kansas City and has been since 1890. I went to Kansas City in 1889 and was there a year and worked under that rule.

The arbitrators at Buffalo made a statement at the last Central Railroad Club meeting that 80 per cent of the transfers were (at Buffalo) on cars east bound. You can readily see how unfair it would be to make the receiving line stand that expense. The western road did the damage, then they ask the eastern road to pay for 80 per cent of the cost of repairs, the 20 per cent going the other way. If you strike a central locality, for instance, Cleveland, or, say Chicago, it would then even itself up, because the cars would have an equal haul.

Mr. Fuss: I think we should go on record, if this is to be a pertinent question at the next Master Car Builders' convention, and if our proceedings are to be published they may have some bearing on that line. Therefore I move you that the sense of this meeting is that the delivering road should be responsible for the expense of transferriug load in the case above cited.

Mr. Hugh Canfield: I second that motion.

Motion carried unanimously.

Mr. Rasbridge: The next subject on our programme is a paper on "Electric Car Lighting," by Mr. J. C. Fritts (D., L. & W.).

The advancement in electric car lighting during the past few years has been so rapid that it is generally admitted that in the near future the method of illuminating passenger cars by electric current generated from the car axle, or some othr method, will be extensively used. Cars so equipped must each be independent of the other for its source of light, and practically an electric plant within itself. It must also contain features that will make it automatic in its action, both in reversing the poles when cars are run in opposite direction and in connecting the generator to the lights and batteries when the critical speed has been reached, and again breaking the circuit when the speed has been reduced to that point. When the machine current is broken, if the lights are being used, current is supplied by a set of storage batteries, which is a part of the apparatus. There are several different electrical systems in use today, but they all embody three important features, which are obtained in various ways by the different systems, and these have been difficulties hard to overcome.

First. The transmission of power from the axle to the armature pulley.

Second. To maintain a constant voltage at the lamp circuit and a uniform output of the generator at the different speeds of the train.

Third. To maintain the storage batteries so as to obtain their highest efficiency.

There are several methods used in the transmission of power from the axle to the armature pulleys, viz., gears, friction pulleys, sprocket wheels and chains. Various other methods have been tried, but to date it is generally acknowledged that the flat belt is the best method yet devised, and is in use on a large percentage of the cars using this system of light throughout the country today. There is a certain elasticity in the belt that takes up the shock a car wheel receives in passing over frogs and cross-overs, which otherwise would be transmitted to the generator if belt transmission was not used.

The second important feature, or the matter of regulation, has been the source of a great deal of annoyance and trouble. A 25 or 30 volt circuit is generally used, and it is necessary to carry enough storage batteries to maintain this voltage when trains are standing at stations or before leaving terminal points. The generator is so constructed that this voltage is obtained when the train reaches a speed of about twelve miles per hour, when an automatic switch, magnetized by the current from the generator, closes, connecting the generator to the batteries and the light circuit in multiple. The speed of the train may vary, but the output of the generator must be kept uniform. In some cases this is produced by the slipping of the belt on the armature pulley, which is regulated from the inside of the car by trainmen moving the generator with a ratchet, which will tighten or slacken the belt as is desired. When the load of the machine reaches the point desired the belt will commence to slip on the pulley.

Lately there has come on the market what is known as an output regulator, to be attached to this system, which automatically shifts the generator, according to the amount of current that is being made. This system can also be operated by hand, if any of the electrical parts should fail, and if the main circuit becomes broken it can be entirely disconnected without affecting the light.

Another form of regulation and one most generally in use, is the weakening or strengthening of the generator fields. This is produced in a number of ways. One is automatically done by throwing resistance in the field circuit. To obtain this there is a rheostat arm, solenoid and pawls which are operated by a motor. These pawls are raised or lowered according to the strength of the current passing through the solenoid; and as the current becomes strong pulls in resistance, and as it becomes weak the rheostat arm is pulled back to its normal position. If all of the different mechanical parts are in order, a very good regulation can be obtained by this system.

Another way to obtain this effect is by the use of what is known as a "bucker," which consists of generating a counter e. m. f. in the field circuit of the generator. By this means the strength of the fields is reduced and prevents any increase in output. Some of these systems are more or less complicated and have a great many different moving parts to take care of, and which frequently cause failures, and it is quite evident that the best system will be the one having the least number of parts to maintain.

Lately a device has been put into use which, up to date, gives perfect regulation, and is produced by bringing pressure to bear on a hard substance (which has been chemically cured) placed in the field circuit. This is something new and consists only of a solenoid and arm with a movement of 3-16 inch, and it promises to be a great advancement in the matter of electric car lighting, and no doubt will be watched with great interest.

There is also soon to be placed on the market a system of regulation which is attached to the armature shaft and is obtained by centrifugal force. This, of course, will give a constant speed machine, which is very desirable for several reasons—namely, no distorting of the lines of force, eliminating the sparking of brushes and burning out of commutators, which is a matter to be considered. However, this system is not yet in service, and it is hardly possible to predict its future, as a certain amount of wear and heat no doubt will be produced, the effect of which will have to be watched when put in service.

Maintenance of storage batteries. Storage batteries have given considerable trouble on account of the plates buckling and rapid deterioration. In preparing storage batteries a pure acid of 1250 specific gravity should be used, procured from a reliable manufacturer who mixes it in large quantities. This will insure a uniform resistance in all cells, but if mixed in small quantities, and by inexperienced help, there is a great possibility of a variance of resistance, which tends to cause an unequal potential in the different cells, with the result that disorder will occur in some, thus throwing more work on the remaining cells, which will also be damaged if left in this condition.

Tests should be made in all cases before being used to see if it contains iron, copper, mercury, chlorine, etc., and if it is found that such impurities exist the acid should not be used, as they will destroy the plates in a short time, which are expensive to replace. After being placed in service inspection should be made frequently to ascertain their condition, and the specific gravity of the acid tested (being careful not to use a mercury hydrometer).

Another way storage batteries have been giving considerable trouble is in the sulphating of the plates. This is sometimes caused by a low discharge, which happens by using the lights too long after some part of the system has failed while car is on the road. Instructions should be issued to all trainmen to stop using lights as soon as they begin to grow dim, as after the plates are sulphated it takes a long and heavy charge to remove it, and no doubt in the near future all railroad companies will issue these instructions, thereby avoiding a certain amount of trouble we are having in this direction. Storage batteries give their highest efficiency when in a temperature of about 90 degrees, and lose in ampere hours one-half of one per cent per degree drop in temperature. Therefore it can easily be seen that in cold weather, when more light is required, that the batteries, which are kept in a box underneath the car, exposed to the cold, etc., suffer considerable loss in output. This is something that the electric car lighting companies should look into, and improve on if possible, as the success of every system very largely depends on maintaining the batteries to their highest efficiency, and if they could be kept at a temperature of about 70 or 80 degrees much better results would be obtained.

The generator that is generally used on the different systems is of the bi-polar type. Some companies hang them from the truck axle safety beam, while others from the body of the car. It is very evident that dynamos hung from the body of the car receive less shock, and are less liable to dampness and foreign substances that would cause shortcircuits and grounds, than those hung from the truck, as they receive the benefit of both the equalizing and elliptic springs. However, one company has hung the carrier iron on springs with a slight lateral movement. This takes up all shock and seems to have advantage over other methods; i. e., the lateral movement, which will help to obtain better and longer service from the belt than could be had under other conditions if these features did not exist.

Care should be taken when placing generators on car trucks; if under sleeping cars or coaches, water drips should be avoided, if under a dining car, opposite the kitchen end is preferable, and at the same time arrange to use as long a belt as possible. Experience has developed the fact that much longer and better service can be obtained from a belt of reasonable length, as it gives a better contact on the pulleys and the lateral movement of the truck will be much more easily taken care of. All wires running from the machine under the car should be thoroughly insulated. Each wire should be placed in circular loom and then inside an iron pipe. This insures absolute safety against dampness, shortcircuits and grounds. Also the wiring inside of car should be carefully applied. If fixtures are used, care should be taken to avoid all contact either from these or any metal around the car, such as screws, rods, pipes, etc. An employe putting trimmings into car before leaving the shop can very easily drive a screw through the insulation of wires and cause a ground that will take considerable time to locate.

Mention might be made of the difficulties encountered in suburban service, and especially on systems where the amperes consumed, when using lights, are as much or nearly equal to that made by the generator. Considering the time lights must be used before leaving terminal points, and the short distance between stations, and the speed that must be attained before the generator cuts in, it can be plainly seen that more current is being used than being made.

Some systems rely on storing enough current during the day to meet this requirement, but conditions are not always favorable to do this, as suburban cars are not in regular runs and at times are likely to be placed in all night service, and if it was possible to keep cars in runs suitable for these conditions, considerable light would be used during the day on some roads that have tunnels and dark train sheds. Therefore it is essential that a perfect system must meet the requirements under all conditions.

It has been the practice to figure as closely on electric car lighting as on other commercial work, but this seems to be impracticable, as different conditions are met on railroads than in other electrical work, and the different companies should figure on a wider margin in all cases, which no doubt will overcome a great many difficulties now experienced in suburban service.

This system of car lighting has several desirable advantages over others in general use. The quick and easy manner in which it can be handled, the perfect distribution of light, the eliminating of heat and odor, making it possible to obtain a better ventilation, thereby adding great comfort to passengers. The matter of safety should also be considered, which is a great advantage over other systems.

The cost of maintenance is one of great importance and one that should be given careful consideration. It does not seem fair to figure on maintenance of one of these systems until it has been in service at least one year, as under ordinary conditions it is not probable that any of the important parts will need renewing.

After several of them have been in service for over three years it has been found that figuring candle power against candle power with other methods of lighting that they compare very favorably during the summer months, but in cold weather the relative cost usually increases and more trouble is experienced, and it is quite clear that the great weakness with electric systems is due to their inability to withstand, to a certain extent, the effects of snow and cold weather, and the different electric car lighting companies should endeavor to overcome these difficulties. Considering the advancement there has been made in electric car lighting during the past few years, it is reasonable to suppose that in the near future a system will be installed, if there has not already been, that will meet the requirements of today. Railroads should be thoroughly equipped to handle this system of lighting and the men who have the care should be taught and given every advantage to familiarize themselves with the nature of the system, which will all have a tendency towards the reduction of the cost of maintenance.

Mr. Rasbridge: I do not know whether anyone is prepared to make remarks on this subject from the fact that we had no intimation until this evening that we were going to have this paper.

Mr. Canfield: I am not as much interested now in this subject as I was a short time ago before I resigned from railroad work, but the members of the Car Lighting Committee have written me a number of times for information on the subject, and I am very glad Mr. Fritts has given this paper tonight. I think he deserves the compliments of the Club for presenting such a thorough and able paper on the subject.

There are one or two questions I would like to ask Mr. Fritts. I note he says the pawls are raised and lowered according to the strength of the current passing through the solenoid, and as the current becomes strong pulls in resistance, and as it becomes weak the rheostat arm is pulled back to its normal position. If all of the different mechanical parts are in order a very good regulation can be obtained by this system. This would indicate that he has had some trouble with that particular type of regulator, and I would like to ask him if he has had any trouble. I would like to preface that question with the remark that it is only to find out what parts are giving trouble that the electric people will be able to correct them. I am not finding fault with anybody's system.

He says the storage battery gives considerable trouble on account of the plates buckling and rapid deterioration. I would like to ask him to give some of the reasons for plates sulphating. He says the acids must be pure, and that they must be tested. I would like for him to say what method he has for testing his acid, and what the result would be if he does not get pure acid.

He cites another trouble: the sulphating of plates, going on to say it is sometimes caused by low discharge which happens by using lights too long after some part of the system has failed while car is on the road. He speaks of certain instructions that ought to be given railroad men on the question of handling and care of light. I think that is true, and the instructions ought to include car men who are cleaning cars at night to not abuse the light when the car is standing still. For instance there are cases where it is necessary to clean a dining car at night, and I have at times noticed all the lights turned on, with the consequence that the next evening there would be a failure of the light.

He brings out a very strong point when he says that it is proven by data that lights are more expensive in the winter time than summer, that they cannot stand snow and ice. That is true. We all know that who have had any experience with it, and I think it is up to the electric light people to make some provision to take care of the light in the winter time. It has been suggested that a line of steam pipes be run around the boxes containing the batteries; but it would not do to have iron too close to the batteries. It would short-circuit them. The pipes would become charged. There ought to be some way of heating these boxes. Mr. Fritts says you cannot get the full use of your batteries unless heated to a temperature of from 70 to 80 degrees, and it is impossible to keep them heated without some heating system. It appears to me that some cheap heating system might be applied to the battery boxes, or give up space enough on the inside of the car to have a battery cupboard. It appears that this is one of the reasons for winter failures.

He speaks of the trouble he has on suburban trains. The generator does not begin to generate electricity until it has attained a speed of 12 miles per hour. That is the way the generator is set, and if they do not run above that speed long enough to take care of the lights of the car, even if they have to run some in the day time, they do not get light at all. I would like to ask Mr. Fritts, if it is not possible to put a larger generator on and a larger battery so as to generate enough electricity at any time to run these cars at night, or if that is not true, is it not possible to generate it at a less speed than 12 miles per hour.

Futher down his paper I note he says that the different companies should figure on a wider margin in all cases. I think he means that they should use a larger dynamo or generator.

He says it is not fair to figure maintenance on one of these systems until it has been in service at least one year. That is true. Very few figures can be made on the first year on an electric lighting device. I think again there are times when it is not fair to compare the cost even after they are a year old. I know a friend of mine who got into trouble with an electric lighting system on account of not testing his acid and he ruined the batteries on several cars, costing several hundred dollars to replace same. It would not be fair to charge that cost up against the electric lighting device. It was due purely to the man not having tested his acid, and he not having tested it, was due to his superior officer not requesting him to have it tested. His superior officer was lame in not having informed himself before the accident occurred and not telling him to do it. Such occurrences as that should not be charged to the electric lighting system.

Mr. Fritts: In regard to the sulphating of plates, some of the best authorities on batteries claim that a charge at a low rate will cause plates to sulphate, and if the acid is of uneven specific gravity in the cells it will cause disorder and result in sulphating some of the plates. I do not believe that enough consideration is given to batteries in general. They are a very important part of the apparatus, and if not kept in good condition many failures can be traced back to them. In my opinion it is very essential to have plenty of storage capacity. A great many batteries are rated at a longer ampere hour output than can be depended on in service in good condition, and it is safe to deduct 30 per cent from the rating. It does not seem practicable, looking at it from a railroad standpoint, to use a battery under 240 ampere hours. This gives a margin that will overcome difficulties that would be experienced if a smaller capacity cell was used. In speaking of a wider margin I mean practically everything connected with the system. Under fair conditions you take any electrical apparatus and it will do the work all right, but you meet conditions on a railroad that are not met any place else. In regard to trouble with the regulators—it goes without saying that an apparatus with anywhere from 10 to 15 moving parts we are going to have trouble at times and something is going to get out of order.

Relating to the test of acids, I wish to say that there are different tests to be made for the different kinds of impurities found to exist in some acids. Iron can be detected in solution in the acid by adding a few drops of solution of potassium ferrocyanide. For copper dilute acid with water until it is quite weak and then add some sulphuretted hydrogen water. For Chlorine—add a few drops of a solution of nitrate of silver and nitric acid. A white percipitate will form if chlorine is present.

In answer to the question of suburban trains giving better satisfaction. If generator cuts in at a low rate of speed no doubt this could be done, but if cut in at too low speed trouble would be experienced in keeping the output uniform when a high speed was reached.

Mr. Canfield: Do you think it possible to attain a speed of 70 or 80 miles per hour in suburban service?

Mr. Fitts: It would hardly be practical to put any device on a car that would not meet all conditions. Sometimes the car may be put on another run. You may want to put it on a fast line, and if your system could not meet these requirements, why it is something you do not want. So it is better to have a system that will meet all conditions that it is liable to come in contact with.

Mr. Murray: In Mr. Fritts' paper he deals with the system where the electricity is generated on the car axle. I have seen electricity generated in the baggage car, and would think that would do away with some of the difficulty. I know of another road where they are putting on storage batteries altogether. Would like to know what Mr. Fritts has to say about these systems.

Mr. Fritts: I do not think that a dynamo placed in the baggage car is practicable for general use. Any system of light on a railroad car to be successful should be independent of the other cars for its source of light. Whenever a dynamo is placed in the baggage car the whole of the train depends on this car for its source of light, and if it becomes disabled in any way or the train breaks in two it affects the lights of the whole train. The storage battery system is expensive, and it is necessary to have a larger number of batteries, which add to the weight and cost of installing; at the same time an elaborate charging plant is required at terminals, with a large number of storage batteries on hand to replace in cars that have short lay-overs. And if trains were delayed too long there is a liability of the batteries becoming exhausted before the car reaches the terminal. These are very undesirable features in both of these systems, and it is very evident that the best light would be one that generates a current from the car axles, with storage batteries of a capacity that will light the car ten hours standing.

This storage capacity would be always on hand to be used any time during the trip, which we would not have on cars that only use the storage batteries.

Mr. Rasbridge: If there are no further remarks on this subject we will pass on to next subject, which is "Recommended Changes in M C B Rules of Interchange."

RULE 18.

Mr. Harris: I move you that the sense of this meeting is that Rule 18 be changed from owner's responsibility to delivering company's responsibility. Motion seconded by Mr. Bundy, and carried. Messrs. Memarest and Rasbridge dissenting.

RULE 46.

Mr. Bundy: I move you we recommend that the words "coupler stop and filling block" be cut out of the rule, making it read as follows: "Damaged coupler accompanying damage to either draft timber or its substitute, or end sill." Motion seconded by Mr. Harris, and carried.

RULE 153.

Mr. Bundy: I move you that this rule be changed to read as follows: "Damaged longitudinal sills if necessitating replacement or splicing of more than two sills except on cars with concealed sills, such should be considered as concealed parts." Motion seconded by Mr. Harris and carried.

Mr. Bundy: I move you that the Sercetary be instructed to forward to the Secretary of the Master Car Builders' Association to be turned over to the Arbitration Committee the recommended changes in M C B rules as recommended by this association. Motion seconded and carried.

Mr. Harris: I move you that we adjourn to meet in this hall the second Saturday evening in May.

The Car Foremen's Association of Cleveland

April Meeting

Minutes of meeting of Car Foremen's Association of Cleveland, O., held at the Kennard April 16th, 1903.

Meeting opened by President Berg at 8 p. m., among those present being the following: A. Berg, J. C. Denerle, H. B. Frischmuth, W. Gonnerman, C. E. Harrison, H. B. Ingersoll, W. Krage, Geo. Lynch, A. T. St. Cyr, G. A. Taylor, B. C. Wallis.

President Berg: The minutes of the last meeting have been printed in the Master Mechanic, and unless there are objections will stand approved.

Reports of committees. Under that head I believe Mr. Taylor has something to say.

Mr. Taylor: In regard to the committee on banquet wish to say that I saw the manager of this hotel and he said he could give us a six course spread for $1 per plate. Of course that would put the tickets up to about $1.25, in order to pay for the printing, etc. We can have the dining hall from about 8:30 until we get through, providing we do not stay until breakfast time. From what Mr. McCabe says he is enthusiastic on the subject, and as far as the Lake Shore shop is concerned we can make a pretty good showing. In speaking to the manager of the hotel I told him that we would have from 75 to 100 present; he said we would have to guarantee a certain number.

Mr. Lynch: In connection with Mr. Taylor's report I will say Mr. McCabe requested me to report for him that if we decide to keep a banquet we can count on his support.

Mr. St. Cyr: May I ask on what date this banquet will take place?

Mr. Berg: That will be decided on later.

Mr. Lynch: Can we guarantee any number?

President Berg: I presume the best way would be to get the thing started, and get all necessary information as we go along.

Mr. Taylor: A week ahead will be sufficient time to give the guarantee. The better way would be to get the tickets printed. If we guarantee 75 and have a larger attendance than that we will have to pay for all over, but if we get less than 75 we will have to pay for the full number.

Mr. St. Cyr: Those tickets do not cost very much, and you will get 200 nearly as cheap as 100. A nice ticket should not cost over $1.50 per hundred. If we get 200 printed we have the tickets, and can explain to the members and others. I think there are quite a number in Ashtabula that will be glad to attend the banquet.

Mr. Frischmuth: I think it would be beneficial to the association to have that banquet, and it will make a better impression in talking about it if we present the tickets. I move we go ahead and have the tickets printed. Motion seconded by Mr. St. Cyr and carried.

President Berg: The motion is carried. Now we can take up the question as to how we are going to defray the expenses.

Secretary Dennerle: My suggestion would be that the extra expense be settled later on. The amount will not be large, besides we have some money in the treasury, and if that is not enough I do not think there is any doubt but what the members will be willing to make up the shortage. It should not be over 10 cents additional for each member; probably not that.

Mr. Taylor: In regard to the date, the next meeting will come on the 21st of May. Why not have it on that day?

President Berg: Mr. Taylor can communicate with the other members of the committee.

The question of raising funds by donations was discussed, and a motion was carried that the executive committee be instructed to communicate with the heads of the departments of railroads and private companies with the view of getting donations to help defray the expenses of the association.

New members—The following applications for membership were received: E. F. Stallsmith, Clerk, L. S. & M. S. Ry., Cleveland, O.; B. C. Wallis, Clerk, L. S. & M. S. Ry., Cleveland, O.; Wm. Korell, Air Brake Inspector, L. S. & M. S., Ashtabula, O.

President Berg: Under that head will come subjects for discussion. Heretofore our subjects, with few exceptions, have been discussions on the M. C. B. Rules. This has been due to the fact that the members who are not Inspectors or Car Foremen have not expressed a desire to give the association the benefit of their knowledge on other subjects.

The Car Inspectors and Car Foremen do not wish to monopolize these meetings with the discussion of the M. C. B. Rules, and desire that other subjects be presented and conversed upon. I realize the fact, as the old saying goes, that "there is nothing new under the sun"; however, I notice that other associations are deliberating upon subjects quite ancient in origin perhaps, but usually they succeed in bringing out some points that are very interesting.

It should be the aim of all of us to make these meetings as interesting and instructive as possible; every member should have something to say and not depend upon a few to do the talking. I have heard men say that your meetings, to judge from the minutes published, do not divulge anything new. They do not think that the time expended in attending these meetings is fully compensated for by the information gained. My experience with these meetings makes me of a vastly different opinion.

The work of these associations is not confined merely to the remarks which appear upon the minutes of each meeting. There are other and unwritten results, namely, the pleasant feeling of social felicity which is created among the members, the getting together in the corners of the meeting places, on trains en route to or from these places of meeting, and others, where one's personal affairs which are most closely identified with those in general are discussed and considered.

We get acquainted with each other, and as a result a better feeling of good fellowship arises between fellow craftsmen. This, coincides with the opinion the officials hold towards these associations; it is their desire in fact, therefore let us do all in our power to make these meetings instructive and of lasting benefit to all.

While I have your attention, I would ask such of you who are out in the yards, have you ever noticed that the train men separate the hose by hand in switching cars?

Mr. Taylor: In watching the switchmen at the shop I have noticed that they separate the hose by hand, but perhaps that may be because they think they are close to the M. C. B., and are being watched. At other points I presume it is not always done.

In regard to the benefit of this association, it is my understanding that any member has the right to bring up a question for discussion. I might not know anything about it, and you may, and it is by the interchange of views that we gain knowledge. I do not care whether it is inspecting, shop work, air brake work, or anything else. As we go along from day to day we run across something we do not quite understand, and by bringing it up here there is sure to be some one present who does understand it, and in that way we can get the information desired.

Mr. Gonnerman: I belong to the association just a year, and during that time I must say I enjoyed it very much. I picked up considerable new information, made the acquaintance of a good many men from different points, and if I were to tell the truth I would have to say that I had a very good time, not to mention the gain in knowledge. I shall certainly do all I can to help the association along. We are all working for a living, and should endeavor to help one another out, and in that way we not only benefit ourselves, but the companies which we represent as well.

As regards the question asked, from my observations I would say that the switchmen very seldom disconnect the hose by hand when switching cars in the yards, which accounts for a good many broken angle cocks, torn air hose, etc.

Mr. Frischmuth: I have been a member of the association only two months, and take a great deal of interest in it and its meetings, but it occurs to me we ought to have a larger attendance. I know very little about car work, being practically a new man at the business, and I have been thinking that perhaps if we would combine business with pleasure it would have a tendence to bring out a large attendance at the meetings.

Mr. Wallis: I am a new member, but I think the best way to get the benefit of the meetings is to attend them, and hear the different opinions expressed on the different subjects. To simply read the minutes as a general thing it is dry reading, and the information contained therein would not be as interesting and beneficial as it would if gotten right here at the meeting.

Mr. St. Cyr: I do not agree with the gentleman at all. I read the minutes of the Scranton and Chicago associations in the Railway Master Mechanic, as well as this one, and do not consider it dry. The reason it is dry to him is because he does not take any interest in such matters. It is evidently out of his line.

As regards separating air hose, will say I have been connected with car department for 18 or 19 years, and since air hose have been used have noticed that some train men will cut the hose and others will not. I know of some men at Ashtabula who will not cut a car unless they are sure the air hose is separated, while others will not bother about it.

Mr. Taylor: Relative to air hose tearing, breaking angle cocks, etc., I spent three years in the hose room, and have found that if you take a Westinghouse and a New York coupling, you cannot couple them and couple them right. The master car builders ought to see that these two couplings go together and will be interchangeable, and then a great deal of trouble will be avoided. Two Westinghouse couplings will come apart all right in switching cars, whether they are first separated or not, while, as I said before, one Westinghouse with a New York will not.

Meeting adjourned.

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OBSERVATION of the application of motor driving to the machine tool equipment in railway shops which are being modernized, reveals a wide variation in the extent to which use is made of this power in discarding counter-shafting. We have in mind several examples where new machine tools are being installed with individual motors which connect through an ordinary system of counter-shafting. One is impelled to inquire the reason for using individual motors if by this means counter-shafts are not to be discarded? Lack of time for studying out particular applications is no excuse, for the manufacturer can be called upon for that. Speed regulation is a mere matter of detail and if counter-shafts are necessary, what is the use of investing in individual motors?

HAVING become apparent that the facilities offered at Mackinac Island were totally insufficient to accommodate the conventions of the Master Mechanics' and Master Car Builders' Associations, it has been decided to hold the conventions at Saratoga. While this change will be a disappointment to many western railway men, there was but little choice left to the committee, as at the date of its meeting there was no time left to make a thorough investigation of points heretofore untried. Chicago was considered, but due to the lack of accommodations to care for the members of the associations and the exhibitors at one immediate point, it was deemed advisable to select some other city.

The headquarters of the associations will be at the Grand Union Hotel, the Master Mechanics' Association convening June 24, 25 and 26, and the Master Car Builders June 29, 30 and July 1.

An interesting feature of the meeting at this time at Saratoga is the fact that the American Society of Mechanical Engineers will be in annual convention at the United States Hotel, June 22 to 26. This occasions an excellent opportunity for the members of the several institutions to mingle and enables those members of the Master Mechanics' Association identified with the American Society to attend both conventions conveniently; offering also to the exhibitors a wider opportunity for the presentation of their displays.

SCRAP has assumed such proportions in the economical management of railroads that its direction may well be considered a business in itself, an organization requiring the care of a department manager. Under the jurisdiction of such a department, it appears expedient to put all classes of second-hand material and miscellaneous material not for any specified use. Road scrap should also be handled by this department, frogs, switch stands, etc., as well as material from the locomotive and car departments. Another side worthy of consideration is the disposition of old shop machines, sale of which might be successfully managed by the department in charge of the remainder of the company's scrap. By careful observation and systematic classification, much material may be selected from the scrap pile which is still capable of giving good use in service. In consideration of this point and the quantity of good material scrapped through ignorance, it would appear an economical venture to place an intelligent, skilled mechanic in charge of the scrap bins, whose duties should include the classification of material and the selection of material capable of further service. Such a man's judgment is superior to that of the average laborer usually found about the scrap shed and it is believed that such a man would more than save his salary to the company by picking out and saving good material, for instance triple valves which are yet in working order, brass on the ends of pipes, nipples and many other useful pieces which would be passed unnoticed by an ignorant laborer. The mechanic in such position should be familiar with the useful, up-to-date and standard castings of the road and know those which have become obsolete and should consequently be consigned to the scrap pile.

OTHER columns of this issue contain a description of some new locomotives on the Kansas City Southern Railway. Among the features of construction which are of interest will be noted the radial staying of the crown sheet, in which a hexagonal headed bolt is used—screwed in from the furnace side in consequence of this head. While the only entirely new point about this plan is the copper wire gasket under the head, yet this method of applying radial stays is not used to the extent it should be, particularly in boilers developing the steam pressures in favor of late. To those whose experience has embraced districts where the bad character of the water often causes enginemen to get caught with buckled crown sheets or even explosions resulting from extreme cases of this difficulty, the mere riveting over of a radial staybolt appears to be a very poor measure in so far as concerns the bolts sustaining the crown sheet. Some two years ago, as a result of argument upon this point, some tests were made in the laboratory of the A., T. & S. F. Ry. at Topeka, Kan., between pieces of firebox steel 4 ins. square, in certain pieces of which a threaded bolt had been inserted and then riveted over, and other pieces in which a bolt without any threading had been inserted and beaded over in the same (usual) manner. Several tests resulted in showing that the threaded bolt pulled through the sheet under a stress of 15,000 lbs., while the unthreaded bolt required 18,000 lbs. to pull it through. While this is not to be taken as in favor of an unthreaded bolt, because of the loosening the latter would evince under the varying stresses, yet it does show that the plain beading-over of a staybolt in the usual manner does not give the support required by the crown sheet. Taking the failing stress of 15,000 lbs. on the 16 sq. ins. supported by the bolt, with 200 lbs. steam pressure, we would have a factor of safety of 4 11-16, which is sufficient on the sides, but emphatically not enough at the crown, which occasionally gets caught without a sufficient covering of water. The result in such a case is greater or less buckling of the crown sheet between the staybolts—this, because the steam pressure above the sheet, bearing down upon the areas between staybolts, which in case of not being covered with water, become hot and accordingly ductible, causes these inter-areas to give down, or, in other words, to buckle. When buckling occurs the threaded holes in the sheet are pulled away from the threaded part of the bolt so that the support afforded by the threading in the sheet so long as it is flat, entirely disappears the moment buckling occurs. The sole remaining support of the sheet then is the heading of the bolt, and since the support given by the hexagonal form shown in the example in question is very considerably more than that afforded by a plain riveted head of the small section generally in evidence, it is evident that this feature of the boilers shown is most commendable. It is true that a large headed bolt has a tendency to be burned away through the action of fire, but this only appears to any serious degree in locomotives using oil for fuel; with coal the action of the fire in this respect is negligible, especially in view of the very great increase of precaution against danger from explosions due to low water, afforded by a crownbolt of ample section of head.

Mr. J. M. Herbert.
General Manager of the Colorado & Southern Railway.

Mr. Herbert was born January 15, 1863, at Delmont, Pa., and entered railway service in 1880 as telegraph operator and agent on the Wabash, St. Louis & Pacific at Jacksonville, Ill He has since held a number of responsible positions with several different railroads and at the time of his appointment, January, 1903, as general manager and vice-president of the Colorado & Southern, was manager of the Denver and Rio Grande.

A LITTLE observation of the number of engines standing outside of the round-house waiting for room over the cinder pits will in a number of instances explain the reason for terminal delays. While in such position locomotives are idle in every sense of the word, for they are not only out of service but so located as well that no boiler washing may be done and little or no repair work may be accomplished. To obviate this difficulty it is necessary either to arrange for greater cinder pit accommodations or install mechanical devices by means of which the ash may be readily disposed of. Even with such mechanical devices sufficient length of pit should be provided to accommodate the demand and so delay the locomotives as little as possible. Requirements of this nature are particularly noticeable at old roundhouses where the work required has outgrown the facilities, and some roads have awakened to this fact and are making provisions to increase the length of cinder pits and provide more efficient coal and ash handling schemes.

By handling coal and ash with the same mechanical system and by arranging the sand supply and water cranes near at hand, much time may be saved in the movement of the locomotive before entering the roundhouse. As an example of operation with mechanical appliances for handling coal and ash systematically, together with ample cinder pit space, we quote the following figures selected at random from a daily report of locomotive departures, the figures indicating the average number of hours that each engine was held. from the time of first reaching yard to actual time of departure, including time of all delays and time consumed in repairs, etc: 5 hours 46 minutes, 6 hours 28 4-17 minutes, 5 hours 37 7-9 minutes, 4 hours 47 1-7 minutes, 4 hours 24 minutes. On one occasion at the round-house from which the above figures were selected, it was desired to determine how rapidly it was possible to clean a number of engines and by actual trial 15 engines were cleaned, knocking out fires entirely, coaled and sanded from 7 a. m. to 10 a. m., the work being done by four hostlers and four helpers.

Wheel Mounting.

By A. R. McAlpine.

RECENTLY, when visiting a number of railroad shops in the middle west, I became interested in the various methods employed to properly locate wheels on axles. The most common practice I found to be the use, at the wheel press, of a simple gauge made of ⅜-in. round iron, its length being equal to the distance from the outside hub of the wheel to the shoulder of the journal when the wheels are accurately mounted. One pressman holds this gauge against the hub of the wheel and watches the progress of the axle until the shoulder of the journal is through the wheel the length of the gauge, when the press is stopped. The check gauge is then applied.

The most expeditious method was one employed in a large contract shop, where the wheel and axle work was done under the piece work system. Here they pressed on both wheels at once, starting the press and letting it run until the pressure was wholly on the axle, one end of axle striking a stop in the tail block, the other bottoming in the sleeve suspended between hub and ram. The check gauge was applied at but one point.

For mounting second-hand wheels neither of these plans could be relied on to do perfect work, but they answer very well where axles and wheels are new, provided there are no bunches on the hub and axles are of exactly the same length. Nor was any attention paid by either of the methods described to the requirements of the M. C. B. Association declaring that "all axles should be carefully centered between centers of journals prior to mounting, and that the standard gauge for locating the wheels equidistant from the center of the axle should be used in mounting wheels." I did not see in use in any shop the gauge referred to (M. C. B. Standard, Plate 22), and but one or two that resembled it. This seemed strange, as it was only last year that this gauge was changed from recommended practice to a standard of the Association by letter ballot, the vote standing 1,000 for to 48 against the change.

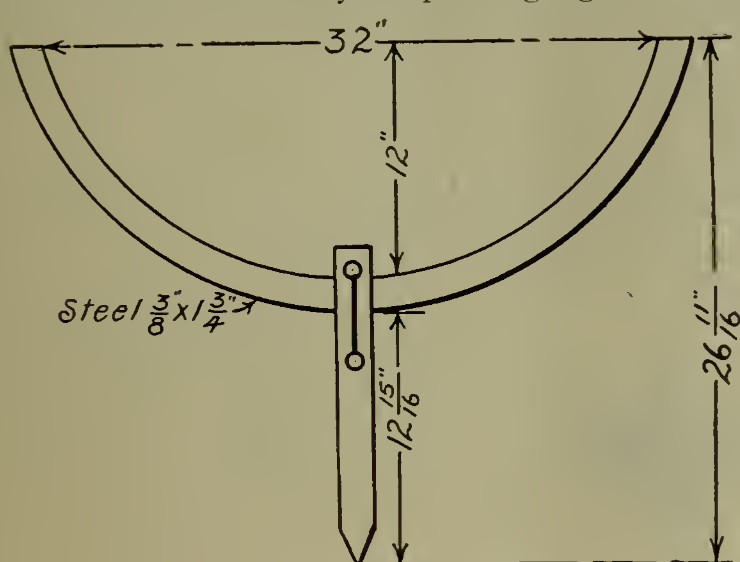


Fig. 1—Wheel Gauge.

I did, however, see gauges which accomplished the object sought. One such gauge was made as per Fig. 1. This consists of a half-circle and pointer welded together with handle rivited on. In operation the gauge is laid on top of axle with the wings kept pressed against the inside flange of wheel until the pointer splits the center mark in middle of axle. This gauge is equally as effective in correctly locating on an axle two second-hand wheels of different patterns as it is for new work.

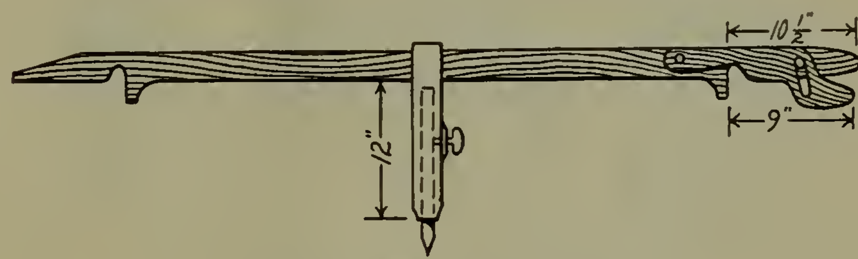


Fig. 2—Wheel Gauge.

Another gauge for this purpose was of the form shown in Fig. 2. On one end of this gauge the part for gauging the outside of flange is on a pivot and swings up out of the way until the flange has passed by, when it drops into position. The pointer is movable and the gauge can be used on wheels of different diameters.

I noticed a modification of this gauge, a half gauge, without the swinging part. This was used in small shops where but one wheel is pressed on at a time.

In one shop they gauged wholly from the outside of the flange, using a gauge as per Fig. 3. The angular part of this gauge is laid on the journal and when the gauge touches simultaneously the inside shoulder of journal and outside of flange the wheel is in position.

The outside hubs of cast wheels made by one manufacturer may vary considerably from the hubs made by another. This fact is generally ignored in mounting second-hand wheels on axles having no center marks, and grave errors result in the position of the flanges relative to the centers of journals, while the flanges may conform exactly to the check gauge.

To detect errors of this character the writer some years ago made a gauge as per Fig. 4. The use of this gauge revealed many cases where the wheels were more than ⅜ in. out of central position on axle, and yet tested by the check gauge they showed up all right. I think the use of this gauge in testing second-hand wheels mounted on axles not having center marks resulted in fewer sharp flanges and end-worn brasses.

This one gauge tested all axles, as three of the four M. C. B. standard axles, viz., "B," "C" and "D," are of the same length (5 ft. 7 in.) between inside shoulders of journals. The other axle, class "A," is one inch longer (5 ft. 8 in.) between the points mentioned. By making the ends of arms ½ in. wide we could use the outside edge for class "A" and the inside edge for the other three axles.

In several shops I noticed that while the wheel was revolving in the boring mill they marked the high or thick point of the flange, and when pressing the wheels

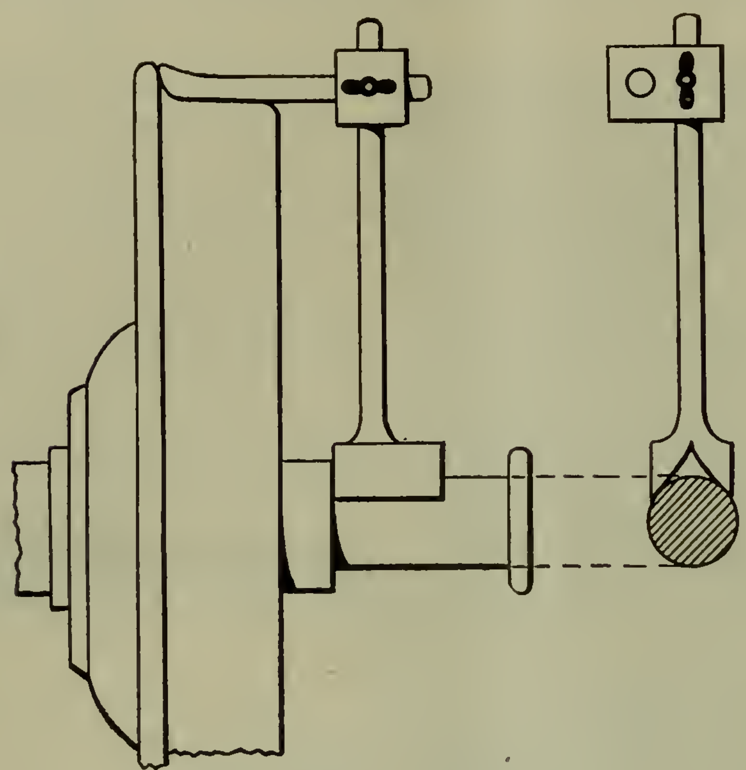


Fig. 3—Wheel Gauge.

on the axle they took care that these marks on any two mated wheels did not come opposite each other; they turned them half-way around.

On one of the largest systems of the country their practice, when turning second-hand steel-tired passenger wheels, is as follows: If one of the tires has a sharp flange they make the diameter of the mated wheel 1-32 in. less than the tire having sharp flange. This, they explained, is done so that the sharp-flanged wheel will in service keep slightly in the lead and the flange be kept from the rail. Otherwise they claim the same wheel would be back in the shop inside of three months with a sharp flange again.

In shops of other important roads, when a pair of steel tired wheels are run into the shop and one wheel has a sharp flange, they press off both wheels, holding them until they can mate each with another of its kind, i. e., two sharp-flanged wheels together and two good flanges together. They thus avoid the necessity of reducing the tread of the good wheel to the diameter made necessary to build up a good flange on wheel having sharp flange, and thus save valuable metal.

When two sharp-flanged wheels have been mated and turned down so as to make farily good flanges, they are used as the middle pair of wheels in a six-wheeled truck, where the extra-lateral play will be least objectionable.

A road having long continuous runs for its passenger equipment has recently adopted the practice of painting white the inside hub of the wheels and the axle for 4 or 5 ins. from the hubs, then tracing black lines on the white surface at three different points on the hub and axle, the lines meeting in the angle. This enables the inspectors to tell at a glance if there has been the slightest turning of the wheel on the axle.

A shop which keeps up the repairs on some thousands of cars has a system of caring for second-hand brasses which is worthy of careful consideration. It is as follows:

When a pair of wheels is removed from a truck, if one brass is found to be fit for further service, the brass and the end of axle it came from are marked with a cross; if both brasses are good, the second brass and its end of axle are marked with two crosses. This marking is done with a cold chisel and takes but a moment.

The wheels and brasses are then taken to the wheel shop, where there are rows of boxes or pigeon holes for the reception of second-hand brasses. These boxes are numbered from one upwards and contain a galvanized band stamped with a number corresponding to the box

Fig. 4—Wheel Gauge.

number. The good brass or brasses are put in a pigeon hole and the band taken out and clasped around the middle of the axle, there to remain until the axle has been refitted and called into service again, at which time the band is removed from axle and exchanged for the brass or brasses in the box with its duplicate number. By this means the brasses are returned to service on the very same journals that they came in on. No fitting is required, nor fear that a hot box will result. The bands are used over and over again and cost but little.

Topeka Shops of the Atchison, Topeka & Santa Fe Railway

Construction of Buildings

(Continued from page 207.)

LOCOMOTIVE AND BOILER SHOP.

THE plan of concentrating several shops in one building is followed in combining the locomotive, boiler and tank shops. These several classes of work are performed in a large building in which there are no walls or partitions separating the several departments, an arrangement which concentrates all locomotive work, boiler and tank work being included as locomotive work; permits the use of the same cranes in serving the several departments; facilitates transportation among the departments and reduces the cost of erection of structures.

The most noticeable feature in the construction of this building, other than its extensive proportions, is the arrangement of saw tooth roofing over the side bays, a type of construction which is a decided departure from the usual practice in railroad shops. The introduction of this feature is for the purpose of increased light by day, the vertical sides of the ridges being glazed and so facing as to give a northern exposure of light. The exposed surfaces of the main shop walls between the ridges are also glazed, increasing the light at such points. In consideration of the fact that the spaces between ridges would offer excellent opportunity for snow to pack, such a construction would be inappropriate for a section of the country frequented by heavy falls of snow, but as Topeka is comparatively free from heavy snowstorms no difficulty is anticipated from this source.

The building is constructed of 13-in. brick walls and skeleton steel framing upon concrete foundations extending down to the first clay stratum. The material of the foundations is mixed in the proportion of one part of cement to two parts of sand and three parts of stone. The entire weight of the roof and superstructure is borne by the steel columns, the walls being relied upon in no way to support the roof. The roof is of Ludowici tile, which constitutes the sole covering, as there is no sheathing beneath the tile.

There are four rows of columns supporting the steel framing, each column resting on a concrete pier spaced on 25-ft. centers. The piers are built up with gas-pipe sleeves to form holes for the anchor bolts and the holes in the bed plates of the columns are so formed as to allow for adjustment for any slight variation. The intermediate and west wall columns, as also the east wall columns from the riveting tower to the north end of the building, are built up of two 15-in. channels, laced with 2½ ins. by ⅜ in. bars, while the remaining east wall columns are built up in 12-in. channels. The columns supporting the double web box girder runways of the traveling crane are similar in construction to the

Fig. 1—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—End Elevation of Locomotive and Boiler Shop.

intermediate columns and are supported on the same foundations. The main trusses, shown in the accompanying line drawing, Fig. 3, are braced longitudinally in pairs, the longitudinal bracing being shown in the same figure. The wall columns are braced by longitudinal bracing arranged at intervals. The proportionate loads for which the roof trusses are figured are as follows: 15 lbs. per sq. ft. for roofing, 10 lbs. per sq. ft. for snow, 25 lbs. per sq. ft. for wind pressure, making a total of 50 lbs. per sq. ft. The structural work was built by the Toledo Works of the American Bridge Co.

The plan dimensions of the building are 852 ft. long by 153 ft. 10 ins. wide, arranged in three bays extending the full length of the shop, the center bay being 74 ft. 3 ins. wide and the side bays 39 ft. 9 ins. wide.

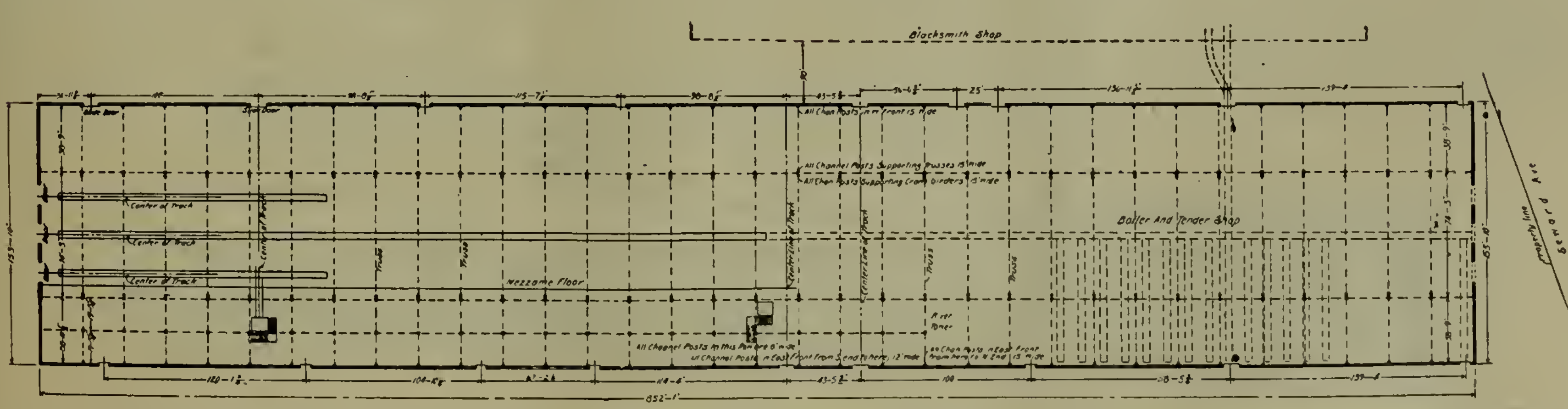
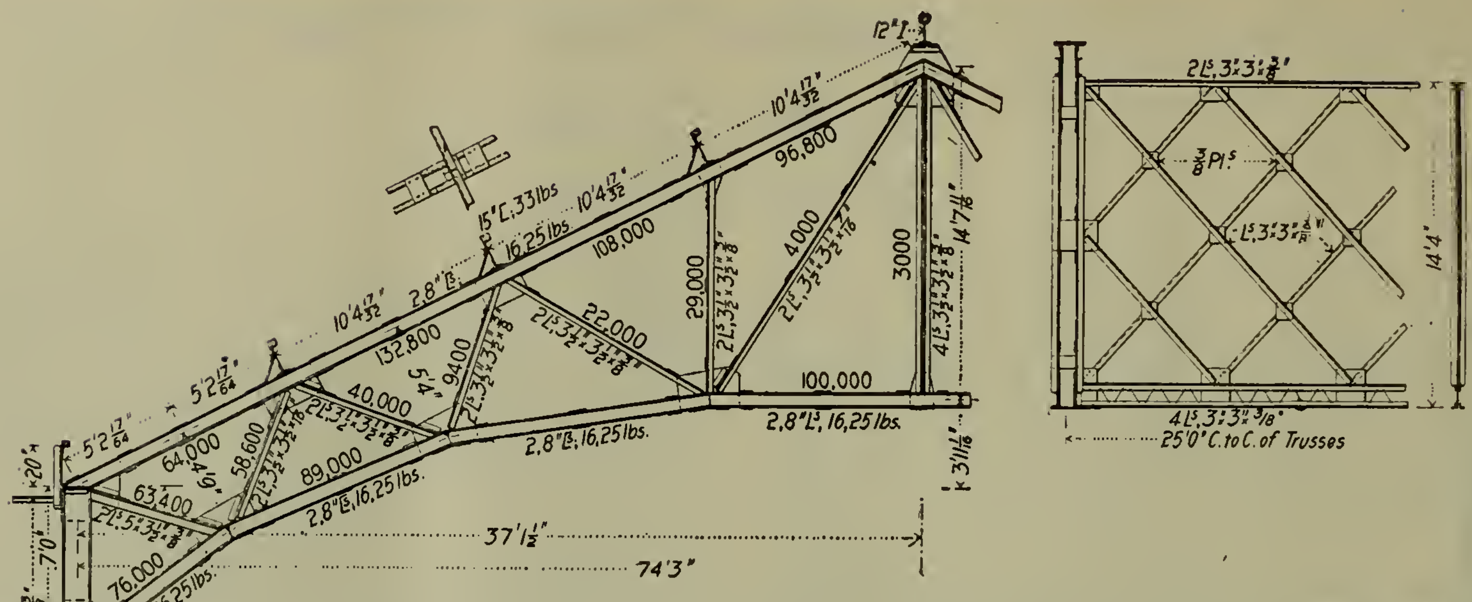


Fig. 2—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Plan of Locomotive and Boiler Shop.



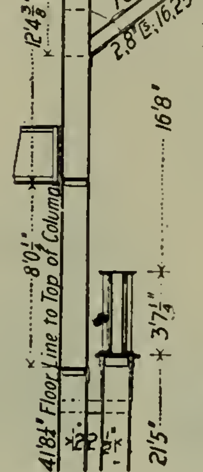


Fig. 3—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Main Truss and Longitudinal Bracing in Locomotive and Boiler Shop.

In the east bay, 300 ft. from the north end of the building, is a riveting tower 25 ft. by 38 ft. 9 ins. and 62 ft. high to the rails of the crane. There are two riveters placed in this tower, which are served by two hydraulic cranes of 10 and 25 tons' capacity, respectively. South of the riveting tower, extending the remaining length of the bay, is a balcony, 525 ft. long, for light machine tool work, air brake department, etc., and a portion of the gallery 38 ft. 9 ins. by 50 ft. is used for a coffee room by the men at noon hour. To support this balcony is an extra row of columns arranged centrally in the bay. The balcony is reached by two electrically operated elevators and two stairways. The general foreman's office is situated 400 ft. from north end of building, against west wall.

The locomotive machine and erecting shop covers 450 ft. of the length of the building, the remainder being occupied by the boiler and tank shop and the machinery necessary for the maintenance of the same. On the locomotive erecting floor are three longitudinal pits arranged on 23 ft. centers. The central pit is 420 ft. long, open throughout its entire length, and the side pits are 160 ft. long, boarded over at convenient crossing points. The tracks of the central pit extend the full length of the building and in the section of the shop devoted to boiler and tank work there are fourteen transverse tracks 67 ft. 6 ins. long. There are also a number of material tracks entering the building, connecting this shop with the yard and other shops of the plant, as shown in the general plan, page 160 of the April issue. All tracks in the shop are laid with 75-lb. rails upon ties of New Mexico pine treated by the zinc chloride process.

The engine pits, shown in Fig. 8, are built of concrete, the bottoms being arched to turn water to the gutter along the sides of the bottom. They are 2 ft. deep, except at the drain, where they are 2 ft. 6 ins. deep. The rails of the pits are laid on longitudinal timbers of white pine 7 ins. by 16 ins.

The flooring is laid upon a foundation of concrete 6 ins. thick, mixed in proportion of one part Louisville cement, two parts sand and four parts stone. Upon the concrete are laid yellow pine nailing strips 2 ins. by 4 ins., arranged on 18-in. centers, to which are spiked 2-in. tongued and grooved hard maple flooring. The concrete extends to the ends of the ties only, in the vicinity of the tracks, in order that renewals may be made without tearing up the foundation.

The building is exceptionally well lighted by day, the greater part of the side and end walls being fitted with large windows and the roof over the central bay has on each side of the ridge a skylight 12 ft. wide extending the full length of the building. These skylights are fitted with translucent fabric instead of glass. In addition to these lighting areas are exposed surfaces supplied by the saw-tooth roof arrangement heretofore described. For general illumination of the shop at night the enclosed type 230-volt incandescent lamps are installed. The individual machine tools are supplied with

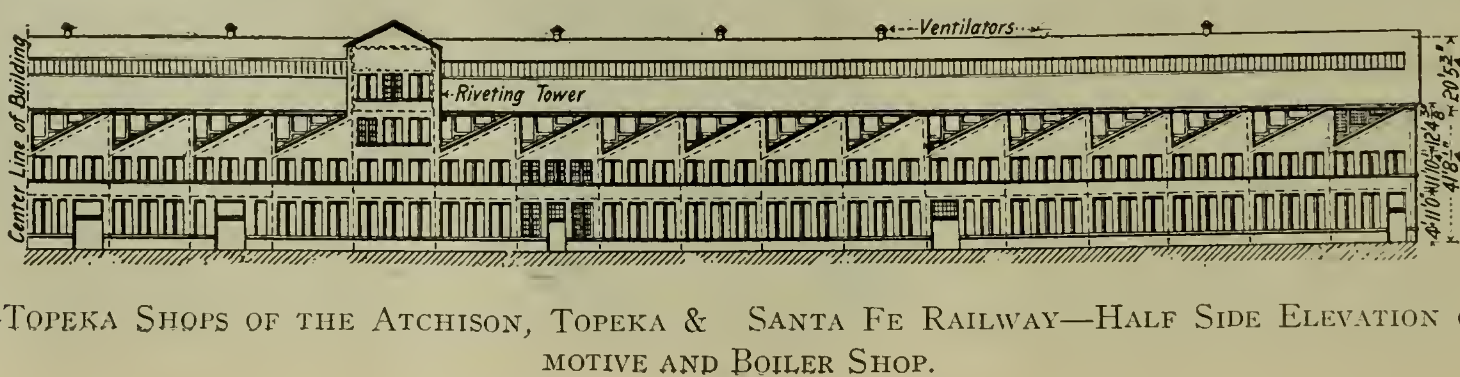


Fig. 4—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Half Side Elevation of Locomotive and Boiler Shop.

16-candle-power 230-volt incandescent lamps, and there are 26 receptacles for portable lamps.

The building is ventilated by Star ventilators arranged along the ridge of the roof on 50-ft. centers. It is heated by the Sturtevant system, four fan rooms being attached to the building, two on each side. Each room is equipped with a horizontal steam engine 8 ins. by 12 ins., operating a blower fan, and a heating chamber filled with coils of pipe through which passes exhaust steam from the engine room. Hot air is delivered by each heating unit into two longitudinal underground conduits parallel with the lines of columns, with a duct leading to the surface at each column. Each duct is fitted with a sheet iron pipe 7 ft. high with a flaring head to deliver the air horizontally toward side walls.

BLACKSMITH SHOP.

The construction of the blacksmith shop is similar to the locomotive and boiler shop, being of brick with independent steel framing. The building is 400 ft. long by 100 ft. wide. The roof trusses span the entire width of the building and are supported at ends by columns built up of two 15-in. channels, laced with 2½ ins. by ⅜ in. bars, resting upon concrete piers and anchored in a similar manner to those in the locomotive shop building. The details of structural work are shown in Fig. 11. The roof trusses are braced alternately with longitudinal braces, as are also the supporting columns. The monitor framing is supported by the longitudinal bracings over alternate bays and by purlins over the

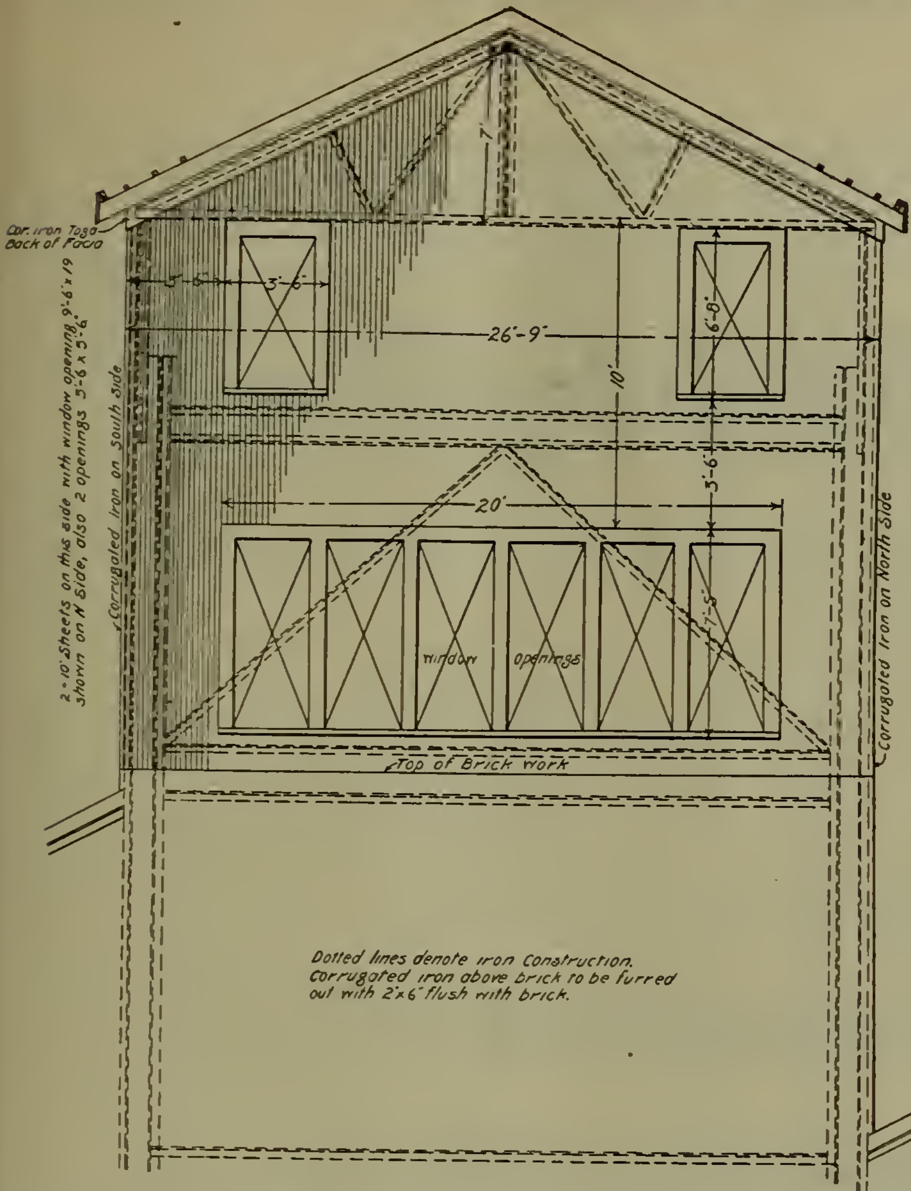


Fig. 5—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Riveting Tower.

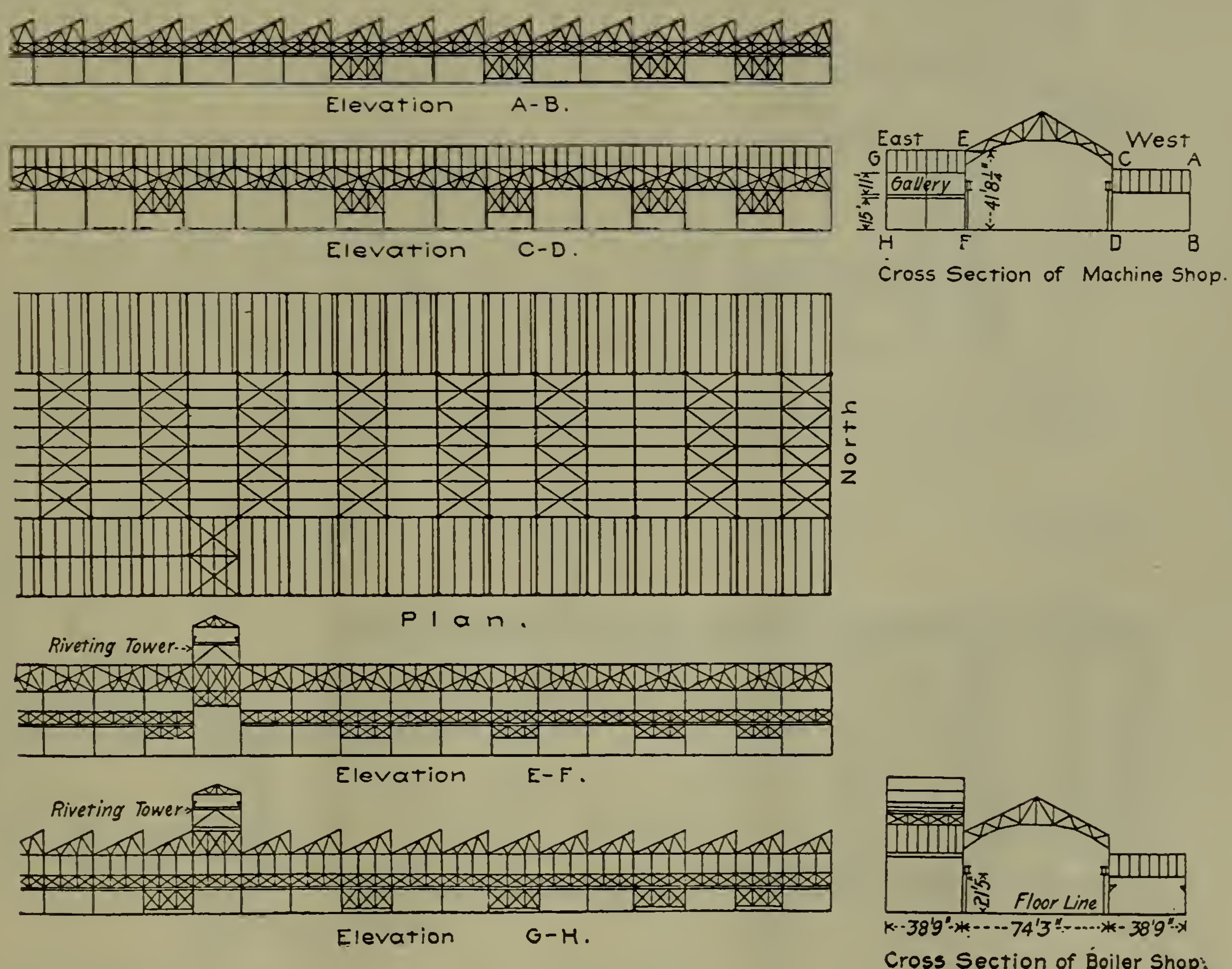


Fig. 6—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Steel Structural Work of Locomotive and Boiler Shop.

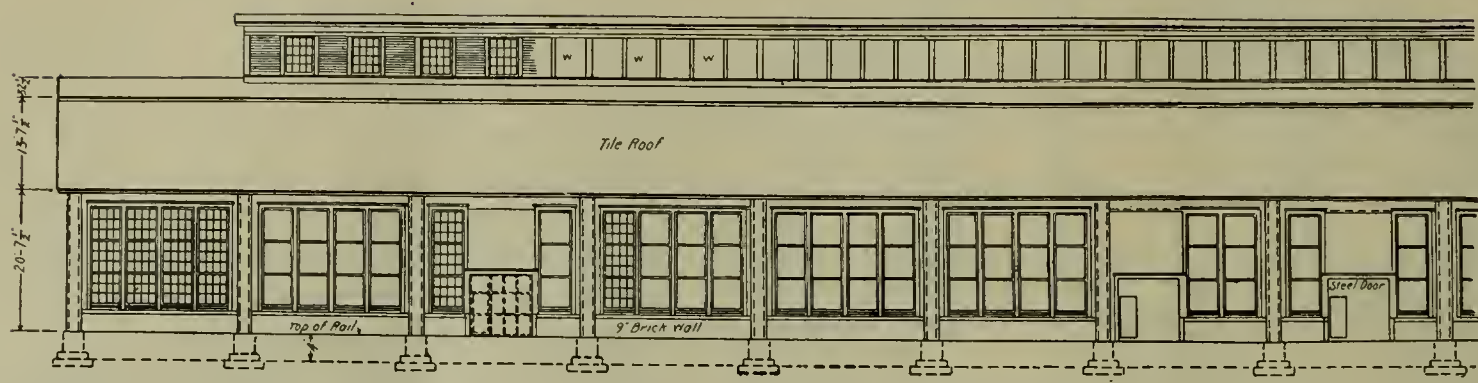


FIG. 7—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—HALF SIDE ELEVATION OF BLACKSMITH SHOP.

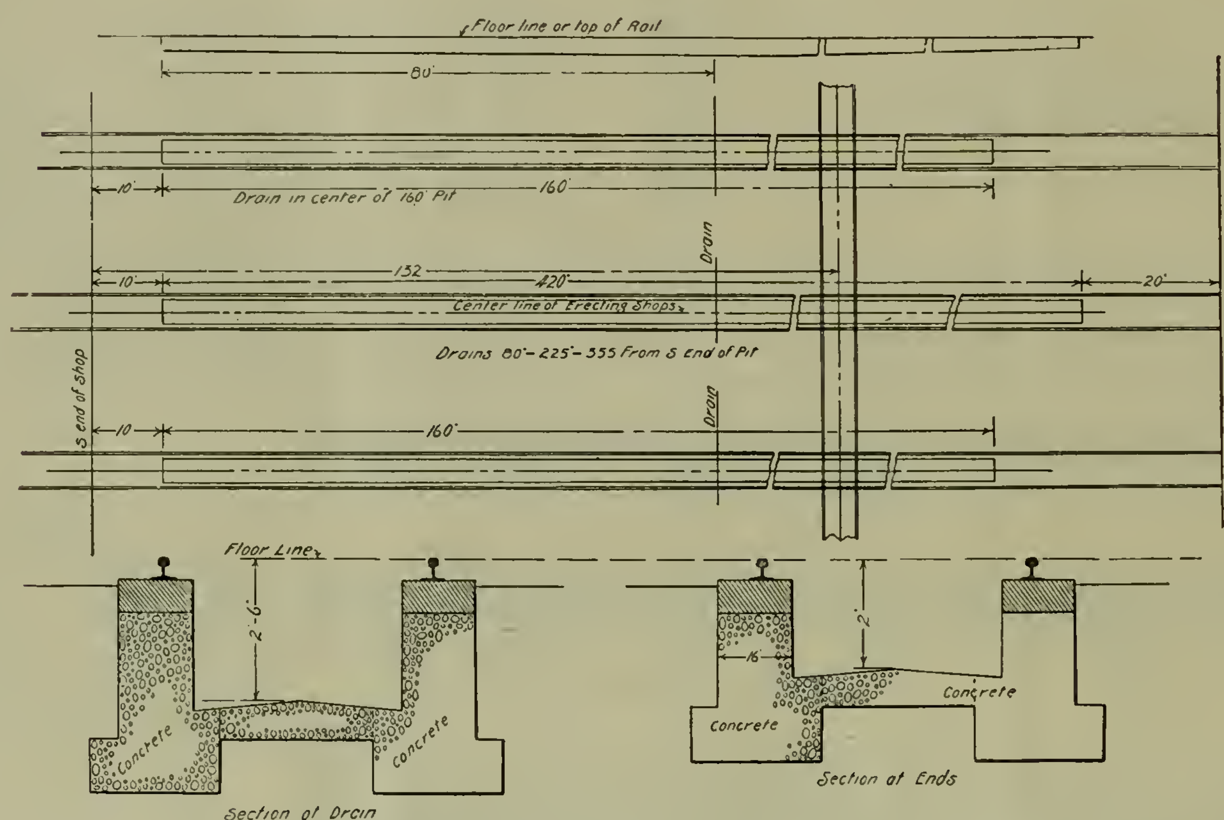


FIG. 8—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—LOCOMOTIVE ERECTING PITS.

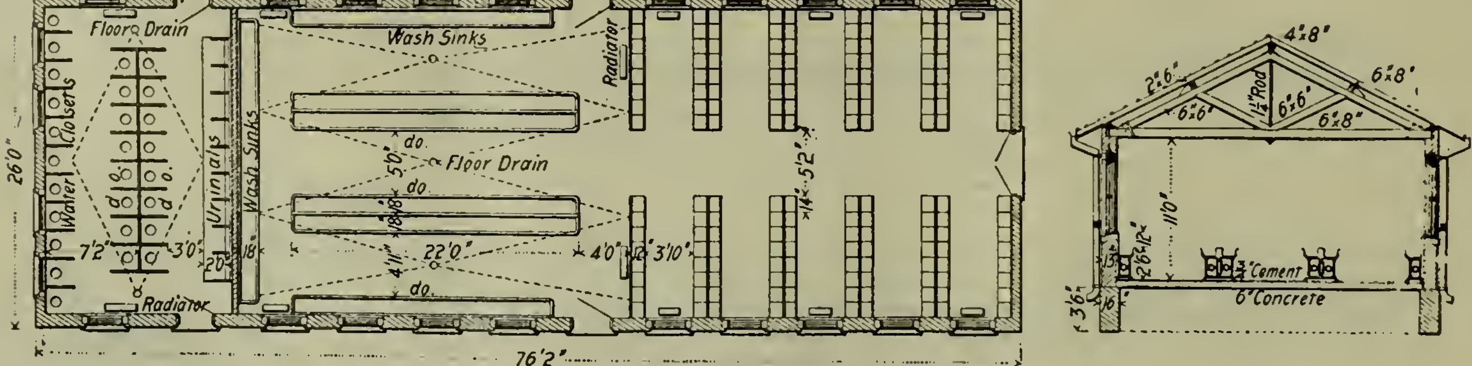


FIG. 9—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—PLAN AND CROSS SECTION OF LAVATORY.

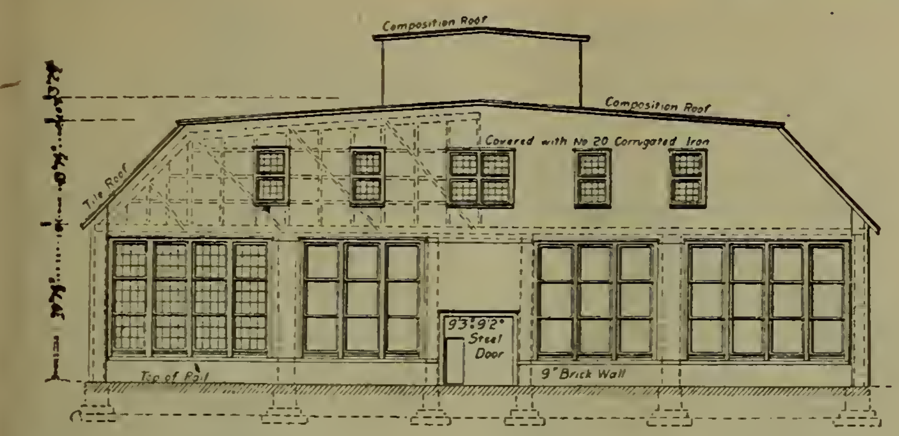


FIG. 10—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA *FE* RAILWAY—END ELEVATION OF BLACKSMITH SHOP.

other bays. Extending the entire length of the building is a strut supported by the roof trusses, built up of two 12-in. channels laced, to support the necessary shafting. The end walls are brick to the top of the windows, above which point they are of galvanized corrugated iron supported by steel framing. The side portions of the roof are tile and the flat central portion is covered with a gravel composition.

The building is well lighted by large glass windows in the side and end walls, which constitute the larger per cent of the wall area. To provide good ventilation there is a monitor in the roof 25 ft. wide and 9 ft. high, extending nearly the entire length of the building, with windows in alternate panels.

The general form of this building is clearly illustrated by the half-tone engravings on page 161 of the April number and by the accompanying elevations, Figs. 7 and 10. The structural work of this building was built by the American Bridge Co. at their Lassig (Chicago) works.

LAVATORIES.

To provide for the convenience of the men employed in the locomotive and boiler and blacksmith shops there are provided three lavatory buildings accessible to these two shops, the relative positions of which are shown on the general plan, page 160 of the April number. A plan and cross section of one of these buildings are presented in an accompanying lint drawing, Fig. 9, by reference to which it will be seen that the closets and urinals are entirely separated from the locker and wash room. In each building there are 320 lockers, 14 ins. by 12 ins. by 4 ft. 6 ins. high, arranged in two tiers built of matched ceiling material with expanded metal doors for ventilation. There are seven porcelain lined cast iron wash troughs in the locker room, piped for hot and cold water. Entrance to the locker room may be had at each

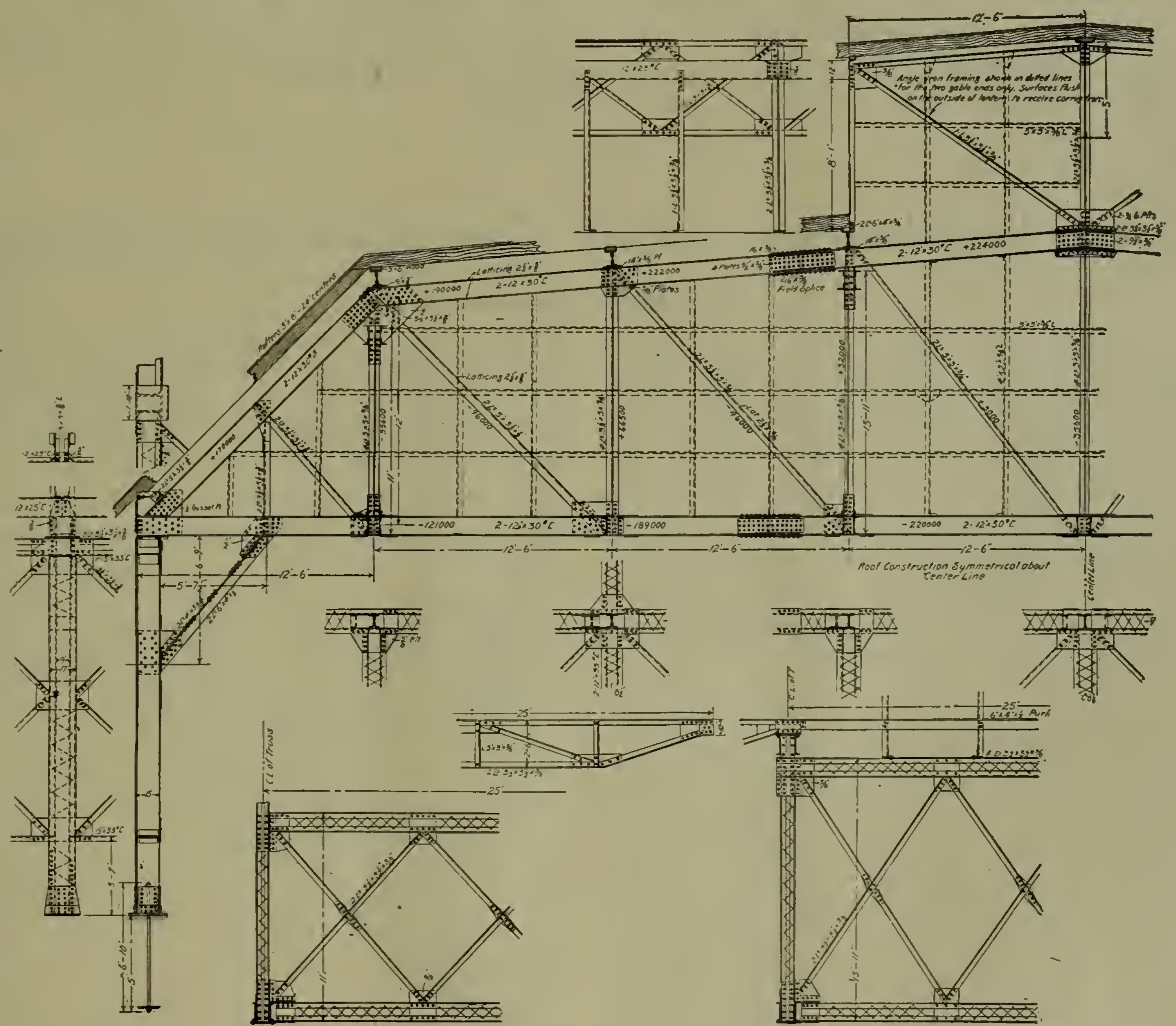


FIG. 11—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—MAIN TRUSS AND LONGITUDINAL BRACINGS IN BLACKSMITH SHOP.

side of the building through doors between the lockers and the wash troughs or at the end of the room through a double door. Entrance to the closets may be had through a door at each side of the building. The lavatories are one-story buildings 76 ft. long by 26 ft. wide, built of brick, with wooden roof trusses and having a tile roof. The buildings are steam heated.

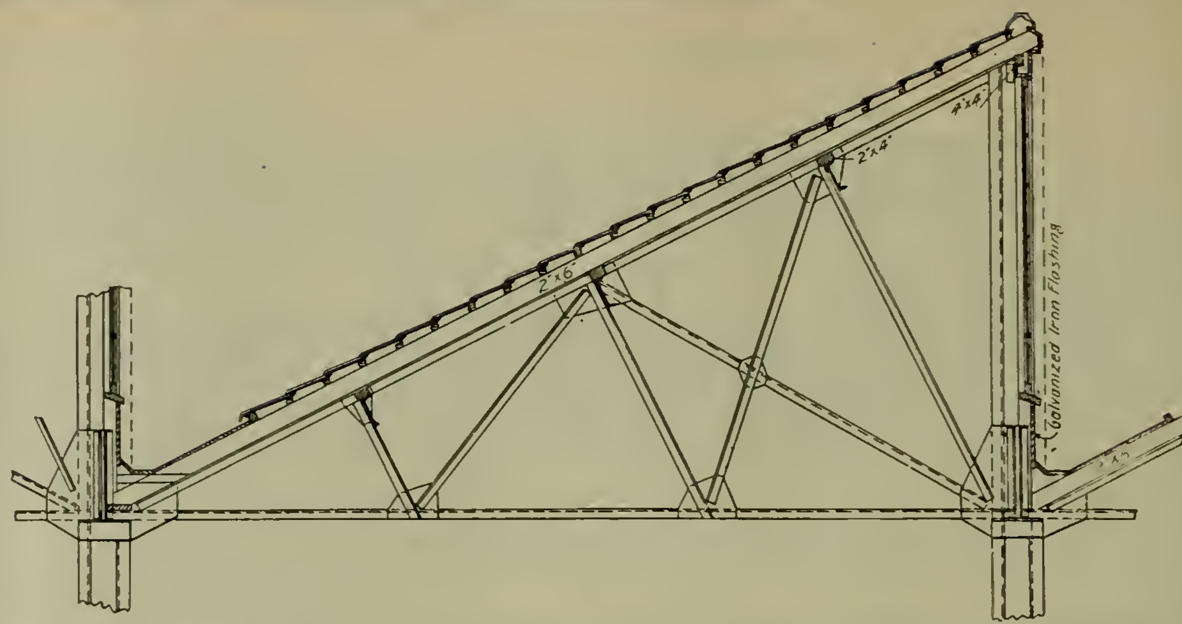


Fig. 12—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Section of Saw Tooth Roof Over Side Bays of Locomotive and Boiler Shop.

OIL STORAGE.

For the storage of oil a 20,000-gallon tank is placed in a brick lined pit which is roofed over. Provision is made for feeding oil directly to the tank from tank cars by gravity. Two distributing tanks are also placed in this pit, to which oil is admitted from the storage tank, and which are used alternately. In order to force the oil through the distributing pipes an air pressure of 20 lbs. per sq. in. is introduced into the distributing tanks. Distributing pipes are laid on a grade so that oil will drain back to the tanks, and all valves are so placed that they may be operated above ground.

WHEEL SHOP.

It is proposed to build a wheel shop 140 ft. long by 56 ft. wide, of similar construction to that previously described for the other buildings. The purpose of this building is to supply a small machine shop for the car department, thus relieving the locomotive department of car department work.

OFFICE BUILDING.

Situated at the southeast corner of the plant, as shown in the general plan, is an office for the shop superintendent and his clerical force. This is a one-story frame building 60 ft. 6 ins. by 24 ft. 6 ins. The building is equipped with a fireproof vault, steam heat and toilet conveniences.

Heavy Passenger Locomotives. Chicago & Alton Railway

Front End Arrangement

On page 163 of our April issue there was presented an illustrated description of the heavy passenger locomotives recently built by the Baldwin Locomotive Works for the Chicago & Alton Railway. At that time we mentioned the exceptionally long smoke boxes with which these engines are equipped. We are now in a position to present the details of this feature, and refer to the accompanying line drawings, Figs. 1 and 2, which represent the front end arrangement of the new locomotives and the standard front end arrangements, respectively. By referring to the detail drawing of the boiler it will be seen that the stack is located 55 ins. ahead of the front tube sheet and the front end as a whole extends 46 ins. beyond this, giving a total front end length of 101 ins. As the steam passages enter the cylinder saddle at their usual locations on each side of the exhaust stand, the objection to an exaggerated length of steam pipe was overcome by extending the rear neck of the niggerhead in the manner shown in the illustration. While noting this it would be well to remark the provisions for bolting the joints; the tube sheet joint being supplied with eight 1-in. studs and the steam pipe joints with four bolts each, while the flanges of the latter have been reinforced with supporting webs, which are not in the way in the present instance and which allow the workman to have considerably more confidence in tightening the joints.

The standard arrangement of front end shown in Fig. 2 has been adapted to the present engine by supplying

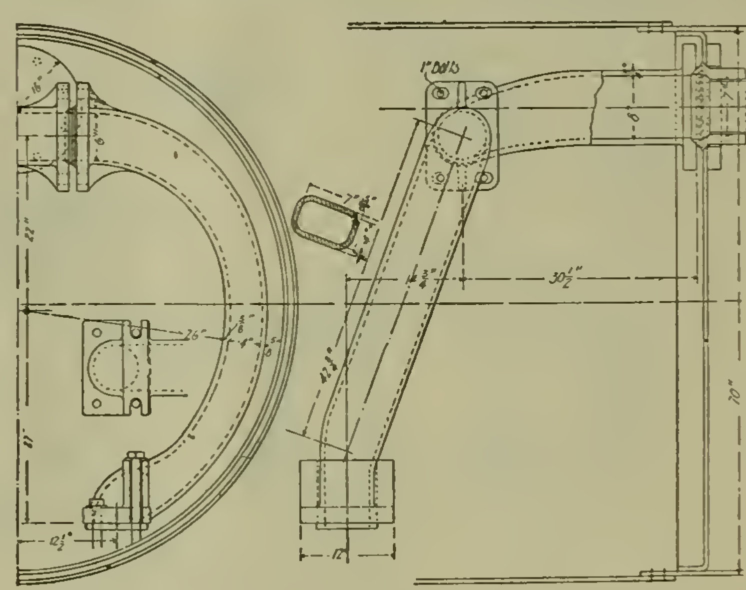


Fig. 1—Front End Arrangement on New C. & A. Ry. Locomotive.

a wider connecting sheet at the nozzle stand, this sheet extending 18 ins. in front and rear of nozzle, instead of 13½ ins., as shown in Fig. 2. Furthermore, the diaphragm plate is then connected with the connecting sheet just mentioned at approximately a 45-degree angle—thus conforming to the recommendations of the Traveling Engineers' Association in the provision of a very easy slope of the diaphragm plate, without necessity of reaching the plate ahead of the nozzle stand. It will be remembered that in the last convention of the association mentioned a very easy slope of the diaphragm plate was recommended in order to prevent the back lash resulting from a plate set too nearly vertical, this back lash of the current of gases from the tubes being considered to effectually block the draft from a considerable number of the tubes. An interesting feature of both the standard and the modified designs here shown in this connection is observable here, in that the top of the diaphragm plates are perforated to an extent which will apparently greatly tend to overcome the effect of a too-sharply inclined diaphragm, an idea which appears to show a neat method of avoiding the difficulties attending the bringing out of the diaphragm in front of a

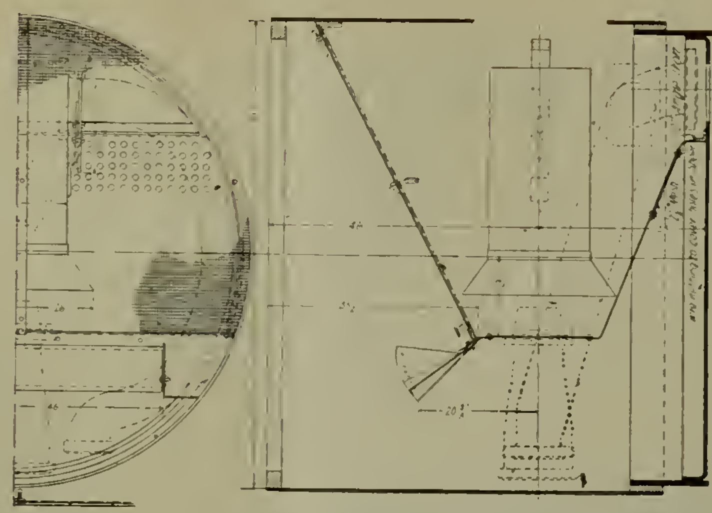


FIG. 2—STANDARD FRONT END ARRANGEMENT—C. & A. RY.

low nozzle stand. Another interesting feature is the arrangement for setting the draft plate. As will be observed, the draft plate is fixed so that it swings up, instead of being bodily raised, as is the usual practice. Hence the position of the draft plate can be very easily altered while the engine is under steam—a convenience which is highly desirable. A petticoat or draft pipe has been provided, as is very usual practice with short stacks.

Freight Locomotives of the Kansas City Southern Railway

THE Baldwin Locomotive Works has recently constructed and delivered five consolidation freight locomotives to the Kansas City Southern Railway, the design and points of interest of which are illustrated by the line drawings and photograph of one of the number. The most interesting features are presented by points in the boiler design, for instance the manner in which the flues and crown stays are applied and the front end arrangement. The centre eight rows of radial crown stays are put in from the interior of the firebox instead of from the outside of the boiler as is the usual practice. The fire box end of each stay terminates in a head of hexagonal form and a copper wire gasket is let into the sheet bearing surface of the bolt head as shown in Fig. 7. The flue holes in flue sheet are tapered 1-32 in. in thickness of sheet, as shown in Fig. 4, being reamed with a reamer tapering 1-16 in. in one inch, from the firebox side of the sheet. The drift pin used with roller to roll the flues is of corresponding taper to that of the reamer with which the holes are reamed. By this method the flues are forced against the sheet throughout its thickness instead of at the edge only as is apt to be the case where there is no taper in the holes and where the tapers of the hole and the pin do not correspond. The front end arrangement is shown in Fig. 8. The deflector plate is a solid steel sheet backed with a perforated steel plate, the perforations of which run horizontally, the object of which is to break up the cinders as they impinge against the sheet. A feature of this deflector plate is that instead of continuing on the angle at which it is located back of the exhaust nozzle it turns horizontally as indicated in Fig. 8 and continues horizontally beyond the nozzle to a point easy of access from the door, where the adjustable portion of the deflector is located, as shown. At this point a connecting plate reaches up vertically to a point at which it connects with the netting, being supported by an angle bar which also affords support for the hinged door frame in which the netting is comprised. In bringing the deflector plate forward to the extent shown there arose a certain amount of interference with the flare of the petticoat, in consequence of which the continuous portion of the same was cut away. The petticoat is arranged in a series of parts and the tip of the exhaust nozzle is located one inch below the center line of flues.

The air drums are placed above the boiler immediately over the firebox, convenient space being presented between the steam dome and the cab, and in this position they do not interfere with any repairs to running gear. Both injectors are placed on the right side and work through a double ingress check, one injector being located immediately forward of the cab and the other within the cab. The air pump is situated on the left side. The ash pan presents a form which may be readily dumped and the operating levers are placed outside of the cab in such position that the pan may not be dumped unless the locomotive is standing at rest, thus providing against dumping ashes while running over the road. The pedes-

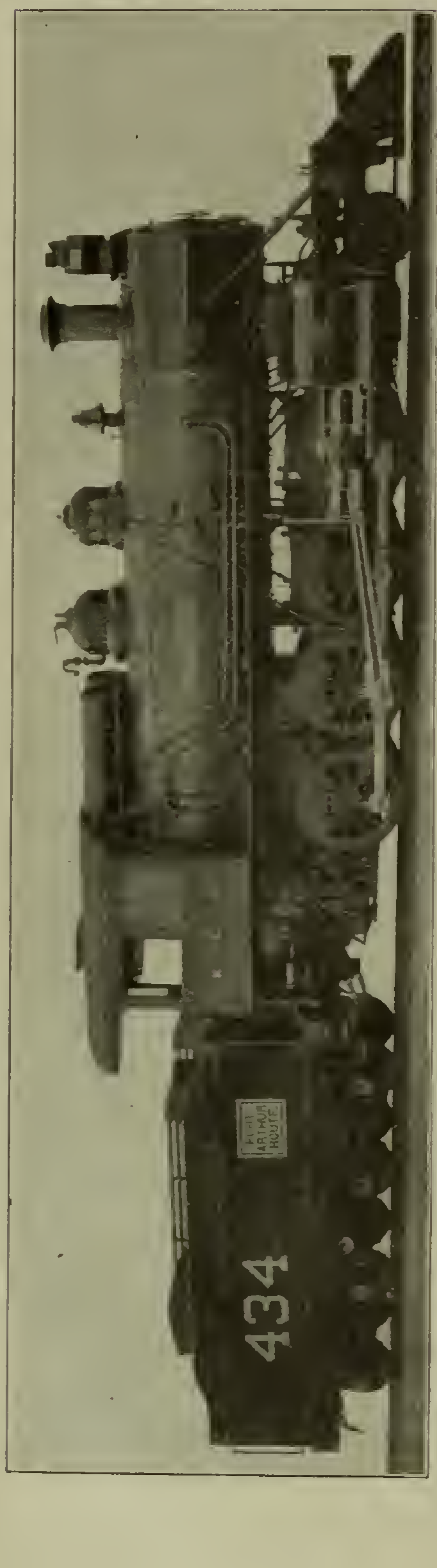


Fig. 1—Freight Locomotive of the Kansas City Southern Railway.

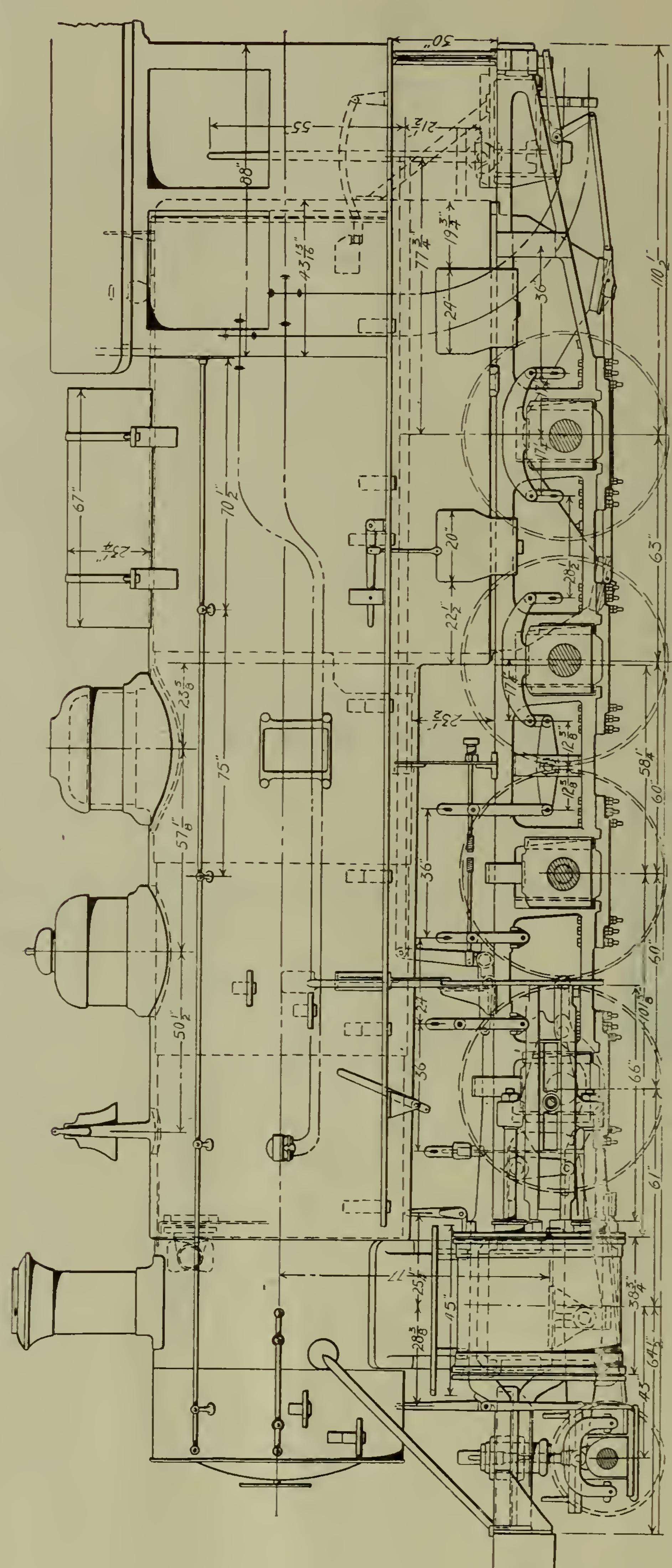


Fig. 2—Freight Locomotive of the Kansas City Southern Railway—Elevation.

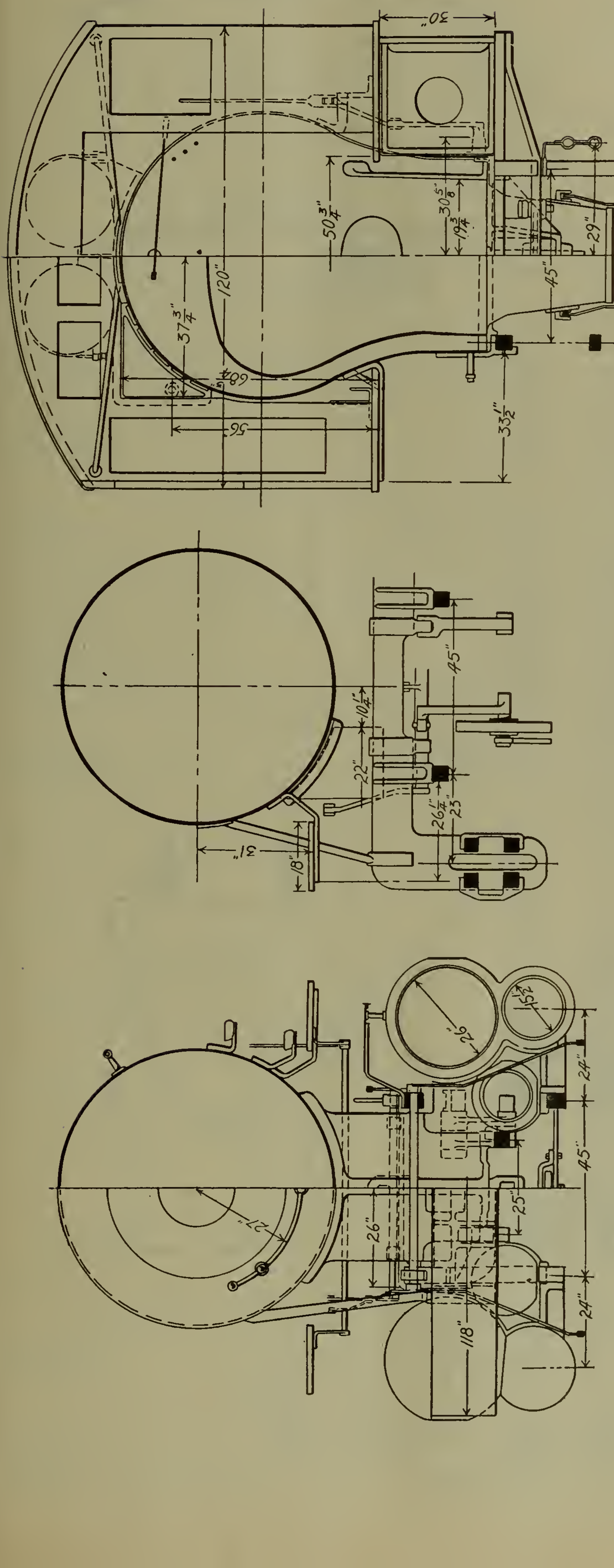


Fig. 3—Freight Locomotive of the Kansas City Southern Railway—End Elevations and Sections.

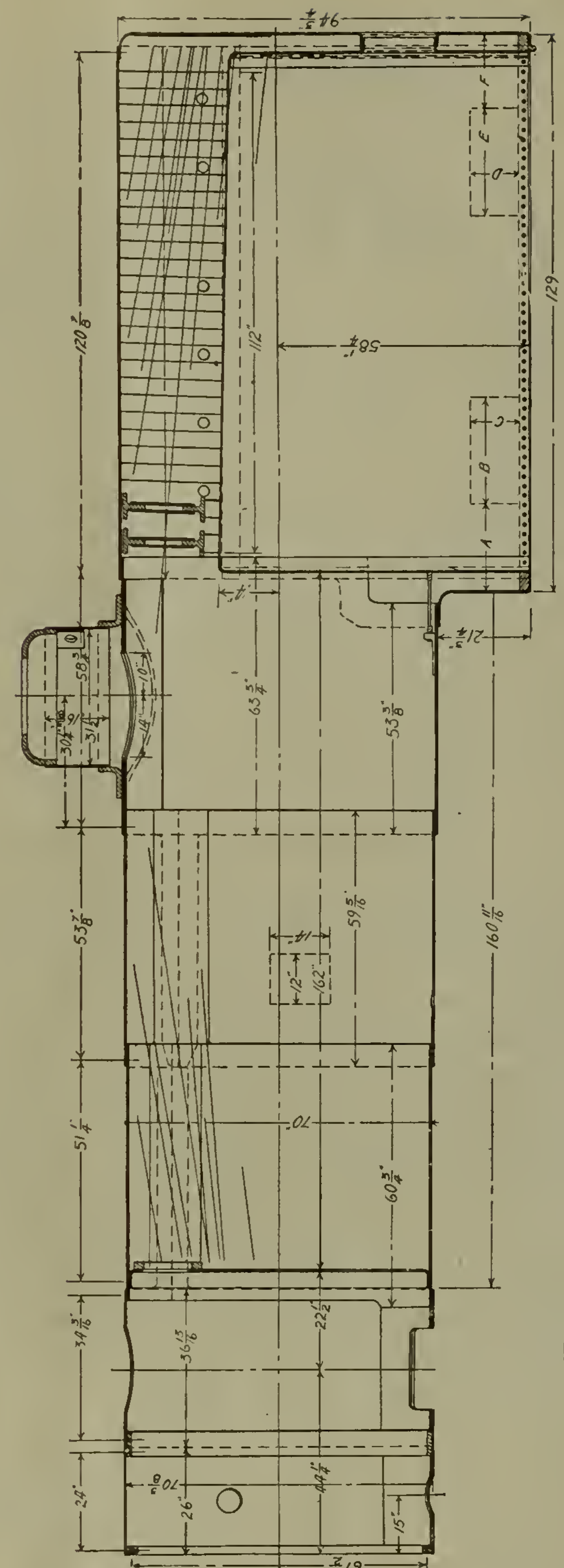


Fig. 5—Freight Locomotive of the Kansas City Southern Railway—Section Through Boiler.

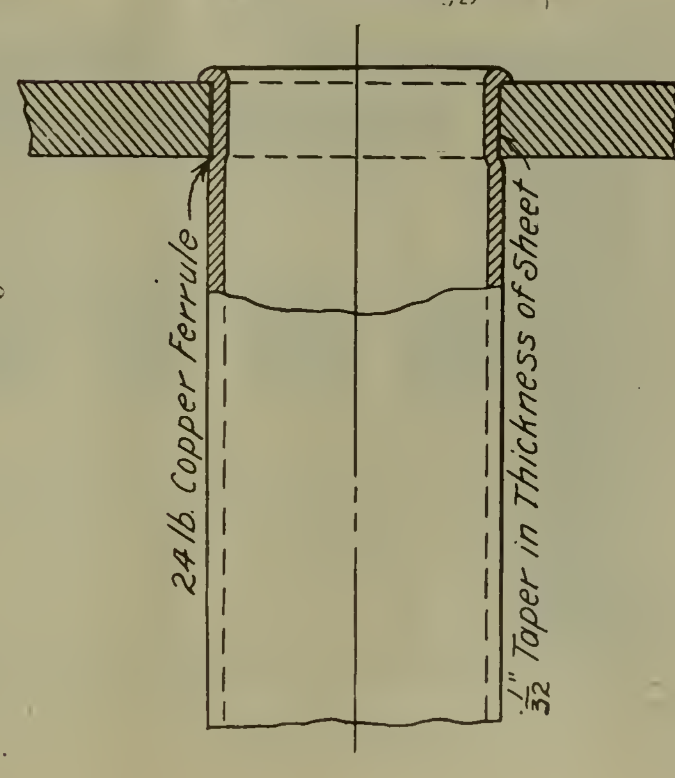


Fig. 4—Freight Locomotive of the Kansas City Southern Railway—Method of Applying Tubes.

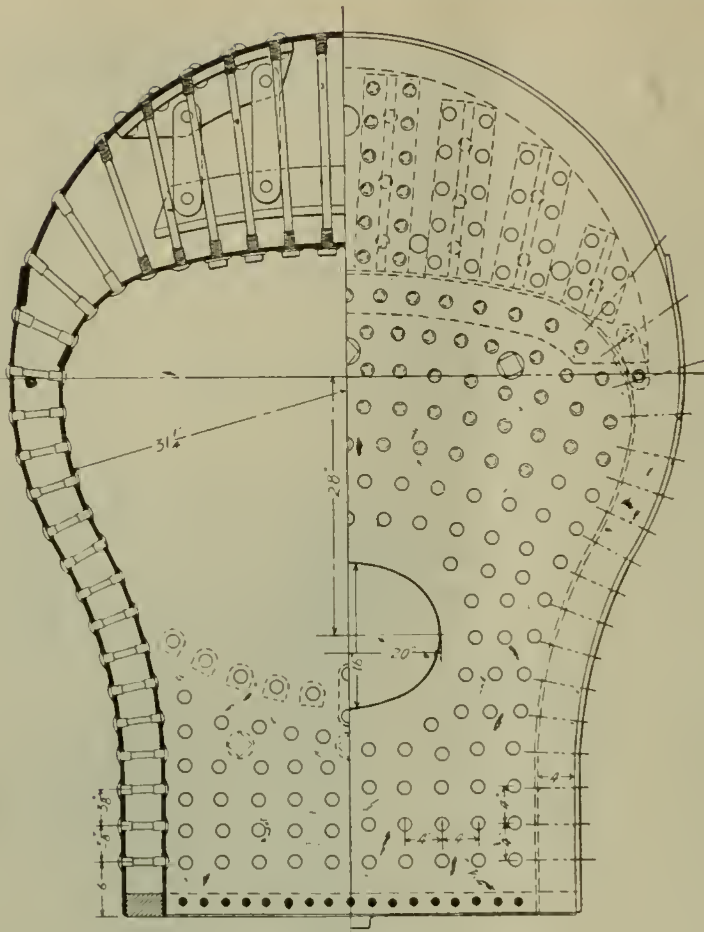


FIG. 6—FREIGHT LOCOMOTIVE OF THE KANSAS CITY SOUTHERN RAILWAY—REAR ELEVATION OF BOILER AND SECTION THROUGH FIREBOX.

tal braces are exceptionally well taken care of by the use of three bolts at each jaw.

Determining the tractive effort from the given dimensions of cylinders and driving wheels, the locomotive is capable of exerting a starting power of 35,800 pounds. The weight on drivers being 165,020, the ratio of adhesive weight to tractive effort is 4.6; the ratio of tractive effort to total heating surface is 15.2 and the ratio of total heating surface to grate area 69.2.

The following table presents the general dimensions and further details of construction:

GENERAL DIMENSIONS.	
Gauge	4 ft. 8½ ins.
Cylinder	15½ ins. and 26 ins. by 30 ins.
Valve	balanced piston
BOILER.	steel.
Type	straight
Diameter	70 ins.
Thickness of Sheets	11-16 in., ¾ in.
Working Pressure	200 lbs.
Fuel,	soft coal
Staying	radial
FIREBOX.	
Material	steel.
Length	120 3-16 ins.
Width	40⅝ ins.
Depth, front	72¼ ins.
Depth, back	69¼ ins.
Thickness of sheets, sides	5-16 in.
Thickness of sheets, back	5-16 in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, tube	½ in.
WATER SPACE.	
Front	4 ins.
Sides	4 ins.
Back	4 ins.
TUBES.	
Material	iron.
Wire Gauge	No. 11.
Number	306.
Diameter	2 ins.
Length	13 ft. 6 ins.
HEATING SURFACE.	
Firebox	193.9 sq. ft.

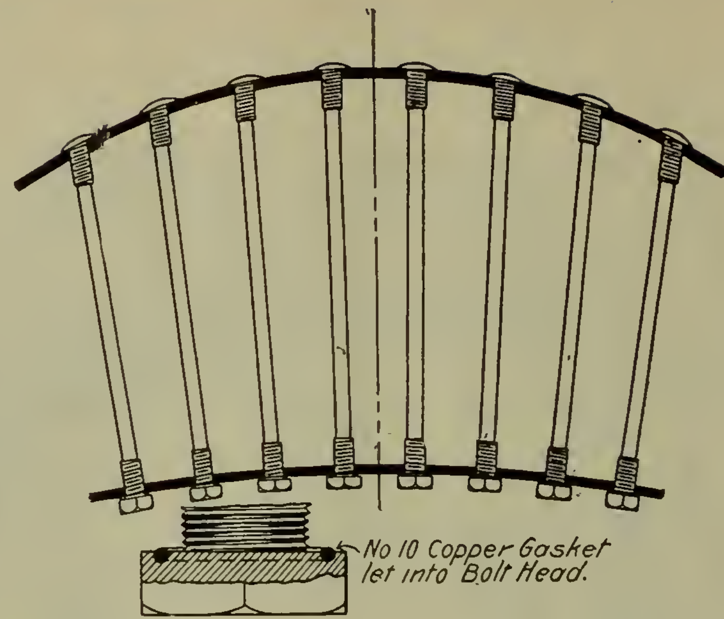


FIG. 7—FREIGHT LOCOMOTIVE OF THE KANSAS CITY SOUTHERN RAILWAY—METHOD OF APPLYING CROWN STAYS.

Tubes	2,147.9 sq. ft.
Total	2,341.8 sq. ft.
Grate Area	33.8 sq. ft.
DRIVING WHEELS.	
Diameter of outside	55 ins.
Diameter of inside	48 ins.
Journals, main	9 ins. by 10 ins.
ENGINE TRUCK WHEELS.	
Front, Diameter	30 ins.
Journals	6 ins. by 10 ins.
Driving	15 ft. 3 ins.
Rigid	15 ft. 3 ins.
Total Engine	23 ft. 11 ins.
Total Engine and Tender	53 ft. 5½ ins.
WEIGHT.	
On Driving Wheels	165,020 lbs.
On Truck, front	22.600 lbs.

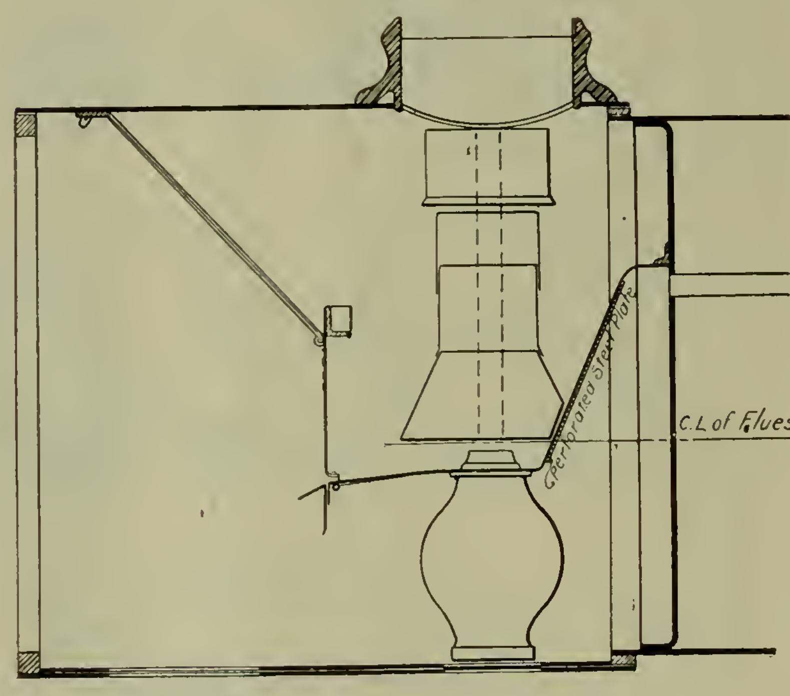


FIG. 8—FREIGHT LOCOMOTIVE OF THE KANSAS CITY SOUTHERN RAILWAY—FRONT END ARRANGEMENT.

Total Engine	187,620 lbs.
Total Engine and Tender, abt.	29,620 lbs.
TENDER.	
Wheels, Number	8.
Wheels, Diameter	33 ins.
Journals	5 ins. by 9 ins.
Tank, Capacity	5,000 gals.
Service	Freight

COMMUNICATIONS

Circular Oil Furnaces

To the Editor:

Referring to the article relative to circular oil furnaces appearing on page 207 of the May issue of the Raliway Master Mechanic, we have been using circular furnaces for over a year, but not in the smith shop. An improvement was made also some six months since by directing the blast at a tangent instead of being central, this gives a whirling flame and more surface is thereby exposed to the oil, promoting combustion in a more complete manner. I believe this to be the best shape for the interior arrangement of a furnace for either heating iron or melting brass. We have three different styles of furnace in the shop here, oil being the fuel used, however I am not prepared to discuss its merits at the present time. I am quite certain, though, that fan blast is superior to compressed air, as the compressed air in the act of expansion withdraws a portion of the heat generated by the oil. Coal and coke take up heat before they are in a fit state to radiate heat, whereas oil carries the carbon in a comminuted state ready to burn at once, the atoms giving in the aggregate many more times the surface area to be acted upon than the solid fuel. Oil as a fuel is but new as yet, comparatively speaking, and the future will see the heat intensified by the use of superheated steam or air.

I send herewith a line drawing of a case-hardening furnace in which the fuel used is soft coal. This furnace has been in use nearly seven years and has been repaired three times. After being filled it requires little attention, and can, by adjusting the dampers, be left all night and will be found at the same heat, requiring little attention, whereas oil used for this purpose is not equal to coal or coke as a concentrated heat is not required, but a regular heat maintained according to the size of the box or amount of work. The fire doors are not shown in drawing and clay should be inserted instead of mortar as packing or luting.

Yours truly,

Thos. C. Lace,

Foreman Mt. Clare Shops, B. & O. R. R.

Baltimore, Md.

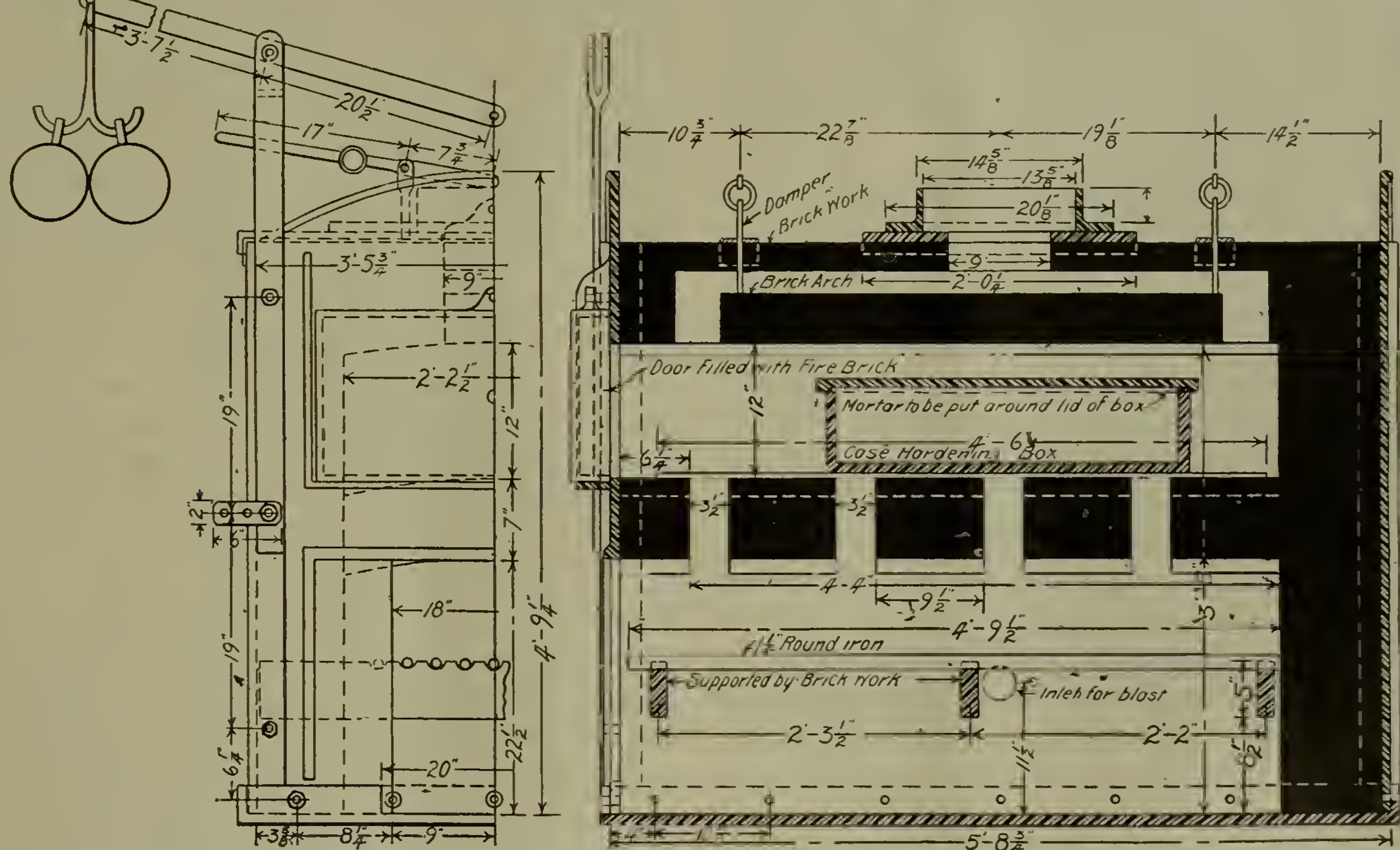
Arbitration Committee

To the Editor:

Would it be considered a heinous crime to criticise the rulings of the Master Car Builders' Arbitration Committee? I must say that the mere idea of just an ordinary car man daring to refuse to meekly accept the findings of this body of experts rather takes one's breath away and will account for the "Lion's Mouth" character of this communication. However, as the ice has been broken I seem to have acquired courage to speak my litle piece.

What appears to me as a weakness in a very large number of the decisions, is their lack of breadth. It is safe to say that there is a fundamental principle underlying each question presented and in my opinion this very principle should be brought out and enlarged upon. The one question under consideration is perhaps, of local importance and the exact conditions may not appear in actual practice in months, but notwithstanding this a decision is rendered as if this case were of paramount importance and there would never be another one of a nature in any way appraching it.

We frequently see previous arbitration cases referred to by one or both of the contesting parties which the



Case Hardening Furnace of the Mt. Clare Shops of the Baltimore & Ohio Railway.

committee dispose of by saying, that they have no bearing on the question before them. What has caused these contestants to form false ideas of the bearing these previous cases have on the one they are interested in? A lack of an established principle in the decision and nothing else. If these decisions had been made broader they would settle not only the case in dispute, but numerous others of a similar nature.

We will say that a case in dispute between two railroad companies hinges on the breaking of four parts or members of a car body. The Arbitration Committee decides that according to the rules the XYZ Ry. is in the right, and cites the particular rule governing same. A few months later two other companies fail to agree in a case which one company says is similar to the XYZ case, but the other cannot see it that way, for the reason there are five defective parts involved. As a matter of fact the principle concerned in the two cases is identically the same and the presence of the additional fifth part does not affect it in the least. Now my contention is, if the Arbitration Committee had, instead of saying, "According to Rule So and So," and stopping there, had quoted the rule and then interpreted it in a broad comprehensive manner, the second case would never have been presented to them for settlement, but both parties would have construed the previous decision in the same way and there would have been no disagreement.

Frequently the committee will give a decision as follows: "Arbitration case So and So is parallel. The committee is of the opinion that the bill is correct and should be paid." The party in the case who does not see that case So and So governs, is "silenced but not convinced." The opposing party quoted the same case to him, but he couldn't see it then and he can't see it now. Wouldn't it be much better if *the reason why* were explained to him? It is but very little satisfaction to a man to be told he is wrong and no explanation given. He should be shown wherein he is wrong and then we should see the happy result of not only silencing him but convincing him also. * * *

Railroad Shop Tools

By Charles H. Fitch

III.

WE FIND nearly every description of hammers and pressure-forming tools employed in railroad shops, for nearly every class of forging is done. The work ranges from the manufacture of heavy axles, frames and slabs to drop forgings and general blacksmithing. In addition to the character of the work itself, the selection of hammers is governed by the amount of work to be done, whether the work is varied and occasional, or such a repetition of the same as will warrant a manufacturing system.

The steam hammer is yet the prince of tools in the blacksmith shop. Its appearance is monumental, and its practical value no less impressive. It possesses in high degree power, simplicity, ease of control and elasticity of action. Its anvil and machine framing are independent. It is free from expense when out of action, and the steam which gives it power can be supplied with the heating of the iron which this power forges, by having the hot furnace gases pass through the flues of a boiler on their way to the chimney. Fig. 1 illustrates a 6,500-lb. double-frame hammer in the work of forging frames from piled slabs of selected wrought iron scrap, at the Baldwin Locomotive Works.

The steam hammer is *par excellence* a hand tool. Some are made self-acting, but, owing to the necessity of manipulating the work in unison with the operation of the hammer, the largest and most powerful hammers are built "hand-acting." They can be made to deliver elastic or dead blows, slow or quick, at the will of the operator by the motion of his hand and foot, and no machine gives greater power to the operator's elbow.

There are two details of significance in the mechanism giving such great facility in handling the prevailing style of hammers. One is the cam path and cam or wiper, sometimes called the dangler. This is very well shown in the sectional view of the Miles single-frame hammer presented in Fig. 2. The practical effect of this detail is that the hammer driven down by force of steam pressure and gravity outruns the fall of the valve by gravity only. The cam path, in other words, falls faster than the cam, so that after the hammer has delivered its blow the cam makes a further movement and opens the steam valve to lift the hammer. This simple device overcomes the difficulty of opening the port after the hammer has come to rest. Otherwise there would have to be a steam cushion and a steam lead on the up, as there is on the down stroke, and the hammer so cushioned could not strike a dead blow or a blow nearly so effective as if uncushioned.

The second detail is the floating pivot. The pivot of the arm having a short leverage connection with the valve stem, and a longer leverage connection with the cam or wiper, may be on the stud of the short arm of a bent lever instead of in the frame. This bent lever, called the working lever, has its long arm adjustable in position upon a sector, and by this ready adjustment the hammer can be made automatic for variable conditions, working with equal ease for thick or thin work, or long or short stroke.

Fig. 1—6,500-lb. Double Frame Hammer Forging a Locomotive Frame at the Baldwin Locomotive Works.

These details are not novel, but it is our intention to describe the most significant features of plant, whether old or new. The treadle motion is easily applied to the system of levers to cause a drop at any point desired.

A steam hammer might conceivably be introduced in which all the actions of the above-described mechanism would be produced by electrical action, but this seems unnecessary and we can see no limit to the use of the steam hammer short of replacement by very expensive presses, or by the formation of parts by the new system of differential fluid pressures which, although very remarkable and wonderful, cannot be expected to influence shop usages for years to come.

While considering the systems of leverage used in working a steam hammer we are led to illustrate a power hammer of 500 pounds falling weight driven direct connected by a Triumph motor, Fig. 3. The system of levers is similar to that of a steam hammer, but motion is given to a rheostat instead of a steam valve. It is very improbable that electrical drive will displace steam in the operation of hammers, but we will have in future articles to devote considerable attention to electrical drive, and circumstances may make it convenient to employ a uniform power in some cases. It is therefore interesting to note the mechanism available, and the rheostatic control, by which a regulation is obtained similar to that of a steam hammer.

With reference to steam valves, several types of round and square piston, gridiron and balanced slide are used, the requirement of a quick-acting balanced valve being satisfied in various ways. Piston valves are much used.

The type of hammer most in use is of several makes which are substantially of the class shown in Fig. 2 of the Miles hammer with single frame, small piston rod and ram set at such an angle with the frame that skew dies are not necessary, and work of the full width of dies and of any length will clear the frame when drawing or finishing. The foundations of anvil and frame are independent.

The subject would be incomplete without mention of the Morrison type of hammer shown in Fig. 4. This cut shows a 1,200 pound hand-acting hammer made by Wm. Sellers & Co. The greater part of the falling weight is in the piston rod, and the whole guidance is in or above the piston, there being no lower guides. The Collin device obviating the ill effects of choked exhaust due to vibrations is shown in the pipe and pan near the head of the hammer. Where automatic action is required an extension is made above the cylinder, and this carries a yoke working in grooves and throwing the valve in accordance with the setting of the working lever. The manufacture of these hammers was begun in 1861, and while they have the advantage of plenty of height above the anvil, the size and wear of the stuffing boxes is less favorable to them, and hammers being placed in western shops are chiefly of the type described as the Miles, although by this we include the Chambersburg, Bement, Alliance and Amer. Engineering Works hammers all of the same general type.

The tendency is to settle upon one satisfactory type. The hammer man does not then have to learn a new machine, and get used to the manipulation of levers in a

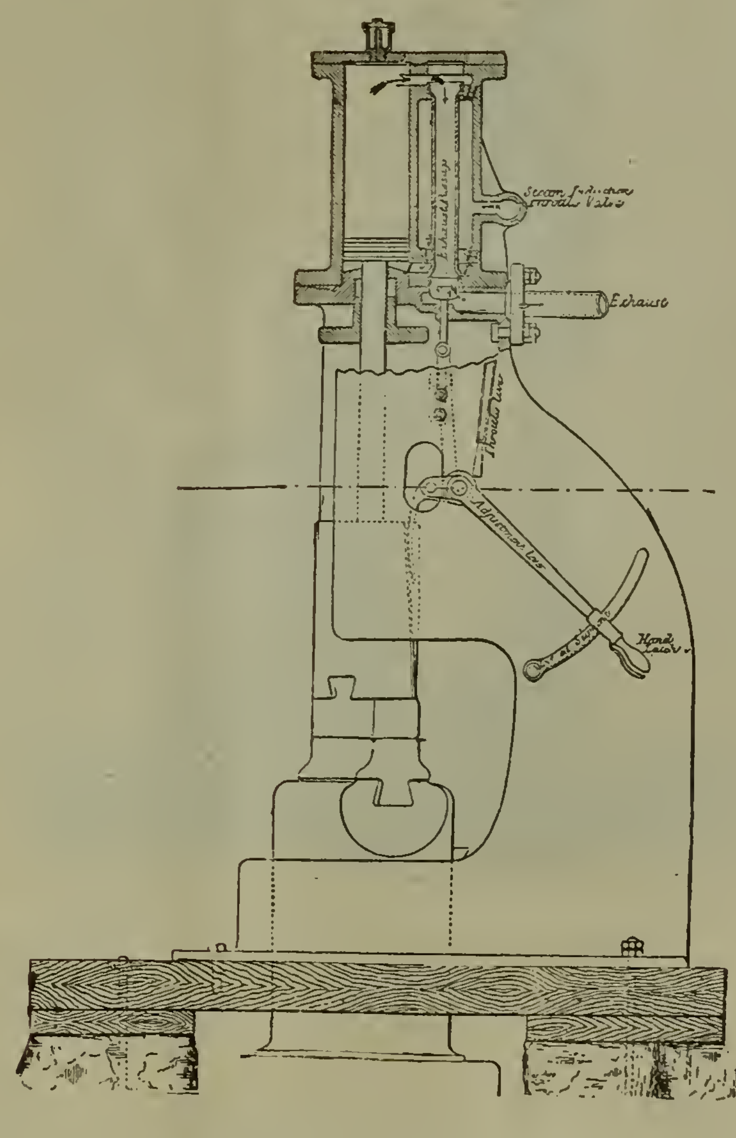


Fig. 2—Miles Single Frame Hammer.

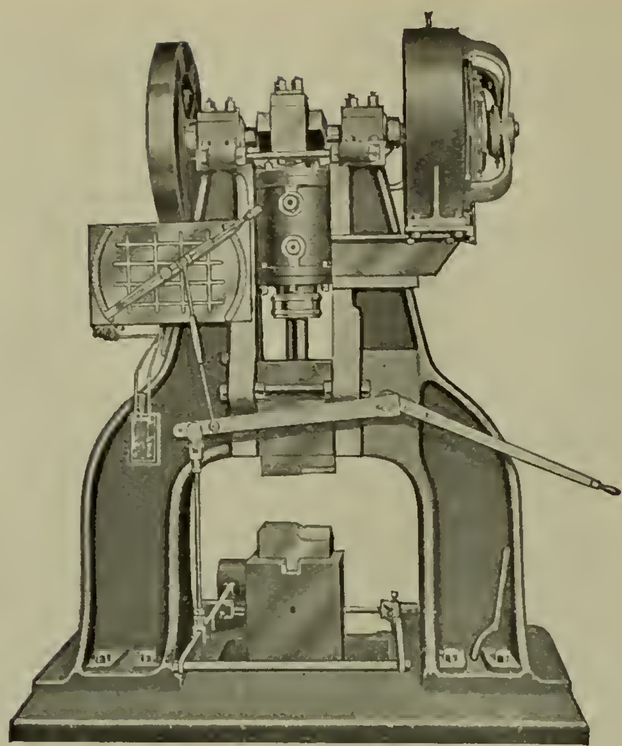


FIG. 3—APPLICATION OF ELECTRIC MOTOR TO HAMMER.

changed position so as to be equally at home with them in changing machines.

Wide as is the adaptation of the vertical steam hammer there is a class of work for which it was long considered

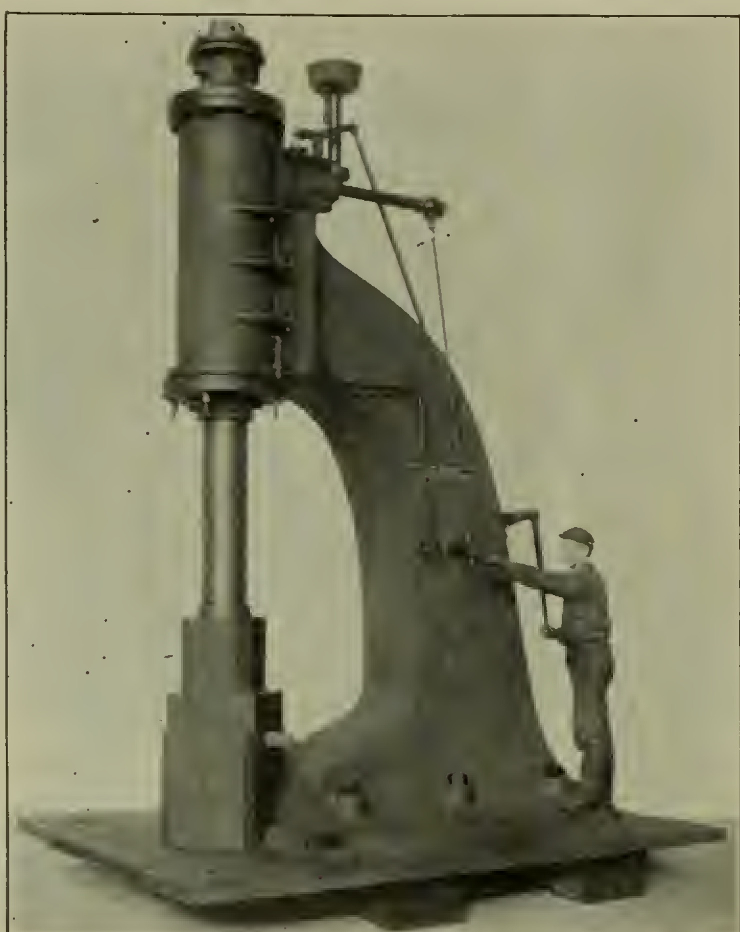


FIG. 4—MORRISON TYPE OF HAMMER, WILLIAM SELLERS & CO.

less suitable than the heavy helve hammer. These helve hammers are used for forging axles from the slabs at C. & N. W. shops, Chicago, and at the Pullman and other shops. Their general character is shown in accompanying illustration, Fig. 5. For finishing axles they have dies of three sizes, concave cylindrical, and the axles are turned in suspension by arrangements of tongs and chains, and are passed from round to round as the swaging down proceeds. These hammers enable 10 to 20 axles per day to be finished according to size of axles. They are powerful steam hammers and are not to be confounded with the old-fashioned cam or trip hammers which deal a much lighter blow. The trouble in using a vertical steam hammer on this class of work is that the blows struck are not central and the bending stress on the hammer stems is severe, while the hammer beam takes up such stresses without detriment. At the Pullman shops however it is probable that the helve hammers will soon be replaced by direct acting steam hammers of greater power by which more effective and penetrating work can be done in slabbing.

To act as a buffer and prevent collision between the

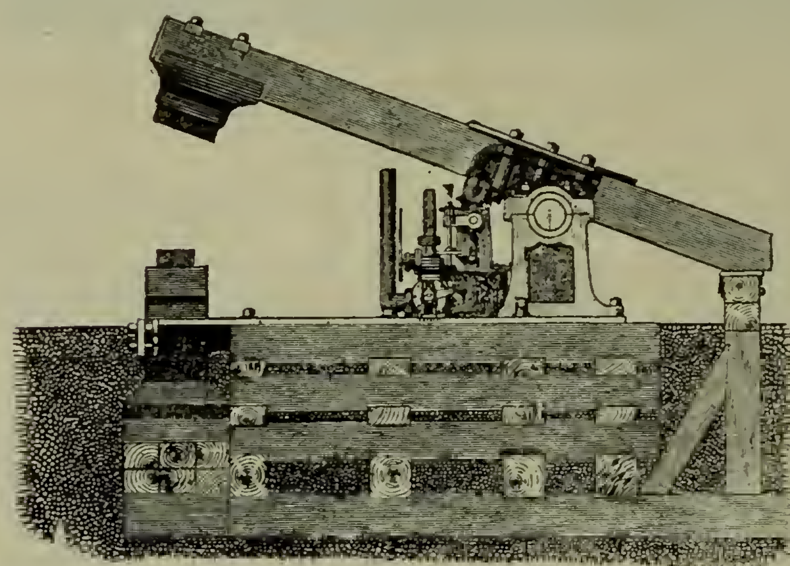


FIG. 5—HELVE HAMMER.

piston and the upper head of the vertical hammer, spiral springs are used. Cushioning devices (air or steam) have also been used, but they require something in the nature of a piston fit in an inverted dash pot, and spiral springs are effective, cheaper and require less care. The steam lead has already been mentioned. If this is effected by a stem struck by the rising piston admitting steam, the piston is not only prevented from going through the cylinder head, but at once delivers a heavy blow for which the operator may not be ready. He loses control at that point, which he does not do with the simple device of a spiral spring.

National Malleable Iron Brake Jaw and Dead Lever Guide

On page 226 of our May issue there appeared an illustrated description of the National Malleable Iron Brake Jaw and Dead Lever Guide. This device should have been described as patented and through an oversight the word "patented" failed to appear in connection with the illustration. We therefore take this opportunity of correcting the error and calling attention to the patents covering the devices.

New Roundhouse of the Baltimore & Ohio Railway

THE Baltimore & Ohio Railroad Company have completed plans for the erection of a new roundhouse at Holloway, Ohio. The building is to contain twenty stalls, provision being made to increase this number as the demands of service increase. For the maintenance of running repairs, machine and blacksmith shops are to be built adjacent to the roundhouse. The buildings are to be constructed of wood upon concrete foundations. The outside sheathing is to be of wide boards arranged vertically, the joints between them being covered with narrow battens and the roofing is to be covered with four-ply slag. Between the machine and blacksmith shops is a 13-inch brick fire wall separating the two shops. To a height of eight feet the walls of all buildings are to be lined on the interior with ⅞ inch tongue and groove matched ceiling material not over 4 inches wide, the same to be capped with a dust board.

The roundhouse walls, as those of the other buildings are of wood, built upon concrete foundations according to specifications identical with those of the shop building. The roofing is 1½-inch hemlock laid diagonally at an angle of 70 degrees covered with four-ply slag. Of the twenty stalls to be originally constructed, two are to be arranged with drop pits for driving wheels and two with drop pits for truck wheels. Referring to partial plan of roundhouse, Fig. 1, standard guage tracks will be seen leading from drop pits to machine shop. Making a complete circuit of the roundhouse is a 21-inch gauge lorry track which is connected by a turntable to a track of the same gauge continuing the entire length of the machine shop.

The roundhouse is served by an 80-foot turntable operated by electric motor.

Concrete foundations support the roundhouse pits. The bottom lining is of vitrified brick presenting a curved surface, supported on a layer of sand. The

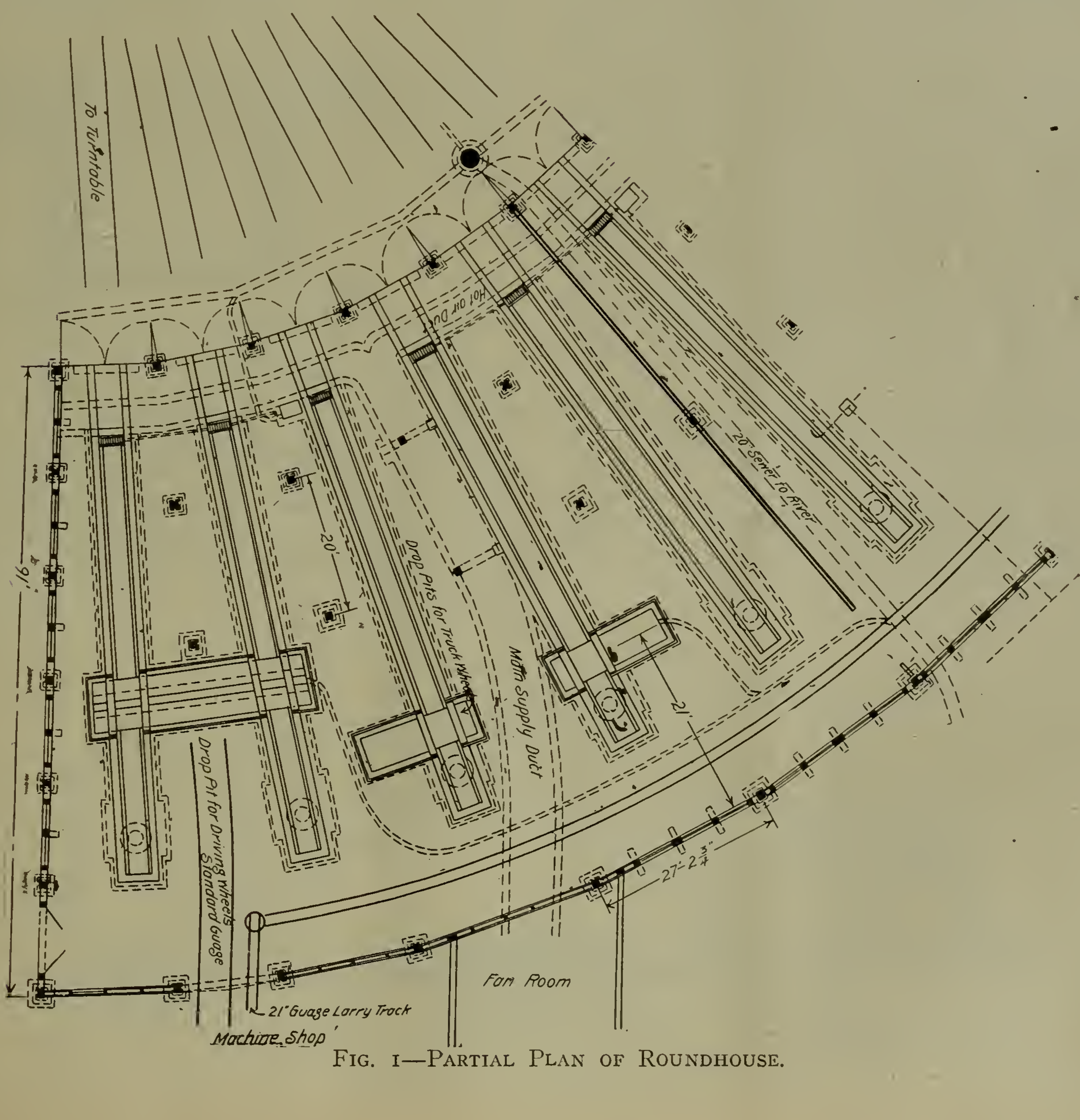


Fig. 1—Partial Plan of Roundhouse.

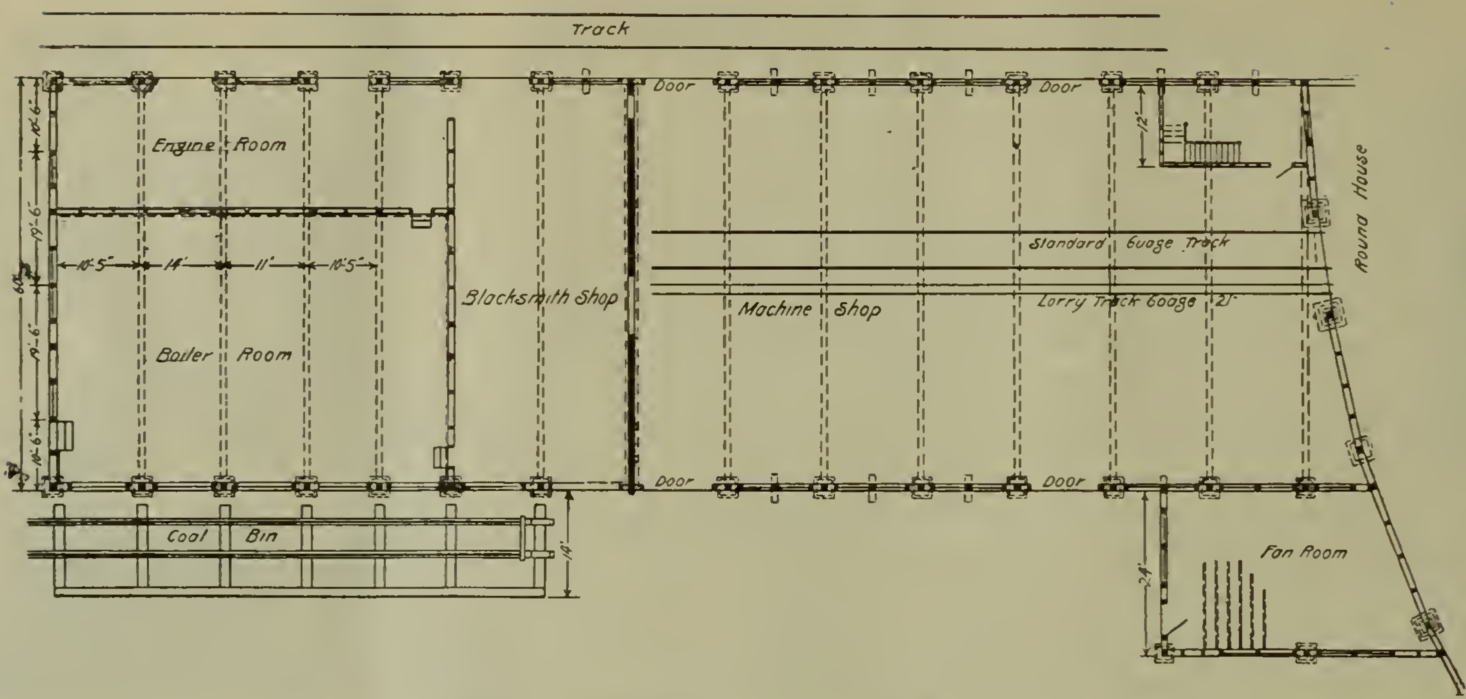


FIG. 2—PLAN OF SHOP BUILDING.

side walls are of hard burned brick, 30 inches thick, surmounted by granite blocks upon which the rails are supported. Specifications require the granite blocks to be of at least 8-foot lengths. Rails are maintained in position by ¾-inch bolts extending through lower flange of rail and through the block. On the floor side of the granite blocks, are situated wooden blocks 6 inches by 12 inches, which receive their support from the walls below, thus adding to the strength of the floor as a jacking foundation. In the immediate vicinity of the pits the floor is of wood constructed of 4 inch by 12 inch planks. The remainder of the flooring is of vitrified brick on edge laid upon 2 inches of sand upon a foundation of concrete. A section of the roundhouse through one of the pits is shown in Fig. 6.

The pits drain towards the turntable, a drain connection being made at the turntable end of each pit, the opening being covered by cast iron gratings. A concentric 12-inch sewer receives the drainage from the several pits and a 6-inch sewer drains the turntable pit. These in turn are drained by a 20-inch sewer leading to the river near by.

The driving wheel drop pits being similar in detail to those installed at the Keyser, W. Va., shops, published in the Railway Master Mechanic, page 412, November, 1902, it is hardly necessary to reproduce them here.

The truck wheel drop pits of which two are to be installed are illustrated in Fig. 4. The brick flooring of the roundhouse continues to the immediate edge of these pits. The pits are supported upon concrete foundations and are built up of vitrified brick, both sides and bottom. The bottom lining is covered with 2-inch planking laid in 4-foot sections. When not in service the drop pits are covered with wooden trap doors, supplied with rings to facilitate their removal.

Connections are made for boiler washer, steam blower and air in every other stall.

As indicated on the accompanying plan, Fig. 2, the machine shop is immediately adjacent to the roundhouse. Through the centre of this shop, extending its entire length, passes a standard gauge track which continues from the roundhouse, for the purpose of conveniently transporting wheels from drop pits to wheel lathes in the machine shop. Parallel to this track and also connecting the roundhouse is a lorry track of 21-inch gauge. The machine shop is

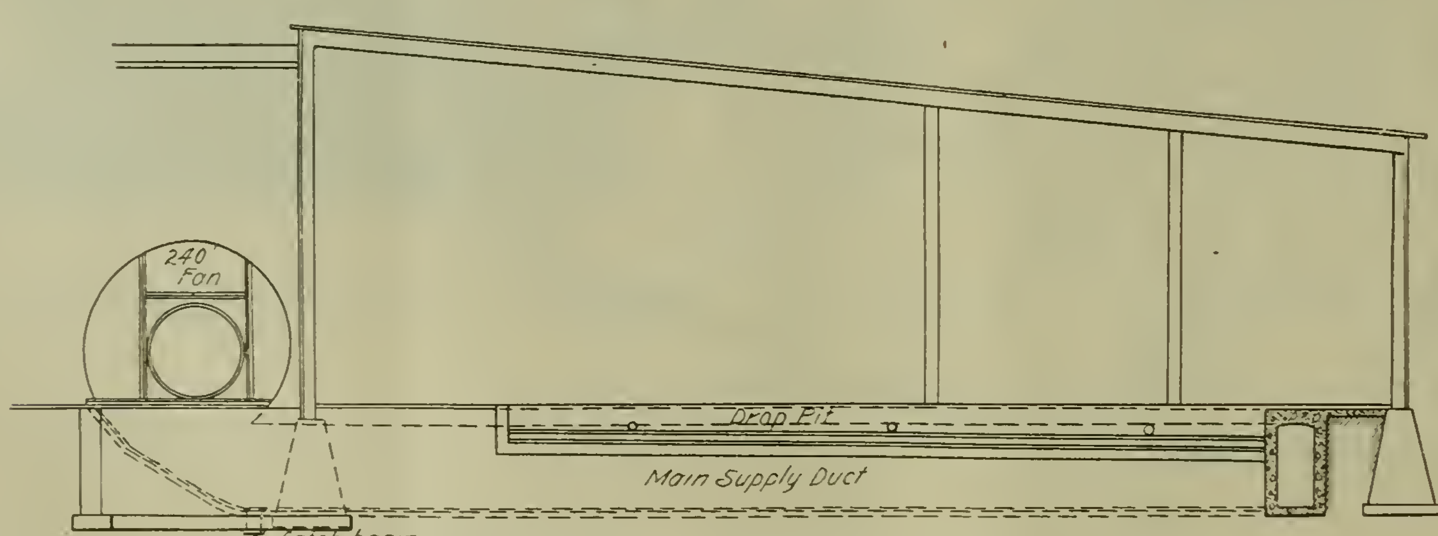


FIG. 3—CROSS SECTION THROUGH ROUNDHOUSE AT C. D., FIG. 5.

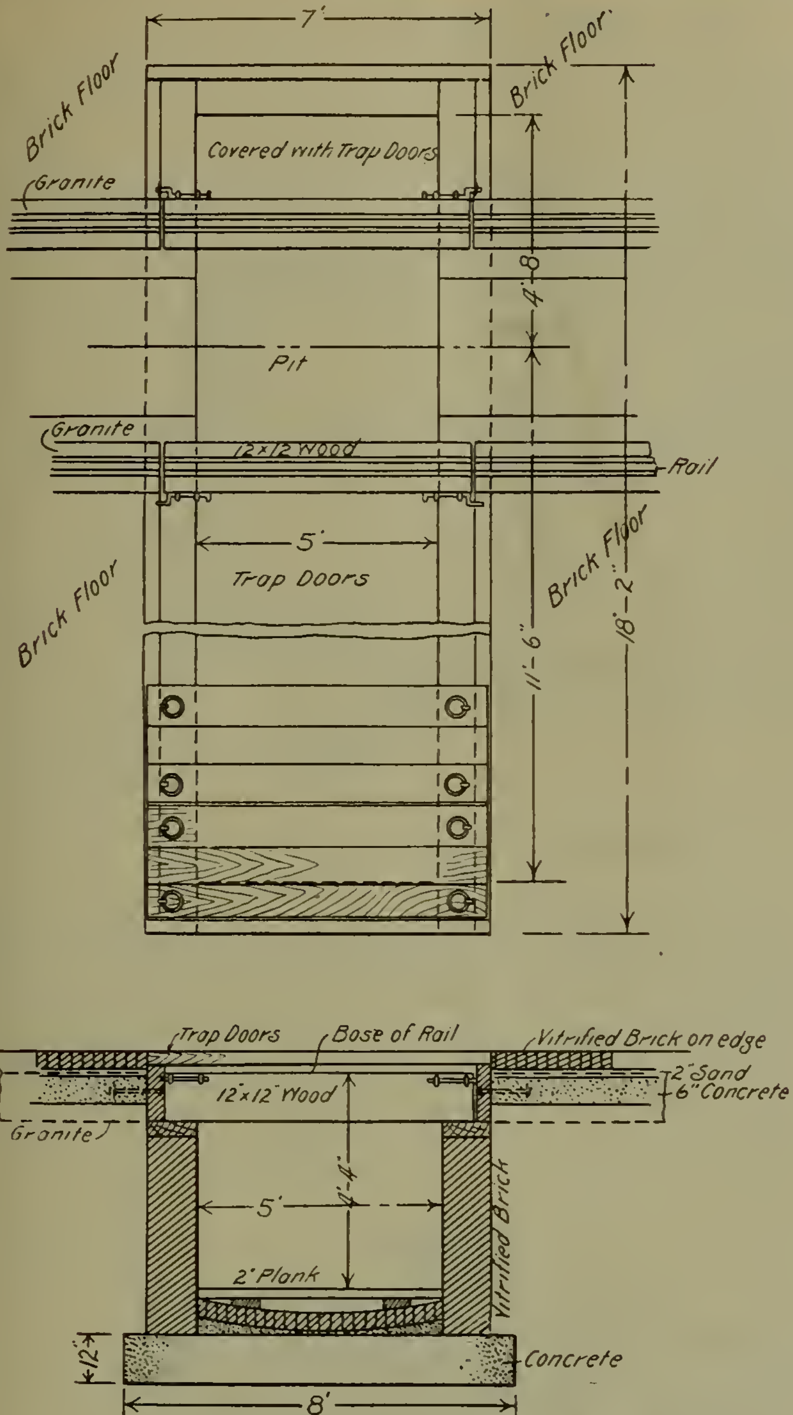


Fig. 4—Drop Pit for Truck Wheels.

99 feet 8 inches in length by 60 feet wide. In one corner is the tool room which supplies the usual tools for the entire plant. Immediately above the tool room is the foreman's office. The flooring is of 3 inch by 8 inch dressed Georgia yellow pine, supported by joists of the same material, 3 inches by 8 inches, undressed. The whole is maintained upon a concrete foundation, in which are embedded Georgia yellow pine sills 3 inches by 3 inches, arranged on 5-foot centres.

Next to the machine shop and adjacent thereto is the blacksmith shop. As indicated above these two shops are separated by a fire wall of brick. The blacksmith shop is 60 feet long by 25 feet 11½ inches wide, the flooring of which is of cinders, well tamped.

The extreme end of the building is occupied by the boiler, engine and dynamo rooms. The boiler room is 55 feet 10 inches by 39 ft. 6 in., and the engine and dynamo room is 55 feet 10 inches by 18 feet. The flooring of both rooms is of vitrified brick arranged on edge, brick work being placed upon 2 inches of sand which in turn is supported by a foundation of natural cement concrete 4 inches thick. Flooring of boiler room is depressed 2 feet.

Adjacent to the boiler room will be a coal bin, having a capacity of two car loads, served by a track elevated 6 feet above grade. The bottom of this bin is on a level with floor of boiler room and its flooring is of the same material. Flooring slopes to one point from which it is drained to sewer.

The heating system is supplied by a 240-inch fan delivering hot air received through coils heated by exhaust steam. The fan house is situated at a point adjacent to the roundhouse and machine shop, the main duct leading into the roundhouse and a minor duct leading to the adjacent shop building. The main supply duct shown in section, Fig. 5, is constructed of Portland concrete and leads to a concentric duct, also of Portland concrete, 36 inches by 82 inches, extending the entire length of the house. Between every other pit a branch is taken off, which is located between the pits and by which hot air is delivered at three points on one side along the inner wall of the pit.

Turntable, ash pits, and machine tools are to be operated by electricity, power for which being furnished by 1 150 K. W. direct connected dynamo, from

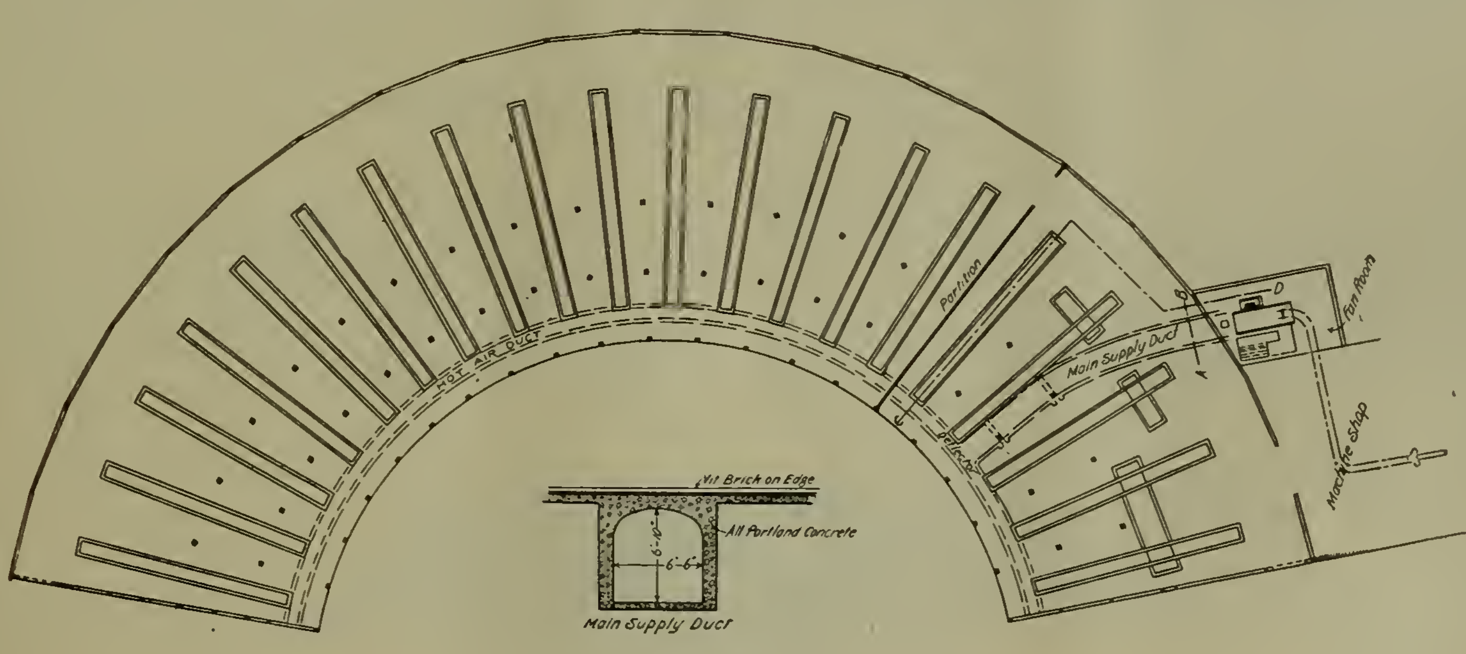


Fig. 5—Plan of Roundhouse.

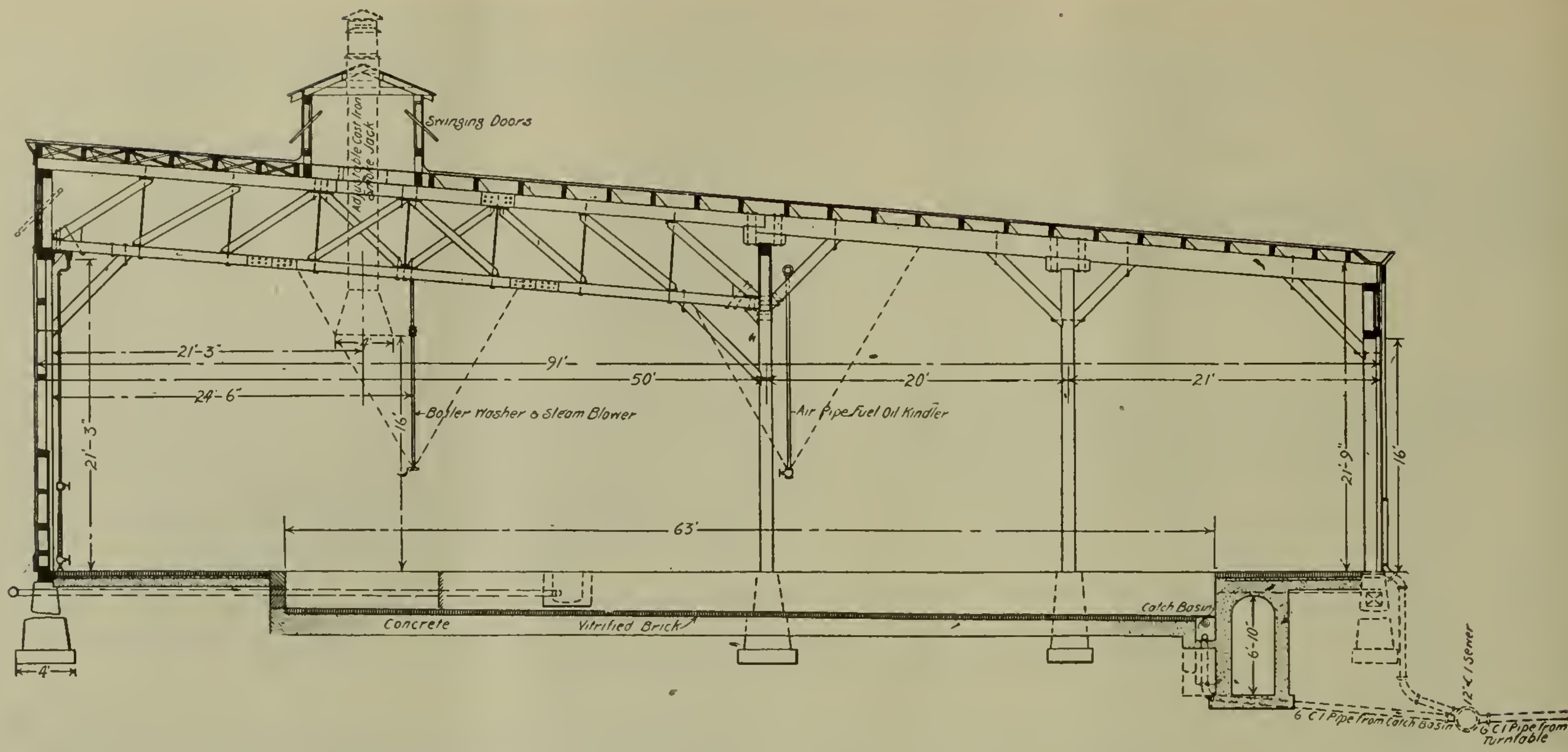


Fig. 6—Cross Section of Roundhouse.

which source power for lighting shops, engine house and yards will also be obtained.

The shop building and roundhouse are well lighted by natural light, being supplied with large windows. The windows of machine and blacksmith shops, boiler and engine rooms and end walls of round house will be similar in construction, except sizes of glass which will be governed by sizes of frames.

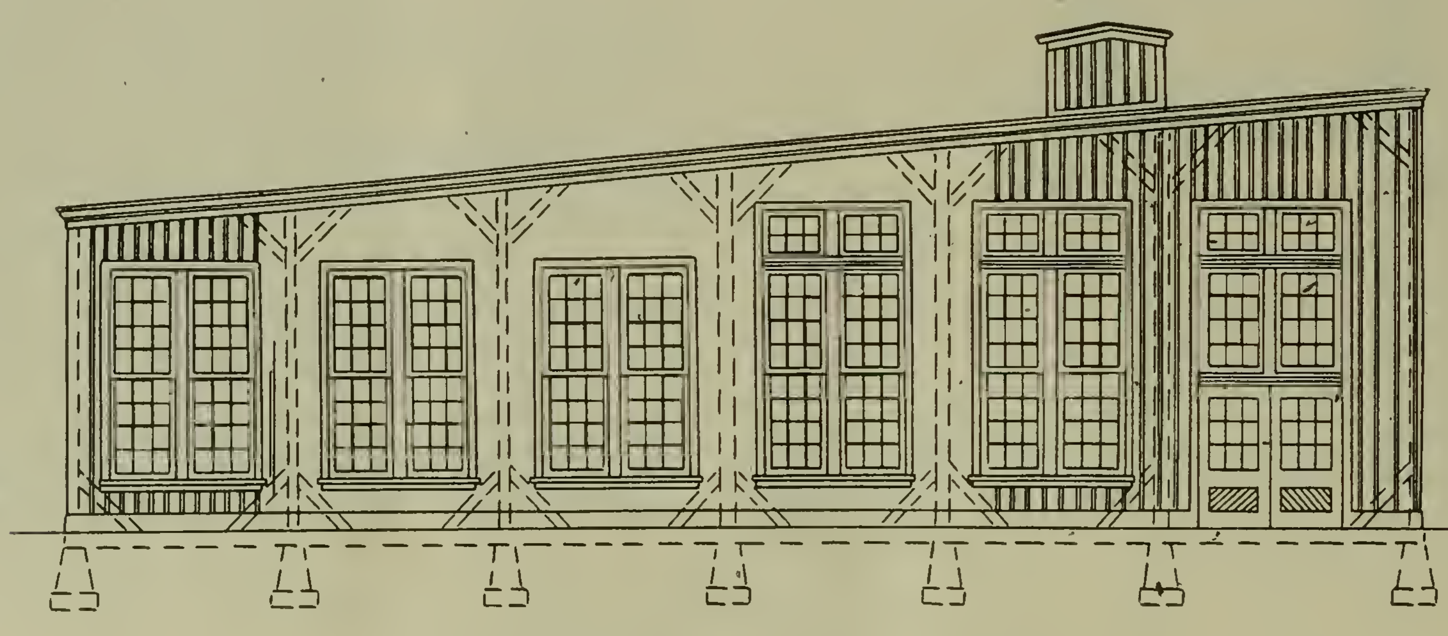


Fig. 7—End Elevation of Roundhouse.

The oil and store house at this point is similar in construction to the oil house of the Keyser, West Virginia roundhouse, which was illustrated in the Railway Master Mechanic, p. 412, November, 1902.

The details of construction shown herewith are similar to those which will be followed by the Baltimore & Ohio in improvements to be made at Connellsville, Pennsylvania, Fairmont, West Virginia and New Castle Junction, Pennsylvania.

In presenting these illustrations, we acknowledge the courtesy of Mr. F. D. Casanave, general superintendent of motive power.

May Meeting of the Western Railway Club

AT the May meeting of the Western Railway Club, held at the Auditorium Hotel, Chicago, May 19, a number of valuable points were presenetd with reference to the efficient operation and maintenance of injectors, in a paper by Mr. F. W. Edwards, of the Ohio Injector Company, and in the consequent discussion by the members of the club. At the close of the discussion reports were heard from the several officers, after which the annual election of officers took place. The following gentlemen were elected to the respective offices of the club: Mr. D. F. Crawford, president; Mr. Le Grand Parish, first vice-president; Mr. J. A. Carney, second vice-president; Mr. P. H. Peck, treasurer; Mr. J. W. Taylor, secretary; board of directors: Messrs. M. K. Barnum, C. B. Young and F. W. Sargent; trustees: Messrs. F. W. Sargent, George Royal and W. F. M. Goss.

Car Foremen's Association of Cleveland

INSTEAD of the monthly meeting of the Car Foreman's Association of Cleveland, O., a banquet was held Thursday, May 21st, at the Kennard Hotel, practically all the members being present, together with a large number of lady friends.

The following responded to toasts, A. Berg, president of the association, acting as toastmaster: H. H. Vaughan, A. S. M. P., L. S. & M. S. Ry., on The Advantages of Car Foreman's Associations; J. D. McAlpine, Relations between Railroad Companies and their Employes; G. A. Taylor, Reminiscences of a Veteran Railroader; C. E. Pearse, Relative Value of Discussion on Car Repairs and Interchange Questions.

The program was interspersed with music and vocal selections. Business was entirely dispensed with, the evening being given up wholly to social enjoyment.

Air Brakemen's Convention

THE tenth annual convention of the Association of Railroad Air Brake Men opened in Colorado Springs, Colo., May 4, with an attendance nearly as large as was present at the convention in Pittsburg last year.

Mr. John Roney presented a paper for the committee of which he was chairman, entitled "The High Speed Brake." The paper covered the actual results in high speed work with the high speed brake on both fast express and suburban trains. A paper on "Water in Train Pipes" was presented by the chairman of the committee on this subject, Mr. F. A. Whitman. This was a continuation of the subject from last year, in the endeavor to obtain further information on the subject, particularly with reference to obtaining a specific minimum and maximum length of pipe to suit all sizes of air pumps, location and capacity of main reservoirs and severity of weather conditions.

The committee on "Recommended Practice," of which Mr. F. M. Nellis was chairman, reported on their work in selecting from the proceedings of the previous conventions such parts as would be of advantage and benefit to general air brake service. This is to be modified each year, and has for its object the formulation of a code of practice endorsed by the Air Brake Association which can be recommended to railways for general use. Discussion of the various topical subjects was also on the program. Among the officers elected for the ensuing year are: E. G. Desoe, B. & A. Ry., president; F. M. Nellis, W. A. B. Co., secretary; Otto Best, N. C. & St. L. Ry., treasurer.

The Chicago Engineering and Constructing Company

The Chicago Engineering and Constructing Company, with a capital of $250,000, has acquired the established engineering and contracting business of the well-known firm of Weston Brothers, consisting of Charles V. Weston and George Weston, with offices at 711 Merchants' Loan & Trust Building, corner of Adams and Clark streets, Chicago. This firm was organized two and one-half years ago to carry on a general engineering and contracting business, and has paid special attention to examinations, consultations and reports upon proposed and existing steam, electric and elevated railways, and has carried on construction in many instances. Among the recent accomplishments of the firm may be mentioned the designing of the intramural transportation system for the Louisiana Purchase Exposition at St. Louis, which has been adopted, and the valuable assistance rendered to Mr. Bion J. Arnold in the preparation of his report to the local transportation committee of the Chicago common council, for which they received due credit in the report.

The officers of the company are: Charles V. Weston, president; George Weston, vice-president; George A. Yuille, secretary and general manager; Hervey B. Hicks, counsel, and Messrs. Addison E. Wells, Fred A. Wells and Edward B. Burling, all of Chicago, together with the above named officers, will make up the board of directors. Messrs. Charles V. Weston and George Weston are already so well and favorably known to the profession and the public as well that a reiteration of their past accomplishments seems unnecessary.

Mr. George A. Yuille will be recognized as the former vice-president and general manager of the West Chicago Street Railroad Company and an officer of other street railroad properties in Chicago. His service has covered both the construction and operation of properties and he is known to those familiar with this field as a manager of great force, tact, skill and ability. His connection with the new company will enable it to reorganize existing properties and bring them up to the best modern standard of practice.

Messrs. Addison E. Wells and Fred A. Wells are known throughout the country as leading building contractors, in which field they have been engaged for many years. They operate under the name of Wells Brothers Company and are now carrying on the construction of large buildings in Chicago, Baltimore, Philadelphia, New York and elsewhere. Their connection with the above company is an assurance to the business world of its stability and a warrant of conservative and efficient management.

For a number of years Mr. Hervey B. Hicks, who is a Chicago attorney, was engaged in engineering service on western railroads and irrigation works, and recently has made a special study of the electric railway field, all of which, in connection with his legal experience, will make his services peculiarly valuable to the new organization.

Mr. Edward B. Burling is a member of the firm of Bentley & Burling, Chicago attorneys.

The Chicago Engineering and Constructing Company is now carrying on the supervision of construction of electric railroads, among which may be mentioned the line from Rockford to Freeport, Illinois, and is preparing plans and specifications for extensions of existing properties. It is prepared to make surveys, estimates, plans and specifications, examinations and reports upon proposed or existing properties, with recommendations for improved operation when desired.

After making investigation of the physical condition and operating practice of existing properties the company will undertake the rehabilitation of their plants, reorganize their operating forces and bring the entire properties up to modern standards of practice, at the same time developing revenue producing possibilities which have been overlooked or neglected, and reducing operating expenses to a minimum.

The company will contract to substitute electrical power for steam power on railroads, in machine shops and manufacturing plants, which is of immediate interest to our readers. This department will receive the attention of expert electrical and mechanical engineers, and contracts will be executed without interrupting the regular work of the plant or shop in hand. The demand for the installation of electrical power machinery in this field will create a large business for the new company.

Personals

Mr. H. N. Arnold has been appointed assistant master mechanic of the Baltimore & Ohio Railway, at Mt. Clare.

Mr. F. P. Barnes, master mechanic of the Santa Fe at Albuquerque, N. M., has resigned.

Mr. W L. Tracy has resigned as master mechanic of the Southern Railway at Atlanta, Ga.

Mr. J. B. Ward has been appointed road foreman of engines of the Cleveland, Akron & Columbus at Akron, O.

Mr. J. G. Platt has been appointed engineer of tests of the Erie, with headquarters at Meadville, Pa., to succeed Mr. A. G. Trumbull.

Mr. S. J. Hungerford has been appointed master mechanic of the Western division of the Canadian Pacific, with headquarters at Calgary, Alberta, Can.

Mr. F. R. Cooper has been appointed master mechanic of the Macon, Dublin & Savannah, with office at Macon, Ga.

Mr. W. F. Yergens, master mechanic of the Chicago and Erie division of the Erie Railroad, has been transferred to Meadville, Pa.

Mr. H. P. Knight has been appointed master mechanic of the Baltimore & Ohio, with headquarters at New Castle, Pa., to succeed Mr. H. B. Brown.

Mr. W. Cockfield has been appointed acting locomotive and car superintendent of the Interoceanic Railway of Mexico, with office at Puebla, Mex., in place of Mr. L. Greaven.

The title of Mr. F. H. Scheffer, general foreman of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., has been changed to superintendent of machinery.

Mr. G. W. Tomkins has been appointed master mechanic of the Kanawha & Michigan, with headquarters at Charleston, W. Va., to succeed Mr. T. M. Downing, resigned.

Mr. O. W. Lewis, acting master mechanic of the Texas Midland, has been given the title of master mechanic, with headquarters at Terrell, Tex.

Mr. F. E. Place has resigned as master mechanic of the Burnside shops of the Illinois Central to accept a position with the Buda Foundry & Manufacturing Company of Chicago.

Mr. Charles A. Scheuble of the Pittsburg & Lake Erie mechanical department, has been appointed general foreman of the Youngstown Car Manufacturing Co., succeeding Mr. Frank Staub.

Mr. John P. Dolan has been appointed master mechanic of the St. Louis & North Arkansas, with headquarters at Eureka Springs, Ark., to succeed Mr. W. S. Lawless, resigned.

Mr. F. S. Stevens has been appointed master mechanic of the North Shore Road, with headquarters at Sausalito, Cal., to succeed Mr. P. J. Elliott, resigned.

Mr. M. Jungling has been appointed master mechanic of the Tifton, Thomasville & Gulf Road., with office at Kingwood, Ga., to succeed Mr. J. J. Anderson.

Mr. W. J. Brown, heretofore general foreman of the Santa Fe shops at Needles, Cal., has been appointed superintendent of motive power of the Ludlow Southern Rd., with headquarters at Ludlow, Cal.

Mr. F. Urban has been appointed general foreman of the locomotive department of the Rio Grande Western shops at Salt Lake City, Utah, to succeed Mr. J. E. Chisholm, resigned.

Mr. C. W. Werst, general foreman of the locomotive department at the Santa Fe shops at San Bernardino, Cal., has resigned that position and has been appointed inspector of work in the erecting department of the Baldwin Locomotive Works.

Mr. George Wagstaff, heretofore chief boiler inspector of the Lake Shore & Michigan Southern, has been appointed assistant master mechanic of the Collinwood, O., shops of that company.

Mr. D. W. Cunningham, heretofore master mechanic of the Chicago, Rock Island & Pacific at Valley Junction, Ia., has been appointed master mechanic of the Colorado & Southern, with headquarters at Denver, Colo., to succeed Mr. W. A. George, resigned.

Mr. D. Quill, acting assistant to general manager of the Texas Midland, has been appointed assistant to general manager; Mr. L. W. Wells, acting chief engineer, has been appointed chief engineer, and Mr. O. W. Lewis, acting master mechanic, has been appointed master mechanic; all with headquarters at Terrell, Tex.

Mr. L. T. Canfield has been appointed superintendent of motive power and machinery of the Mexican Great Eastern, with headquarters at the City of Mexico. During construction Mr. Canfield will have an office at 120 Liberty street, New York.

Mr. H. C. Van Buskirk has been appointed general master mechanic of the Fort Worth & Denver City Ry., with headquarters at Childress, Tex., to succeed Mr. Milton Player, whose title was master mechanic.

Mr. A. G. Trumbull, who recently has been appointed mechanical engineer of the Erie, with headquarters at Meadville, Pa., graduated from Cornell in 1899, served as special apprentice on the Erie and was engineer of tests prior to his present appointment.

Mr. J. S. Brownlee, heretofore locomotive foreman of the Canadian Pacific at Moose Jaw, has been appointed acting superintendent, with headquarters at Brandon, Man., to succeed Mr. J. G. Taylor, transferred.

Mr. J. C. Homer, formerly master mechanic of the Toledo & Ohio Central at Kenton, O., has been appointed superintendent of motive power of the Detroit Southern, with headquarters at Springfield, O., to succeed Mr. H. E. Passmore, resigned.

Mr. H. H. Maxfield, assistant master mechanic of the Pennsylvania R. R. at Camden, N. J., has been appointed assistant engineer of motive power of that road at Jersey City, N. J., to succeed Mr. J. L. Mohun, who has been appointed mechanical engineer of the Western Steel Car & Foundry Co. of Chicago.

Mr. Willard Kells, who recently resigned as master mechanic of the Erie to become assistant master car builder of the Union Tank Line, has resigned the latter position to become master mechanic of the Lehigh Valley at Sayre, Pa., to succeed Mr. John Hawthorne, resigned.

Mr. J. H. Bannerman, master mechanic of the Illinois Central at Clinton, Ill., has resigned that position and has been appointed mechanical superintendent of the Tennessee Central, with headquarters at Nashville, Tenn., to succeed Mr. W. M. Baxter, whose title was assistant to president and mechanical superintendent.

Mr. William Apps has resigned as master car builder of the Algoma Central & Hudson Bay, effective on April 30, to engage in private business at Toronto, Ont., and Mr. E. Hacking has been appointed to succeed him, with headquarters at Sault Ste. Marie, Ont. Mr. Apps was for over six years master car builder of the Canadian Pacific before going to the Algoma Central & Hudson Bay in August, 1902, and from October, 1891, to December, 1895, was master mechanic of the Illinois Central at Chicago.

Mr. George Lickert, foreman of the Union Pacific roundhouses at Cheyenne, Wyo., has been made assistant to master mechanic William Nilan of the Wyoming division, with headquarters at Cheyenne. Mr. F. A. Thompson of Rawlins will succeed Mr. Lickert, and W. R. Edwards will succeed Mr. Thompson at Rawlins, Wyo. Mr. Edward S. Fay of Cheyenne has been appointed general foreman of the Cheyenne shops to succeed Mr. W. S. Murriam, resigned. Mr. J. R. Sexton will succeed Mr. Fay as machine shop foreman.

Mr. F. D. Casanave, general superintendent of motive power of the Baltimore & Ohio Railroad, has tendered his resignation, to take effect June 1. Mr. Casanave's resignation is the result of ill health. He was for a number of years general superintendent of motive power of the Pennsylvania Railroad, with headquarters at Altoona, having succeeded Mr. T. N. Ely upon the latter's promotion to chief of motive power in October, 1893, and previous to the latter date was sperintendent of motive power of the Northwest system of the Pennsylvania Lines at Fort Wayne, Ind.

Notes of the Month

Mr. T. R. Wyles, representing the Detroit Graphite Manufacturing Company, has moved from 1425 Monadnock Block, Chicago, to 1112-13, the same building.

The Rand Drill Company report the removal of their San Francisco office from 223 First St. to the Rialto Building, additional space being needed because of the rapidly expanding business of this company.

Mr. F. A. Delano, general manager of the C. B. & Q. R. R., gave an address before the engineering students of Purdue University upon "The Comparative Development of American and European Railways," on the 13th of May.

The Pressed Steel Car Company, Pittsburg, has received an order from the South Fork Coal Mining Company for 150 pressed steel self-clearing hopper cars, of 100,000 lbs. capacity, to be constructed at their Allegheny works.

The Westinghouse Electric & Manufacturing Company have ordered 10 flat cars from the Pressed Steel Car Company, Pittsburg, those cars to be equipped with structural steel underframing and to have a carrying capacity of 136,000 lbs.

The Frank S. De Ronde Co., 46 Cliff St., New York City, are distributing a small circular descriptive of the good points of the De Ronde paint and varnish remover, explaining its adaptability to all surfaces whether of the finest woods or materials. This liquid is said to contain nothing to injure nor stain the hands or the ground surface and there is no objectionable odor associated therewith.

In consideration of the fact that "there are signs that very much work now done by cutting will be done by grinding and those soonest informed upon the subject will profit most by it," the Norton Emery Wheel Company, Worcester, Mass., is offering educational information along this line by publishing in pamphlet form a "Few Points on Grinding," reproduced from the American Machinist, February 5, 1903.

The Nernst Lamp Company is rapidly invading those sections of the country heretofore uncovered. New York, Pennsylvania, the New England and Atlantic Coast states have agencies in every city of importance, while additions have been made in Salt Lake City, Denver, Lincoln, Neb., San Francisco, Los Angeles, Seattle, and generally throughout the Mississippi and western states.

While the Patent Metallic Weather Strip Company believes their single edge or flat strip, which has been largely used during the past twenty-five years, to be the best for railroad use, they find there are some who prefer a cushion strip, therefore they have succeeded in getting up a "cushion" manufactured specially for railroads. This strip retains all the main points of their flat strip in making the edge as well as the underneath side perfectly tight, and having a flat metallic back, can be nailed tightly to the woodwork of windows or doors without in any way injuring the metal backing of the strips. This strip, the Browne's flat back eureka cushion strips, is illustrated in a pamphlet issued by the company, at 133 and 135 West 22nd St., New York City.

The Stowell Manufacturing Co., Jersey City, N. J., have issued an illustrated pamphlet entitled "Good Roofs," setting forth the advantages of efficient roofing, calling attention to the damage which has been caused by poor roofs, and indicating the advantage of making a careful decision in the selection of material used in covering buildings. A description and illustration of the asphalt roofing manufactured by the Stowell Company appears on page 175 of the April issue.

The 1,000 flat bottom Gondola cars with twin hoppers, which the Chesapeake & Ohio Railway Company are having constructed at the McKees Rocks Works of the Pressed Steel Car Company, Pittsburg, are to be equipped with C. & O. standard arch bar trucks, pressed steel bolsters and brake beams, manufactured by the Pressed Steel Car Company, Miner draft gear on 800 of the cars and Sterlingworth draft gear on 200, Chicago frictionless side bearings and Westinghouse air brakes.

J. A. Fay & Egan Co., manufacturers of woodworking machinery, of Cincinnati, Ohio, have just published a very artistic art nouveau pamphlet, entitled "Instruction on the erection and care of band saw mill, band resaws, band saws, etc. This book is dedicated to the sawyers of the world. Upon request this little book (which is fully illustrated) will be sent free of charge to any sawyer, by addressing J. A. Fay & Egan Co., of No. 145 to 166 W. Front St., Cincinnati, O.

The White Mountain Paper Company has recently purchased from the Westinghouse Electric & Manufacturing Company three 1,000-kilowatt and one 300-kilowatt, three-phase, engine-type alternators, which are complete with exciters and are to be direct connected to Hamilton-Corliss engines installed in its paper mill at Portsmouth, N. H. The various machines in this mill will be operated by Westinghouse, type "C" induction motors, aggregating 5,500 horse power. When this apparatus is in operation it will comprise the largest individual electrical installation in a paper mill in the world.

Attention is directed to a copy of a new series of "Examples of Rapid Milling." This is a 32-page pamphlet showing illustrations and giving data on 28 milling operations taken from actual practice and showing the work for which Cincinnati geared-feed millers are adapted. It is issued for free distribution among shop men with a view to giving instruction on the subject of milling. These data cover a wide range of work and are suggestive of methods and results that can be obtained by milling other work of a similar nature. They embody the Cincinnati Milling Machine Company's recommendations as to the manner in which these machines should be used.

Because of the persistent effort of certain manufacturers to market an imitation of the "Barrett jack," it was necessary for the Duff Manufacturing Co., exclusive manufacturers of this jack, to institute proceedings against the Buckeye Jack Manufacturing Co., et al., restraining any further issue of catalogues representing imitations of the "Barrett jack" and restraining the sale of the so-called "Buckeye jack," an imitation of the "Barrett."

The Duff Manufacturing Co. manufactures the original "Barrett jack" in all designs and capacities, with new and patented improvements from time to time. Their product is the result of many years' experience and the assistance of practical men throughout the country in designing and producing a lifting jack that may be relied upon under all circumstances. They promise always to maintain this standard and to sell their product at prices consistent with the use of best material and workmanship obtainable.

The Erie R. R. has offered to provide transportation over its line to the Saratoga conventions for members of the Master Mechanics' and Master Car Builders' Associations, upon application to the proper officials of this line. The Delaware & Hudson Co. has extended the same courtesy.

The fact that the Canadian Pacific Railway has placed two orders, for 20 locomotives each, with British works has been extensively commented upon. The same company has now placed an order for 20 ten-wheel compound, freight locomotives with the Saxon Engine Works of Chemnitz, Germany. These orders are due to the fact that American builders could not make the time delivery required. "Turn-about is fair play," and the whirligig of time has now given the European builders the same kind of opportunity which a few years ago it gave to American builders. The locomotives are to be built on the railroad's specification and will be of American type, but foreign workmanship.

A company in England is introducing a vacuum process for cleaning railway coaches. In operation it is used with a wide nozzle in the same manner as pneumatic pressure is used in this country—the difference lying in that the dust is drawn into the nozzle and through piping to be deposited in a receptacle instead of being merely blown into the air whence it settles down again. The exhaust is derived from portable plants operated by electric motor or gas engines at small terminals and from larger, permanent plants at the larger terminals. The vacuum process is much more satisfactory in many respects than the pressure process and is well worth the investigation of officials concerned with coach cleaning.

The Monthly Official Railway List, also known as the "Red List" and as "Magraw's List," has been sold by the Railway List Co. to William E. Magraw and R. A. Bagnell, and the first number under the new management is the May issue, which announces some of the many improvements contemplated. Mr. Magraw is widely and favorably known from his connection with the Railway Review as its manager, and his experience in the daily newspaper and trade journal fields is a guarantee of the undoubted success of the Monthly Official Railway List. Mr. R. A. Bagnell, who is associated with him, is as well known from his former connection with the Railway Review and his present position as western manager of the Pocket List of Railway Officials. The "Red" List was established over twenty years ago as an annual and for several years now has been issued monthly owing to the imperative demand by the railroad officials for a monthly publication. While the "List" will continue to be published from the same offices as the Railway Review for the present, it is understood that it is no longer under the same ownership.

In consequence of the work of changing the line of the Mexican National Ry. from narrow gage over to standard gage, a large amount of new standard-gage power has been purchased. A considerable amount of the narrow gage power, however, consists of locomotives so modern that they bear a rather close relation to ordinary standard gage locomotives in respect to size and power. Some of this modern narrow gage power is being changed over to permit of operation on standard gage track, particularly in yard service. The alterations are very simply made; new cylinders are suit the old wheels when pressed on the new axles. The purchased, new axles made and the frames brought out to major portion of the old machinery is utilized by simply lengthening the tumbling shaft, cross braces, etc. A moment's reflection will call to mind the vast amount of work which this change of gage entails in other particulars than the line itself. In the mechanical department all car trucks are to be widened as well as locomotive equipment. All shops and roundhouses and the gage limits of these must be extended. An interesting example of this occurred at the moment of the decision to widen the gage. A new roundhouse at Monterey had advanced to the stage of practical completion of the walls. Upon the decision this work was stopped for redesign, and the walls had to be torn down and the whole plan to undergo entire modification.

In a circular issued by William C. Baker attention is called to the fact that certain dealers in railway supplies are infringing upon exclusive rights of his company under the Baker patents upon car heating apparatus and fittings. Judge Kohlsaat, sitting in the United States Circuit Court for the Northern District of Illinois, granted an injunction against the Crane Company restraining them from making and selling a combination cock in imitation of the regular Baker article. Not being satisfied with this decision, the Crane Company appealed the suit to the United States Circuit Court of Appeals for the Seventh Circuit, and a decision has just been handed down by this Court affirming the decision of the lower court in every respect. As this court is the court of last resort in patent cases, this decision is final and conclusively settles the question of the validity of the company's rights.

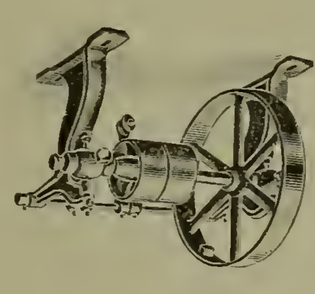
It has recently come to their knowledge that certain parties have been furnishing to railway companies combination cocks and other car heating fittings identical in all respects, except quality of material and finish, with their patented articles, but which are inferior imitations and infringements of the Baker patents. Suit has been brought against the parties handling these articles and warning is given that all who buy, sell or use any but the genuine articles will be promptly prosecuted.

The Armstrong Cutting-Off Machine

(Patent applied for.)

Designed for Cutting off Self-Hardening Steel Rapidly, Accurately and with Economy.

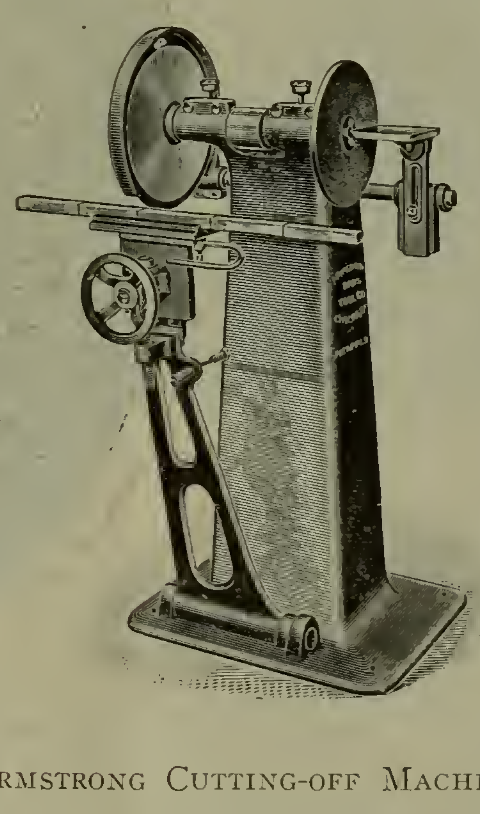
The Armstrong Bros. Tool Company have found that in the manufacture of tool holders it is necessary to cut off large quantities of self-hardening steel into cutter lengths.



Their experience has been that this class of steel gives best satisfaction when cut off cold. The ordinary shop practice has been to cut the steel off hot or to break it off with an anvil. The objection to the latter method is that the break is liable to be very irregular resulting not only in a serious loss of steel but also in vastly increased grinding with attendant waste of time and emery wheels. After experimenting with various methods of doing this work they have developed the machine illustrated which in a slightly different form has been in use in their works for about two years giving perfect satisfaction and with practically no expense for maintenance. The cutting is done by a disk of special grade tool steel revolving at high speed. Any attempt to cut soft steel or ordinary cast steel with a disk to such an extent as to reduce its speed to a point where it is ineffective, if it does not actually bind or break the disk. Owing to the peculiar nature of self-hardening steel, however, it is not affected in this manner by the cutting disk, which makes in it, even when forced hard, a clean, clear cut incision. The periphery of the disk is coated with self-hardening steel particles, and these particles do the actual cutting.

Having had numerous inquiries from machine shops in every part of the world regarding their method of cutting-off self-hardening steel, they have decided to place the machine on the market.

It will be observed that the machine is of combination form, the steel cutting disk being mounted on one end of the spindle while the other end of the spindle carries a 12-inch grinding disk. The speed at which the mahine is intended to run is such as to give the very best results for both operations. The construction of the machine is first class in every



Armstrong Cutting-off Machine.

respect. The spindle is of tool steel ground true. Bearings are cast iron and are dust proof, with convenient and positive adjustment for wear and to take up lost motion. The swinging table is provided with a length gauge and is conveniently adjustable for steel of different sizes or depth of cut. The cutting disk is provided with a neat guard which can easily be swung back out of the way when changing disk. The grinding disk is made of boiler plate and is provided with an adjustable table so located that the operator will not interfere with cutting off long bars of steel.

Each machine is equipped with countershaft, one cutting disk, one grinding disk, one breaking block, one press for emery disks, one dozen emery cloth disks, assorted, one pound lubricating grease and one can special cement for attaching emery cloth to grinding disk.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

CALVIN A. MAY.

We take much pleasure in presenting to our readers this month the portrait and sketch of one of the old veterans of the craft who has so far dodged us, but we have "rounded him up" at last, as they say of the wiley steer out in his country. His name appears among those present at the second convention of our association, which was held at the St. Nicholas Hotel, New York, Sept. 6, 1871, being then connected with the P., C. & St. L. R. R., at Steubenville, O.

Mr. May was born at Templeton, Mass., May 3, 1830. His first car painting was at Bradley & Rice's, Worcester, Mass., for Homer & Burrill, contracting painters. Upon the starting up of the car shop at Norwich, Conn., he went there to work for George Lovell, as foreman. About the fall of 49, he went to Kimball & Gorton's car shop at Philadelphia, Pa., to work for Sylvester Howe, contractor, where he worked at sub-contracting until 1856. when he went to Kirk & Rhodes' car shop, Rochester, Western Pa., as foreman painter for "Dan" Boyden, contractor; but the panic of '57 closed the shop, so he went back to the Philadelphia shop of oseph R. Bolten & Co., formerly Kimball & Gorton's where he shortly was promoted to the foremanship, and remained there as such until the closing of the place as a car shop in April, 1867. Then during that month and year, he did his first work on railroads as foreman painter, first on the "Pan Handle road at Steubenville, Ohio, where he remained until September, 1877, when he went to work for the Houston & Texas Central Ry., at Houston, Texas, where he has remained since until retired under pension rules for age, adopted in 1903.

MR. CALVIN A. MAY.

He expects to make his future home with his son in East Pittsburg, Pa., and we wish him many years of health and pleasure in his retirement, and hope he will meet with us in Chicago next September.

He writes that he is succeeded by Mr. Fred Fenwick, who was working there before his arrival.

Varnish as a Foundation for Paint

Primarily, and principally, of course, varnish is designed as a finish for paint; and this idea is so thoroughly embedded in the minds of some that they cannot think it can be used in any other way. In fact, they would sooner think of painting a durable job on glass; and whenever a varnish job for any reason must be repainted they think the varnish must first be removed down to the paint, or the whole job burned off and a building-up begun again from the wood or metal in order to ensure good work. It is so contrary to their ideas and limited practice that they would as soon think of clapboarding a house directly upon the frame and putting boards atop of that as to paint anything new or old that has been varnished.

Now there is a great deal of "scarecrow" about all this. The fact is an outside finishing varnish of the "clear quill" is the best possible priming on galvanized iron, if not many other metals, if you want the paint to adhere and not chip off. We have heard of its being used as a primer for wood on passenger car work, but we hardly think we should want to sanction its use for this purpose in its clear state. We are of the opinion, however, that a portion of good varnish-gum, cooked into the refined linseed oil, will enhance its value, when mixed with suitable pigments, for a primer for all kinds of railway equipment painting. It will have an adhesion not to be derived in any other way. The gum will impart a toughness to the fibre of the oil, or paint, that is so desirable inits tenacity, like the hair in the mortar of the plastered to clinch and cling to the lathes; also it will render it more impervious to moisture, sealing the pores of the wood against its admission.

The main reason why some fear to paint over varnish is on account of lack of adhesion, as they think, between the two, as the paint cannot penetrate the varnish in order to take hold. But this is erroneous. If the undercoats, whatever their name or nature, have taken hold of the wood, or other substance painted, by penetration, and adhere, no fear need be entertained of what is built upon them, no matter if a coating of varnish intervenes. Do not our cutting-in coats of color adhere to last year's coating of varnish? "O, well," you reply, "that varnish has become thoroughly dry, and even porous and absorbent, so that the color penetrates and holds." There is an argument here, we will admit, but it will adhere to varnish that has not become thus absorbent. We do not, of course, advocate painting over freshly-applied varnish; but, the fact is exigencies sometimes arise where a letter-board or number-panel has got to be repainted, in order to change the wording, or the number, on a car that was varnished but a few days ago and has not yet been run out of the shop. What shall we do; remove the varnish with a varnish-remover? Well, that is one way—perhaps a safe way; but doubtless that varnish, if fairly hard and dry, may be sandpapered down well and then a thin coat of color, made elastic and adhesive by the addition of some bruised oil, or the same finishing varnish before applied may be given it; and, when dry, another coat flattened only sufficiently to render the application of gold leaf to the letters to follow practicable, and no harmful results will follow. Why? Because your varnish was fairly hard, and because you have such a thin film of color over it and under the varnish to follow that the latter will seal it and sort of amalgamate it together with the whole.

If some of these what may be termed by some, hazardous experiments are tried on a small scale one may add to his fund of information as to what is allowable to do under straitened circumstances that are liable to arise in the careers of us all, and thus be prepared for emergencies. For example, the writer once had in his early days a sign to paint, the board of which was so full of pitch that no shellac would cure it and he gave it a coat of hard-drying varnish and went on and painted it with good results, for the varnish had body enough to stop it. Many other similar incidents might be cited as proof that varnish as a primer and foundation is not so bad as often painted. We are not so sure but that it would prove a good primer for new locomotive tanks to prevent rusting and scaling.

Permanent Staging

No steam railroad car paint shop is up to date in its construction to-day without permanent staging as one of its important appointments. In fact, this indispensable adjunct should be in mind when the shop is planned, so that when built the posts, upon which the pulleys run and the staging is attached, shall be the right distance from the cars in order that the arms of the staging may be of the right length and swing to work properly. It is too often, however, that this is an afterthought; but it is better to be considered then than not at all, and to have a shop conducted on the old pre-historic plan, strewn with horses and planks from one end of it to another, so that after dusk no one could get through it unlighted without danger to his anatomy in some way or other.

Elsewhere in this issue is a view of the interior of the Boston & Maine paint shop at Concord, N. H., which shows how this permanent staging is rigged and operated. There are other kinds, of course, but this works very well. It will be noticed that there are hooks attached to the posts at intervals and that there is a link at the end of the hoisting rope; this is designed to adjust the stage at different heights by hooking the link on to one hook or another. The planks seen on the floor are for use across the ends of cars and are the only ones allowed adrift. Mr. Warner Bailey, the veteran foreman painter, who is a strict disciplinarian, by the way, having gone through the war as a soldier, will not permit the side staging plank to be removed, and had to resort to several schemes to fasten them in their places so that they could not be taken away. He first had them chained, as seen in the view, but this did not prove satisfactory. He now has them wired to their places, we believe, with entire satisfaction. His shop is a model of neatness at all times, for he will not permit the accumulation of anything therein not essential to the prosecution of the work. He will "read the riot act" or throw it out himself with muscular action and emphatic English.

PAINT SHOP, BOSTON & MAINE RAILROAD, CONCORD, N. H.

The picture lacks one important feature to look perfectly natural, and that is Mr. Bailey himself standing in the foreground, usually with some flower held by the stem in his month, for he is a great botanist and has some plants, especially in winter, on a table at the end of the shop near his office. In the spring he directs the work of beautifying the shop grounds, setting out plants, etc., some of which, of course, have to be taken up in the fall to preserve them.

We stated in our article on "The Copper-Sheathed Car" in last issue that "a certain railroad not a thousand miles from here" had ordered 134 of these cars. Perhaps we may now be allowed to state, as the order is so far advanced, without any discourtesy, that it is the N. Y., N. H. & H. R. R., where this kind of a car originated, but that the number ordered is 126, divided among the Mason Mfg. Co., Springfield, Mass.; Osgood Bradley & Sons, Worcester, Mass., and the American Car & Foundry Co. (Jackson & Sharp plant), Wilmington, Del., fifty and fifty-one at the two first-named concerns and twenty-five at the latter. Now the strange part is that these cars are to be given a coat of enamel over the copper, matched to the standard body color of the road! This appears to be a compromise between a painted and a copper-covered car and while not the design of the inventor we understand it is the request of the president of the road, in order that these cars shall look like the painted and varnished equipment with which they run. We shall watch these cars with some interest to see how that enamel sticks to the copper and how it is maintained as to cleanliness from smoke and dirt absorption.

"Cutting-in Versus Touching-up"

West Albany, N. Y.

Editor Railroad Paint Shop:

As our good friend Mr. F. S. Ball has given us his views on the subject of "Cutting-In versus Touching-Up," I have thought that perhaps a word from another veteran painter on this important subject would not be amiss.

I agree with the statement that touching-up and varnishing, as practiced 10 years ago, has become obsolete, and that in most large shops cutting-in is now the rule. But I cannot so readily agree to the reasons for this change. Ten years ago a large majority of the leading railroads were using the light body-color; also an elaborate ornamentation; and cutting-in around this ornamentation with a light body-color could not be successfully done, as one coat was not sufficient to cover, and to apply two or more coats was expensive and impracticable; therefore cutting-in was seldom, if ever, practised at all. But with the advent of dark body-colors the conditions are changed. The dark colors fade very rapidly, which make them difficult to match and touch-up, but on the other hand they are easy to cut-in. When properly put on with a soft hair brush one coat is quite sufficient to turn out a good job.

It has been my observation that most roads very soon adopted the cutting-in process after changing from the light to the dark body-color. The Pullman Company, I think, were one of the very first to do this. I know of one western road which adopted the cutting-in process more than ten years ago, for the reason that it was found to be the most economical and practicable way of maintaining the good appearance of the passenger equipment.

A CORNER STENCIL BY WARNER BAILEY.

Relative to oil cleaners; they came into general use several years after many roads had adopted the cutting-in process, consequently they could have had no influence, or bearing, on the subject whatever. I agree with Mr. Ball that a varnished surface, which is cleaned as often as is the practice on some roads, with an oil cleaner which contains a large percentage of impure soaps and free alkali, soon becomes in the condition which he describes, namely, the varnish worn thin, rendering the repairing of such a car necessary; but I must contend that the oil cleaner which contains none of these injurious substances, when properly used, will turn out an absolute benefit to the varnish, and will prolong its life and durability. We varnish cars nearly every day, which have been in service 18 months or more and which have been repeatedly cleaned with oil cleaners, upon which the varnish is in first-class condition, showing no signs of being worn thin; and were it not for the body color badly faded and the numerous bruises upon the surface which require puttying, these cars could be revarnished and turned out in first-class condition.

We are cutting-in our cars today, not because the varnish is perished or worn out from the use of oil cleaners, but because the body-color is faded and we find that cutting-in is the most economical and satisfactory way of renewing the good appearance of our passenger equipment.

Yours truly,

H. M. Butts.

Death of Adam A. Nicoll, Sr.

Learning some time ago indirectly of the death of a former member of our association, the veteran foreman painter of the Northern Central, Adam A. Nicoll, we wrote to his son, who succeeded him there, for particulars, and we received the following letter, which we insert as an obituary:

"Editor Railroad Paint Shop:

"What you heard in reference to my father's death was correct. He died March 5th, 1903, in the 76th year of his age. He had been ailing for about five weeks, and while he was only confined to the house for about a week, we could see that he was failing very rapidly, yet death came very suddenly; he was on his way down the stairs and dropped dead on the landing. He had Bright's Disease and weakness of the heart; doctors always term it "heart failure."

"He commenced working for the Pennsylvania R. R., when it was owned by the State of Pennsylvania, in fact it was upward of 50 years, or about 6 years before I was born. In 1868 he quit the service of the P. R. R. Co. and went into business for himself for about a year and then went to work for the Northern Central R. R., at York, Pa. Prior to this we had been living in Lancaster, Pa. He was sent to Balto. Shops, of the N. C. R., when the shops were moved, first having charge of the Balto. & Potomac work; and, I think, it was in 1874 he was discharged from the B. & P. R. R. and rehired as foreman of the N. C. R., in which capacity he was employed, until pensioned the first day of January, 1900. He did no work of any kind, living on his pension, and the income from his property. He was born in Baltimore, Dec. 6th, 1827. I am sorry that I am not able to give you a photograph of my father, as I have not one; my sister, who kept house for him, is the only one who has one of him, and she is away and will not be back for the best part of the summer. My father, I can truly say, was as faithful an employe as ever I knew, or have seen, as he gave his whole time and attention to business. Many times I have seen him in the evenings in years past, sitting and drawing new designs for ornamenting head linings. While I was raised under his tutorship, I only wish I was as good a hand as he was. Respectfully,

ADAM A. NICOLL, JR."

The Maintenance of Passenger Equipment

Editor Railroad Paint Shop:

I have read a great deal in your columns about caring for passenger equipment on the various roads. Each of your correspondents seem to think they have discovered the best and cheapest method of keeping their cars looking clean and fresh, and at the same time prolonging the life of the paint and varnish. With that end in view, after experimenting in many different ways, we have finally settled on the following method, finding it to fill all requirements and at the same time being very reasonable in cost. We shop our coaches every six months for cleaning and varnishing. They get a thorough scrubbing with soft soap and pummice, then a light sandpapering with number 00 paper, then only one coat of finishing varnish.

At the terminals they are dusted off in the usual way, and, when thought necessary, get a washing with clear water only. Our trains run through a mile of tunnels daily, but we use wood for fuel and that, of course, does not effect paint as badly as does coal.

Our cars are painted yellow, with brown letterboards and cornerposts. Some that have been in daily use for eight years, have needed but one coat of yellow on the body; and the letter boards and corner posts have never been cut-in nor reguilded, nor do they require it now. And yet their appearance was such when last turned out, a few months since, as to make one of your eastern tourists exclaim, "Oh! what a pretty train."

We also wash the inside and apply a varnish renovator, dust the cushions and paint the floor.

I assure you, we have had many compliments from travelers on the uniform neat appearance of our trains, both inside and out. I entertain no doubt, whatever, that by adopting our method, roads with equipment painted a dark color need not repaint nor reguild their coaches oftener than once in eight years. Our engines are not brought in as often, but often enough to be kept in pretty good shape. We don't find it necessary to scrape them down to the iron, until they have been in use twenty-five years.

Joseph Castle,
Master Painter, Virginia & Truckee R. R.
Carson City, Nevada.

Editor Railroad Paint Shop:

In the April issue of The Railway Master Mechanic I was much interested in an article edited by you under head of Death of Ex-President Leopold. It is quite natural for me to feel an interest in a business I followed for forty years, and being an ex-president of the Master Car Painters' Association, it is most gratifying to me to know that I am still remembered, although I have not been identified with the trade for past ten years. I am pleased to say I am still alive and interested in the wellfare of the association that honored me some thirty years ago with its presidency.

Most sincerely yours,
James Van Pelt,

Sources of Color

An interesting enumeration has been published in a technical trade journal of sources of color. From this it appears that the cochineal insects furnish the gorgeous carmine, crimson, scarlet-carmine and purple-lakes; the cuttle fish gives sepia, that is, the inky fluid which the fish discharges in order to render the water opaque when attacked; the Indian yellow comes from the camel; ivory chips produce the ivory black and bone black; the exquisite Prussian blue comes from fusing horse hoofs and other refuse animal matter with impure potassium carbonate; various lakes are derived from roots, barks and gums; blue-black comes from the charcoal of the vine stock; Turkey red is made from the madder plant, which grows in Hindoostan; the yellow cap of a Siamese tree produces gamboge; raw sienna is the natural earth from the neighborhood of Siena, Italy; raw umber is an earth found near Umbria; India ink is made from burned camphor; mastic is made from the gum of the mastic tree, which grows in the Grecian archipelago; bistre is the soot of wood ashes; very little real ultramarine, obtained from the precious lapis lazuli, is found in the market.

Notes and Comments

We have just learned that another of our members has passed away. Mr. W. R. McMasters, formerly with the Wabash Ry. at Decatur, Ill., died some time during February last, having been granted a leave of absence on account of failing health a year or two ago, and whose place was filled by Mr. B. F. Seisler, formerly with the Pittsburg & Western at Allegheny, Pa. Mr. McMasters was a brother of Harry G. McMasters, formerly with the Illinois Central and now of the Southern Pacific. So they go, one by one; and, while we mourn our loss, we must fill up the ranks with new recruits.

David Prince, secretary and treasurer of the Prince Manufacturing Company, New York, died at his home in Elizabeth, N. J., April 9, aged 67 years. Mr. Prince had been ill for about three months. Mr. Prince was born in Brooklyn in 1836 and in 1879 succeeded to the business established by his father, Robert Prince, in the manufacture of metallic paint, in which he was highly successful.—Western Painter.

We learn with regret that our fellow associate, Mr. John T. McCracken, of the Jackson & Sharpe plant, American Car & Foundry Co., Wilmington, Del., is seriously ill. John's many friends among our associates earnestly hope for his speedy recovery.

In our May issue the typos left out letters from some words and added too many to others; but, like the Yankee's timber, some of which was cut too short and other too long, "it will average about right."

Ruskin said, "It is not a question of how much we are to do, but how it is to be done." The average railroad paint shop reverses the sentiment of that in its practice to-day.

The Car Foremen's Association of Chicago

May Meeting

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, May 13th. In the absence of President Parish Vice-President La Rue presided.

Among those present were the following:

Ackerman, J.	Hensel, Paul	Marsh, Hugh
Bates, G. M.	Johnson, Axel	Neath, W.
Bossert, Chas.	Joseph, H. A.	Ostermann, R.
Cardwell, J. R.	Julian, J. B.	Powell, C. R.
Colgrove, F. H.	Jones, R. R.	Perry, A. R.
Cook, R. J.	Kirby, T. B.	Silvus, W.
Cook, J. H.	Kuhlman, H. V.	Stott, D. H.
Depue, Jas.	Kline, Aaron	Stevens, C. J.
Dahlgren, P. M.	Kroff, F. C.	Schultz, F. C.
Edwards, J.	Ketchum, I. J.	Treptow, A.
Guthenberg, B.	Lockrey, J. F.	Tabler, M. H.
Godfrey, J.	La Rue, H.	Vansickle, M. B.
Harris, S. H.	Lau, W. C.	Wharton, R.
Harvey, H. H.	Longfellow, F.	White, P. W.
Hull, E. E.	Miller, Geo.	

Mr. La Rue: A day or two after the last meeting I received a communication from the Secretary informing me that I had been elected Vice-President of the Car Foremen's Association of Chicago. My not being at the meeting of course it was rather snap judgment, but at the same time as the affair has gone through and I was elected, gentlemen, I thank you for the compliment. To-day I received a telephone message from Mr. Parish that he would not be here to-night and asked me if I would kindly take the chair for this evening. Possibly I will not be able to fill the position as good as Mr. Parish but will do the best I can.

The first order of business is the reading of the minutes of the previous meeting. I suppose all of you have read them, as published in the Railway Master Mechanic and if there are no objection they will stand approved as printed.

Secretary Kline: The following have made application for membership:

Chas. E. Johnson, Car Inspector, S. W. S. C. L., Chicago.
Wm. K. Lavis, Asst. Foreman, C. B. & Q., Chicago.
H. A. Lindstrom, Bill Clerk, C. R. I. & P. Ry., Chicago.
Geo. Miller, Bill Clerk, C. R. I. & P. Ry., Chicago.
Chas. Musfeldt, Car Inspector, L. S. & M. S., Chicago.
N. J. Turnquist, Foreman, C. R. I. & P., Chicago.

President La Rue: Under the head of "Unfinished Business" we will take up the proposed amendment to the Constitution that was read at the last meeting, providing for a Second Vice-President.

Mr. Cardwell: I move you that the recommendation be adopted. Seconded and carried.

Mr. La Rue: This brings us to the regular program of the evening. Subject No. 1 is: A receives his own car from B with two broken draft timbers and other minor defects, and a repair card on issued by B covering one second-hand coupler with yoke, two followers, spring, etc., applied. A asks for defect card, but B refuses to issue same, claiming that no combination of defects existed. He claims that the coupler was pulled out but not broken; that when the car was put on the repair track for repairs the coupler was missing. He further adds that considering the coupler as not being broken there is no combination of defects. A claims that if the coupler had not been broken it should have been reapplied; that B has not proved conclusively that the coupler was not broken.

The broad question brought up by this dispute is whether a missing coupler in connection with broken draft timbers, or other defects which make a combination, shall be considered as being broken or not, there being no definite knowedge in regard to its condition."

Mr. Powell (I. C.): It is my opinion that defect card should be furnished by the delivering road. I believe there is an Arbitration Case, No. 484, the second paragraph of which the Committee has decided that it is fair to assume that a missing coupler is broken, where damage would show a combination of defects, or that at least the car owner should be given the benefit of the doubt and the delivering road, or the party making repairs, should consider the equipment broken unless it can show conclusively that it was not broken. I believe in this case the opinion should be that the equipment was broken unless the party having control of the car can show that they found the coupler in question and know that the knuckle or shank were not broken. The company in possession of car should make repairs at their expense. In other words, if he allowed the car to remain in service with the two broken draft timbers until the coupler was lost he ought to give the owner of the car a card for the broken items. In my opinion the owner is justified in demanding defect card.

Mr. La Rue: In other words he should have stated on the repair card that the coupler was re-applied to make that point clearer.

Mr. Powell: In this question the assumption is that they did not apply the same coupler but applied another second-hand coupler, presumably as good as the one lost off the car. If they had found the coupler that was pulled out and showed conclusively that it was not broken and could have been re-applied to the car, then the labor charge for applying the coupler would have been all right and no card should be furnished for the draft timbers. In this case they merely take it for granted that the coupler being missing it is in good condition, on the grounds that the rules state labor charge only can be made against car owner for replacing missing couplers. That is the usual argument, namely the coupler is in good condition when lost. In this case there is a combination of defects and it is not shown in a decisive manner that the coupler was not broken and I believe delivering road to be responsible.

Mr. Bates (C. B. & Q.): The case that Mr. Powell quoted was a case in dispute between the Missouri Pacific versus the L. E. & St. L. Consolidated and the decision refers to car 2732. It says: "As to car 2732, the repairs as noted on the card are evidence of unfair usage: that if the damage was the result of bolt holes being worn oblong it had already been acknowledged by the M. P. Ry. as being in safe condition to handle when accepted from connecting line: and, if not, the M. P. Ry. should have made such repairs as Sec. 1 Rule 4 authorizes." The Arbitration Committee says: "The repairs of this car consisted of one draft timber, one deadwood, one tail pin and key, one cast stem draw bar, two followers, one draw bar spring and ten ⅞ x 18-inch bolts. The draw bar and attachments were lost and apparently the draft timber and deadwood were damaged. The burden of proof that this was not a combination rests with the party doing the damage. It has not shown that the damage to draft timber was not accompanied by simultaneous damage to either the couplers or draw bars, draw bar springs, drawbar pockets or their substitutes or followers, and is therefore not entitled to make bill, and this charge should be withdrawn." That is the stand I think I would take in this case: The repair card, as I understand it, said that they applied one second-hand coupler, with yoke, spring and follower plates and the reason for applying it was because they were missing, and from that I would take it that B did not know whether the coupler was in good condition or not, and therefore I think he ought to furnish a defect card for the additional damage.

Mr. Jones (B. & O.): The car came in off the line on the 20th and inspector had record of one draft timber broken. The coupler was intact at that time. Five days afterwards, while switching in the yard, the coupler was pulled out. It was not broken —merely pulled out and the repairs were made on the 26th of the same month. The coupler was missing when the car came in on the repair track and the repair card was so made out. It would be impossible to go out in the yard and hunt up couplers in order to re-apply the same coupler. The coupler applied was merely a second-hand coupler and another coupler was put in to have going out in the yard to get the coupler that was pulled out.

Mr. Powell: Is it not a fact that the draft timbers were damaged while the car was being handled on a chain with the coupler out.

Mr. Jones: The car was not handled on a chain. The draft timber was damaged before the coupler was pulled out in the first place.

Mr. Bates: There were two timbers damaged when the car reached home, at the same end and presumably damaged at the same time this other damage was supposed to have occurred.

Mr. La Rue: Were they broken in such a manner as to weaken the strength of the draw bar so that it would pull out.

Mr. Bates: I cannot say as to that. They were broken so badly that we had to remove both timbers. Of course as a repair card was on the car showing that the coupler was missing we took it for granted the facts were just as stated on the repair card. If it was known that this coupler was not broken I do not think the repair card should have been made out the way it was.

Mr. Jones: The coupler was not broken at the time the draft timbers were. The car came in with draft timbers broken and the coupler was afterwards pulled out.

Mr. Bates. On our line if the coupler is missing and we cannot locate it we make no bill for any repairs, because we always give the owner the benefit of the doubt. There are lots of couplers pulled out in the yard where we cannot tell what car they came out of. The inspector simply finds a car with the coupler missing and says so on his repair card and that is all he knows about it. We make the repairs and charge it up to profit and loss, but if it is going to be rulable that we can charge the owner we will have to change our method of making bills.

Mr. La Rue: Of course, gentlemen, this identical damage on this identical car is a question of fair service. Now then a decision, it seems to me, on this question would also cover cases of cars coming in off the road and should be considered very carefully. This is a broad question, that the party claiming that the coupler is all right and knowing that it is all right. In this case they do know afterwards that it was all right, but supposing the coupler had been lost ten miles out on the road, the car chained up and brought to the terminals how long then before you would know that the coupler is all right? It seems to me the same decision to be rendered in this case would cover that.

Mr. Jones: The car was not brought in on a chain. If the coupler is gone you cannot tell whether it is broken or not. In this case the coupler was in the car when the draft timbers were broken or when the car came in off the line.

Mr. La Rue: That is true, but the decision in this case will cover others such as I have mentioned.

Mr. Cook (C. B. & Q.): Did the party replacing the coupler afterwards find out that the coupler was not broken?

Mr. La Rue: Yes, sir. The stand is taken that immediately afterwards they knew the coupler was all right.

Mr. Cook: In that case I think he would be allowed to bill for replacing the coupler. I know in our experience when we get cars with draft timbers broken and couplers missing we make it a point to find the coupler and see whether or not it is broken. Even if it takes two or three hours, and is it not worth while from a financial standpoint? If we can locate the coupler and find that it is not broken we can make bill for the draft timbers and make a notation on the back of the repair stub that the coupler was found and in good condition. If we cannot prove conclusively that the coupler is in perfect condition we would not be allowed to collect the bill.

Mr. La Rue: There was no notation on this repair card that the coupler had been located and found to be all right, simply a repair card made out as shown in the question. But it seems rather doubtful in my mind that the coupler was pulled out and be intact and the draft timbers and everything else intact and no damage to them.

Mr. Kroff (P. F. W. & C.): I think a coupler can pull out after the draft timbers are broken, at least I have seen a good many cases of that kind and if a person was to hunt up all the couplers that are pulled out it would keep them quite busy and delay the repairs to a good many cars. Why is it then that the rules have laid down that labor can only be charged for replacing a missing coupler? They can be pulled out without being broken and if the draft timbers break and spread it would be a very easy matter to pull out the coupler.

Mr. Bates: I think that every one here knows that frequently couplers are pulled out where there is no other damage done except a broken spindle or a broken coupler pocket and I think that the rule Mr. Kroff just quoted covers just such cases as that: but where there is a set of draft timbers broken and a coupler and a lot of other items missing I think it is the duty of the railroad that does this damage to find that coupler and see personally and be in a position to know that it is all right. If they fail to do that I cannot understand how they can figure it as owners' defects.

Mr. Jones: It is a pretty hard mater to chase around the yard to find missing couplers. If the inspector reports a coupler broken or a coupler pulled out you cannot go out in the yard to see whether this damage was done or not.

Mr. Bates: I do not see that the inspectors having a record of coupler missing cuts any figure at all. Now very often they report a coupler pulled out, they do not know where it is pulled out, they simply see that it is gone and they say it is pulled out. That does not mean that the coupler is in good order by any means and I think it rests entirely with the company that does this damage to know positively that the coupler is not broken before they render any bill.

Mr. La Rue: You mean that it should be noted on the repair card.

Mr. Bates: It certainly should.

Mr. Harvey (C. B. & Q.): In the case in question I am of the opinion that it is incumbent upon the road which did this work to show conclusively that the old coupler was not broken, and unless they can do so they should furnish defect card. We have had a great deal of trouble in just such cases, and I am satisfied that the road with which I am connected has lost a great deal of money simply because we were unable to locate missing couplers in connection with broken draft timbers.

We have now overcome this trouble to a great extent by having switchmen fill out a blank form and turn it in with their time slip. This form when filled out shows just where the missing coupler can be found, and we are now able to bill for many broken draft timbers which formerly we had to put in at our own expense on account of not knowing the condition of the missing couplers.

Mr. Cook: The claim is made that because the coupler was not broken when the car came in off the line, that it was not broken when it was lost. I think every one will agree that couplers are liable to be broken at any moment while cars are being switched, and if they did not see the coupler after it was lost and know that it was not broken I do not see how they can collect the bill.

Mr. Powell: It seems to me from the statement of facts the position taken by Mr. Bates is correct. However, the question does not appear to be correctly stated, because in this case it appears the coupler has been located and it is absolutely known to be in good condition and in that case the receiving road ought not demand a defect card. From the question of facts as presented in the subject, the statement being made on the repair card that the coupler was missing, it is evident that the party making out the repair card did not know that the coupler was actually in good condition and it is fair to assume that the owners are entitled to a defect card under the statement of facts as presented, but take it as a matter of fact in this case, the party making repairs made an error in making out the repair card in showing the coupler as missing. The repair card should not have been made out in that way but should have showed coupler was located and found in good condition, in which case, under the M. C. B. Rules, the delivering road would not be entitled to a defect card. It was apparently an error on the part of the party making out the repair card.

Mr. Jones: When our Repair Foreman makes out his report he puts down in his report "missing" or "broken," whatever it may be. The man who makes out the repair cards gets his information from the Foreman's book. He has to show whether missing or not. Supposing the coupler was broken in the yard Inspector reports it broken if that is the only defect on, or if the coupler is pulled out he makes it coupler missing and if it is broken we make a bill on the owner for the repairs. In this case the coupler was pulled out and we made a charge of two hours for putting another one in.

Mr. La Rue: It seems to me in a case of this kind, knowing that there would be a combination of defects, it should have been the duty of the party repairing the car to have ascertained whether that coupler was in good condition or not. He should have found that out at least in time to have noted it on the stub. Of course in this identical case we have got the man's word for it, but in my opinion it is not the rule. I think the better plan is, when there is a doubt of that kind it should be ascertained to be a fact and so noted on the stub, then you have got prima facie evidence that it was looked after, but in this case now, after the prisoner has been arrested and the trial comes on, then the facts are stated.

Mr. Jones: This thing happened five days after the car was first damaged. The coupler was pulled out five days after the car arrived off the line. Suppose we had broken the coupler five days afterwards would that make a combination?

Mr. Godfrey (C. R. I. & P.): I would like to ask if both the timbers were broken at the time the coupler was applied, or was only one timber broken at that time?

Mr. La Rue: As I understand it only one draft timber was broken at the time the coupler was applied, and after the car got home two draft timbers were found broken.

Mr. Bates: When the car arrived home it had this coupler in and a lot of stuff missing and some wrong repairs, all at the same end, and the breakage of the timber showed for itself that the draft timber was broken previous to this coupler being applied.

Mr. Jones: Suppose the two draft timbers were broken when the car came in off the line and the coupler intact, where are you going to get a combination?

Mr. La Rue: You will have to be governed by what the question calls for exactly. "The broad question brought up by this dispute is whether a missing coupler in connection with broken draft timbers, or other defects which make a combination, shall be considered as being broken or not, there being no definite knowledge in regard to its condition."

Mr. Jones: Is it not admitted that where the draft timbers are broken and coupler pulled out you can only charge for the draft timbers. This is a case where the coupler was not missing at the time the draft timbers were broken when the car came in off the line.

Mr. Powell: In order to bring this thing to a head I want to say that the Illinois Central has issued personal instructions to all its Superintendents on the question of missing couplers, that, in case of cars arriving at shop points with draft timbers broken and couplers missing we have endeavored to impress on the minds of our trainmen that where a coupler is pulled out of a car while in a train it should be brought to shop with the train, in the car if it is empty, or on the caboose, so that the shopmen who make repairs may have positive knowledge of the condition of the coupler. Last month we had a number of cases where we had to mark the stub "no bill" simply because the trainmen did not or could not bring in the coupler and we could not ascertain the condition of it, the result was, we had to give the owner the benefit of the doubt.

Mr. Bates: I think we ought to postpone the vote on this until we get all the papers and then have it submitted to a committee to act on before bringing it again before the Association. I think if we postpone this and get all the papers it will explain the case.

Subject No. 2. A applies to B's car a standard M. C. B. coupler with slot for continuous rod key 5 inches long, should be 6 inches. B objects to this and calls it wrong repairs per Rule 45. B charges A for a new coupler and allows credit for the one removed as second hand. A objects to this, claiming that no charge should be made for betterment. How should it be decided?

Mr. Bates: I have looked up this matter and find an Arbitration Decision, No. 558, which does not allow the owner to charge for any betterment on his car. As I look at this case, the owner removed a good second-hand M. C. B. coupler and applied a new one. All that he can charge for, in my opinion, is labor for making the change, because the coupler that he removed is practically just as good as the one he put in, and as the Arbitration Committee has decided that the owner cannot charge for any betterment between the parts removed and replaced, that are not damaged, I do not think this bill is correct.

Mr. La Rue: I would like to ask Mr. Bates why there are some 5-inch slot couplers on some cars and 6-inch on others.

Mr. Bates: I presume the 6-inch key is the strongest, at any rate, the party that puts in a 5-inch key instead of a 6-inch ought to furnish a defect card for the wrong key. The coupler that was taken out in this case was fitted for a key, as well as having holes for a pocket, and in most cases where roads use a slot coupler they also have cars fitted with pocket couplers and it does not seem right to charge any betterment where it is using both kinds of couplers on its cars.

Mr. Kroff: I think about as Mr. Bates does on that subject. I think all you can charge would be labor for changing the coupler and charge for the wrong draft timber key.

Mr. Bates: I do not think anybody disputes the fact that wrong key was used, but that does not make the coupler wrong, in fact the owner admits that himself, when he allows credit for second-hand coupler removed, which shows that the coupler was not wrong. The coupler is an M. C. B. standard, only that it has rivet holes in addition to a slot keyway, and you cannot scrap an M. C. B. standard because the rules do not allow you to. B gave second-hand credit, which shows that the coupler was all right and he had no right to charge for a new coupler because Case 558 decides that.

Mr. Jones: I presume this 6-inch slot was put in there to give the key greater strength and on account of A applying a coupler with 5-inch key I think the car owner is entitled to defect card for wrong cross key, nothing more.

Mr. Bates: As I understand this case, B's car was on A's line and while A handled the car broke the coupler, and when he replaced it found the old one had a 6-inch keyway in. He had none of that kind in stock so he put in a 5-inch key along with the new coupler and I believe gave a defect card for the wrong key and the owner than made this charge for the difference between a new and second-hand coupler in addition to the key.

Mr. Powell: The case is simply this. The car was on A's road and A uses a 5-inch slot American Continuous coupler, M. C. B. standard type, and not having a 6-inch coupler on hand applied a 5-inch and renders charge against the owner of the car for applying a coupler. The owner got joint evidence card showing that the coupler should have been 6-inch, in place of 5-inch, took the joint evidence card and the repair card and rendered bill. He did not even go to the trouble of getting a defect card but took the joint evidence card and the repair card as authority for bill. They made no charge for the difference in the key, accepting the 5-inch key in place of the 6-inch, but made charge for the difference between the new coupler they applied and the second-hand coupler removed, which in my opinion is a charge for betterment which the rules do not allow, and the only charge that should have been made would be for labor in changing the couplers. The coupler with 5-inch slot had rivet holes in shank which was supposed to be used in repairs of M. C. B. standard pocket couplers.

Mr. Bates: I will say that the road I am with have no such cars, excepting a few they have acquired and we carry that kind of coupler in stock, but every one of them is fitted with rivet holes to be used with pocket, or stem or key.

Mr. Ketchum (C. R. I. & P.): In my opinion a coupler with 5-inch slot would be wrong repairs and the charge should be for labor changing couplers.

Mr. Treptow (L. S. & M. S.): I think A should have applied defect card for the wrong key 1 x 5 in place of 1 x 6 only, and it is right for A to object to the charge for betterment. B had no right to charge for a new coupler in place of the one A put in as he could have used a second-hand one just as well, but if he put in a new coupler he should not charge for betterment. It is the same as if B receives a foreign car and breaks the pocket, he can put a new pocket on that second-hand coupler, but if he uses a new coupler he can only charge for the pocket and nothing for the coupler. That is an M. C. B. coupler that can be used in some other car if he cannot use it under his own cars and he can only charge for replacing the coupler and putting the car back to its original construction.

Mr. Powell: I would make a motion to the effect that charge in this case should be for the labor only of changing the coupler. Carried.

Subject No. 3. B applies to A's car a new Hien coupler, charging $7.50, cause of repairs being old coupler body broken, knuckle, lock link and pin missing; credit allowed for scrap body and knuckle, second-hand lock link and pin. In view of Arbitration Cases 452 and 560 is charge correct?

A member: I think they should have allowed 75 per cent credit for good second-hand knuckle.

Mr. Bates: I agree with the gentleman that just spoke and I think Arbitration Case 452 fully covers the ground. When a coupler body is broken it usually breaks off back of the horn and leaves the knuckle and other parts in good order and on the line of the road that does the damage and they ought to allow second-hand credit for those parts, including the knuckle, lock link and pin.

I move you that it is the sense of this meeting that B should give credit at 75 per cent of the new value for the knuckle, lock link and pin in this case, and scrap for the body. Carried.

Meeting adjourned.

The Car Foremen's Association

of Scranton

May Meeting

On Saturday evening, May 9th, the regular monthly meeting of the Car Foremen's Association of Scranton was held in the R. R. Y. M. C. A. Hall, Scranton, Pa., Mr. R. B. Rasbridge, presiding. Present, 60.

Mr. Rasbridge: The minutes of the previous meeting having been printed in the Railway Master Mechanic, if there are no objections we will dispense with the reading of same and approve them as printed.

Secretary: I have the following list of applicants for membership:

Geo. W. Ditmore, Car Inspector, D. & H. R. R., Jermyn, Pa.

J. H. Halligan, Mill Room Foreman, D. L. & W. R. R., Scranton, Pa.

N. L. Sandleas, Asst. Air Brake Ins., C. R. R. of N. J., Mauch Chunk, Pa.

Thos. H. Smith, Blacksmith, St. Clair Car Shops, P. & R. R. R., 117 Market St., Port Carbon, Pa.

H. W. Harris, Gen. Foreman, D. & H. Co., Delanson, N. Y.

Leabold B. Kelble, Air Brake Foreman, L. V. R. R., 110 Hopkins St., Sayre, Pa.

Mr. Rasbridge: As these names have all been approved by the Executive Commitee, they will be enrolled as members of this Association.

As there are no reports of committees to be heard, we will open the second subject on our programme, which is:

"Which gives better service on passenger equipment, the collarless journal, or the M. C. B. type, taking into consideration the comparative cost?" I will state, however, that we were to have a paper by Mr. P. J. Langan on the subject of "High Speed Brakes," to begin the meeting to-night, but he has disappointed us due to his taking unto himself a partner for life, and is now sojourning in Colorado.

In connection with this subject, I would be pleased to have every gentleman present enter into the discussions and bring out everything we possibly can. If any member present knows anything about the comparative cost and can give actual figures on this question, we would be pleased to hear from him at this time. I do not know of any road represented here to-night who has gone into this matter in a general way. As far as our road (the P. & R.) is concerned, our experience has been limited. We have had no experience at all except what we have had with the Pullman cars, and that has been limited. I do not know whether any of the roads represented here have equipment running with collarless journals or not, but we might give our experience and state what benefits we have derived from its use, what our recommendations would be, and what we have noticed, and so on.

Mr. Hall: In reference to the matter of collarless journals, I had some years ago considerable experience with them, but to give you any definite answer that they are any better than the present M. C. B. type, I cannot. I have handled so many different kinds, that I cannot say which is the best. I had charge of all the Pennsylvania Pullman equipment at one time and I experienced just as much trouble with the collarless journal as I did with the M. C. B. type or collar journal, on both through and local service. I have no figures to offer, and I cannot say that one is better than the other. We had just as much success with one when I was on the road as we did with the other. On the road with which I am at present connected we have so little of that kind of service that I do not see that there is any difference in them at all. We have just as much trouble with the collarless journals as with the collar journals. I cannot say anything more in favor of the collarless than I can of the collar journal. I would like to hear from somebody who has had more experience with the collarless journals.

Mr. Wilson: Have experienced some trouble with the collarless journals on the P. R. R. The Pullman and dining cars are equipped with them, and occasionally they get very hot. The casting in front of the journal also wears out, which necessitates the application of new ones. Do not know the cost of either one, but from a matter of experience, would recommend the M. C. B. type of journal.

Mr. Rockwell: My experience with Passenger work has been somewhat limited, but I will say for the benefit of the members present that the D. L. & W. use the collarless journal throughout on their passenger equipment, and we find the same gives very good satisfaction. In regard to the relative cost, I am unable to say, because I have not looked into the matter that far.

Mr. Rasbridge: I understand you to say that you have collarless journals on your modern equipment. Don't you have collar journals on your second-class equipment?

Mr. Hall: I would like to ask Mr. Rockwell whether he has trouble with hot boxes on that equipment?

Mr. Rockwell: I would say that our hot boxes average between six and nine a month on the entire system. We have 750 cars in our passenger equipment.

Mr. Hall: I will state in regard to this matter that we are using the M. C. B. type of journal, and we have 640 passenger cars on our line, and we do not have three hot boxes a month.

Mr. Stuckie: I do not know whether I could offer any suggestions. It has been several years since I have had dealings with the collarless journal. When I was on a western road we had better success and less hot boxes with the collarless than with the collar journals. On account of the mountainous road and the curves we had less friction with the collarless journals. I cannot give you any figures on it, but the percentage of hot boxes went down when we commenced using the collarless journals.

Mr. Wilson: I would like to ask Mr. Rockwell how many miles were made on collarless journals with one oiling.

Mr. Rockwell: All of our through trains are oiled at Hoboken. They make one round trip from Hoboken to Buffalo and return, which is 820 miles with one oiling, then we do not oil them unless it is needed. Our local trains out of Hoboken are oiled once every two weeks or twice a month.

Mr. Wilcox: I have not had much experience with the collarless journal, but I see them coming into Ashley sometimes and they have considerable trouble with them. I find they have considerable difficulty in applying brasses to get them to fit. In regard to the relative cost: I do not know anything about that.

Mr. Fuss: I practically know nothing about collarless journals, but I would like to have Mr. Rockwell, Mr. Wilson and Mr. Hall explain to us why they create less friction.

Mr. Rockwell: There would be certainly less friction on account of having no collar; you would not have the end wear.

Mr. Rasbridge: In that respect suppose you should strike a reverse curve, would you not have the same friction on your fillet?

Mr. Rockwell: Yes, to a certain extent.

Mr. Hall: Mr. Rockwell has tried to give you that information pretty thoroughly but I will gamble that there is just as much friction on the end of a collarless journal as there is with the collar. I have had that experience, and I have seen the brass wedge on the front of the No. 5 cap on Pullman cars worn completely through, until it was 1-16-inch with the lateral motion. There is just as much, if not a little more, lateral motion with the collarless as with the collar journal. On a high-speed train the collar journal will make more mileage than the collarless. The end wear is more. There is more lateral motion given, especially in the Sessions truck than there is on the ordinary M. C. B. type of truck at the present time. On the M. C. B. type of journal you will find very little end wear on a good constructed truck. Take the Sessions truck at the present time, with the 5 x 8 journal or 4½ x 8 and you will find that the wear is something enormous on the end up against the wedge.

Mr. Rasbridge: I want to say for the benefit of Mr. Fuss that my experience has been in regard to that, that we have a limited number of cars with the collarless journal. We have had more hot boxes with the collarless journals than with the collar. I believe, as Mr. Hall has stated that you get more lateral motion with the collarless journal than you do with the M. C. B. type, from the fact that our experience has been in following this thing up you will find you get more end wear on the fillet end than you do on collar journals. The only thing that occurs to me in looking over this subject is this: I believe the only thing in favor of the collarless journal to-day is on roads where you have direct lines, for instance in prairie countries. You in a large measure eliminate the end friction on your journal bearing which you get with the collar; but you take on mountainous roads or roads that have many curves, taking into consideration the conditions of bearings removed, we find our experience has been that the wear is on the fillet end of the brass. We limit our inspectors on lateral motion on bearings. Many of us have adopted the lead lining bearing, and when the lead lining is worn out, the brass is practically worn out. From the fact that you get an excessive lateral wear you get enough to condemn the bearing. That is the reason why so many railroads to-day use an inferior metal in casting brasses. Our experience has been that we usually find in bearings that have caused any trouble, that it has developed from the center of the bearing towards the back of the fillet end, probably 80 per cent. It goes from the center back to the fillet end. We experience very little trouble with journals heating where the defect is developed on the front or collar end of the journal. Railroads in purchasing bearings take this into consideration and buy an inferior metal. The minute your lead lining is worn out, and you get a bearing on your brass you have a hot box. We have and I know the Lehigh Valley have a form for hot boxes on passenger cars. We have every inspector fill out this form covering all hot boxes on passenger equipment. It gives the initial and number of the car. He states the end wear, thickness of the brass and he states whether the lead lining has been swiped out, or whether the bearing is on the solid part of the brass, he also states what in his opinion caused the journal to heat; gives the condition of the packing, whether it is dry or has received sufficient oiling, and whether the packing is away from the journal. We get the general conditions, and very often we find that the box is properly packed, with sufficient oil in the packing. In that case we call the bearing in and turn it over to our chemist, who states what in his opinion is the cause of it. If it is the fault of the bearing he so states. If the bearing is perfect he states that as far as his examination is concerned he cannot see that there is any defect in the bearing. Very often we get bearings with what is called "copper spots," caused by waste grab. Very often the trucks are out of line, and a severe application of the brakes causes the car to lurch forward, and the packing is up against the bearing. Your bearing naturally grabs a small particle of waste and that winding around the bearing causes a copper spot. There is no amount of oil that you can put in that box that will avoid these conditions. Very often you will find a bearing with a little bright spot, say ⅜ or ½ inch wide around the journal bearing. Otherwise it is perfct, and that is the only indication you have of any trouble with that bearing. Very often in the composition of the metal you have too great a proportion of copper, and before pouring that metal it might be that the copper is mostly in the bottom of the composition, and on the last pour you get a greater portion of copper that is necessary, and with these conditions you will have trouble.

Mr. Hall: In regard to what is mostly the cause of hot boxes on cars equipped with collarless journals; is it improper lubrication or what? For the benefit of the members present I will tell them what my experience has been as to why so many hot boxes charged up against the collarless journals. Somebody just spoke about the waste getting under the brass. It is simply caused by the imperfect packing of the boxes. If you will carry out the regulations of the proper way of packing boxes there is no reason why waste should get up under your brass. I traveled on the "Chicago Limited" for three straight months to find out the cause of hot boxes, and I found out every time that the hot box was developed by stuffing too much waste in the bottom of the box and getting it up against the front of the stop wedge, curling around the journal, and the friction account of the dry waste caused fire. If the system as laid down is carried out in the method of packing boxes there would be no occasion for hot boxes, caused by waste getting under the brass.

Mr. Fuss: Those are some of the points I wanted to bring out. We can learn something by getting the thing started in this way. The reason why we have had no experience at our Ashely Shops is simply because it is not what we would call an inspection point for passenger work. We occasionally get a foreign car in there with collarless journals. I remember a few years ago one coming in there loaded in our operating yard, where the loads come in, and it had the inside of the brass badly worn, and the end of the journal rubbed so against the block that is in front that it had it worn out. I remember having a wrought iron one made, because we did not have anything to repair it with. We had considerable trouble getting the brasses to fit. As far as practical experience goes I have none, but I should think that the fillet at the back end of the journal having to bear all of the lateral strain at one point would make more or a greater number of pounds bearing per square inch in that place than if it had a collar on the opposite side to take off one-half of the strain; at least it would seem so to me.

Mr. Helfrich: No doubt you all know the Pullman cars are equipped with collarless journals. I have found in the experience I have had that we have had more hot boxes on collarless journals than we had with the collar journal. My experience has told me that we have had more trouble with the Pullman cars on account of hot boxes than what we have had with journals having collars. I believe that most hot boxes arise from improper lubrication, as previously explained by Mr. Hall. The journal boxes have been filled with packing, and of course filled too much in front of the journal. You will find that in most cases on collarless journals the packing has worked in on the end of the journal bearing. I find that the friction on the end of the journal is equally as great as on the collar journal. The brasses on collarless journals are worn on the ends; in fact more so than with the collar journals.

Mr. Wilson: Speaking about the waste in front of the journal. I think it is a good practice at least on some divisions. I know of one on the P. R. R. that boxes were packed according to Galena practice, which we found would not do as the division is very dirty. We then placed a little waste that was almost dry in front of the box, and got much better results. Of course, where you have good ballast, the Galena practice is by far the best.

Mr. Hall: We do not do anything of the kind. We propose to have the waste half way up to the journal, just enough to keep the waste from working to the sides. That is the only way you will get success. This putting a big wad of waste in the front of the box is all moonshine. It is simply throwing oil and waste away. The only way is to keep your waste down half way up the side of the journal, and keep it well lifted up. Turn it up once in a while from the bottom of the box, and I will gamble as far as lubrication is concerned you will have no hot boxes. If you have a hot box, there is another cause for it, either in the truck, or something else. If you will pack your box the way it is being done by a great many people you will not have this trouble.

Mr. Rasbridge: The recommendations of the Galena Oil Company are as near perfection as possible, and about 99 per cent of the roads are lubricated by that company. Before they put out a recommendation the different roads are consulted in regard to their method of packing boxes. I spent no little time on this subject, and also made recommendations at different times. A box, if properly packed, should have the waste come up to the center line of your journal and give the waste all the oil it will contain. In the first place you want a dust guard, you want a little packing inside of your collar; then you want enough waste in the front of the box—moderately dry, as it is not necessary to lubricate the journal on the end. The quantity of packing you place in the front of the box does not do any lubricating. This should be large enough to prevent lateral motion in rounding curves. The trouble to-day is in examining boxes, there is not enough attention paid to the condition of the packing in the back of the box. The lid is simply lifted and the appearance of the packing in the front of the box is taken into consideration. This is due to the fact that the inspector is not given sufficient time to perform a desirable inspection of the boxes. In many cases they do not atempt to lift the box lids. We instruct them to place their hand on the top of the box, and while his hand is on the box, his eye is on the wheel or something else. He has to use every available moment in the inspection of that car, at the same time he has to use both eyes and hands. Very often an inspector performs a close inspection of a car and the packing is pulled away from the back end of the journal, and about five miles from your inspection point you will have a hot box. The inspector will state that he is positive that there was sufficient packing in there and that the oil was flowing on top of the packing. At the same time he cannot use an iron to feel just whether the packing is back in the box. He has not got the time. He must make the best use of the time allotted him to make his inspection. Very often there is considerable trouble developed just through that. I believe the only way we can get perfect conditions would be to have certain points. For instance, you run a car between Hoboken and Buffalo. I think Scranton would be the proper place to see that conditions were as nearly perfect as it was possible to get them before you start th car out, and barring mechanical defects, bad foundry practice or waste grab (which you should not have if the box is properly packed) that car ought to run clear through to Buffalo and make the round trip. Naturally you don't expect that. You will have an inspector at Buffalo, and if conditions are perfect there, the car should return again.

Mr. Robinson: In regard to the M. C. B. type—collar journals —and the collarless journals: From what little experience I have had over at the D. L. & W. Machine Shops, I find we have fully as many in fact more hot boxes with the M. C. B. journal than we do with the collarless journal. There is one point that we have not yet brought out here to-night, and that is the lateral wear on the brass on the collar journal, making it necessary to re-cast that brass. With the Pullman type of journal, unless they are worn very badly they can be re-lined. Would not that enter into the cost of maintenance? It seems to me that it would be a great deal cheaper to re-line a brass than to cast it then re-line it. Another thing I have seen a great many M. C. B. axles come in with the collar sometimes considerably more than half worn off. There must be considerable wear on the end of those brasses to make the collar wear pretty nearly out. I would like to hear somebody explain that, and say if it wouldn't enter into the cost of maintenance. As far as the end brass is concerned on Pullman wedges, we find a great many of them worn out. They are easily replaced, and for my part I would much rather handle a collarless journal than the M. C. B. type.

Mr. Rasbridge: If nobody else has anything to say on this question, we will proceed with the next subject, which is:

"A delivers to B one of B's cars with cut journal, and gives B defect card for one journal cut. B claims he is entitled to card for the other journal on same axle. Is B entitled to two journals cut or not?"

I would like to hear from the inspectors at interchange points on this subject.

Mr. Siegel: I understand this, for instance if we offered the D. & H. Co. a car with one cut journal, and they demand a defect card for cut journal and two journal bearings. I should decline to give defect card for two cut journals, because only one existed. If the journal was cut beyond the limit it would simply be thrown to one side and scrapped.

Mr. Rasbridge: If you were at an interchange point and a car comes in you having a very short time to perform your inspection and deliver the car, and the inspector comes along (say you are delivering it to the D. & H.) and he finds a cut journal, and he would tell you that he would take the car but he wanted a defect card for cut journal and two journal bearings, what would you do?

Mr. Siegel: I would not give it to him.

Mr. Fuss: He is giving a defect card for one cut journal. If that journal was so badly cut that it could not be re-turned, it is a scrap axle, and should be carded as such. I do not see why he should give defect card for the other journal any more than if we give them a defect card for thin flange wheel and they would ask us for defect card for two thin flange wheels.

Mr. Rasbridge: You have no right to demand a defect card for anything that does not exist, and you are not supposed to demand defect card for hypothetical cases or something that is liable to happen. In this case it is plainly stated that you have one cut journal. The receiving road in this case would have a perfect right to ask for defect card for one cut journal, and the rules plainly state that change of bearings necessary due to delivering company's defect, you can bill the car owner or delivering company for that change of bearing. There is nothing to be gained in demanding card for two journal bearings or demand defect card for something that does not exist.

Mr. Wilson. We had B's car on our line and we carded for cut journal, but they wanted a card for two cut journals, which was refused on authority of Rule 28. I think that covers the case.

Mr. Rasbridge: Our instructions are that with change of wheels there must be an application of new bearings in all cases whether it runs a mile or fifty miles. If we change wheels we must change bearings. If bearing is applied five miles from interchange point, and they find it is necessary to change that bearing, they have a perfect right to change it. This is a question that has been asked me at different times, and it does not take me long to tell them what to do. In this case if it is necessary to change bearings, change both bearings, and the application of wheels. Rule 28 covers the case. A defect card is not required. He can bill for the two journal bearings on his defect card, and you can't evade it.

Mr. Fuss: In the first place if the journal is cut bad enough to wear out a brass you have no business to run it any further. If they apply a new brass, or a dozen brasses I do not see an occasion for giving defect card.

Mr. Rasbridge: If he gave defect card for one cut journal and two journal bearings, he would have to depend upon the honesty of the receiving road as to the bill. We do not admit no matter what our experience has been that there is dishonesty intended by any company. Inspectors sometimes do things that appear to be dishonest, but it is due to their not fully understanding the rules. When these rules were formulated they were formulated with the full understanding that all roads were honest and would apply the rules in every particular. It is like everything else, if you want to take advantage of a man you can do it. In this case the only thing that appears to me would be if a man wanted to take advantage of you on the change of journal bearings simply because you enumerated it on the defect card, why he could bill you. At the same time if the man was honest who made repairs and you did issue defect card for two journal bearings and he found it was not necessary to change the two, he would naturally bill you for one. The whole thing depends upon the honesty of the man making repairs, and by accepting car with card for cut journal and one journal bearing he has protected his company to the fullest extent according to the rules.

Mr. Wilson: If a man asks you for two journal bearings on defect card, he is trying to do you.

Mr. Fuss: If journal bearing for instance is worn a little, and it comes off one journal, it is no trouble at all, if a man understands his business and knows how to apply a bearing, to try it on some other journal. If he tries it on another journal he can readily see whether it will have a perfect bearing or not, or if it is too hollow for this size journal, or if it has a bearing in the center. He can see if it is fit to go on another journal or not. It is possible to use a brass on another journal than the one it has been running on provided the journal is not larger than the one it has been originally applied to. If it cannot be used, a defect card should be issued.

Mr. Stair: I do not see as far as I am concerned that it would make any difference whether you got defect card for one or two cut jǒurnals, if the party making repairs decides it is necessary to apply two bearings, according to the rules, they can bill you for it. I do not se that the defect card would have any bearing on the matter any more than to show that the car was defective.

Mr. Fuss: I move you pass the hat around for the benefit of the Y. M. C. A. Motion carried. Amount collected, $5.67.

Mr. Hall:

On motion, duly seconded, the meeting adjourned to meet the second Saturday evening in June, at the call of the secretary.

R. W. Burnett,
Sec'y.

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The Conventions

AFTER the fortunate escape from Mackinac and the delay of a week, the conventions of the Master Mechanics' and Master Car Builders' Associations assembled at Saratoga to hold one of the most brilliant series of conventions in their long and creditable history. It was brilliant not only in point of numbers, but in the quality of papers and reports presented to the technical meetings. The supply men were out in full force as if to emphasize the popularity of Saratoga as a place of meeting. Many firms who would not have even sent a representative to Mackinac not only sent one but several to Saratoga in addition to a large expensive exhibit, so that the representation of these supply houses was larger than ever before. The result of it all was an exhibition of railroad appliances that was well worth the journey to have the privilege of inspecting. It represented the latest developments in car and locomotive work, and was a good expose of what has been brought out in the year that has passed.

It is possible that the assembling of the American Society of the Mechanical Engineers at the same time and place, for its regular spring meeting, may have added something to the gatherings which are under consideration but it is doubtful if any great advantage was gained from this. On the other hand, the mechanical engineers should congratulate themselves that they have had an opportunity to see what kindred associations are doing and how they are doing. If any of these gentlemen were present at the presentation of the papers of the railroad associations they cannot fail to have been impressed with the extremely practical view with which all subjects were considered; with the thoroughness with which they were investigated; with the entire subordination of the theoretical to the practical and finally with the vigor and interest with which the discussions were carried on, upsetting the best calculations of the executive committee as to the time limitations and extending them almost indefinitely. In this connection but one suggestion can be made, and that is that fewer reports, papers and topics be presented, so that ample time may be allowed to all and thus the hurry attendant upon the closing hours, with the inevitable slurring of some matters, be avoided.

Closely allied with the success of the assemblage are the social features which have been so ably guided by an indefatigable entertainment committee. Naturally there is some adverse comment in regard to the lavishness with which this part of the program is executed, but the old veterans who remember the days of the olden time when men hesitated about attending on account of the wild and reckless methods followed by individual entertainers, look upon the present system as a near approach to those of Utopia. To be sure the entertainment is lavish, abundant and upon a most generous scale, but it must be borne in mind that the reason for it is great, important and of world-wide interest. When we consider that the total cost of holding these conventions will make a half million dollars seem a conservative estimate, the six or seven thousand spent for public entertainment sink into comparative insignificance. It is a great occasion and is worthy of all that can be done.

Of course the real reason for the gathering lies in the sessions of the few hundred men who assemble to discuss the technical aspect of locomotive and car affairs. Here, too, we find the same breadth and liberalness that characterizes all of the other features of the convention. As the whole has grown from a petty assemblage to a national concourse, so have the papers and reports grown from a consideration of petty details to that of the broad and fundamental principles of the mechanics of railroad rolling stock.

It will be quite beyond the province of this article, to enter into a critical discussion of each and every paper that was presented, as they may be judged individually by their presentation elsewhere. So while all were of more than common interest the main features of the technical meetings can alone be touched upon.

According to the recently established custom of alternating the opening of the conventions, the Master Mechanics were the first to hold their sessions this year.

In President West's opening address attention was called to the losses resulting from the great anthracite coal strike, and the increase in the cost of locomotive operation due to the rise in the price of bituminous coal. He also spoke of the establishment of the Jerome Wheelock fund in order to enable the association to conduct scientific investigations. Surely this is a matter of the utmost importance, and each year there are questions arising that are of vital importance to have answered that can only be solved by prolonged and expensive investigation. Heretofore such work has been undertaken and executed by some one road with an excess of public spirit. But every year such work becomes more and more complex and costly, and it is well that the Master Mechanics' Association should have a fund which can be drawn upon for this purpose.

Directly apropos of this matter of the length of time required to answer the present-day questions propounded to the motive power department is the exemplification of the time required by the committee on ton-mileage by whom the first report was presented to the convention.

MR. GEORGE W. WEST,
PRESIDENT OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

MR. J. W. MARDEN,
PRESIDENT OF THE MASTER CAR BUILDERS' ASSOCIATION.

They were asked to prepare a ton-mile basis for the locomotive reports of switching engines, and in order to get at some of the fundamentals, one member of the committee spent nine months with apparatus in continuous service to ascertain that the present allowance of six miles an hour is about twice as great as it should be. So that after one year's work, the committee has just succeeded in obtaining sufficient data to serve as the basis for future investigations.

As a general rule the Master Mechanics' Association does not exhibit any reactionary tendencies in discussion, but we regret to say that there did seem to be an evidence of it in this first discussion. It seems almost incredible that men would take the floor to argue that inasmuch as switching engines are the most expensive engines on the road to maintain, they should be given an ample mileage allowance so that their apparent cost would be no more than for the road engines. To which an earnest protest was made against the theory that facts should be covered and concealed, as nothing will put the motive power men in a stronger position before their superior officers, give them greater confidence in themselves and enable them to judge of the results of changes than to give exact facts. On the whole the subject was discussed on the broad plain that it deserved.

The same may be said of the excellent report on "Electrically Driven Shops." Here attention was given, not only to the broad, general principles of the work, but to the details of the design and arrangement, and, as stated later in discussion, the report reflected "the conservative opinions of the committee based on knowledge within the scope of their experience and was, from the nature of things, conservative."

The tendency to follow old leads and thresh out matters of detail was shown later in the noon hour discussion on long locomotive flues. It seemed as though this topic had a hold upon the members that could not be relaxed. It was handled in every conceivable light, and the influence of tubes having a length of more than 16 feet upon efficiency, tube sheets, shell, combustion, steaming capacity, stay bolts and so on, was turned over and over until the discussion formed an almost complete compendium of practical experience upon the subject. Not only did it stick and hang in the noon hour discussion, but later, after the presentation of the report on "Recent Improvements in Boiler Design," it cropped up again and held the convention for hours to the exclusion of such topics as the ratios of firebox to tube surface, superheated steam, water-tube boilers and firebox construction.

As already remarked it is, of course, impossible to pass in review all of the work that was done in three busy days, but there were a few other papers that should receive consideration.

One of these was the individual paper on the "Effects of Tonnage Ratings on the Cost of Transportation," in which the, to some, rather startling suggestion was made that the amount of work done by locomotives in time of congestion can actually be increased by reducing the tonnage rating. This naturally brought forth some objections, but the arguments in the paper in connection with the standing of the author on the subject evidently prevailed, and the contribution stands as a most valuable exposition of the value of the tonnage rating for locomotives.

The other papers that are especially worthy of attention were the reports on "Piston Valves" and the individual paper on "Engine and Tender Connections," both of which received an earnest discussion.

Turning now to the convention of the Master Car Builders we find the same conditions of earnestness and serious preparation that characterized the first. But, aside from the discussion on the Rules of Interchange and the report of the Arbitration Committee, which we have always with us, the noon hour topic of the steel car brought as vigorous a discussion as anything upon the program. The five heads under which the subject was scheduled covered the ground very thoroughly and gave the advocates of the composite car a fine opportunity to set forth their ideas. It developed, in the course of this discussion that the steel car is a recognized factor in railroad operation and one that has come to stay. Further, that the cost of repairs is much less than was expected, and can compare most favorably with the wooden car, especially in cases of wrecks, where the rolling stock is badly damaged; that the class of labor required for such repairs can even be cheaper than that needed for wooden cars and that the time lost is less. At the same time it was acknowledged that the steel car is far from being the perfected structure that is desired and that much remains to be done before it will be above criticism. This holds especially in regard to those designs that are so arranged that there are many parts concealed and not readily accessible to the inspectors; but it was confidently expected that these objections will be overcome, just as they have been in the wooden cars. The advocates of the composite structure urged the advisability of using a wooden superstructure and one speaker even held that side sills and intermediates had best be of southern pine. In short the discussion was of such character that everyone interested in the matter can find food for thought and the designer who has a new project in mind cannot employ his time more profitably than by a careful study of what was said; while, if manufacturers do not avail themselves of the suggestions offered, they are not the progressive set of men that they have had the credit of being.

Slight reference has been made to the report of the Arbitration Committee. When the amount of gratuitous work done by this committee is taken into consideration, it may be permitted to repeat the compliments paid it in an individual paper on "A Review of Its Decisions." The author called attention to the length of time during which the interpretation of the rules of interchange had been in their hands and found that "the trend of the decisions rendered have been towards the establishment of certain broad and fundamental principles of justice that may be said to underlie the whole system of interchange as it exists to-day." Then, after reviewing these principles somewhat in detail he closed by saying that "the whole history of the Arbitration Committee had been an unbroken record of consistency, equity and justice."

Straws are said to be good indicators of wind direction, and there is possibly no better exemplification of this than the discussion on couplers. All of us who have memories extending back for a period of fifteen years can recall the vigorous objections raised to the M. C. B. couplers on the ground of expense. It would add so many dollars to the cost of each car, and those with an inclination towards the use of the multiplication table were quick to show many millions of dollars of extra investment to the railroads of the country. At first only the cheapest of constructions were considered; then came the requirements for the use of steel, to be followed by the advocacy of greater care in maintenance and construction; until, in the discussion under consideration a considerable amount of machine work was advocated and no one said the speaker "nay."

If this straw means anything it means that railroad men have come to consider rolling stock as something else than a rough uncouth collection of the heterogeneous vehicles thrown together and performing work in a more or less satisfactory manner, but a machine that is deserving of careful attention from designer and user. The result of this developed position is that many things are prepared and seriously considered to-day that fifteen years ago would have been thought wild and extravagant.

In the reports on car details such as side bearings and center plates, the requirements for high speed foundation brake gear, cast iron wheels, steam and air line connections, collarless journals, and the proposed pedestal and journal box for passenger cars for 5x9-inch journals, there are suggestions galore. Some of them will be referred to the association for adoption as standards or recommended practice through the letter ballot, and some will find their value in their suggestiveness and the backing of experience with which they have been set forth. Certainly all deserve recognition and will doubtless receive it.

So the conventions of 1903 have come and gone, and while comparisons are both undesirable and impossible, these will certainly rank well both in interest and value, and they will remain as one of the mileposts indicative of the steady advance in achievement and aim of the two great associations that are identified with the mechanical departments of American railroads.

The Camera and the Conventions

Sunday Morning.

As usual everyone seemed glad to get to Saratoga and for that matter just as glad to get away. Both the Master Mechanics and the Master Car Builders' Associations are to be congratulated on the work done, not only in the convention hall, but on the work done during the year by the various committees. The exhibits were numerous and interesting and attracting the desired attention, although some of them were away out in the back yard of the Grand Union.

The Railway Master Mechanic does not attempt to publish a picture of everybody every year and the accompanying "snap shots" are of just a few who happened to be in the right light at the right time. Neither do we pretend to do any but amateur work, and the accompanying half-tones are published as being a pleasant souvenir of the good time at Saratoga that was sandwiched in with the more serious work.

And more serious work there certainly was as is evidenced in the report of the conventions, which appears in another portion of this same issue. The good work done by these two associations cannot be emphasized too much nor reiterated too often. It is greatly to the credit of the

P. H. Peck, Vice-President of the Master Mechanics' Association, and J. W. Taylor, Secretary.

Mr. George W. West, President A. R. M. M. A., 1903.

Mr. Young and Mr. Torrey of the C., B. & Q. R. R., and Mr. Thurneur of the Aurora Metal Co.

Mr. Van Alstine Looks into the Question.

men who comprise the two associations that year after year they meet at Saratoga or at whatever meeting place selected and enjoy the attractions of the place without neglecting in the least the valuable work of the convention hall Possibly the relaxation of the afternoon makes a better convention for the following forenoon and makes good the old adage "All work and no play, etc."

Number 13 for luck was the choice of Mr. L. G. Parish of the L. S. & M. S. and that list of members and guests was by the way found to be most useful at this year's convention, and considering the great amount of work involved, was very creditably gotten up.

The badges furnished by the committee were a constant reminder of Mackinac, and during the first few days when the weather was so cold and disagreeable congratulations were in order that the conventions were not being held in that northern summer resort.

Had it not been for the generous assistance of his friends the familiar face and form of Peter H. Peck might have been missing from Saratoga this year. Mr. Peck came by the way of the Erie and the D. & H. and the Erie conductor by mistake took up his D. & H. transportation and for a while it looked like walking from Binghampton. Mr. Peck's many friends, however, came to his rescue and the hat was passed, a large collection of pennies filled it and Mr. Peck arrived safe and sound.

The ball game on Saturday between the East and West

W. P. Mellon, Mrs. W. White and W. White of the L. E. & W.

Mr. Mellon—Mrs. White—Mr. White—Mr. Taylor.

A Family Party in Which, as Usual, the Young Lady is the Center of Attraction.

G. B. Coffin and Heath & Milligan Exhibit, and in the Background the Exhibit of the General Manifold Co., Whose Sign Shows Up in the Upper Right Hand Corner of the Picture.

T. R. Wyles, of the Detroit Graphite Mfg. Co., a Good Fellow Who Sells Good Paint and Who Reads a Good Paper.

was witnessed by a large and a very enthusiastic crowd and the West, of course, won. The Galena-Signal laundry bags were put to immediate use and out of them an unknown quantity of peanuts was sold by the young ladies, who were particularly interested in the success of the game. The fair peanut venders were Mrs. A. L. Whipple, Mrs. J. S. Stayman, the Misses Lucy A. Timms, Rena K. Purves, Laura Brown and Thompson. The nines were composed of Captain F. K. Brazier, C. H. Bowers, W. L. Hayden, G. W. Martin, H. Delaney, Jr., R. C. Vilas, Jr., F. H. Anderson, C. H. Jenkins, L. W. Midgley from the West and Captain F. M. Wise, J. G. Bateman, E. S. Ludlow, J. Symington, C. Symington, F. L. De Armond, C. W. Martin, Charles P. Storrs, William C. Dodd from the East. The game was umpired by Mr. T. B. Purves, Jr.

The exhibits this year were larger than ever before and the attention of the members of the two associations was called to a number of new devices. We note in the following some of the exhibits. The Acme Supply Company of Chicago, successors to G. S. Wood & Co., exhibited their vestibule diaphragm. They were represented this year by W. D. La Parle and G. S. Wood.

Adams and Westlake of Chicago, had their usual

C. E. Postlethwaite, F. P. Huntley, Pressed Steel Car Co.—Gould Coupler Co.

S. W. Midgley—National Car Coupler Co.

Roland C. Fraser and His Exhibit—U. S. Metal & Mfg. Co.

handsome exhibit in a prominent place in the grounds showing their system of acetylene gas car lighting. They were represented by F. B. Jones, secretary; W. S. Bartholomew, manager eastern branch; E. Langworthy, F. E. Grigg and W. S Hamm.

The American Balance Valve Company of Jersey Shore, Pa., exhibited the American balanced slide valves, American balanced piston valves, the J. T. Wilson high pressure balanced valve, the American Metallic piston rod and valve stem packing, the Nixon safety stay bolt sleeve. They were represented by J. T. Wilson and Frank Trump. The photograph taken of their exhibit was not clear enough to be represented in half tone for publication among our snap shots, but the American balanced slide valve, because of its merit, will certainly not be forgotten among the other exhibits.

The American Brake Shoe and Foundry Company, with their exhibit of brake shoes and miscellaneous iron and steel castings, is represented among our "snap shots" in the familiar face and form of Mr. F. W. Sargent. Mr. Sargent is seen in good company standing with Mr. Hodgkins of St. Louis. The other representatives were W. W. Snow, Otis H. Cutler, J. D. Gallagher, J. S. Thompson, R. C. Mercer, Louis Seibold, E. L. Adreon, Jr., W. D. Sargent, F. H. Coolidge, N. T. Hobart, Frank A. Barbey and Arthur Gemunder.

The American Machinery Co. of Grand Rapids, Mich., had a much larger exhibit than last year and one that seemed to be very interesting, judging from the large sized crowd that was constantly seen in their exhibit booth. The Oliver wood trimmers have been growing

LeGrand Parish—G. M. Basford.

Perfect Circulation and Pure Water.
Kennicott—Magraw—Toppan.

Mr. McConnell—Mr. Post—Mr. Moore.

C. H. Howard, W. C. Squire and Their Exhibit of the American Steel Foundries, and W. B. Leach, M. M. of the B. & A. R. R.

very rapidly in popularity with the railroad trade and during the past year the demand both domestic and foreign has kept the factory at Grand Rapids filled with orders. Mr. Oliver exhibited not only his wood trimmers but also his Universal saw bench, wood lathes, hand jointers and band saw. The company was also represented by E. T. Gorham, Geo. C. Hubbard and H. Armstrong.

The American Steel Foundries Company of St. Louis and New York, was represented by C. H. Howard, R. H. Weatherly and W. C. Squire, and a photograph of a portion of their exhibit, together with Mr. Howard and Mr. Squire, will be found on the same page with this item. This company's exhibit was one of the largest on the grounds, although their portion of the exhibit was delayed by floods. They, however, displayed the Davis wheel center, models of the "Player," "Ajax," "American" and "Keystone" trucks, cast steel passenger trucks, double-body bolsters, Leeds pilot coupler and miscellaneous trucks and bolsters. A number of photographs and drawings were also shown in the exhibit.

The Anti-Bursting Pipe Company of Washington, D. C., presented its exhibit for the first time, showing a device for preventing the bursting of water pipes by freezing. A photograph of the exhibit will be found in this issue, showing Mr. Howe Totten, who represented the exhibit, explaining the device.

Geo. W. Wilden, Mech. Eng. C. of N. J., and Geo. A. Cooper, Consulting Engineer Mex. and G. E. on P.

Mr. Bergert—Mr. Henry.

A Thorn Between Two Roses.
Bourne—Cooper—Elliott.

Col. Dickinson and His Party on the Car on Which President Roosevelt Rode 15,000 Miles. This Car is Equipped with the Axle Lighting System of the Consolidated Ry. Electric Lighting and Equipment Co.

Armstrong Bros. Tool Company of Chicago, the tool holder people of the world, had their usual interesting exhibit of a full line of tool holders, showing improved form of extra large cutters; also planer jacks and clamp lathe dogs and "Universal" ratchet drills. Mr. Paul Armstrong represented the exhibit and we represent Mr. Armstrong in this issue doing two men's work and explaining how his tools do four times as much work as any other.

The Aurora Metal Company, of Aurora, Ill., exhibit is not shown among our photographs, but Mr. Thurnauer, the proprietor, appears in one of the pictures and is seen in good company with Mr. Young and Mr. Torrey of the Burlington. Mr. Thurnauer exhibited this year the Lewis and Kunzer metallic piston packing.

The Boston Artificial Leather Company of New York City, exhibited car seats covered with moroccoline, rolls of moroccoline in different colors and grains and decorated leather. They were represented by A. E. Prince and J. H. Warden. A photograph of their exhibit will be found in this issue.

The Buckeye Malleable Iron and Coupler Company of Columbus, Ohio, is among our photographs and in their exhibit was shown the new Major automatic coupler.

The Pressed Steel Car Company.
Chicago—New York—Pittsburg.
Mr. Mitchell, Mr. Gayley and Mr. Postlethwaite are the Men Who Sell the Pressed Steel Cars.

Reeves Band.

"Perfect Circulation" Magraw and His Torn and Tattered Flags, the "Red" and the "Blue."

Mr. Hodgkins—Mr. Sargent.

The company was represented by L. M. Slack, who until recently was with McCord & Company, by J. C. Whitridge and H. L. Winslow.

L. C. Chase & Company, of Boston, had their usual large exhibit, which was so comfortable that many lingered to rest after having seen the exhibit. They showed their complete line of Sanford Mills car plushes, including new patterns in the frieze qualities and chase leather, also the new Chase curtain fixtures and car curtains. They were represented by F. B. Hopewell and R. R. Bishop, Jr.

The Coffin-Megeath Supply Company of Franklin, Pa., who manufacture and sell many well known railway devices and specialties, made an exhibit of their car coupler. They were represented by J. S. Coffin, S. A. Megeath and S. R. Allen.

The Chicago Railway Equipment Company of Chicago, is among those exhibits which were photographed but which did not materialize in the developing. We are, however, able to publish a picture of Mr. Farley, who is one of their well known representatives. Their exhibit comprised the National hollow, Kewanee, Diamond, Sterling, Monarch Solid and "Ninety Six" brake beams, automatic frictionless side bearings and "Creco" slack adjuster. E. B. Leigh, A. J. Farley, C. F. Huntoon, B. F. Pilsor, E. G. Ely, F. E. Caine, E. G. Buchanan and A. J. Schevers represented the company.

Columbia Nut Lock Company, of Bridgeport, Conn., made an interesting display of the Columbus lock nut. They were represented by A. H. Davis.

G. H. Williams and Friends Resting from the Strenuous Life of the Convention.

Mr. Totten at Work. He Explains the Workings of the Anti-Bursting Pipe.

Exhibit of the Buckeye Light.

Exhibit of the American Machy. Co., Manufacturers of Oliver Wood Working Tools.

Commonwealth Steel Company, of St. Louis, represented by J. S. Andrews, C. T. Westlake, and A. W. Remsen, exhibited models of their trucks and separable bolsters.

Consolidated Car Heating Company of Albany, N. Y., would have been found among the "snap shots," but the film containing the picture of this exhibit was another that never materialized. A picture, however, of one of their well known representatives, Mr. C. W. Martin, will be found on another page and he is represented on the ball teams, photograph of which is published on this page. The company made its usual exhibit of their steam heating apparatus, steam couplers, steam traps, etc. They were represented by F. C. Green, R. D. Pruyn, J. F. McElroy, W. H. Fulton, C. S. Hawley, and C. W. Martin.

Frank S. De Ronde Company of New York were well represented with complete exhibit, showing their insulating paper for refrigerator cars and varnish remover. Their exhibit is shown in a photograph in this issue. The company was represented by F. S. De Ronde, J. P. Davidson and C. E. Ellis.

Excelsior Car Roof Company of St. Louis, exhibited inside and outside their metal roofs, F. B. Hart representing them. A photograph of their exhibit does not appear this year and Mr. Hart was also missed, although the camera was snapped several times in his direction.

Fabrikoid Company of Newburgh, N. Y., manufacturers of artificial leather for car seats and curtains, has a photograph of its exhibit among the other pictures. They were represented by M. V. Waring and J. K. Rodgers.

J. A. Fay and Egan Company of Cincinnati, the large and well-known wood working machinery people, ex-

The Base Ball Teams, East and West.

Walter D. Crosman, Sales Manager of the Railway Department, Western Roofing & Supply Co., Chicago, Who Are Agents for the Locomotive Lagging and Flexible Cement Roofing Manufactured by the Philip Carey Mfg. Co.

Nat. C. Dean and Party far from the Madding Crowd, Enjoying the Quiet of the Front Porch of the U. S. Hotel.

hibited photographs of wood-working machinery and a photograph of the Master Car Builders' Convention of 1874. They also showed a new band saw. They were represented by A. N. Spencer.

The Franklin Manufacturing Company of Franklin, Pa., showed its exceedingly complete line of asbestos dust guards, asbestos-magnesia molded boiler covering, asbestos train pipe covering. J. R. Evans represented the company.

The General Manifold Company, of Franklin, Pa., had their usual exhibit showing their useful and time-saving manifolding devices, repair cards, defect cards, requisition blanks, etc. The company was represented by George L. Morton, Edward Z. Lewis and L. D. Sweet.

The Gold Company's Heating and Lighting Company, of New York, exhibited their car heating apparatus, duplex coil system and straight steam, operated under steam; also various parts of apparatus shown separately. They were represented by Edward E. Gold, John E. Ward, William E. Banks, W. H. Stocks, C. H. Gately, E. B. Ervin and C. B. Friday. A photograph of Mr. Ward and some of the other representatives will be found elsewhere in this issue.

The Gould Car Coupler Company, of New York City, exhibited their improved M. C. B. journal boxes, improved malleable draft rigging for freight equipment

Willard A. Smith—Charles T. Schoen.

Pittsburgh Spring & Steel Co.

A VERY INTERESTING DISCUSSION ON THE PORCH OF THE GRAND UNION.

MR. BRYDON OF WADSWORTH-HOWLAND CO.

with spring buffer blocks; improved M. C. B. coupler for 100,000-pound car and improved locomotive tender coupler for heavy equipment; steel passenger platform with friction buffer and draft gear. Friction draft gear for freight for wood or steel sills. Improved roller side bearings for freight cars. A photograph of Mr. Huntley, secretary of the company, appears on another page.

The Handy Car Equipment Company, of Chicago, showed the Handy swinging pilot coupler and the snow car and locomotive replacer. Charles L. Sullivan, president, represented the company.

Heath and Milligan Manufacturing Company, Chicago, who were represented by G. D. Coffin, had an interesting exhibit in a prominent location, as can be seen by referring to picture of their exhibit which appears in this issue. They showed railway coach and car colors.

Homestead Valve Manufacturing Company, of Pittsburg, whose exhibit is photographed in this issue, was represented by their president, F. Schuchman, and Bertrain Schuchman, showed the Homestead locomotive blow-off.

The Ingersoll-Sargent Drill Company, New York, exhibited the Haeseler pneumatic chipping and riveting hammers, pneumatic drills and hose coupling. They were represented by C. H. Haeseler, E. S. Mooney, Philip Weiss and Myron Preseler.

Jenkins Bros, of New York, was represented by John H. Williams, A. A. Langston and Charles W. Martin.

MR. SCHUCHMAN OF THE HOMESTEAD VALVE CO., SHOWS HIS FAMOUS LOCOMOTIVE BLOW OFF VALVE.

S. J. BOWLING OF THE HUTCHINS CAR ROOF CO.

C. L. Sullivan of the Handy Car Equipment Co. Passes a Very Quiet Sunday.

Mr. and Mrs. C. W. Martin, the Misses Small and Mr. McNaughton.

Jr., and exhibited their valves and packing.

Kenincott Water Softener Company, of Chicago, showed their water softening apparatus, what was left of it by the time it arrived, but if we have no photograph of the exhibit we publish in this issue a picture of the two men who are doing the water softening business, Cass L. Kenincott and W. R. Toppan.

The McConway and Tarley Company of Pittsburg, exhibited their steel and malleable iron couplers for freight and tenders of the Kelso and Janney patterns. They were represented by E. M. Graves and I. H. Milliken.

The McCord Company of Chicago exhibited the McCord journal box, McCord spring dampener, McKini gasket and Torrey anti-fiction metal. They were represented by James A. Davis and Judson A. Lamon. Their souvenir in the shape of an ink stand journal box proved very popular.

Walter Macleod & Co., of Cincinnati, O., showed an exhibit of their portable pneumatic specialties, painting machines, oil rivet forges, sand blast heaters, etc. A photograph of their exhibit appears in this issue.

The Manufacturers Railway Supply Company, of Chicago, showed their interlocking car and driver brake shoes and interlocking driver brake head. A photograph of their exhibit appears in this issue. They were represented by C. W. Armbrust, C. S. Shallenberger and E. S. Marshall.

Mason Regulator Company, of Boston, showed their complete line of their steam specialties and locomotive reducing valve. They were represented by Wm. B. Mason and F. A. Morrison. A photograph appears in

Miss Soule, Who Manufactures the Dust Guard.

Exhibit of the Fabrikoid Co.

Mr. Armstrong, the Tool Holder Man, Doing the Work of Two Men.

this issue of their exhibit and of Mr. Morriso.n

Merritt & Company, of Philadelphia, showed their combination sheet steel ventilated. Dustproof Sheet Steel and Expanded Metal Lockers. They were represented by S. P. Carter.

The Metal Plated Car and Lumber Company of New York exhibited a section of a metal-plated car, sheet copper. They were represented by Eugene Chamberlain and Garrett Burgert. Mr. Burgert's picture appears in this issue.

The National Malleable Casting Company of Cleveland, O., were represented by J. V. Davidson, F. R. Angell, W. E. Coffin, D. W. Call, Maurice C. Pilson and George F. Ames. They exhibited the Tower coupler, the National journal box and the National car door fastener.

The National Car Coupler Company, Chicago, was represented by S. W. Midgley and J. A. Hinson. They exhibited their car coupler, a photograph of which appears in this issue, together with a picture of Mr. Midgley. They also manufacture the National steel platform and buffer for passenger cars, and the Hinson draft gear and the Hinson drawbar attachment.

The Pittsburg Spring and Steel Company, Pittsburg, showed their locomotive and car springs. They were represented by D. C. Noble, president, and B. C.

Exhibit of "Moroccoline" by the Boston Artificial Leather Co.

Mr. Lamon is Not in a Snow Storm, but on a Poor Film.

Three New Englanders Taken in a "Dim Religious Light."

Exhibit of the Standard Car Truck Co., the Barber Truck, and Mr. J. C. Barber.

Noble, vice-president. A photograph of their exhibit will be found in this issue.

The Railway Appliances Company of Chicago showed the Stanwood car step, the Ajax vestibule diaphragms, Fewing's car and engine replacer, Globe ventilators, Whall metallic window casings, Symington journal boxes and dust guards, also pictures of Priest snow flanger and pneumatic tools. They were represented by George H. Sargeant, B. T. Lewis and C. F. Quincy.

The Railway Materials Company of Chicago showed Ferguson oil furnaces and Ferguson locomotive fire kindler. They were represented by W. M. Simpson and George L. Baurue. Mr. Baurue's photograph appears in this issue.

Rand Drill Company, New York, showed steam, electric and gas driven compressors; a complete line of Rand pneumatic tools. They were represented by F. M. Parson, F. M. Hitchcock, Geo. A. Howells, D. J. Hurley, A. B. Holmes, Clarence Peck, Cade Peck, O. S. Shantz, W. H. Travers, W. E. Gilman, J. A. Prescott, R. O. Hodges, F. C. Weber, M. DeF Sample, E. M. Mackie, W. F. Trieber, A. M. Bosworth, R. O. Hodges, R. D. Hurley and William Wilhelm.

The Safety Car Heating and Lighting Company of New York exhibited their car lighting and heating apparatus. The new features are fancy deck lamps, bracket lamps and a steam heating exhibit in Cottage "L," showing all the latest improvements in this line.

Mr. Oliver Turning Out Souvenirs for the Ladies.

F. W. Brazier of the New York Central and His Party.

Mr and Mrs. J. F. Deems and Mrs. H. F. Ball.

N. S. Reeder and J. H. Mitchell of the Pressed Steel Car Co.; J. E. Simons, O. W. Edwards Co.; J. L. Armit, Pressed Steel Car Co.

They were represented by R. M. Nixon, E. F. Slocum, W. H. Hooper, C. A. Hooper, B. V. H. Johnson, J. M. Towne, J. S. Henry and A. Sebold.

The Simplex Railway Appliance Company of Chicago is well represented by a photograph in this issue of their representative, W. W. Butler and his party, taken in their exhibit. They showed the Simplex bolsters for 80,000-pound capacity cars; also for 60,000 pound cars; Susemihl frictionless side bearings and brake beams for all service. They were represented by W. W. Butler, Geo. C. Murry, Geo. C. Scott, F. L. Susemihl and Robert Ripley.

The Saule Dust Guard Company of Boston was represented by Miss Saule, whose photograph is taken with the exhibit. The exhibit consisted of samples of Saule rawhide lined dust guard, which has been placed on many of the leading railroads.

The Standard Coupler Company of New York exhibited the Standard steel platforms, Sessions' standard friction draft gear, Standard couplers. They were represented by G. A. Post, president; H. H. Sessions, vice-president; A. P. Dennis, secretary and treasurer; R. D. Gallagher, Jr., mechanical engineer, and J. S. Turner, general agent.

The Standard Car Truck Company of Chicago showed models of the Barber roller bearing truck. They were represented by J. C. Barber and L. W. Barber.

W. W. Worthington & Co., New York, showed the Perry-Brown combination coupler and draft rigging, Brown journal box and Ruth flue machine. They were represented by W. W. Worthington, T. DeC. Ruth, H. I. Dilts.

H. B. Underwood & Co., Philadelphia, Pa., showed

Geo. T. Anderson and Family.

Thornton N. Motley—W. F. La Banta, Purchasing Agent, and J. F. Walsh, Supt. of Motive Power, C. & O. Ry.

Mr. Morrison and the Mason Regulator Co.'s Exhibit.

The Center of Attraction—Adams & Westlake Exhibit.

catalogue of special tools, boring bars and valve seat facers. They were represented by Albert D. Pedrick.

U. S. Metal & Manufacturing Company, New York, showed full size model of the "Johnson Hopper Door," full size model of the "Johnson Flush Door" for box cars, the "Dexter" and "Dexter, Jr." brake beams, the Cliff & Guilbert automatic hose reels, the Camel journal bearing; prints of the combination steel draft rigging and under frame. They were represented by B. A. Hegeman, Jr., president; R. C. Fraser, railroad department manager.

Walworth Manufacturing Company, Boston, Mass., exhibited ratchets, Mack & Dodge injectors, Bestosking packing, Stilson wrenches, stocks and dies; pipe taps, pipe vises, pipe cutters, nipple holders, Smith's railway track ratchet, steam whistles. They were represented by Geo. E. Pickering.

C. H. Whall & Co., Boston, Mass., exhibited metallic window casings, car ventilator and samples of fiber. They were represented by F. R. Whall.

The Westinghouse Air Brake Company, Pittsburg, Pa.; The American Brake Company, St. Louis, Mo.; Westinghouse Automatic Air and Steam Coupler Company, St. Louis, Mo.; Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., exhibited two quarter size four-wheel car models equipped with Westinghouse air brake, freight and passenger; Westinghouse friction draft gear, freight and passenger application; Westinghouse automatic air and steam coupler, freight passenger; American automatic slack adjuster, freight

Mr. Whitredge and the Exhibit of the Buckeye Malleable Iron & Coupler Co.

Mr. Ward of the Gold Car Heating Co., Together with the Gold Exhibit and Representatives.

Mr. Brown of Pittsburg and of the Damascus Bronze Co.

Chas. E. Meech and His Exhibit.

and passenger; Westinghouse high speed reducing valves. They were represented by E. M. Herr, E. L. Andreon, N. F. Niederlander, L. F. Purtill, S. J. Kidder, S. D. Hutchins, G. A. Hagar, F. M. Nellis, F. B. Erwin, W. M. Probasco, N. W. Trapnell.

Wilmarth & Morman Co., Grand Rapids, Mich., exhibited "New Yankee" drill grinders. They were represented by Chas. E. Meech. A photograph of their exhibit also appears in this issue.

Many firms who did not make exhibits were well represented, among whom were the Acme Machinery Company of Cleveland, the Chicago Grain Door Company of Chicago, The Damascus Bronze Company of Pittsburg, the Detroit Graphite Manufacturing Company of Chicago, the Damascus Bronze Company of Franklin, Pa.; Thos. Prosser and Son of New York, and the W. H. Miner Company of Chicago and many others.

The Daily Railway Age had an even better issue than ever before and, as usual, answered questions for everybody at their office and made themselves an indispensable adjunct to the conventions. The publishing of a complete record in the morning of the proceedings of the day before in the convention hall is of great benefit to those attending these meetings. Much other interesting matter was also published from day to day and we quote from one of their issues the following which will be of interest to many of our readers. It consists of a complete record of meeting places of the railway me-

Clement F. Street of Wellman-Seaver-Morgan Explains His Railroad Devices.

Mr. Norton and His Exhibit.

Frank S. De Ronde Co's Exhibit, Represented at the Convention by F. S. De Ronde, J. P. Davison and C. E. Ellis.

Bethlehem Steel Co. Exhibit—A. L. Colby in the Center of the Picture, and O. D. Hoag of the Shelby Steel Tube Co.

chanical conventions, prepared by M. N. Forney: "In The Daily Railway Age of June 18, 1902, you published a compilation which I prepared showing the dates and places of holding the annual conventions of the Master Car Builders' and of the Master Mechanics' associations since their organization. I find upon further investigation that this list in order to be absolutely accurate calls for a few corrections which are embodied in the following list:

	M. C. B.	M. M.
1864	July—West Albany	
1864	Sept.—New York City	
1865	June—West Albany	
1865	Sept.—New York City	
1866	June—West Albany	
1866	Sept.—Adrian, Mich.	
1867	May—Springfield, Mass.	
1867	Sept.—Altoona, Pa.	
1868	June—Dayton, O.	Cleveland, O.
1869	June—Chicago.	Pittsburg.
1870	June—New York	Philadelphia.
1871	June—Richmond, Va.	Louisville.
1872	June—St. Louis.	Boston.
1873	June—Boston	Baltimore
1874	June—Cincinnati	Chicago.

Exhibit of the Brake Shoe that Leaves No Scrap. —The Manufacturers Railway Supply Co.

Around the Doorway of the Grand Union. Mr. McConnell—Mr. Setchell.

F. D. Casanave—Mrs. H. F. Ball.

Mr. and Mrs. W. C. Arp, J. L. Woods and A. J. Farley.

1875	June—New York	New York.
1876	June—New York	Philadelphia.
1877	June—Cleveland	St. Louis.
1878	June—Niagara Falls	Richmond.
1879	June—Chicago	Cincinnati.
1880	June—Detroit	Cleveland.
1881	June—New York	Providence.
1882	June—Philadelphia	
1882	Oct.—Niagara Falls	Niagara Falls.
1883	June—Chicago	Chicago.
1884	June—Saratoga	Long Branch.
1885	June—Old Point Comfort	Washington.
1886	June—Niagara Falls	Boston.
1887	June—Minneapolis	St. Paul.
1888	June—Alexandria Bay	Alexandria Bay.
1889	June—Saratoga	Niagara Falls.
1890	June—Old Point Comfort	Old Point Comfort.
1891	June—Cape May	Cape May.
1892	June—Saratoga	Saratoga.
1893	June—Lakewood	Lakewood.
1894	June—Saratoga	Saratoga.
1895	June—Alexandria Bay	Alexandria Bay.
1896	June—Saratoga	Saratoga.
1897	June—Old Point Comfort	Old Point Comfort.
1898	June—Saratoga	Saratoga.
1899	June—Old Point Comfort	Old Point Comfort.
1900	June—Saratoga	Saratoga.
1901	June—Saratoga	Saratoga.
1902	June—Saratoga	Saratoga.
1903	June—Saratoga	Saratoga.

"I think it will be valuable and interesting to have in a permanent form a record of this kind for future use and for the information of the new men who are now coming on the scene of action.

A Pair of Regulars.

Mrs. C. E. Postlethwaite and Mr. and Mrs. J. H. Mitchell Viewing the Alligator at the Ostrich Farm.

Exhibit of L. C. Chase & Co.

J. T. Chamberlain, M. C. B. of the B. & M. R. R.

The Railway Master Mechanic in this July issue publishes a larger paper than ever in its history, a larger single issue, in fact, than has ever been published of any railway publication on account of the annual conventions of the Master Mechanics and Master Car Builders. This is, of course, very gratifying to the publishers, and we trust that we have succeeded in our attempt to publish in condensed form in this issue every thing of interest that took place at the recent conventions at Saratoga. We have endeavored to give a complete yet concise report of all the happenings in the convention hall. Complete enough so that they will be found of use as reference and concise enough so that the busy reader will find time to read it all. The more important of the papers have been published, some of them in full and abstracts of some. Our editorial pages are devoted in this issue entirely to a commentary of the work done in the conventions. Our "snap shots" are simply a glimpse of the social side. We try to present to our readers a complete account of all the doings at the recent conventions at Saratoga with the hope that a still greater interest in the work of these associations may be created among the mechanical officials of the railways in this country.

W. C. Arp, S. M. P. Vandalia Line and D. F. Crawford, S. M. P. Pennsylvania Co.

W. W. Butler of Simplex Railway Appliance Co. and His Party.

American Railway Master Mechanics' Association

Thirty-sixth Annual Convention

WEDNESDAY'S SESSION.

THE thirty-sixth annual convention of the American Railway Master Mechanics' Association was called to order by President George W. West, Wednesday, June 24th, 1903, at Saratoga Springs, N. Y. In appreciation of the thanks due for so many being spared to appear again this year, the president requested that the meeting be opened with a prayer by the Rev. Dr. Joseph Carey, pastor of the Episcopal church of Saratoga. In behalf of the village of Saratoga, the Hon. Mr. Knapp, president of the village, greeted the members of the association in a cordial message of welcome.

In his presidential address, Mr. West, rather than spend the time of the association with a review of its past work and a prophecy of its future, considered several points of vital importance in railroad operation as it exists in the immediate present, of particular interest to railway mechanical officials. His opening words may be considered as congratulating the association upon its lucky escape from the inconvenience and inadequency of Mackinac Island.

Continuing with the more serious problems confronting motive power men, President West called attention to the fact that while it had been attempted to indicate that recent freight congestion was due to lack of motive power the truth lay in lack of sufficient terminal facilities, proving the unknown factors entering the problem of operating high speed trains.

A consideration of decided importance is the fuel bill and the effect upon the same by the improper loading of locomotives. "It is strange that notwithstanding this one item of expense on many roads equals the cost of repairs and wages of enginemen combined, it is given the least attention of anything entering into the performance sheet figures. The wide firebox engines lose a large percentage of their savings and other advantages in the extra coal used in cleaning fires and that consumed while held on side tracks and at terminals. Undoubtedly any road having 100 locomotives in service can well afford to employ one man to every 100 miles of road to give this question of fuel his entire attention. Like a great many other things that have been tried on railroads, the tonnage rating has in some cases been overdone, and in others only on paper. Of all the attempts at rating the capacity of our locomitives, this tonnage basis has been the most abused; in the one case engines are going over the road with much less than their rated capacity, which is disastrous to the fuel side of the sheet, and in other cases the engines of same class and condition are given much more than their rated capacity, which is just as severe on the fuel charge." . . . "Much time and money have been spent in valve gear, exhaust pipes, and smoke box front end arrangements to reduce the quantity of coal consumed while engines are working steam, while practically nothing has ever been done to prevent the waste while the engines are at rest."

He further directed attention to the service rendered by high-speed tool steel and the benefits derived from the increased output depending upon this grade of steel; the opportunity offered by the American Engineer and Railroad Journal for obtaining results relative to efficient arrangement of locomotive draft appliances, and to the opportunity in the field of investigation offered by the Pennsylvania Railroad in connection with the complete testing laboratory at the World's Fair in St. Louis during 1904.

Following the adress of the president and immediately previous to the intermission allowed to permit the visitors unintersted in the business of the meeting to retire, Mr. Scott H. Blewett addressed the meeting explaining the numbering systems used this year in connection with the badges. While this system necessitated some little detail work on the part of the committee it simplified the method of designating the members and provided a means of barring those not entitled to the privileges of the association.

The secretary's report showed the present membership of the association to be 752, of which active members number 699, associate 17 and honorary 36. The treasurer's report showed a balance on hand of $3,085.56.

The following amendments to the constitution were offered by the executive committee: Article 3, section 1, an addition: One representative member may be appointed by any railroad company to represent its interests in the association; such appointment shall be in writing and shall emanate from the president, general manager or general superintendent. Such member shall have all the privileges of an active member, including one vote on all questions, and in addition thereto shall, on all measures pertaining to the determination of what tests shall be conducted by the association or the expenditure of money for conducting same, have one additional vote for each full 100 engines which are in actual operation or of process of purchase by the road or system which he represents. Such membership shall continue until notice is given the association of his withdrawal or the appointment of his successor.

Article 3, section 3, an addition: Representative members shall pay, in addition to their personal dues as above, an amount for each additional vote to which they may be entitled, as shall be determined each year by the executive committee, prorated upon the cost of conducting such tests as may be determined upon at each convention, provided that no such assessment shall exceed $5.00 per vote.

The above being a notice of amendment, and in accordance with the constitution, shall lie on the table until the next annual convention.

Under the head of new business it was announced that the Interstate Commerce Commission in March last modified the safety appliance law covering the application of grab irons to tenders and locomotives, making the law effective September 1st next. In consideration of the importance of this matter a committee was appointed to look into it and confer with the Interstate Commerce Commission.

REPORT OF COMMITTEES.

Ton Mile Statistics.

The report of this committee showed a surprisingly low figure as representative of the mileage per hour of locomotives in strictly switching service, the results of the observations made indicating that the present arbitrary credit of six miles per hour is nearly twice too high. During the discussion it was suggested that ten miles per hour be assumed as the arbitrary credit of switch engine mileage per hour, as any lower figure would give the general appearance of an exceedingly high charge for switch engine repairs per mile. The fact was further evidenced, however, that the cost of switch engine repairs per mile exceeds that of road engines and as long as this is the case it is more sensible to face the facts squarely, endeavor to determine the actual cost of repairs per mile and report the circumstances as they exist.

Believing it to be more practical to know the actual performance of the locomotive rather than the mere mileage, Mr. George L. Fowler (New York) presented a design of dynamometer which might be used for making observations as no one would care to subject a dynamometer car to the rough usage of switching service.

The committee was continued to make further investigation along this line, and instructed to confer with the committee of the American Railway Association, to make a positive recommendation at the next meeting.

TOPICAL DISCUSSIONS.

Long Locomotive Flues.

In the absence of Mr. H. D. Taylor, Mr. H. F. Ball (L. S. & M. S.) opened the discussion, giving his experience as finding no more trouble with long than short flues. In connection with wide fireboxes, however, he has observed greater leakage with both short and long flues. Mr. A. L. Humphrey (C. & A.) expressed his opinion that the trouble lay in the water and not the length of tube, basing his opinion on the performance of two pacific type large passenger locomotives having wide fireboxes, and flues 20 feet long, 2¼ inches in diameter. One of these locomotives, in a good water division, is giving absolutely no trouble while the other in a bad water district is leaking a little, but not enough to cause the leakage to be attributed to the long flues, as no more leakage is noticeable than with locomotives having 2-inch flues, 13 feet 6 inches long. Further discussion brought forth remarks tending to show that the length of flue must be governed by the design of the locomotive and as there is no objection to the long flue there is an advantage to be gained in heating surface by the increased length of flue.

Setting Locomotive Flues.

Mr. P. H. Minshull (N. Y., O. & W.) opened the discussion of the "most satisfactory way of setting flues in the firebox tube sheet" and "the best style and form of tool for setting and repairing them," by setting forth some general principles of practice and expressing the necessity of conscientious work by a competent workman. While many examples of present practice were cited in the ensuing discussion, but little suggestion was offered which might be followed in order to reduce leaky flues materially. As most leaks are found to occur while the locomotive is between the cinder pit and the round house, and these on the side in which the injector was operated, Mr. R. D. Smith (B. & M. R.) has adopted the practice of permitting no water to enter the boiler after the engine has arrived at the clinker pit, unless there is a good fire on the grates, the blower on and circulation kept up. While this practice has but recently been adopted, Mr. Smith believes that considerable advantage is to be derived therefrom, in consideration of the results so far received.

Grinding as a Method of Finishing Piston Rods and Crank Pins.

In talking of this method, Mr. H. H. Vaughn (L. S. & M. S.) cited some figures showing the relative time consumed in finishing by grinding and by the usual method on the lathe. His opinion might be considered as largely expressed in the following: "I would assume the saving on grinding, as against the lathe work, as between four and six to one, according to the job, the grinding taking only a quarter to one-sixth of the time occupied by the lathe. As against that we have the fact that the grinding machine must be an exceedingly heavy machine to stand the removal of metal at that rate. That makes an expensive machine and I should be doubtful whether any shop not doing manufacturing work, not making new rods to any extent, would be warranted in introducing the grinder. The point of interest is the finish on the rod, the finishing of the rods at the rapid rate. The ground finishing is cheap, and, so far as we can learn is, if anything, just as easy on the metal as the file finish."

THURSDAY'S SESSION.

Drawbar Attachments.

The meeting was opened Thursday morning by Mr. Henry Bartlett (B. & M.) presenting in abstract his paper on Drawbar and Buffer Attachments for use between Engine and Tender. The discussion of this paper elicited but little information additional to that presented by the author, the general opinion being, however, that the spring attachment is the most desirable arrangement now in service for use between engine and tender. Mr. H. H. Vaughn believed that by using a spring attachment, having a certain amount of initial tension, an advantage would be gained by utilizing the weight of the tender to balance the engine, an opinion agreed with by Mr. D. Van Alstyne (C. G. W.) who so expressed himself. Continuing, Mr. Vaughn suggested using a straight buffer face with which to get a purely sliding action, believing this to be superior to a buffer plate with a rounded surface, as the effect of the latter will be to cause grinding between the spring buffer and friction plate as the engine curves away from the tender.

Following the discussion of this paper a letter was read by the secretary stating that the Pennsylvania Railroad has arranged with the Universal Exposition of 1904 at St. Louis, to install a locomotive laboratory as a part of its exhibit, upon which to conduct a series of tests upon the highest scientific basis, and requesting the association to appoint three members to act, with a similar number of members from the American Society of Mechanical Engineers, as an advisory committee. In consideration of the importance of such an opportunity of gathering accurate data upon locomotives, the president subsequently appointed Messrs. H. H. Vaughn, F. H. Clark and C. H. Quereau to act as an advisory committee in matters relating to the proposed locomotive testing laboratory.

REPORT OF COMMITTEES.

Electrically Driven Shops.

A number of the main points of interest appearing in the paper were touched upon by M. C. A. Seley (C., R. I. & P.), chairman of the committee, in presenting the report. In view of the number of new shops which will necessarily be erected to maintain the large motive power equipment being built and the usefulness of electricity in the operation of such plants, the association appreciated the value of the report as presented. In the discussion consequent thereto the remarks centered largely upon some of the details of electrical operation in railroad shops, the selection of one of the several systems to operate most satisfactorily, the effect of machine tool arrangement, speed control and arrangement of motor driving, upon the output of the shop and cost of operation.

Locomotive Front Ends.

In presenting this report, Mr. H. H. Vaughn, chairman of the committee, called attention to the tests conducted at Purdue University for the American Engineer, saying that in consideration of no testing plant being available for the use of the committee they deemed it expedient to await the results of the above-mentioned tests before proceding. They believe these tests establish the relation between stacks and nozzles as clearly as they ever will be established for a 54-inch front end; however, as engines of the future will have larger front ends, from 70 up to 80 inches, further tests should be conducted upon engines having larger front ends to establish a relation among different sizes.

It is hoped that an engine having a 75-inch front end will be available to be placed upon the Purdue testing plant in a few months and the committee was continued to make further investigation upon these relations so effectual in the performance of the locomotive.

Mr. Quereau took occasion to mention the idea apparent in the minds of some that results obtained from laboratory tests are purely theoretical and that no practical value may be attached to them. He believes laboratory tests, under competent supervision, to be the only method by which actual results can be obtained and fair conclusions made, because in the laboratory all conditions may be made constant except the one being tested.

Pipe Unions.

The report of the committee appointed to confer with the pipe union manufacturers and submit drawings of proposed standard forms of pipe unions, being short was read by Mr. Quereau, chairman of the committee. After a short discussion of the advisability of adopting a standard for pipe unions, the association adopted the standards adopted by the American Society of Mechanical Engineers.

Locomotive Forgings.

Mr. F. H. Clark (C., B. & Q.) in presenting the report in behalf of the committee, covered the main points; the most novel feature which may be mentioned being the manner of taking the test piece.

Mr. Kincaid (American Locomotive Company) acting in behalf of Mr. J. E. Sague, spoke of some tests made at the Schenectady works in which the recommendations of the committee had been followed. It was found that the test piece could be removed in 15 or 20 minutes, in good condition to be prepared for the testing machine. The horizontal boring mill appeared to be the best machine for removing the test piece. Regarding the specifications, Mr. Kincaid advocated a slight increase in the percentage of manganese.

TOPICAL DISCUSSION

Weights of Locomotive Parts.

Mr. R. H. Soule opened the discussion of "range of weights of principal parts of locomotives (which are too heavy to be lifted by hand) for use in determining the capacities of cranes and hoists," refering to a list of parts which he had received from the Baldwin Locomotive Works and the American Locomotive Company. The necessity of some source of information to which could be referred the principal parts of locomotives in designing shops and arranging for crane and hoist capacities, has been keenly felt so that the remarks of Mr. Soule were duly appreciated and the list of weights which he has compiled will add materially to the value of the proceedings of the association.

At this point Mr. J. N. Dickey, a member of the Board of Railroad Commissioners of the State of New York, addressed the convention in behalf of the governor, extending a hearty welcome to the members.

As Wednesday's session closed with the remarks of Mr. Vaughn relative to grinding as a means of finishing work, it was suggested at this time to request an expression from Mr. Norton (Norton Grinding Company) who, in a few brief remarks, outlined the rapid advance made in grinding during the past two years.

Tool Steel.

The discussion of "new tool steel and effect on shop practice" elicited a few remarks relative to the character of the steel with regard to the character of the work to be done and the ability of machines to withstand the heavy service imposed by the introduction of high speed tool steel.

REPORT OF COMMITTEES.

Boiler Design.

Mr. D. Van Alstyne, chairman of the committee to investigate "recent improvement in boiler design" presented the report in abstract. The hour for adjournment having arrived, the discussion of the subject was continued until Friday's session.

FRIDAY'S SESSION.

The discussion of the report of the committee on boiler design constituted the opening work of the association Friday morning. A consideration of the cause of leaky flues and the proper adjustment of tubes attracted the greatest attention evidenced by the discussion. The most appropriate suggestions were offered by John Player (American Locomotive Company) in which he implied that the whole trouble with the present locomotive boiler resolves itself into one of circulation. With the proportionate decrease in the amount of firebox heating surface consequent upon the increase of grate area in modern designs of wide firebox boilers and with the approach of the grate toward the lower row of flues, the heat impinging against the flue sheet has been intensified; with the result that there is often a sheet of steam against the flue sheet instead of a body of water. The prevailing arrangement of flues affords so small a space between rows of flues as to interfere materially with circulation along the face of the flue sheet. Mr. Player further advocated the location of boiler checks in such positions as to assist circulation in a better manner than the present location and to direct the flow of water toward the throat sheet.

Ryerson Scholarship.

Secretary Taylor read a communication at this point in the meeting, from Joseph T. Ryerson and Son, offering the selection of the candidate for one of the three scholarships maintained by this firm, in any institution offering a desirable technical education. Mr. Quereau offered a resolution accepting the trust, which was unanimously adopted by the association.

Internal Combustion Engines.

In the absence of Mr. R. P. C. Sanderson (S. A. L.), Secretary Taylor introduced Mr. Sanderson's paper on internal combustion engines by reading abstracts therefrom. Mr. Soule had prepared a discussion of this paper which, in his absence, was read by Mr. Quereau. Mr. Soule believes that while Mr. Sanderson does not overstate the performance and possibilities of the gas engine, he does fail to give the steam engine credit for the best performance of which it is capable and quoted figures evidencing a lower coal consumption per horsepower per hour than the minimum credited the steam engine by Mr. Sanderson.

The Metric System.

This paper was abstracted by its author, Mr. Angus Sinclair, who condemned the adoption of the metric system in this country. The resolutions offered by Mr. Sinclair were adopted by the association.

Locomotive Headlights.

A comparison of the several types of headlights was presented by Mr. William McIntosh (C. of N. J.) in which he showed that while the cost of oil was less than that of carbide for acetylene lights and steam for electric lights, the maintenance of the oil lamps together with its expensive appurtenances would cause serious question of its economy; and it falls far behind in the candlepower of either acetylene or electricity, and failing also in entire reliability. In summing up, he considered it apparent that the oil-burning headlight has had its day, and must give way to better devices.

Report of Special Committee on Grab Irons.

Upon the report of the committee appointed to consider the application of grab irons and hand holds to the front end of the locomotives and rear end of tenders, in consideration of the amendment to the safety appliance act to take effect September 1st, 1903, the association decided to adopt the M. C. B. standard of equipping flat cars for the application of grab irons to the rear of locomotive tenders and to request an extension of time from the Interstate Commerce Commission in order that a standard may be adopted for equipping the front end of locomotives.

Effect of Tonnage Rating Upon Cost of Conducting Transportation.

The proposition expressed in this paper by Mr. Quereau is to arrange the trainload in such relation to the capacity of the locomotive as will give better train service, at the same time reducing the coal bill, an arrangement which will require the consideration of each division separately. The suggestions offered were concurred in by several members who believed that the rating should be reduced to the maximum economical basis instead of the maximum theoretical basis.

REPORT OF COMMITTEES.

Locomotive Performance.

In the absence of Mr. F. M. Whyte (N. Y. C. & H. R.) chairman of the committee, the report was presented briefly by Mr. G. M. Basford (American Engineer). There being no discussion, the report was received by the association.

Revision of Standards.

This report was presented by Mr. T. A. Lawes (C. & E. I.) the changes recommended being adopted by the association.

The Progress of the Year.

Mr. H. D. Gordon presented this report in the absence of the chairman and after a brief remark by Mr. C. A. Seley (C., R. I. & P.) the discussion was declared closed.

Piston Valves.

As Mr. F. F. Gaines (L. V.) chairman of the committee was not present, the report was presented by Mr. F. H. Clark who called attention to the principal features appearing in the report and the suggestions of the committee. The discussion following the presentation of the report would indicate that there is a diversity of opinion among railroad men regarding the relative merits of piston and slide valves. Replying to an objection raised by several members as to the dropping of the reverse lever into the corner and the rocking of the valve motion occasioned by it, Mr. John Player stated that the lever should not be dropped down while the engine is speeding, but dropped down gradually as the speed of the locomotive decreases. The object of this is obvious. The piston valve runs in a bushing, and not over a plain surface like the slide valve. The lubrication for the bushing and valve is taken on the metal, and the lubricating surface is that over which the packing ring travels. The surface covered by the exhaust, which is not covered by the travel of the valve when working, becomes dry and encrusted to a certain extent with the scum which is usually found in a steam chest. When the lever is dropped in a gear, this scum must be cut off at one stroke, practically speaking, or else it snaps in the packing rings and the packing rings travel over it, and the fact of almost dropping the lever down at speed is one of the most serious objections in the use of piston valves. It causes practically all the trouble of breakage of packing rings and the failures of the valve motion referred to. If the valve is handled in a proper manner, not dropped down when run at speed, but dropped down gradually as the engine slows down, there wil be no trouble experienced with the cylinder.

TOPICAL DISCUSSION.

A discussion of the steam turbine was presented in a paper read by L. R. Pomeroy.

REPORT OF COMMITTEES.

Subjects.

Mr. G. M. Basford presented the report of the committee on subjects, saying that while a large number had been presented, it was hoped that the executive committee would select from the list such subjects as they saw fit.

The association adopted a resolution that the invitation from the president of the Louisiana Purchase Exposition, the Business Men's League of St. Louis and the mayor of St. Louis be received with thanks and recommended for favorable consideration by the executive committee.

Mr. W. G. Wallace, representing the Traveling Engineers' Association, expressed his appreciation of the courtesy shown him by the Railway Master Mechanics' Association and spoke of a report which is to be presented at the next meeting of his association, on locomotive front ends, which he hoped would meet with the approval of the Master Mechanics' Association.

Mr. George A. Post, representing the supply men, addressed the association and presented President West with a past president's badge.

The result of the ballot for the election of officers for the ensuing year is as follows: President. Mr. W. H. Lewis, S. M. P., Norfolk & Western; first vice-president, Mr. P. H. Peck, M. M., Belt R. R. of Chicago; second vice-president, Mr. H. F. Ball, S. M. P., L. S. & M. S.; third vice-president, Mr. J. F. Deems, G. S. M. P., N. Y. C. & H. R.; treasurer, Mr. Angus Sinclair.

Master Car Builders' Association

Thirty-seventh Annual Convention

MONDAY'S SESSION.

PRESIDENT J. W. MARDEN called to order the thirty-seventh annual convention of the Master Car Builders' Association, Monday morning, June 29th, 1903, in the ball room of the Grand Union Hotel, Saratoga Springs, New York. Following the usual opening prayer, led by the Rev. Dr. Joseph Carey, pastor of the Episcopal Church of Saratoga Springs, and the address of welcome by President Knapp of the village of Saratoga Springs, Mr. George H. Daniels, general passenger agent of the New York Central & Hudson River Railroad was invited to address the association. Mr. Daniels complimented the Master Car Builders on their achievements in producing standards and securing uniformity in car equipment, construing their work as indicating the true American spirit so evident in progressive results. Continuing, he offered well selected arguments showing wherein the spirit of American progress causes other nations, especially the English, to wonder why Americans surpass all other people on earth in many accomplishments.

In the usual course of opening events Mr. Marden delivered his presidential address, which is in part as follows: "As a result of the prosperous condition of our country, our railroads have been taxed to their uttermost to handle the business that has been offered them. Large orders have been given for the construction of new equipment and car building companies have run full time and overtime to meet the demand.

The conditions which exist to-day are different from those which existed when our association was organized in 1867. The interchange of cars at that time was practically confined to what were known as "Line" cars. Today our cars are interchanged over all the roads in the United States and Canada. Our rules of interchange have been revised from year to year to meet the existing conditions until they are now practically complete. Our freight cars which were then built with a capacity of

20,000 pounds, are now built with a capacity of from 60,000 to 100,000 pounds.

As with our nation, so it is with our association. Our success is due in a large degree to the wisdom of our founders. They were practical men. They builded better than they knew. From a gathering of ten master car builders at West Albany car shops, in July, 1864, to discuss methods of working together on freight cars, has grown our present association with a membership of 534, representing 1,749,939 cars.

The advent of heavy capacity cars brings additional problems for us to solve. The material that enters into their construction should be carefully tested with a view of using as light material as will give the required strength; especially is this true of wheels and axles.

Your committee on arbitration is to be commended for the efficient manner in which they have considered and passed upon the business that has come before them in the past year. The fact that only sixteen cases have been presented to the committee for their decision indicates that our members have a good understanding of the rules, and proposed changes should be carefully considered before they are made.

I would recommend that in appointing committees the members be selected within distances that will make it convenient for them to assemble often. The more they can interchange opinions on the subject that is before them the better they will be pleased with the result which they present us."

The report of the secretary showed the membership of the association to be 293 active members, 204 representative, 19 associate, 18 life, giving a total number of 534. There is an increase of 119,923 in the number of cars represented in the association by representative members. The financial transactions of the association for the past years were as follows: Receipts, including balance last year, $9,572.75; expenses, $9,260.11; balance, $312.64.

The following amendments to the constitution were adopted:

Article 3, section 2:

"Any person holding the position of superintendent of the car department, master car builder, mechanical engineer, foreman of railroad car shop, joint car inspector, or one representative from each car manufacturing company or other company owning over one thousand cars, which are not in process of purchase by other parties, may become an active member by paying his dues for one year. Unless expelled from the association his membership shall continue until after his written resignation is received by the secretary."

Article 3, section 4:

Omit the words "mechanical engineers" in the first line of this section.

Mr. E. A. Moseley, secretary of the Interstate Commerce Commission, addressed the association on its relation to the Safety Appliance Act and its various amendments; and complimented the association on its adoption of a coupler which reduces the risks run by trainmen in coupling cars and which has lowered the number of accidents ensuing therefrom.

In consideration of the important bearing of this act upon the application of safety appliances and the interpretation of the law as expressed by Mr. Moseley, this address appears on another page of this issue.

In view of the fact that it is to the interest of the Master Car Builders' Association to keep in close touch with Interstate Commerce Commission a motion was adopted to the effect that a committee be appointed, and continued from year to year, to meet with the commission in the decision of points of recommended practice and standards of the association.

TOPICAL DISCUSSIONS.

Four or Six-Wheel Trucks in Heavy Passenger Service?

The first of the topical discussions taken up was the question, "Is it possible to build 4-wheel trucks for heavy passenger equipment which will satisfactorily take the place of the present 6-wheel trucks? Are 4-wheel trucks with steel frames satisfactory?" This topic was to have been opened by Mr. Edward Grafstrom, mechanical engineer of the Atchison, Topeka & Santa Fe Railroad. He was drowned in the floods at Topeka recently and the secretary was unable to get anyone to take his place. Mr. W. P. Appleyard opened the disucssion as follows: "As I have been asked a number of times within the last few years as to our passenger trucks under from 50 to 60-foot cars, it being known that the New York, New Haven & Hartford Railroad was operating such cars on 4-wheel trucks, I will open the discussion on the topic. The cars weigh in the neighborhood of 70,000 to 80,000 pounds, with particular reference to baggage cars, owing to the lading which they receive, and their effect on the journals of a 4-wheel truck. I simply want to say, for the purpose of opening the discussion, that we have, as long back as the New Haven road has operated 60-foot cars, done so on a 4-wheel truck. All of the 60-foot cars are run on 4¼ by 8 journals. The ordinary type of passenger truck is used, and I can add that we have had practically no trouble with them, either in the way of hot boxes or other damage to the trucks."

The expressions of several members would indicate that good service had been rendered by 4-wheel trucks under heavy equipment operating over good surfaces and heavy rails. Mr. R. P. C. Sanderson (S. A. L.) said that in the case of a poor track with a light rail, the extra equalization secured by the 6-wheel truck is required to insure easy riding. The experience of Mr. J. J. Hennessey (C., M. & St. P.) leads him to believe that the question of 4 and 6-wheel trucks depends upon the service, for on some divisions of his road the cars carried on 4-wheel trucks give as good service and apparently ride as easily as those carried on 6-wheel trucks, while on other divisions, where the tracks are not as good, where there are many short curves and where a large number of stops are made, the 4-wheel trucks do not give service nearly so good as that given by 6-wheel trucks.

Repair Shop for Freight Cars.

In the paper prepared by Mr. George N. Dow (L. S. & M. S.) on the discussion of the topic "What is the Ideal Arrangement for a Repair Shop for Freight Cars at Outlaying Division Points?" he gave an outline of the freight car repair shop of the L. S. & M. S. Railway at Ashtabula, O., where the transportation department handles 2,500 cars daily.

Drop Test for Axles.

Mr. E. D. Nelson, in opening the discussion relative to a "Modification in Height of Drop for Testing Car Axles," directed attention to the fact that the heavy blow required to be withstood in drop tests, as specified by railroad companies, is tending to drive iron axles out of service. Continuing, he presented a number of specifications together with results of tests, indicating the different heights of drop required to break axles of different diameter at the center. Mr. J. J. Hennessey's experience has been that while steel axles show more uniform results than wrought iron axles when subjected to the drop test, the steel axles give more failures on the road. Mr. W. C. Squires (American Steel Foundries) suggested that railroads would obtain better axles by purchasing guaranteed material than by binding down the manufacturers with specifications, as the latter would follow up guaranteed axles very carefully.

The Metric System.

Mr. Argus Sinclair introduced the resolutions appearing in his paper condemning the adoption of the metric system as a standard, in view of the confusion which would follow the selection of the decimal divisions of an inch. After a clever argument against the metric system by Mr. R. P. C. Sanderson, the recommendations of Mr. Sinclair were accepted.

REPORT OF COMMITTEES.

Brake Shoe Tests.

The report of the standing committee on brake shoe tests presented results of tests made of four brake shoes delivered to the committee by railroad companies, the report being considered largely a matter of routine work done by the committee.

Triple Valve Tests.

The report of the Committee on Valve Tests being called for, the following letter was read from Mr. G. W. Rhodes, chairman: "The Committee on Triple Valve Tests has not been asked to make any investigation during the past year. One or two inquiries have come up during the year as to the form of application in case tests were desired, but they did not result in any action." On motion the report was received.

Draft Gear.

Mr. T. A. Lawes read the report of the Committee on Draft Gear, and, there being no discussion on the report, it was ordered received and filed.

TUESDAY'S SESSION.

Tuesday's session opened with the presentation of communications from representatives of St. Louis and the Louisiana Purchase Exposition, inviting the association to hold its next annual convention in St. Louis. These communications were referred to the executive committee.

REPORTS OF COMMITTEES

Standards and Recommended Practice.

The report of this committee was presented by Mr. A. M. Waitt, chairman, who presented the sense of a few communications which had been received since the report was compiled. Especial attention was directed to the fact that as the introduction of electric traction upon portions of steam railways had already assumed some importance, it will be advisable to consider standards which will be applicable to the conditions governing both steam and electric motive power. Upon motion it was decided to submit the suggestions of the committee to letter ballot. The question regarding air-brake hose was referred to the arbitration committee.

Side Bearings and Centre Plates.

Secretary Taylor presented this report in abstract, enumerating the several recommendations offered. Mr. Sanderson suggested that it is as important to have the exact contour right in a pair of center plates as it is for couplers, and upon his motion the report was referred back to the committee with the request that they furnish a full contour outline of the center place proposed which can be submitted to letter ballot for adoption this year.

Cast Iron Wheels.

In behalf of Mr. Wm. Garstang (C., C., C. & St. L.) the report was read by Mr. Ettinger and the discussion deferred.

Arbitration.

During the consideration of the Rules of Interchange the secretary read the number of each rule and where no changes were proposed by the committee the rule was passed. In cases where recommendations were suggested, with the approval of the committee, they were considered and acted upon by the association.

The following change in Rule 2, suggested by the Western Railway Club, was read before the association: "Empty cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 3 to 54 inclusive. Loaded cars offered in interchange must be accepted. If not in safe and serviceable condition the receiving road to transfer the load at its expense."

Though the arbitration committee had given this suggestion due consideration, they did not deem it expedient to make the change, and therefore recommended that no change be made in Rule 2. The subject met with a very lively discussion and Mr. A. L. Humphrey (C. & A.) offered a motion to the effect that the question be decided by letter ballot and called for a vote by roll call. The motion was lost, as shown by the following: Affirmative, 563; negative, 573. Mr. A. L. Humphrey offered such amendments to Rule 112 as to make the rule read as follows: "Refrigerator cars, special stock cars, all-steel cars, tank cars (except the tanks) and other freight cars, designed for special purposes not referred to above, shall be settled for at the present cost price, as may be agreed to by the parties in interest, less the deduction for depreciation due to age, which shall be on the same basis as for regular freight equipment."

Mr. W. S. Morris, chairman of the arbitration committee, replied to the arguments of Mr. Humphrey by saying: "For the information of the gentleman from the Chicago & Alton road I will call his attention to the general remarks in the first part of the report of the arbitration committee, which was not submitted to the convention except in the form of the printed report. What was said there is as follows: 'The question of repairs of and detailed prices for repairs of steel cars, as well as prices for steel cars destroyed, has been carefully considered by your committee, and an effort made to obtain prices for these items, but the information obtained was so meager that it was thought best not to suggest any prices.' We think the point just taken by Mr. Humphrey is very good, but we could not indorse a suggestion to include it in our present rules without referring the whole matter of steel cars to a special committee on that subject, who would give all these questions more attention than the arbitration committee could do."

Mr. Humphrey's amendment was not adopted.

The recommendations of the committee were carefully considered and the rules were unanimously adopted as amended, their report being duly accepted and approved.

On motion it was decided not to include the "Per Diem" rules in the proceedings of the association.

REPORT OF COMMITTEES.

The discussion of cast iron wheels having been deferred, the subject was again taken up after the consideration of the Rules of Interchange had been concluded. On motion of Mr. A. M. Waitt the committee was continued and requested to confer with a representative committee from the Car Wheel Manufacturers' Association, in order that the Master Car Builders' Association may have the benefit of the best knowledge from all sides of the question. The committee is expected to have personal conferences with representatives of the wheel manufacturers and present the results of such conferences at the next convention of the association.

TOPICAL DISCUSSION.

Steel Cars.

The interesting subject of the steel car was introduced by the presentation of an individual paper by Mr. Humphrey. Because of its bearing on a topic so generally considered by railway officials, this paper is presented in abstract on another page of this issue.

The attention attracted by the steel car was emphasized by the extended discussion consequent upon the introduction of this topic. Mr. C. A. Seley (C., R. I. & P.) expressed the opinion that the matter of respective weight of wooden, steel and composite cars is largely a matter of design and the adaptation of car principles in applying strength of the members used. The carrying strength of the car should be placed in the underframing, the superstructure merely to have strength sufficient to carry it through its life. The depth of siding available on a hopper car or a gondola car affords room for a truss of such considerable strength there that is available below the floor line, that we can carry all of that portion of the load which naturally goes to the side and not carry it to the center sill by an upper construction. He considered the matter of rust of much importance and worth being cared for. As far as corrosion is concerned, it is a matter of local conditions which requires careful study by those whose cars are engaged in the transportation of coal, for such deterioration is due to the material contained therein.

Mr. J. J. Hennessey directed attention to a difficulty existing in the present construction of the majority of steel cars, viz., the fact that it is not the part which fails that costs the money to repair, but it is the labor involved in getting at that small part to make the necessary repairs.

While it was generally conceded that the steel car has not yet attained perfection in design, the opinion prevailed that this type is the car of the future. With reference to the class of labor to be employed in repairing steel cars it was the sense of the meeting that the ordinary car repairer is capable of performing this work satisfactorily, and should be trained to such work rather than place it in the hands of skilled mechanics.

REPORT OF COMMITTEES

Coupler Tests.

Owing to the absence of Mr. R. N. Duborow, chairman of the committee, Mr. Samuel Thompson (Penn.), who has been closely identified with the detail of the work in testing the couplers, presented the report in abstract and directed attention to the more important recommendations embodied therein. In view of the hour at which the subject was introduced the discussion of the report was deferred until the Wednesday session.

WEDNESDAY'S SESSION.

REPORT OF COMMITTEES.

Collarless Journals.

Mr. F. W. Brazier (N. Y. C. & H. R.) opened the Wednesday morning session by the presentation of the report of the committee on collarless journals. The concensus of opinion was that collarless journals do not give as satisfactory results as collar journals, as they wear excessively at the fillet and break off at that point. The opinion generally prevailed that collarless journals are more difficult to inspect on account of the journal bearing key covering up a part of the journal and also filling part of the box.

On motion of Mr. D. Van Alstyne (C. G. W.) a resolution was adopted urging the Pullman Company to consider a change of their standard as soon as possible, changing from collarless journals to journals with the M. C. B. collar.

Loading Long Material.

This subject was introduced by Mr. R. P. C. Sanderson (S. A. L.) in behalf of the special committee appointed for its consideration. In view of the amount of time which would be consumed by the association in taking up the rules and recommendations offered, it was decided, on motion of one of the members, to submit the matter to letter ballot, a method by which each rule and recommendation may be voted upon individually.

Tests of M. C. B. Couplers.

The discussion of the tests of M. C. B. couplers, deferred at the Tuesday session, was opened by Mr. W. F. Bentley (B. & O.). Taking up some of the recommendations of the committee, Mr. Thompson spoke, in part, as follows: "Your committee would like to suggest at this time that the large casting, the pattern of this, is freely offered by the Pennsylvania Railroad Company to any company which desires to make a test along these lines. We thought it was an important matter and we took it up so that we could in our next specification recommend a separate knuckle test for buying separate knuckles for repairs. The larger pattern, referred to above, which is the chief part of this device, is easily made, and we would like to get some data from the members so as to have some results to report on next year. There is no action to be taken there, I believe, but the specifications which come next, which have been under discussion—I do not know whether all the points here have been covered, but I believe the additional allowance of deflection for the guardarm test has been increased. This practice has been found very closely to approximate what we can get in a coupler. We find that 1⅞ ins. deflection will be ample for some couplers. Again, we find some couplers come very close to this 1⅞ limit, and to be just all around your committee believes that 1⅞ limit should be substituted in the specification instead of the 1-in.

As to the section relating to the ⅛-in. vertical play between the knuckle and the bars, I will state that this is found advisable in order to get perfect interchangeability in your knuckles without having bumps instead of the 1-16 of an inch allowed by the present specifications.

The new jerk test proposed requires one coupler to be tested, instead of requiring two couplers for each jerk test; we think further experiment during the coming year will bring out the point whether the new construction of the machine will allow us to use one coupler instead of two for this test; in other words, we will gain the price of one coupler on each test, if this scheme works out. Your committee recommends here that the long lever be still worked for, that we still try to get a lever operated from both ends of the end sill, during the coming year. The one feature about this is that there is a great deal of danger in cars coming together and not having a knuckle kicking device on the couplers. For this reason and others your committee recommends that the arrangement which gives a man two chances to cut or couple the cars, where with the single lever he has but one, should be used in connection with all freight equipment; that the railroads work along these lines in fitting up their various classes of cars and that, after a wider experience with the different kind of arrangements, several should be singled out and used as standards."

The ensuing discussion developed but little in addition to the report of the committee. On motion of Mr. Sanderson the committee was requested to prepare a draft of the exact recommendations to be submitted to letter ballot.

Outside Dimensions of Box Cars.

In the absence of the chairman of the committee, the report was read by Secretary Taylor. The drawings submitted with the report were not presented for adoption or recommended practice, but rather to induce discussion in order to endeavor to explain away existing discrepancies, with a view to the final adoption of a standard design acceptable to the association. After an extended discussion of the matter at hand, a motion was adopted to continue the committee and increase its membership to five, with instructions to further consider the question of suitable design for the standard box car, its outside dimensions and general construction above the floor.

Pipe Unions.

This report, being short, was presented by Mr. Quereau. On motion of Mr. Hennessey the association adopted the standards which were recommended by the American Society of Mechanical Engineers and also approved by the Master Mechanics' Association.

Steam and Air Line Connections.

In presenting this report Mr. H. F. Ball (L. S. & M. S.) gave the reasons of the committee for recommending a 2-in. steam train pipe. The experience of roads handling 10, 12 and 14 cars in the winter time has been such that it has been found very difficult to heat the rear cars in the train. Delays are also caused at terminals in getting steam through the train line. Experience shows that in severe weather at terminals where switching is done it takes from 10 to 15 minutes at times to get the steam through. With this in view the committee made a test on a train of 16 cars and the results show that a very material reduction in the steam pressure can be used for heating trains and the delays at terminals cut down very materially in getting steam through the train line. In the tests made by the committee it was found that by contracting the opening of the inlet valves the getting of steam through the train line at terminals is greatly facilitated. The committee does not recommend any particular diameter, but the tests were made with ¼-in. openings, from which very good results were obtained.

The ensuing discussion evidenced the association's approval of the 2-in. pipe, questioning, however, the adoption of such a standard, in view of the fact that the climatic conditions of the far south do not involve the necessary increase of efficiency in steam heat required in a more severe climate. On motion of Mr. Quereau the association gave its approval of the recommendations of the committee with reference to the diameter of steam train pipe and fittings and submitted the recommendations with regard to the location of the air brake, air signal and steam hose connection and dimensions of couplings, for approval as standard.

Signal Lamp Brackets and Sockets.

Mr. W. F. Bentley (B. & O.), in presenting this report, called attention to the necessity of a recommended practice in order that the builders of new equipment will have something as a reference. He further stated that the bracket presented is not a patented device and it is so arranged that it will accommodate any of the lamps now in use in addition to accommodating a flagstick, an arrangement which will do away with the necessity of carrying additional flagsticks in stock to be lost by trainmen.

In view of the considerable exchange of passenger equipment and the confusion which results from foreign cars with large brackets coming on to the various lines, the recommendations of the committee were adopted as recommended practice.

Pedestal and Oil Box for Passenger Cars with Axles Having 5 by 9 Inch Journals.

The report on this subject presented by Mr. T. B. Purves, Jr., was recived and submitted to letter ballot as recommended practice.

Car Lighting.

The report of the committee on car lighting was accepted and the committee discharged.

INDIVIDUAL PAPER.

Mr. George L. Fowler presented an individual paper on a "Review of the decisions of the Arbitration Committee," which met with very hearty applause.

REPORT OF COMMITTEES.

Standard Requirements for High Speed Foundation Brake Gear for Passenger Service.

This report was read by the secretary and the discussion opened by Mr. E. M. Herr. Replying to questions raised with regard to the adoption of malleable iron parts in this connection Mr. C. A. Seley expressed his belief that equivalent strength with perhaps light weight can be obtained in malleable iron by a distribution of the metal not feasible in wrought iron.

The Proper Design and Construction of Tank Car Equipment.

As there were no advance copies of this report distributed, the report was read in full by Mr. C. M. Blaxham (U. T. L.). After a short discussion of the designs of tank car equipment, the report was referred to the consideration of the American Railway Association with the indorsement of the Master Car Builders' Association.

Subjects.

The report of the committee on subjects, presented by Mr. Brazier, was duly accepted and referred to the executive committee.

Election of Officers.

In accordance with the usual custom the report of the committee on nominations was read and the secretary cast the ballot electing the following gentlemen: President, Mr. F. W. Brazier, assistant S. R. S., N. Y. C. & H. R.; first vice-president, Mr. W. P. Appleyard, M. C. B., N. Y., N. H. & H.; second vice-president, Mr. Joseph Buker, assistant S. M., I. C.; third vice-president, Mr. W. E. Fowler, M. C. B., C. P.; treasurer, Mr. John Kirby.

Executive Committee—Messrs. D. F. Crawford, J. T. Chamberlain, J. S. Chambers, and Mr. T. S. Lloyd to fill the unexpired term of Mr. L. T. Canfield

In behalf of the Supply Men's Association, Mr. Scott H. Blewett, in a few admirably chosen words, presented President Marden with the insignia of the past president of the association.

The American Society of Mechanical Engineers

IN interesting feature associated with this meeting of the Master Mechanics' Association was the convention of the American Society of Mechanical Engineers at the United States Hotel, Saratoga Springs, New York, June 23rd to 26th. The conventions of the two associations taking place at the same time offered an opportunity for an interchange of ideas, permitting the master mechanics to attend some of the sessions of the mechanical engineers and listen to discourses on questions prevailing in the more general field of mechanical engineering, at the same time placing at the disposal of the members of the latter organization a suitable occasion on which to obtain an insight into the problems of vital importance in the mechanical equipment of railroads.

The reports of the several committees and the individual papers presented, form valuable additions to existing technical literature. The meeting was well attended by members sufficiently interested to devote their time to the business at hand, with the result that the convention was a success in every way.

In the usual course of opening events the society was welcomed to Saratoga by Mr. A. L. Rohrer, who was responded to by President Dodge. Following the president's remarks, Professor Hutton read Mr. J. M. B.

Scheele's paper on the "United States Army Gun Factory at Watervliet Arsenal, New York." Mr. R. P. Bolton presented a paper describing a test made by him on an hydraulic elevator system recently installed in the new department store of R. H. Macy & Co. in New York City. After some criticism of the results obtained by the test, a paper was read by Mr. J. B. Blood, presenting a proposed form of rational train resistance formulae.

The Wednesday morning session was opened with a report of the tellers on the election of members, at which time it was announced by President Dodge that all members who are elected are immediately entitled to the full privileges of membership without further formality.

The matter of the Union Engineering Building, for the construction of which Mr. Andrew Carnegie has offered $1,000,000, was taken up and a set of resolutions adopted expressing the appreciation of the society and empowering the council to carry out the details necessary to realize the generous purpose of Mr. Carnegie.

The result of the vote with reference to the metric system problem indicated the fact that the majority of members are opposed to the adoption of the metric system as the only legal standard.

The revision of by-laws was taken up and the report of the committee on revision was clearly presented by Mr. O. W. Hunt, chairman. After some discussion it was voted to print the new constitution as drafted by the committee and after circulating it among the membership to put its adoption to letter ballot prior to the December meeting.

Professor Spangler presented a report of the committee on specifications, which was accepted to be printed for distribution and final discussion by the society.

The regular paper, entitled "Turbine Flow Recorder," by C. M. Allen, was placed before the meeting, but was not discussed.

Some data on hoisting hooks by John L. Bacon was read in abstract by the secretary and was ably discussed by Mr. Waldron.

Mr. Bacon gave a description of the manner in which the hooks were tested and the different material and treatment of each. These included plain iron, carbonized and hardened, and round and triangular sections. The test showed that the untreated hooks sustained considerable deflection before yielding and the treated hooks, while giving a higher yielding point, would break with small deflection and little warning.

"Strains Produced by Excessive Tightening of Nuts," a short paper by A. Bement, was read and elicited considerable discussion as to the possibility of preventing the evils resulting from careless or ignorant use of main strength in setting up nuts.

Mr. Henning said that in many cases it is better to use a large number of small bolts than a smaller number of large bolts. In the former case, if nuts are tightened unduly, the bolts will break instead of the casting, and as the spacing between bolts is smaller, the tension upon the nuts to prevent leakage does not need to be so great.

"An Indicating Anglemeter," by C. E. Sargent, was the next paper considered, but it met with little discussion.

A paper by Mr. Stanley H. Moore on "Fits and Fitting," was presented by the secretary.

The paper by Mr. Charles Day of Philadelphia on "The Machine Shop Problem," the paper by Mr. H. L. Gantt of Schnectady, N. Y., on "A Graphical Daily Balance in Manufacture," and the paper by Mr. Fred W. Taylor of Philadelphia on "Shop Management," were read at the Wednesday afternoon session and because of the relationship existing among them they were considered largely together in the extended discussion which ensued.

Mr. F. A. Waldron presented a paper on the "Steam Turbine from the Operating Standpoint." This paper met with a brief discussion which developed nothing of importance.

The Thursday morning session opened with a paper by Mr. E. A. Hitchcock on "The Experiment Boiler of the Ohio State University, with Results of Some Trials." Following the discussion of this subject, the society passed to the consideration of a paper by Prof. Jacobus, "Water and Heat Consumption of a Compound Engine at Various Powers," which in turn was followed by Mr. McGeorge's paper on "Drawing Office Equipment."

The secretary read a communication from the Pennsylvania Railroad Company calling attention to the proposed locomotive tests which they purpose instituting at the Louisiana Purchase Exposition, to be held in St. Louis next year, and requesting the society to appoint a committee of three members to act with a like committee to be named by the railroad Master Mechanics' Association in supervising the tests. The president appointed the following gentlemen to act in this capacity, Mr. E. M. Herr, Mr. J. E. Sague, and Mr. W. F. M. Goss.

The next paper presented was on "The Bursting of Emery Wheels," by Mr. Chrales H. Benjamin.

After a brief discussion of the "Topical Discussions and Notes of Experience" submitted, the meeting adjourned until the Friday afternoon session, which was held at the Union Chapel in Schenectady.

On Friday morning the society went to Schenectady by a Delaware & Hudson special train, which arrived at the Schenectady plant of the American Locomotive Company at 10:30. The works were inspected, the party being escorted by officials of the company to all points of interest, especially the new buildings.

After luncheon the members went to the Union College chapel, where the fifth professional session was held. The first paper was by Mr. John Riddel on "A 60-Foot Boring Mill," which he designed for the General Electric Company.

Mr. W. F. Slichter presented a paper on "Alternating Current Motors for Variable Speed."

"Positive Governor Drives," by Mr. A. H. Eldrege, was next paper on the program, and it was read in abstract by the secretary. The author strongly advocates the use of gearing or sprocket and chain to replace belts for governor drive.

The society passed a vote of thanks to Union College for courtesies extended and to the American Locomotive works, the General Electric Company, and to the ladies of the local committee for the hospitality and kindness shown the society at the meeting.

Prof. Hutton called the attention of the society to the heroic death of Mr. Edward Grafstrom, a member of the society, employed as mechanical engineer by the Atchison, Topeka & Santa Fe, who lost his life by the upsetting of the small steamboat he was in change of after he had succeeded in rescuing seventy-seven persons from the flooded Topeka district, and the society voted that an appropriate minute should be inserted in its transactions relative to the death of the member.

At the conclusion of the business session the members of the society went to the General Electric Works. Under the direction of Mr. Emmons, Mr. Rohrer and Mr. Rice, the party were shown through the shops. Afterward the members of the society enjoyed a ride on the single-phaze motor cars which are being tested on the test track of the company.

The sixth session was opened by a paper entitled "Test of a 12-Horsepower Gas Engine," by Prof. C. H. Robertson. This paper gave the record of tests made at Purdue University and continuing over a period of six years. The equipment of the engine with indicator rig, Prony brake, gas meter, etc., was shown and described.

A paper by Mr. H. F. Halladay and Mr. G. O. Hodge was read in abstract by the secretary. This paper was the outgrowth of a series of tests made to determine the economic performance of a standard internal combustion engine of the Otto type using kerosene and gasoline under similar conditions. The engine used was a standard horizontal four-cycle type, made by the Otto Gas Engine Company.

Other papers were presented in abstract on "Gas Engine Testing," by Mr. E. G. Oliver; "Comparative Oil Tests," by Mr. W. F. Parish, and "Test of an Eight-foot Fan Blower," by Mr. E. S. Farwell.

The paper on a "Hot Well as an Oil Extractor," by Mr. A. H. Eldredge, was presented and discussed by Mr. Carey. The paper on the "Mechanics of Air Brake Systems," by Mr. H. G. Manning, was withdrawn by the Publication Committee.

In closing the session and convention a set of resolutions expressing thanks to the various concerns and persons who had contributed to the entertainment of the society was read by the secretary and accepted by the members. President Dodge, in a few happily chosen words, then closed the convention.

Personals

Mr. C. P. Cramer has resigned as general foreman of the Baltimore & Ohio shops at Lorain, O.

Mr. Arthur H. Fetters has been appointed assistant mechanical eugneer of the Unon Pacific, with headquarters at Omaha, Neb.

Mr. H. C. Ellsner has been appointed general foreman of the Baltimore & Ohio terminals at Chicago, to succeed Mr. H. E. Hess.

Mr. P. K. Sullivan, traveling engineer of the Ohio River division of the Baltimore & Ohio Southwestern, has resigned.

Mr. A. F. Currier has been appointed superintendent of the car record department of the New York, New Haven & Hartford, with office at New Haven, Conn.

Mr. Howard Jones has re-entered the service of the Nashville, Chattanooga & St. Louis as chief draughtsman.

Mr. J. B. Gannon has been appoinetd master mechanic of the Central New England, with headquarters at Hartford, Conn., to succeed Mr. W. A. Brown, resigned.

Mr. J. C. Nolan, master mechanic of the Arkansas Southern, has also been appointed superintendent, with headquarters at Ruston, La.

Mr. Robert B. McLaren has been appointed assistant road foreman of engines of the Pittsburg division of the Pennsylvania Railroad, with office at Pitcairn, Pa.

Mr. Nicholas Lynam, assistant master mechauic of the Pennsylvania Railroad at Harrisburg, Pa., has resigned to accept a position with the Pennsylvania Steel Co.

Mr. Wliiam B. Ott has been appointed assistant master mechanic of the Pennsylvania at Harrisburg, Pa., to succeed Mr. Lynam, resigned.

Mr. Ira Southwick has been appointed master mechanic of the Toledo & Western, with headquarters at Sylvania, O., to succeed Mr. Johu Cunningham, resigned.

Mr. W. A. George, who recently resigned as master mechanic of the Colorado & Southern, has been appointed roundhouse foreman of the Chicago & Alton at Bloomingtou, Ill.

Mr. H. L. Bartels has been appointed road foreman of engines of the Baltimore & Ohio, with headquarters at Parkersburg, W. Va., to succeed Mr. P. K. Stillman, resigned.

Mr. W. V. Turner has resigned as superintendent of air brake inspection of the Atchison, Topeka & Santa Fe, to accept a position with the Westinghouse Air Brake Company.

Mr. George T. Depue has beeu appointed master mechanic of the Erie at Hornellsville, N. Y., to succeed Mr. Joseph Hainen, resigned to accept service with another company.

Mr. John Wahlen has been appointed master mechanic of the Montpelier & Wells River, with headquarters at Montpelier, Vt., to succeed Mr. G. Jacobson, deceased.

Mr. W. T. Aylesbury has been appointed car accountant of the Terminal Railroad Association of St. Louis, to succeed Mr. C. B. Horner, who has been assigned to other duties.

Mr. S. L. Bean, who recently resigned as superintendent of shops of the Northern Pacific at Brainerd, Minn., has been appointed master mechauic of the Atchisou, Topeka & Santa Fe, with headquarters at Albuquerque, N. M.

Mr. J. W. Dalman, who recently resigned as master mechanic of the Baltimore & Ohio at Newark, O., has accepted the position of assistant master car builder of the Union Tank Line, with headquarters at New York.

Mr. E. A. Walton, division superintendent of motive power of the New York Central & Hudson River, has removed his headquarters from Corning, N. Y., to Oak Grove, Pa. Mr. Waltou will have supervision of the building of the new shops at the latter place.

Mr. H. C. Van Buskirk has been appointed general master mechanic of the Fort Worth & Denver City, with office at Childress, Tex., to suceed Mr. Milton Player, whose title was master mechanic.

Mr. W. S. Murian has been appointed master mechanic of the Southern at Alexandria, Va. Mr. W. H. Hudson has been appointed master mechanic at Atlanta, Ga., to succeed Mr. W. L. Tracy, resigned.

Mr. Thomas Melrose has been appointed works foreman (superintendent of shops) of the Mexican Railway at Apizaco, Mex., and Mr. W. Newton has been appointed ruuning shed foreman (roundhouse foreman), with headquarters at Orizaba, Mex.

Mr. F. F. Clayton has beeu appointed car accountant of the San Pedro, Los Angeles & Salt Lake Railroad, with office at Salt Lake City, Utah. Mr. Clayton has heretofore been chief clerk in the car accountaut's office of the Oregon Short Line.

Mr. E. R. Thomas has been appointed master mechanic of the Chicago & Northwestern at Winona, Minn., to succeed Mr. William Hutchinson, who has been transferred to Mason City, Ia., to succeed Mr. E. B. Thompson.

Mr. R. W. Burnett has been appointed general foreman of freight and passenger car repairs of the Central Railroad of New Jersey, with headquaretrs at Elizabethport, N. J.

Mr. G. A. Bowers, who recently resigned as master mechanic of the Southern Railway at Alexaudria, Va., has been appointed master mechanic of the Baltimore & Annapolis

Short Line and Annapolis, Washington & Baltimore, with headquarters at Annapolis, Md. Mr. Bowers formerly held this position before going to the Southern.

Mr. J. P. McMurray, fomerly traveling engineer of the Rio Grande division of the Santa Fe, has been transferred to a similar position on the Pan Handle division, with headquarters at Newton, Kan.

Mr. A. W. Wheatley, master mechanic of the Northern Pacific at Glendive, Mont., has been transferred to Brainerd, Minn., as superintendent of shops to succeed Mr. S. L. Bean, resigned. Mr. J. F. Cutler, heretofore general foreman of shops at Mandan, S. D., has been appointed master mechanic at Glendive, Mont., to succeed Mr. Wheatley. Mr. John Jackson, heretofore foreman of machine shops at Brainerd, has been appointed general foreman of shops at Livingston, Mont.

Mr. F. P. Barnes, who recently resigned as master mechanic of the Atchison, Topeka & Santa Fe at Albuquerque, N. M., has been appointed superintendent of motive power and machinery of the El Paso & Northeastern system, with headquarters at Alamogordo, N. M. Mr. C. W. Wurst, who was recently appointed acting superintendent of motive power and machinery, has become connected with the Baldwin Locomotive Works.

Mr. George R. Henderson has resigned as superintendent of motive power of the Atchison, Topeka & Santa Fe, to take effect on August 1. Mr. Henderson was formerly assistant superintendent of motive power and machinery of the Chicago & Northwestern, going to the Atchison, Topeka & Santa Fe as assistant superintendent of machinery on June 1, 1901. He was appointed superintendent of motive power of the latter on January 1, 1902.

Mr. George W. Smith, assistant superintendent of machinery of the Illionis Central, has been appointed master mechanic of that road at Burnside, Ill., to succeed Mr. F. E. Place, resigned. Mr. Smith was formerly master mechanic of the coast lines of the Atchison, Topeka & Santa Fe, which position he resigned in April, 1902, and a month later entered the service of the Illinois Central as master mechanic at Waterloo, Ia. In September, 1902, he was appoinetd assistant superintendent of machinery.

Mr. W. F. Teat has been appointed master mechanic of the Atlanta, Knoxville & Northern, with headquarters at Blue Ridge, Ga., to succeed Mr. S. J. Anderson, who was recently killed in an accident. Mr. Teat has heretofore been general foreman of the Louisville & Nashville shops at Montgomery, Ala., for two years, and previous to that time was master mechanic of the Shreveport & Red River Valley Railroad.

The following appointments have been announced in an official circular issued by W. S. Morris, mechanical superintendent of the Erie: "Mr. C. E. Fuller is appointed assistant mechanical superintendent of this company and its operated and controlled lines. Mr. W. C. Hayes is appointed assistant mechanical superintendent of this company and its operated and controlled lines, vice Mr. George Donahue, resigned. Effective on June 1, 1903." Headquarters, Meadville, Pa. Mr. Hayes heretofore has been general road foreman of engines at Meadville.

Mr. J. E. Muhlfeld, superintendent of motive power of the Newark, Chicago and Cleveland divisions of the Baltimore & Ohio, has been appointed general superintendent of motive power for that road, with headquarters at Baltimore, Md., effective on June 1, to succeed Mr. F. D. Casanave, resigned. Mr. Muhlfeld was formerly superintendent of rolling stock and machinery of the Intercolonial Railway of Canada and went to the B. & O. last October as assistant to the general superintendent of motive power. He was made division superintendent of motive power at Newark, O., on February 1 of this year.

Mr. G. A. Schmoll, master mechanic of the Baltimore & Ohio at Baltimore, Md., has been appointed division superintendent of motive power of that road, with headquarters at Newark, O., to succeed Mr. J. E. Muhlfeld, promoted. Mr. C. T. Turner, formerly general foreman at Mount Clare, succeeds Mr. Schmoll, and Mr. C. J. De Vilbies, formerly master mechanic at Cleveland, is transferred to Newark, O., as master mechanic, in place of Mr. J. W. Dalman. He is succeeded at Cleveland by G. F. Hess, formerly general foreman at South Chicago. Mr. J. D. Harris, assistant to general superintendent of motive power, has resigned.

The following changes in the mechanical department of the Southern Railway are announced and took effect on June 22: Mr. Joseph Hainen is appointed general master mechanic of the Eastern district, with office at Greensboro, N. C. Mr. Alexander Stewart is appointed general master mechanic of the Western district, with office at Chattanooga, Tenn. Division master mechanics in each district will report to the general master mechanic of that district. The positions of assistant mechanical superintendent, general foreman of car repairs and general engine inspector are abolished. Mr. S. M. Dolan is appointed master mechanic of the Mobile division, vice Mr. S. R. Richards, transferred. Mr. S. R. Richards is appointed master mechanic of Danville, Charlotte and Asheville divisions, vice Mr. J. T. Robinson, resigned. Mr. J. B. Michael is appointed master mechanic of the Knoxville division, vice Mr. A. Stewart, promoted.

A pathetic incident of the recent floods in the Topeka-Kansas district was the death of Mr. Edward Grafstrom, mechanical engineer of the Atchison, Topeka & Santa Fe Railway, who lost his life by the upsetting of a small steamboat which he had used in rescuing seventy-seven persons from the flood. Mr. Grafstrom was born at Notola, Sweden, December 19, 1862. He was educated at Orebro Classical University and at Boras Technical University, where he received the degree of mechanical engineer at the age of 19. Upon his arrival in America, in 1882, he immediately became connected with the Pennsylvania Railroad in the shops at Altoona. He was shortly promoted and sent to Columbus, O., where a few years later he became chief draftsman for the company. After serving the Pennsylvania Company for seventeen years, he accepted the position of mechanical engineer for the Illinois Central Railroad, which place he soon left to take the same position with the Atchison, Topeka & Santa Fe Railway.

Notes of the Month

One of the most unique and beautiful publications issued by the passenger department of the Boston & Maine Railroad, Boston, is the "Colored Bird's Eye View" showing the White Mountains region as viewed from the summit of Mt. Washington. It is circular in shape, printed in colors and shows the ravines, lakes, mountain tops and valleys. These interesting points are all numbered, and the key at the bottom gives the name of each number. It is valuable as a guide for the person intending to visit the mountains, and makes an interesting souvenir or reminder for the tourist who has once been in this section. The "Bird's Eye Map" will be mailed to any address upon receipt of six cents in stamps by the Passenger Department, Boston & Maine Railroad, Boston.

Attention is called to the following corrections for Trautwine's Civil Engineer's Pocket Book, 18th edition, 1902:

Page.

434. Line 8. For 62.5 h, read $62.5\ h.\ \frac{h}{2} = 31.25\ h^2$.

This supposes the back of the block to be vertical. In any case,

p = 62.5 × area of back of block × depth of center of gravity of back below water surface.

490. In first figure, for 0.125, read — 0.125.

526. Table 3. In each case the * should be over Diam. in ins.

758. End of last line under Impact. For **D**, read **Oo**.

877. Weight of iron bar 8¾ ins. square, 1 ft. long. For 247.9, read 257.9.

882. First foot note. For See p. 247, read See p. 526.

Mention has been made several times recently concerning the rapid strides which have been taken by the Pressed Steel Car Company of Pittsburg, in the manufacture of pressed steel cars, and it is with pleasure that we note that this company has made and shipped up to and including May 29, 1903, 100,467; this figure represents the actual number of cars which are in service today manufactured by the Pressed Steel Car Company, which includes steel cars as well as wooden cars for which steel underframes have been furnished. This company has, for some time past, shipped over 120 cars per day from their McKees Rocks and Allegheny plants, using in the manufacture of these cars from 45,000 to 50,000 tons of steel plates per month. From the present outlook, all previous records in the car building industry which have been established will be eclipsed; it is estimated that the output this year will exceed 38,000 finished cars.

Large orders for cars, both wooden and steel, have been received for early delivery, in addition to a large number of pressed steel body and truck bolsters, freight car and engine tender trucks, as well as other pressed steel specialties for wooden and steel cars.

H. B. Underwood & Co. have recently doubled the capacity of their shop at 1025 Hamilton St., Philadelphia, by building an addition exetnding 125 ft. to Buttonwood St. They have replaced all out of date tools and appliances with modern equipment, and while their shop is not one of the large ones, it is better equipped than any other shop of its size.

Some of the recent additions of tools include a complete equipment of guages, Niles double tool boring and turning mill, a Fellows gear shaper, a No. 2 Colburn keyseater, a five-foot Pond radial, new lathes, cold saw and a complete equipment of small tools.

The portable tool business of this concern has more than doubled since Mr. D. M. Pedrick has taken charge of the mechanical end of it, and the business of their repair department has increased since they enlarged their plant. The concern was established in 1870 by L. B. Flanders and Mr. D. W. Pedrick has been connected with it ever since.

Their reputation for turning out the highest grade of portable cylinder boring bars, portable rotary valve seat planing machines and many other special portable tools is well known among the master mechanics throughout the country.

Consider Colorado as a place to spend your summer vacation and you will find that it meets the requirements. Colorado has been brought nearer the east by our fast train service—only one night on the road from Chicago or St. Louis to Denver. The railroad fare is low during the summer—about one-half the regular fare, and on certain days less than half. Colorado has hundreds of moderate-priced hotels and boarding houses—more perhaps than any summer resort country. The prices range from $8 per week upward. Nowhere can be found such a glorious combination of climate and scenery as in Colorado. The air invigorates, strengthens, revives—it is Nature's own tonic. All the outdoor sports that can be enjoyed anywhere are possible in Colorado. Plenty of golf courses and the finest kind of trout fishing. Just consider these facts for a minute and then write for a copy of the Burlington's "Handbook of Colorado." It does not attempt a description of Colorado's charms, but it does tell facts about 200 or more hotels and boarding houses—shows the location, how reached, name and address of proprietor, rates by the week and month, principal attractions, etc. No charge for a copy. Will be glad to send copies to your friends.

Among the orders recently received by the Hicks Locomotive & Car Works are the following: Two combination cars and two passenger coaches for the Chicago Short Line Ry.; one baggage car for the Duluth, Missabe & Northern Ry.; two chair cars to the Waterloo & Cedar Falls Rapid Transit Co.; two coaches for the Lehigh & Hudson River R. R.; one passenger coach, one combination car and one caboose for the Tremont & Gulf R. R.; one passenger coach for the Transylvania R. R.; one freight locomotive for the Pine Bluff & Western R. R.; fifty gondolas and one 50-ton freight engine to the Trinity & Brazos Valley R. R.; ten flat cars for the Weed Lumber Co.; ten flat cars for the Coos Bay, Roseburg & Eastern Ry.; one six-wheel engine for the Bowling Timber Co.; one six-wheel switch engine for the International Harvester Co.; two constructon locomotives for McArthur Bros.; one 50-ton mogul engine to the Itasca Lumber Co.; one 40-ton mogul to the Berry Lumber Co.; one theatrical car to D. H. Gillispie; one theatrical car to Ward & Wade; twenty-five refrigerator cars to the Chicago Great Western Ry.; fifteen freight cars and two locomotives to the Council City & Solomon River R. R.; one locomotive, one passenger coach, one combination car and one baggage car and ten floats to the South & Western Ry.; one additional freight engine to the Santa Fe Central Ry.; one freight locomotive and one caboose to the Waterloo & Cedar Falls Rapid Transit Co.; one six-wheel switcher to the German-American Lumber Co.; one baggage car to the Butte, Anaconda & Pacific R. R.; one hundred flat cars to the Cuba Co.; twenty flat cars to the Coeur d'Alene & Spokane Ry.; fifteen flat cars to the Nash Lumber Co.; one six-wheel switch engine to the American Lumber Co.; one locomotive to the Florida & Alabama Land Co.; two narrow-gauge engines for Garvey Bros. & McGee.

W. P. Crockett, vice-presdent St. Paul Ry. Supply Mfg. Co., has been appointed Chicago representative of the Northern Metallic Packing Co., of St. Paul, and will handle their well-known Northern metallic packing and the Curran locomotive chime whistle.

NOTES ON TRACK.—By W. M. Camp, editor of the Railway and Engineering Review. Published by the author at the Manhattan Building, Chicago. Bound in cloth, 6½x10 ins.; price $3.00 per copy, postage paid.

This book contains 1214 large-size pages and 620 illustrations, 160 of which are reproductions from photographs. The book treats of both track construction and track maintenance exhaustively, going thoroughly into all the details. There are twelve chapters on the following subjects: I, Roadbed; II, Track Materials; III, Track Laying; IV, Ballasting; V, Railway Curves; VI, Frogs and Switches; VII, Track Maintenance Work; VIII, Double-Track Construction; IX, Track Tools; X, Work Trains; XI, Miscellaneous Subjects; XII, Maintenance of Way Organizations. There is also a chapter of supplementary notes and tables covering a variety of interesting subjects identified with track work, and tables for measurements of point and stub switch turnouts, measurements of crossovers, yard tracks, etc. There is a very complete index, covering 18 pages of the book, and containing 3036 headings and 3714 separate references, which renders the book convenient for reference purposes.

Although the title of this book indicates that it has been written mainly for the engineering and maintenance of way departments, it nevertheless contains a great deal of information that is of use to the mechanical or motive power department. There is an original and thoroughgoing exposition of one subject which, so far as we are aware, is not treated in any other book, and that is "The Action of Car Wheels on Curves." The treatment of this subject covers 26 pages of the book and goes into a thorough explanation of the phenomena attending the action of car wheels in passing curved track, including the relative position of the wheel flanges with respect to the rail head, the canting of rails on curves and the necessity for widening the gage on curves. The action of four-wheel car trucks and of each type of locomotive wheel base is taken up separately and carefully anaylzed with reference to its behavior on curved track. There is a careful discussion of the effect which the flanging of all the drivers of consolidation and mastodon locomotives has with reference to the widening of gage on curves. Sharp Curve and Curve Guard Rails, Rail Wear, Sharp Flanges and Derailments are subheadings under this section of the book, and all these are carefully and full discussed.

Another interesting part of the book, from a mechanical standpoint, is the treatment of the subject of the effect of improper locomotive counterbalancing, when engines pass over track at high speed. The book shows photographic illustrations of track which has been damaged by improperly counterbalanced locomotives running at high speed, and locomotives hauled over track at high speed without side rods. In the same connection the interesting series of experiments on the effect of locomotive counterbalancing carried out at Purdue University by Professor W. F. M. Goss a number of years ago is described in connection with the author's treatment of the subject.

The striking feature of this, the latest book on track construction and maintenance of way, is the large amount of detail information intended for all classes of railway men. The preface states that the author's aim in writing the book was to treat the subject from the standpoints of both trackmen and engineers, making the book useful to all concerned with railway building and maintenance. The book is printed on a fine quality of paper, showing the half-tone illustrations clearly and, being set in long primer type, it is easily legible. Altogether it contains something more than three-quarters of a million words, and it will undoubtedly be regarded among railway engineers as a standard work on track and maintenance of way.

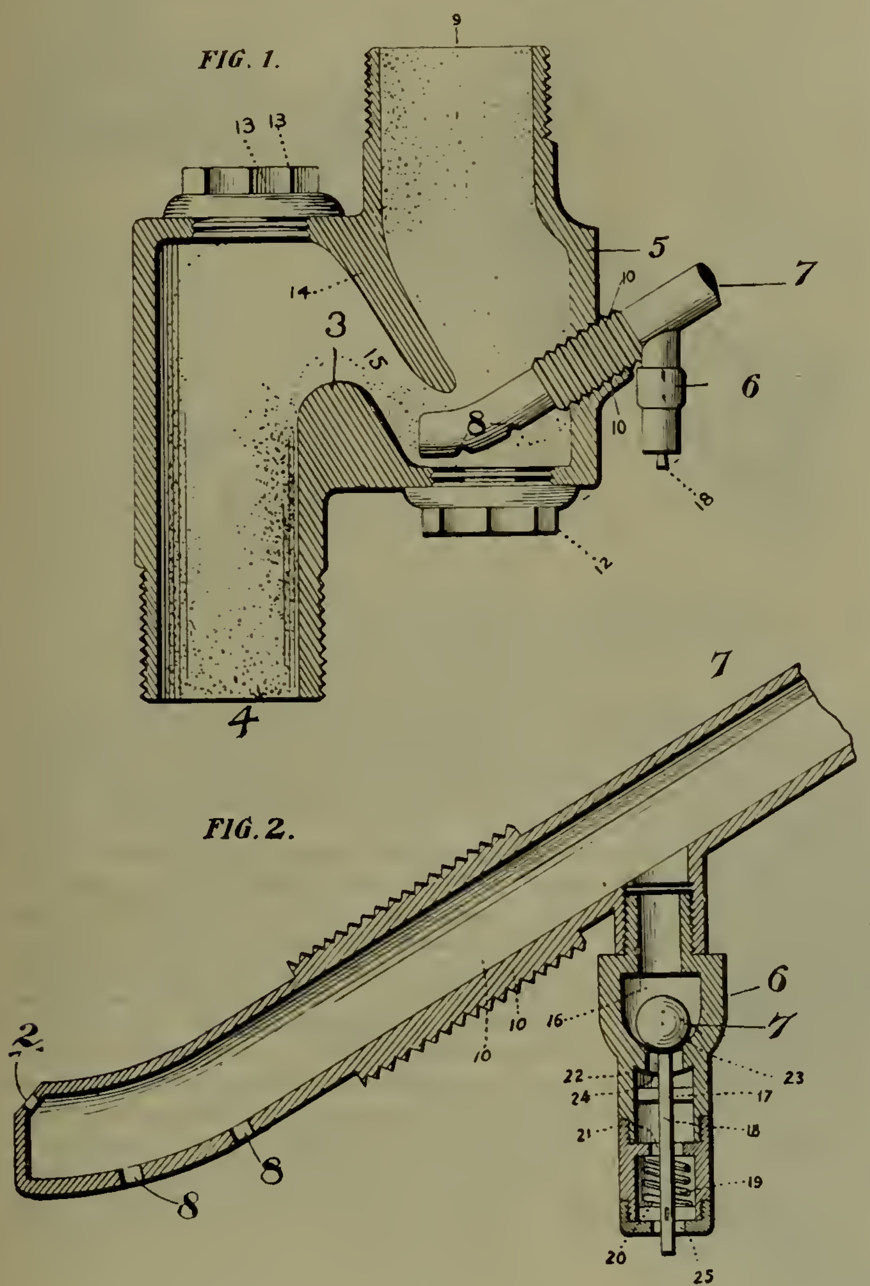
Curtain Fixtures

The public is readily appreciative of devices which add to the convenience of maintaining its comfort and the average traveler is interested in the attachments for manipulating curtains in cars. The L. C. Chase Company, of Boston, has originated a device whereby the fixtures holding curtains in position may be conveniently operated by the mere pressure exerted by the thumb when grasping a curtain to raise or lower the same. This curtain fixture is applied in the usual position. The pieces operating in the curtain groove consist of two small lips which exert pressure against the sides of the groove, one of the lips being so hinged as to permit lateral motion. Within a sleeve in the lower portion of the curtain is a spiral spring to expand the lips and the device for compressing this spring and releasing the curtain is operated by merely exerting a light pressure upon a plate placed centrally on the lower edge of the curtain. A further convenience of this device is afforded by the fact that merely pressing any point of the curtain rod toward the exterior of the car will fold the lips together and release the curtain. The entire curtain, as well as this fixture, is manufactured by the L. C. Chase Company.

The Edwards Simplex Air Sander

For Use on Either Locomotive or Street Cars.

The accompanying line drawing shows an upright sectional view of the trap. These sanders have been in use for some time on the P. & L. E. R. R. and it is claimed by the motive power officials that they have many points of advan-



Edwards Simplex Air Sander.

tage over other styles of sanders now on the market, viz.: The nozzle is always buried in the sand and pointing toward the opening it readily discharges the sand over the bridge where gravitation along with the blast carries it to the rail. It can be readily seen that it does not require but a small amount of air to operate this device as the sand cannot cake or pack in the trap, it is guaranteed by the inventor and manufacturer to put sand on the rail as long as there is sand in the box and trap. The inventor and patentee of this device is F. H. Edwards, proprietor of the American Metallic Packing and Supply Co., of Cleveland, O., who are placing it upon the market. Any further information regarding it can be had by addressing the above named company.

Fire Protection Engineering

In response to urgent requests from insurance companies, architects, and contractors, Armour Institute of Technology offers a four years' course in fire protection engineering, leading to the degree of Bachelor of Science. This course will be inaugurated at the opening of the college year, Sept. 21, 1903, under the direction of Prof. Fitzhugh Taylor, formerly engineer of the Underwriters' laboratories. The requirements for admission are identical with those for the mechanical, electrical, civil and chemical engineering courses. Advanced students who desire to enter this course will be given due credit for work done in other engineering courses of the college of engineering of Armour Institute of Technology or of other colleges. A special feature of the course will be a series of lectures by prominent insurance officials, architects, and contractors, upon the practical features of their work. For further information address Victor C. Alderson, Dean.

Fabrikoid

"Fabrikoid" leather is a leather substitute which has been in use in this country for a number of years with entire satisfaction in the upholstering of furniture, car seats, carriages, and the application of "Fabrikoid" is so varied in other channels that we have not space herein to give full details, except to state that it is a substance which enters into the manufacture of dress shields, hat sweats, shoes, bookbinding, paint, and numerous other articles.

The Fabrikoid Company found its business increasing with such rapidity that last spring it was thought wise to move to Newburgh, where ample space could be obtained for enlarging and where there was an ample water supply. New works were erected and an ideal plant for the purpose installed.

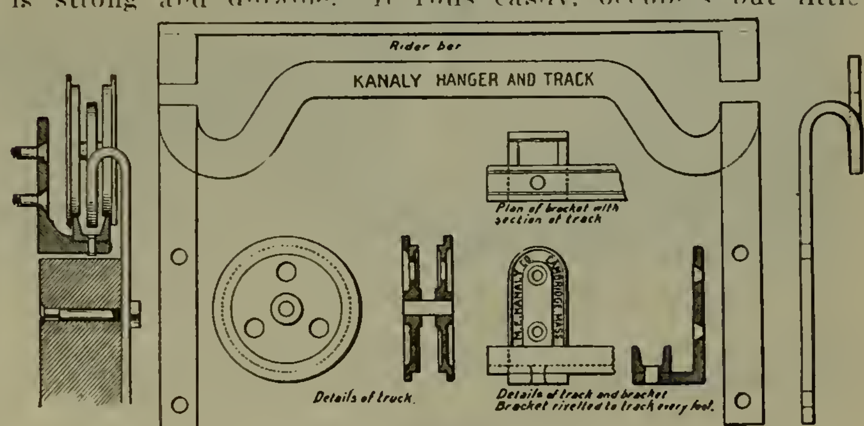
Artificial leather has been in growing demand of late years, as, through the improved processes, an artificial leather could be built up which will wear about as well as real leather, and whose appearance would deceive, sometimes, experts. The cost of the artificial leather, as compared with the real article, shows a large margin in favor of the artificial product.

"Fabrikoid has received the stamp of approval on the part of the government and is used in the U. S. navy for boat cushions, where it is subjected to very severe and climatic conditions; in the postal department for carriers' bags, and in the other departments for table coverings and cushions. Some of the largest railway lines in the United States have been using Fabrikoid for years with perfect satisfaction. It is also being used for car curtains, both for open trolley cars and railway coaches.

The Fabrikoid Company has only lately entered into the manufacture of car curtain materials, but it is anticipated that this branch will advance as rapidly as the other branch of their business. Their claim is that "Fabrikoid" is better than the real hide, and numerous letters of customers attest to the truth of this statement. A number of testimonials from some of the largest manufacturers in the country who have used "Fabrikoid" extensively bear out all the claims that the company make for their material.

The Kanaly Door Hanger

Shown herewith in detail are the parts of the Kanaly Door-Hanger, a device which is so arranged that it is impossible to become derailed and is easily applied to any door. The hanger proper is made of one piece of steel, therefore requiring no rivets in construction. The track is of channel steel with malleable iron brackets and the limits of the run are prescribed by the curves of the rider bar. The construction of parts is such as to produce an appliance which is strong and durable. It runs easily, occupies but little



The Karaly Door Hanger.

space above the door and a fact worthy of consideration is that the hanger will last the life of the car to which it is applied.

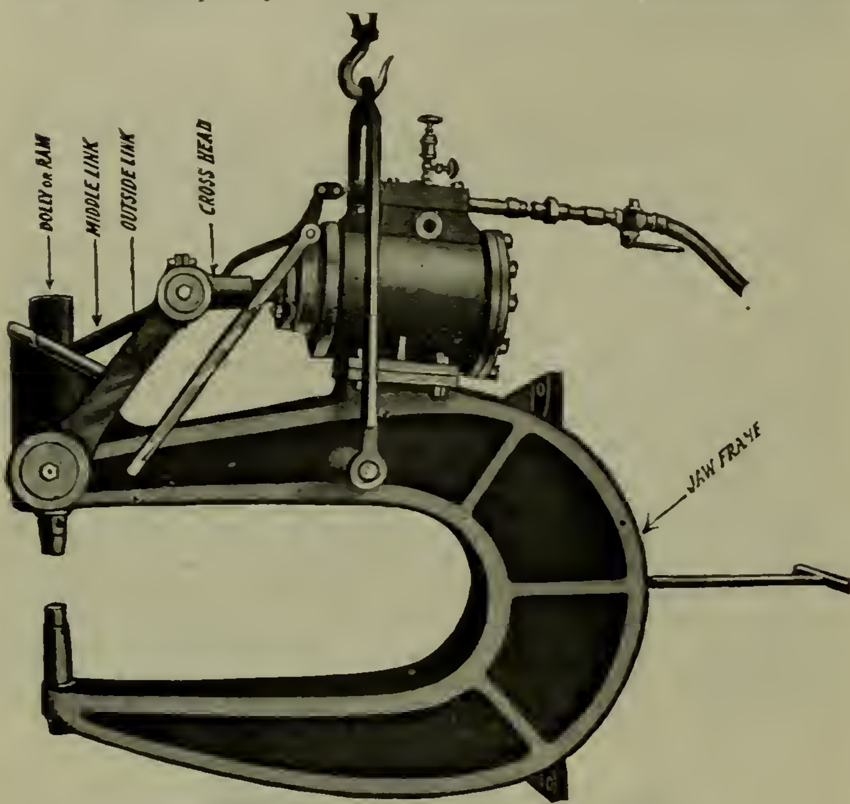
This device is manufactured by the M. E. Kanaly Co., 299 Prospect street, Cambridgeport, Mass.

The Allen Pneumatic Riveters

John F. Allen, 370-372 Gerard avenue, New York City, was the pioneer in the manufacture of portable pneumatic riveting machines and one is sure to find "Allen" riveters included in the equipment of the leading railroad and other machine shops of the country. The simplicity in construction of these machines, combined with ease of operation, together with the very satisfactory results obtained in their use, has lead to them being widely imitated.

A good idea of the standard type of Allen Riveter will be obtained from a study of the engraving presented herewith, which shows a machine with 10-inch cylinder and capacity up to 1-inch rivets. In its construction the piston rod connects levers of different lengths, forming a toggle joint. The lower ends of the larger levers are attached to fixed centers on the frame and the end of the central short lever is attached to the dolly-bar, into the lower end of which the head-tie is screwed. By this latter arrangement any change that is desired in the distance between the dies can be easily effected.

A different leverage is obtained which affords a pressure not found, it is claimed, in any other riveter, patent rights on which were granted Mr. Allen. There is also a patented cut-off contrivance which prevents any possible leakage of air. The dolly-bar acts in a direct line with the axis of the rivet. The capacity of the Allen riveters is guaranteed and



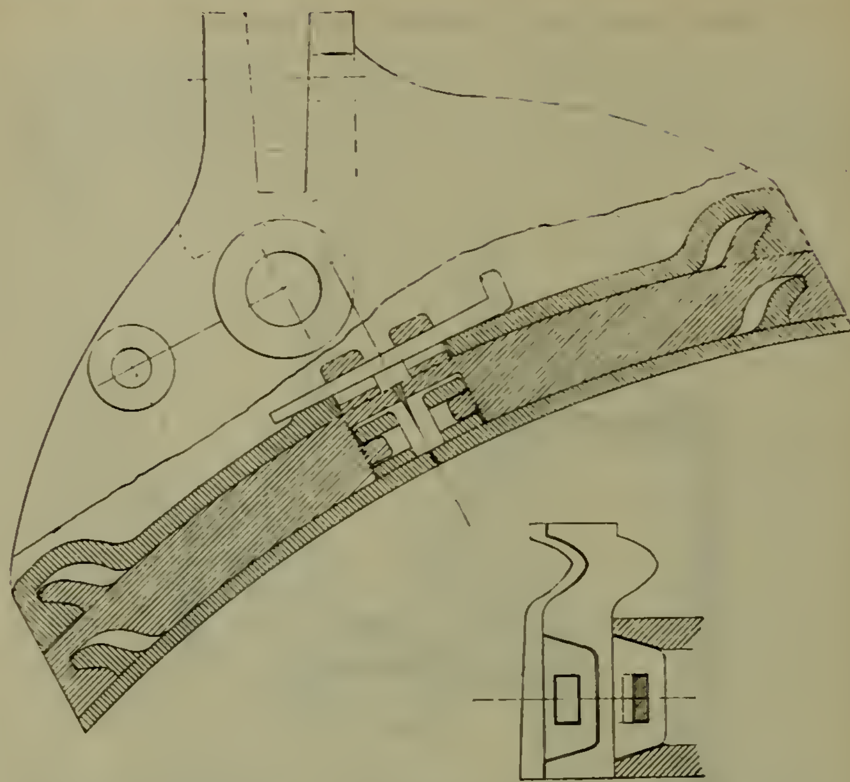
ALLEN PORTABLE PNEUMATIC RIVETER.

riveters with 8-inch cylinder will handle rivets up to ⅞-inch; 10-inch cylinder, 1-inch rivets, and 12-inch cylinder, 1¼-inch rivets. The machines are balanced and when hung up may be operated in either a vertical or horizontal position. Lugs are furnished with all sizes above 25-inch reach, by means of which they may be fixed in position as stationary machines. All Allen riveters may be operated by steam or compressed air and it is stated are much lighter in weight than any other machines that are built for the same work.

We note that Mr. Allen has recently supplied his riveters to the following concerns: American Car & Foundry Co., Milton, Pa., 17 riveters; Detroit, Mich (8); Berwick, Pa. (9); Simplex Railway App. Co., Hammond, Ind. (18), and St. Henri, Canada (7); American Locomotive Co., Providence, R. I., Dunkirk, N. Y., and Scranton, Pa. (9); Pennsylvania R. R. Co., Altoona, Pa. (5); Locomotive & Machine Co. of Montreal, Canada (4); Barney & Smith Car Co., Dayton, Ohio (3); Southern Car Foundry Co., Birmingham, Ala. (2); Tennessee Coal & R. R. Co. (2); Cleveland Crane & Car Co., Cleveland, Ohio (1). This is a list of installations to which any American manufacturer would be proud to refer.

Interlocking Driver Brake Shoe and Head

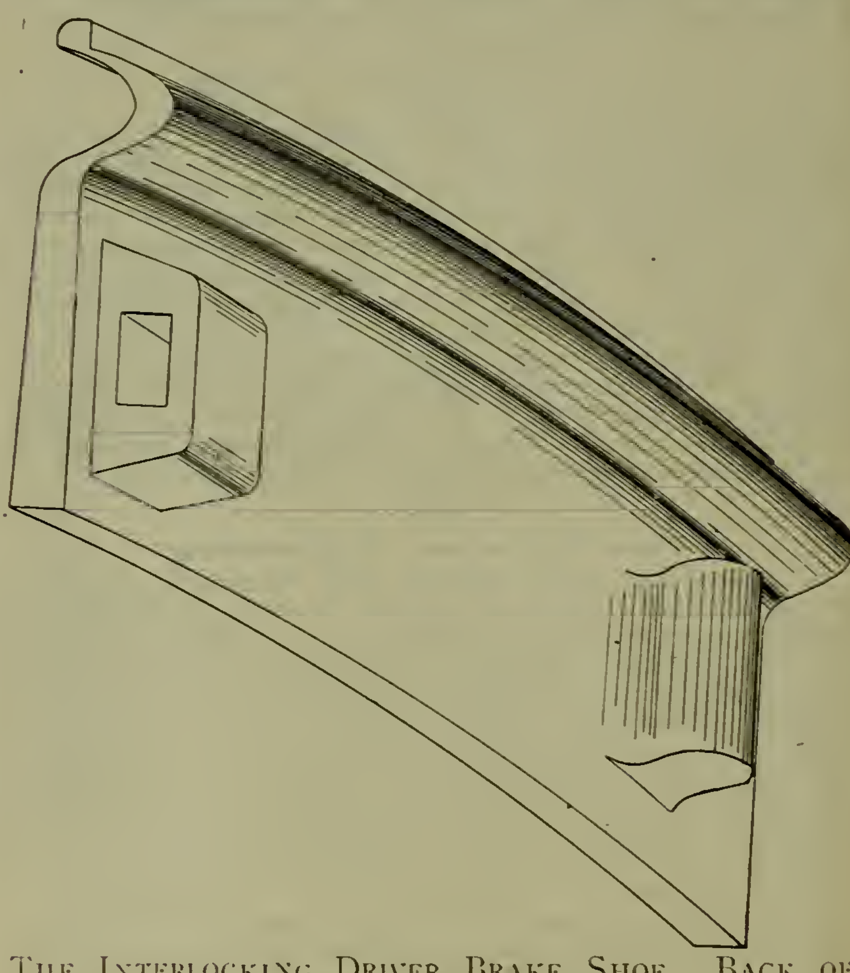
The brake shoe is an important end of the brake equipment and though it is a part which is often overshadowed in discussions of air brake mechanism, it is none the less worthy of attention, for the brake shoe is the actual medium through which the braking force is applied to the wheel to reduce and finally stop its motion. Therefore a shoe should be applied which is not only efficient in retarding the motion of the wheel, but one which is also possessed of sufficient strength to withstand the effects of strain applied to the shoe. It is very well known that shoes attached to the brake head in the ordinary manner bear only at two points and unless supplied with a strong permanent backing are often found in service to break transversely across the center of the shoe. A practical solution of this difficulty is the application of a shoe made in two parts so arranged that each section has two points of contact, giving four bearing points to the shoe. A visit to the scrap heap will show a quantity of metal in each scrapped brake shoe amounting to about 50 per cent of the original shoe which



THE INTERLOCKING DRIVER BRAKE SHOE AND HEAD. PART OF HEAD CUT AWAY, SHOWING SECTION THROUGH SHOES.

had to be discarded, for the reason that if allowed to wear to any greater extent it would become so thin as to be unsafe for service. This manifests the desirability of a shoe, practical in service, which may be used until entirely worn away.

To overcome the difficulties here mentioned a driver brake shoe has been designed which has proved economical and efficient in service. The design of this shoe is shown in the accompanying line drawings, by reference to which it will be seen that the shoe is made in two parts and secured to the head at four points, insuring four bearing surfaces against the head. In stead of being pinned to the head in the usual manner the shoe is attached by a system of lugs. The application of lugs increases the strength of the shoe, as it does not necessitate the presence of weakening holes through the shoe. An important feature of this design is the fact that the shoe may be entirely worn away until the lugs alone remain. To accomplish this the shoes are so designed that they may be applied to the brake head in



THE INTERLOCKING DRIVER BRAKE SHOE. BACK OF ONE-HALF OF THE SHOE.

pairs, the faces of the shoes being arranged with pockets to accommodate lugs in such a manner that one shoe may be applied to the face of another as readily as to the head. Upon first being placed in service a single plain faced shoe is applied to the brake head. When this shoe has become partially worn away it is removed from the head and locked into the pocket of a new shoe and both attached to the brake head. Continued service will wear away the original shoe, allowing the second shoe gradually to approach the tire until it in turn receives all the wear and is finally so reduced as to be necessarily backed by another new shoe. The process is then repeated as in the instance of the original shoe, and continued indefinitely as each shoe is worn away.

While it is necessary to apply a new head designed especially for this type of shoe it is believed that the economy resulting from the increased wear of which each shoe is capable is sufficiently large to more than pay for the new heads from the saving made by the first set of shoes.

A type of shoe having similar advantages has been designed for operation in car service. This shoe was described and illustrated on page 423 of the November, 1902, issue of the Railway Master Mechanic. The driver brake head, driver brake shoe and car wheel brake shoe are manufactured by the Manufacturers' Supply Co., Fisher Building, Chicago, this company being the sole owners of patents covering the interlocking brake shoe and driver brake head.

Soule Rawhide-Lined Dust Guards

The hide used to line the journal opening of the Soule dust guard is a hide specially imported for this purpose. It is what is known as a Singapore buffalo hide. The East India buffalo is a water animal in its habits, living and feeding in wet ground and muddy pools;; consequently its hide is saturated with oil, and on account of the warm climate is provided with a scanty growth of hair.

The hide is as hard as that of the rhinoceros and is very thick. On the shoulders and neck it is almost bullet proof. The Singapore buffalo hide is impracticable for many manufacturing purposes, as belt and belt lacing, because by friction it becomes hard and polished and does not give an even drawing surface—but for these same reasons is superior as a journal bearing.

The hide which forms this bearing is so placed that the wear comes upon a cross section of the hide. As soon as this surface is located by the friction of the revolving journal the oil cells of the hide give out the natural oil with which the pores are filled. This immediately produces a polished surface; furthermore, heating rawhide and thus extracting the oil leaves a substance akin to horn in consistency, which forms a perfect bearing.

As this surface is worn it is constantly reinforced and hardened by the other oil cells in the hide. The bearing, always hardening, resists the wear of the journal as long as the dust guard is kept in the box, and as it fits the box perfectly in the first place there is no necessity of its being pressed upon the journal by perpendicular pressure.

The Soule dust guard is found to save oil, exclude dirt, save the journal bearings and protect the oil box. It has absolutely nothing to get out of repair and is easily and quickly adjusted. This dust guard is in use on passenger, freight, electric cars and locomotive tenders.

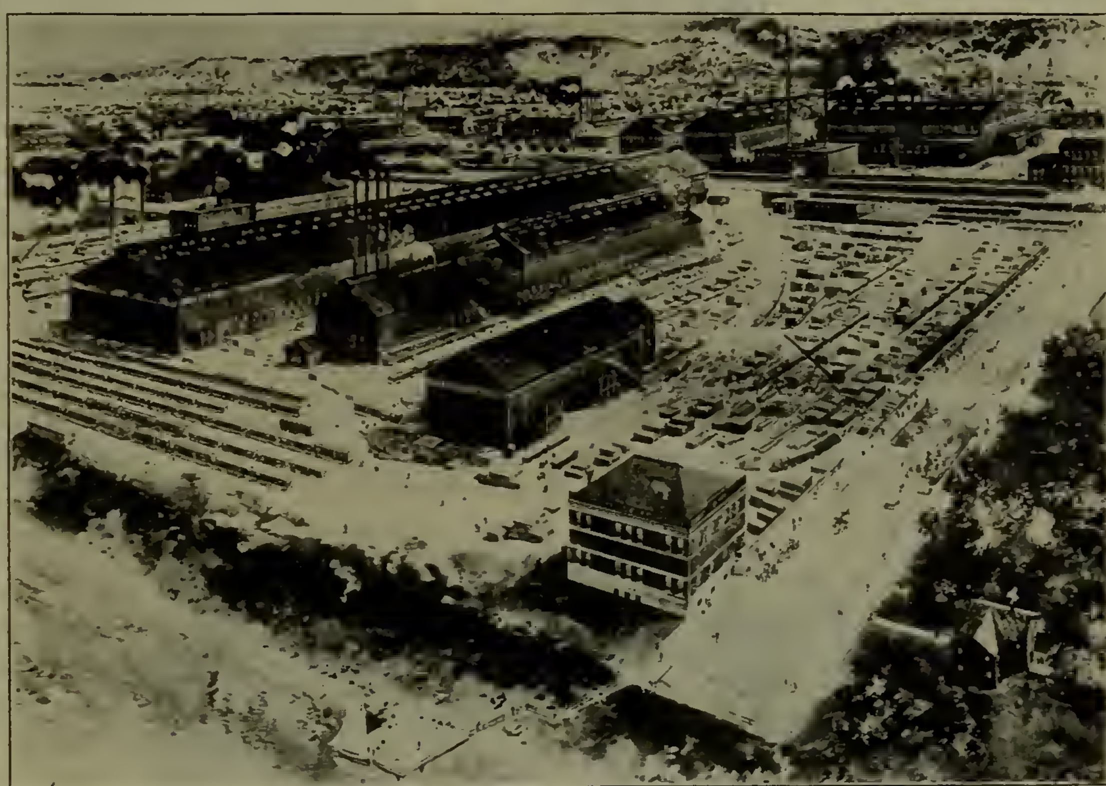
Manufactured by the Soule Dust Guard Company, 113 Devonshire street, Boston, Mass.

Plant of the Pittsburg Spring and Steel Co.

The illustration presented herewith shows the plant recently purchased by the Pittsburg Spring & Steel Company, of Pittsburg, Pa., from the Pressed Steel Car Company. The site consists of five acres located on the Allegheny division of the Pennsylvania Railroad, between McCandless avenue and Fifty-second street, Pittsburg, extending to the government line of the Allegheny river. The Pittsburg Spring & Steel Company is therefore now fully equipped to manufacture elliptic and coil springs on an extensive scale and under satisfactory conditions of delivery.

The personnel of the organization is composed of men thoroughly familiar with the business, on account of their long experience with the A. French Spring Company. The following gentlemen constitute the officers of the company: President and treasurer, D. C. Noble, formerly secretary and treasurer of the A. French Spring Company; T. H. Given, vice-president, president of the Farmers' National Bank, Pittsburg; L. C. Noble, vice-president, formerly eastern manager of the A. French Spring Company, Chicago; George W. Little, assistant treasurer, and W. H. Gardner, assistant secretary, both of whom were previously with the same company. The directors are: D. C. Noble; T. H. Given; Henry Aiken, president Hydraulic Machinery Company, Pittsburg; James Neale, secretary Brown & Co., Pittsburg; H. K. Porter, president H. K. Porter Company, Pittsburg; L. C. Noble and T. N. Motley, president of the T. N. Motley Company, New York.

The plant now operated by the company is modern in every respect and is the largest individual spring plant in the country. All the buildings are of structural steel and are equipped with ten tons electrically operated traveling cranes for handling material throughout the entire length of the buildings. All the buildings are accessible by standard tracks arranged in the yards. The building equipment includes the main shop, 466 feet long by 112 feet wide, which is used as the principal spring shop. The boiler room, engine room, machine and blacksmith shops are situated in a building 325 feet by 60 feet, which, as shown in the illustration, is next to the main shop. The steel house is located in a building 150 by 47 feet. The small building seen in the foreground is used for the offices of the mill, supplying commodious and



Plant of the Pittsburg Spring and Steel Company.

convenient quarters. The electrical equipment is of Westinghouse manufacture and power is furnished through 40 horsepower motors arranged for group driving. The plant is also thoroughly equipped with hydraulic appliances, including testing machines and hoists. All furnaces use natural gas exclusively and a producer gas plant is provided as an auxiliary in case of emergency. Currents for both power and light are furnished by 100 kilowatt dynamos direct connected, ample provision being made for reserve.

Not only are the officers of the association men who have been associated with the manufacture of springs, but the foremen and many of the mechanics who were previously in the employ of the A. French Spring Company. The manufacturing department is in charge of John Proven, general superintendent, who was formerly superintendent of the above-mentioned company; John Easton, master mechanic, and C. F. Reese, foreman of the coil department, were formerly with the same company, the former having previously had charge of the machine department and the latter in the same department with which he is now associated. In consideration of the experience of these gentlemen in the manufacture of springs with the well-known concern named, no better assurance could be afforded of the quality of the product of the Pittsburg Spring & Steel Company.

The Wilbern Adjustable Hanger For Shop and Freight-house Doors

The Wilbern Adjustable Door Hanger is being favorably received by the numerous systems for use on freight house and heavy shop doors. Figure 1 shows the general appearance of the freight house door hanger. It is made of malleable iron and is provided with both vertical and lateral adjustments, hardened steel roller bearings and a stop to prevent jumping the track. Figure 2 shows the detail of construction, method of procuring the adjustments, etc. Lateral adjustment is procured by means of a threaded axle held rigid by a nut so that the wheel and rollers can turn about it. To adjust the door, this nut is loosened and the axle turned with a wrench. This feature permits doors to be hung close to the wall, and chafing, resulting from warping of the door, can be easily corrected. The vertical

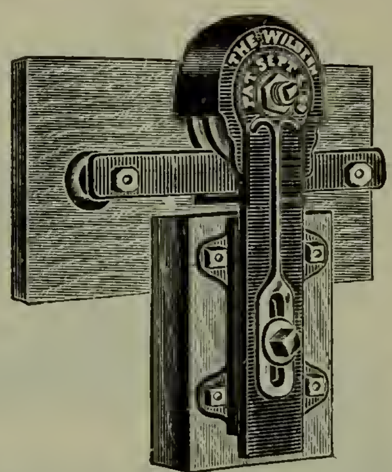


Fig. 1—The Wilbern Adjustable Hanger.

adjustment is procured by means of a plate with teeth engaging a ratchet on the hanger. The plate is held securely fastened to the hanger by means of a cap screw; to adjust the door vertically this cap screw is loosened, letting the plate drop free of the ratchet. This adjustment allows the door to be hung close to the floor, and scraping resulting from the settling of the building can be quickly corrected. It is also valuable where doors are hung double, as the doors can be fitted snugly together and kept so. These adjustments result in a great saving of repairs, as doors can be kept in good working order at all times without the necessity of calling a skilled mechanic to do the repairing. The Wilbern is the only adjustable flat track hanger on the market. Several of the largest systems in the country are

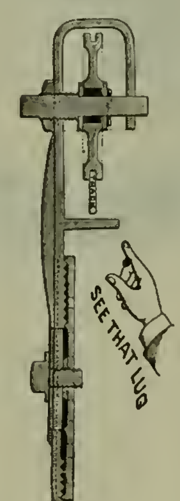


Fig. 2—The Wilbern Adjustable Hanger.

now using the Wilbern exclusively and find it very satisfactory and very economical. It is made in various sizes for different sizes of doors. No. 2 Special is being used quite extensively for heavy shop doors. The manufacturer will be pleased to submit samples to any system interested. Address Midland Iron Works, Racine, Wis.

Allier's Air Painting Machine

The Allier painting machine, an illustration of which is shown herewith, is designed to meet the requirements of railways for rapid, economical and efficient painting of stations, woodwork in general and repainting of cars. The machine is a recent invention and is manufactured by the C. L. Bastion Mfg. Co., 76-82 Illinois street, Chicago. The manufacturers claim it has given most excellent results, the same having been evidenced by the demand for the machine. Among the points in which it excels, it is claimed that it uses only one-third of the amount of paint used by other white-washing machines. It gives a satin finish with no streaking, and one machine will do the work of ten men with brushes. It is so constructed that the paint and air meet at the outlet, forming a fine spray. The trouble with white-washing machines has been that they squirt the paint instead of spraying it. This deficiency has been met by the Allier machine, which is found to spray the liquid effectively. The Allier machine is operated at 90 pounds pressure for thin mixtures on rough surfaces and for thick mixtures on smooth surfaces the pressure required is 100 to 110 pounds. The nozzle of the machine is held from 12 to 15 inches from the work and so held as to strike the surface squarely. It

Allier's Air Painting Machine.

is claimed that this is the only machine that successfully handles cold water, oil, mineral or graphite paint. The tests made show that the cost of two coats of paint by means of this machine is one-third the cost of two coats by hand.

Metal Plated Cars

Metal plated cars, after being submitted to all conditions of service for more than six years, have demonstrated their entire utility and a marked economy in maintenance as compared with cars finished in the ordinary manner with paint and varnish.

The following facts admit of but little, if any, discussion: A less expensive grade of lumber can be used under metal covering. The yearly shopping for cleaning and varnishing is eliminated, allowing cars to remain in service continuously. Metal surfaces are easily cleaned at wash tracks by ordinary methods, causing cars to always present an attractive appearance. In the event of raking or otherwise damaging, panels are quickly replaced and much less time is required to deliver car for service than when wood is used and finished with paint and varnish. If copper covering is damaged in service, requiring its removal, it has a market value as scrap equal to at least 50 per cent of its original cost. The fire-proofing qualities of metal covering is self-evident and of inestimable value in protecting car exteriors. All joints are water tight and wood under metal afforded absolute protection; a most critical examination after six years' service of metal covered sheathing failed to discover any deterioration in the wood. First cost of covering wood with metal is a trifle in excess of the usual finishing with paint and varnish, but this excess is more than compensated for by the avoidance of original cost of painting and varnishing or at any time thereafter. Yearly shopping of car for paint and varnish and withholding car from service for purposes indicated above.

For further data and information address Metal plated Car & Lumber Co., 170 Broadway, New York.

Chain Blocks

The time of unloading cars is usually an important item with railroads, especially so where the cars occupy positions on switches and spurs where it is desired to handle the maximum number of cars per day. It is therefore, desirable to install some method of unloading cars which will handle material readily and quickly. This has been accomplished in a number of instances by installing a jib crane, the base of which is situated at one side of the track, equipped with a hoisting rigging operated by a handle and set of gear wheels located on the mast supporting the jib. Another and more satisfactory arrangement has been the erection of a steel

Chain Blocks in Railroad Service.

structure spanning the tracks and equipped with similar cranks and gearing; a structure of this sort does not require the heavy foundation necessary to prevent a post or pillar crane from overturning, but the attachment of gearing to the supports and bridge make it impossible to erect a structure independent of the hoisting mechanism.

This difficulty is overcome and the expense of erection materially reduced by using a form of combined chain block and trolley furnished by the Yale & Towne Manufacturing Co., in which the hoisting and traversing mechanism are combined in the hoist and operated by pendant hand chains. The steel structure is thus freed from all mechanism and simply serves to support a single or double track consisting of I-beam or plate girders according to the capacity required and type of trolley which may be selected. A single I-beam with a good type of trolley running on the lower flange is suitable for moderate capacities; for heavier work double beams or girders with four-wheeled trolley running on top are preferable.

With such a structure the cost of foundations and the ground room required are reduced to a minimum, and ordinary structural material in stock in any locality may be used. Where steel is not readily available a timber structure with ordinary tee rail spiked to the top makes a satisfactory and serviceable bridge.

Standard structures of excellent design are furnished complete, which are usually more economical than special construction. Regular sizes span one or two tracks and roadway, and range up to forty tons capacity by the use of two standard twenty-ton Triplex crane trolleys. With these a forty-ton casting can be loaded or unloaded over the side of a gondola car by eight men at record speed in ten minutes; the hoisting and traversing mechanism costing less than $1,500 in addition to the cost of the structure.

The high speed and easy work which is now obtainable in hand hoisting is not generally realized. It is made possible by saving the heavy friction losses in ordinary hoisting mechanism. An effective type of hoist found serviceable in such work is made by the Yale & Towne Manufacturing Company, who make three kinds of blocks, the comparative efficiencies of which were determined by a series of tests conducted under the supervision of Dr. R. H. Thurston, at Cornell University.

The Triplex block, with its independent and automatic sustaining device, attains an efficiency of over 79 per cent, and thus effects a remarkable saving both for hoisting and lowering, the labor being reduced more than one-half. Because of this the Triplex block has proved of great value and is rapidly displacing the older types of blocks wherever quick work is wanted and economy in time and labor is sought.

The Duplex block with its improved worm gearing and solid steel trunions attains an efficiency of 40 per cent, which is one-quarter more than obtained by any previous design of screw hoist. This is a double chain screw hoist in which the load sheaves are carried on a solid steel shaft instead of on a cast iron sleeve, and which has safety guides to prevent the load chains from slipping. It is remarkably compact and portable, and in speed and power stands next to the Triplex.

The Weston Differential Block as made by Yale & Towne has an efficiency of 31 per cent, being one point lower than that of the best ordinary screw hoists. It requires more power but lifts at a higher speed, and the accurate fit of chains and sheaves insures unusual durability. It is the simplest and least expensive of all chain blocks, and adapted for use where the higher speed and power of the Triplex and Duplex blocks are not desired.

In recent designs of power houses operating railroad repair shops, it has been very usual practice to install traveling hand cranes for facilitating repairs to machinery in operation therein. For such work as this the Triplex block has been found very efficient and also in the several shops, for lifting and transferring material which may be handled by hoists operated upon overhead tramways.

Any further information relative to the chain block and results of comparative efficiency tests will be supplied by the Yale & Tower Manufacturing Company, 9-11-13 Murray St., New York City.

Falls Hollow Staybolt

The Falls Hollow Staybolt Company have opened an office in the Vanderbilt Building (132 Nassau street), New York, for the sale of their hollow and solid staybolt iron, which is well known to the railroad and marine trade. The office is in charge of Mr. Fred W. Bennett, who also represents C. B. Hutchins & Sons, Detroit, Mich., manufacturers of freight car roofs and roofing materials. Mr. Bennett is well known to the railroad supply trade through his connection with the railroad press, the American Steel Casting Co., and the Chicago Pneumatic Tool Co. The argument which the manufacturers present in favor of the hollow staybolt is that this iron being rolled around a mandrel leaves a hole through the center of the staybolt, making the strength uniform and the bolt flexible, therefore no one point is weaker than another, which they claim to be the

Chain Blocks in Railroad Service.

case with the solid bolt, drilled through from 1 inch to 1¼ inches, which makes a breaking point.

It is claimed that the drilled hole stops at the vital point and causes the bolt to break much quicker than it otherwise would were it not drilled. The object in drilling is to detect breakage, but mechanical opinion inclines to the belief that the drilling process causes bolts to break.

The Perfected Roofing Terne

The American Tin Plate Company is making a terne that must interest every architect, everywhere. It is called U. S. Eagle N. M. (new method), and it is an improvement on their famous M. F. (most favored) terne that has been the standard terne, American and England, for more than a half century.

Tin House in Laughlin Works, American Tin Plate Company.

The new method is a finishing process through which the plates pass after they come out of the tinning pots. The treatment that the plates receive effects an instantaneous setting of the coating mixture, so that the plates get an evenly thick coating from end to end and from side to side.

The plates receive a smooth mottled surface, free from dirty grease, cleanly to handle, and when finished have, in addition to the metal coating, a cover of transparent paint, that does not interfere with the easy soldering qualities of the plates, but acts as additional protection against unfavorable atmospheric influences.

The U. S. Eagle brand is made so that it fills strictly all the prescribed requirements of the United States navy department, in accordance with the following specifications, and a guarantee to this effect is given with each box.

1. All the pickled, annealed and cold-rolled black plates have been cleansed in a weak acid solution, they are thoroughly washed in clean water, after which nothing is brought

Assorting Room at Laughlin Works, American Tin Plate Company.

in contact with the black plate but pure palm oil, pure new lead, and pure new tin.

2. The coating consists of thirty-two per cent pure new tin to sixty-eight per cent pure new lead. The coating is thoroughly amalgamated with the black plate by the palm oil process.

3. When the plates come out of the tinning pots they are placed horizontally in a setting bath of liquid oily substances of a temperature below the melting point of the coating mixture, to compel perfect coating.

4. All U. S. Eagle N. M. plates are carefully assorted and are free from defects, blisters, bad corners or imperfectly coated spots.

5. Each sheet is stamped with U. S. Eagle N. M. trade mark. These requirements are specified by the United States navy, and as usual with government specifications, are very exacting, insuring the very highest possible grade of roofing tin, which the manufacturers guarantee to surpass—in plating workmanship and finish—the product of every other mill in the world.

Another feature of this very heavy coating and careful selection of black plates is the great flexibility and pliability in working, a condition that will be greatly appreciated by the mechanic and the builder, as well as by the purchaser.

Write to Mr. W. C. Cronemeyer, agent, Carnegie building, Pittsburg, Pa., for samples of the U. S. Eagle N. M. and M. F. ternes, as well as for a copy of the booklet, "A Fifty-Year Roof," a manual of terne manufacture and roof making, which contains a great volume of tabulated matter and formulae of value to every one concerned in housemaking.

The American Tin Plate Company produces many other brands of roofing—all reliable in their various spheres of usefulness, in the various weights and in the usual sizes, but recommends the use of the best, because the best is the

Inspecting Terne Plates at Laughlin Works, American Tin Plate Co.

cheapest in the end. All products of this company are sold by the first-class wholesale metal houses throughout the United States.

Kyle Art Gass

The discovery by Mr. J. D. Kyle (the original patentee) of the method of making the Kyle Art Glass was due to many years of experimental work in a similar business and is remarkable for being the only advancement made in the line of art glass since the old style of leaded glass was discovered. The public have for many years desired something new in this line and the glass companies have experimented almost continually to perfect some form of art glass which would be less bulky or awkward to handle and place in position and which would be stronger, cleaner and better and suitable for other purposes than windows, doors and transoms, but the idea remained a mystery until discovered by Mr. Kyle.

The Kyle art glass is superior in every respect. The manufacturers use only one single sheet of plate glass, except for extraordinarily large designs and in such cases only a very few pieces are necessary. By this means they avoid the disfiguring bars and braces and dirt-gathering corners and crevices which are unavoidable in all other styles of art

COUNTING AND WEIGHING PLATES AT LAUGHLIN WORKS, AMERICAN TIN PLATE COMPANY

glass. By their process every color is hand-painted and baked on the glass, so any desired shade or tint can be produced without the cumbersome, weak and expensive method of "leading" together many thicknesses of different colored glass. They reproduce facsimiles of any celebrated paintings by the old masters, so that in effect they have been pronounced by some of the acknowledged best art critics in the business to be even superior to the original, as it is not possible to give the life-like effect on canvas which is produced by the light shining through the glass. In fact, by this process it is possible to produce an absolutely correct picture of any object or article whatever in any size desired, and give it a tone and life which cannot be equaled by any other method. The Kyle patented luminous decorated glass for walls, ceilings, mantels, furniture, etc., is a new departure and the only thing of the kind ever attempted. It gives an opportunity for interior decoration far superior to anything ever offered and can be funished in any design. The company's processes are covered by broad patents, thoroughly protecting them against infringement.

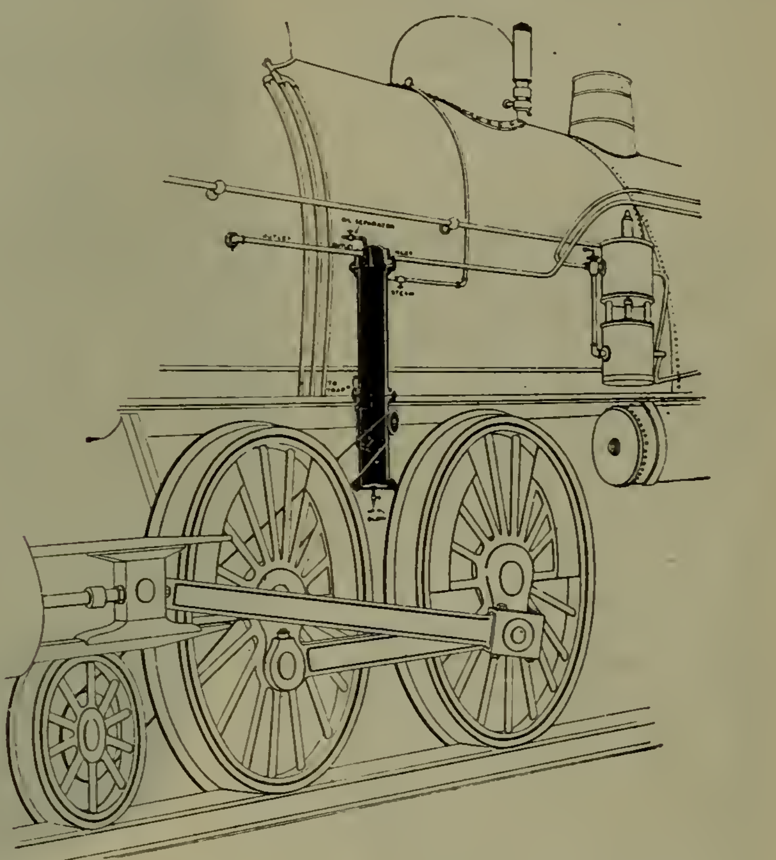
The Kyle Art Glass Co., Springfield, Ohio, will be pleased to furnish designs and estimates on application for the Kyle art glass work, of any size or shape for any purpose whatever, and guarantee entire satisfaction in every instance.

Caldwell's Centrifugal Feed Water Heater and Purifier

Caldwell's Centrifugal Feed Water Separator and Purifier is a machine built on scientific principles to purify and free water from scaling properties before the water enters the boiler, by a mechanical device. It is a well-established principle that the scaling properties readily separate from the water when the water once enters the boiler. The proof of this is the fact of the scale on the flues, and if the separation can be made in the boiler, it can as readily be made in the purifier, and when the separation or dissolution takes place in the purifier it is under control and can be blown off before it can adhere. By this system water is first passed into the intensifier, where it is heated up to 275 degrees to 300 degrees F.; from the intensifier the water next passes through the centrifugal separator and while the water is still at its highest degree of heat and the separator is running at a high velocity of speed. This operation, together with the intense heat, separates all the solubles from the water; then the water descends into the temperature reducer or cooling chamber. In this chamber the water is cooled down 30 degrees to 50 degrees, and as the solubles having been separated by the intense heat and the operation of the centrifugal separator, the water is allowed to settle, and the scaling properties are blown off at the lower end of this chamber, leaving soft water. Then the soft water is passed from the cooling chamber into the second and last intensifier, where the water is again heated up to 285 degrees to 350 degrees F., or to the temperature of the boiler, according to the steam pressure. The water is taken out of the last intensifier at the top, it being the hottest point and the water there being the purest. The centrifugal separator is driven with a water motor, electric dynamo or belt, and the condensation and surplus water should be trapped back to the surge tank.

The machine is also an oil separator. The oil, after being separated from the water, rises to the top and is blown off. By giving this careful attention and blowing off frequently, the oil can be prevented from getting into the boiler. This is very important, as it is a bad thing to allow oil to get into the boiler.

The accompanying illustration showing the sectional view of the locomotive shows the position of the centrifugal separator and purifier, also showing the centrifugal separator connected by cable to the axle of the front truck; this is a very convenient way to furnish power for propelling the centrifugal separator, and the effect on the separator is the same when the locomotive is traveling in either direction. The device is five feet in length, when the height of the locomotive will permit it; it is 7 and 10 inches in diameter, two sizes, and contains 14 to 20 1-inch flues. The portion above the running board to the feed water pipe contains the flues; this section is divided into two parts by a parting strip in the head or dome of the machine, with seven flues in each part. The portion below the running board contains the centrifugal separator, with the lower part constituting a settling and cooling chamber. The part of the machine containing the flues is filled with live steam, which

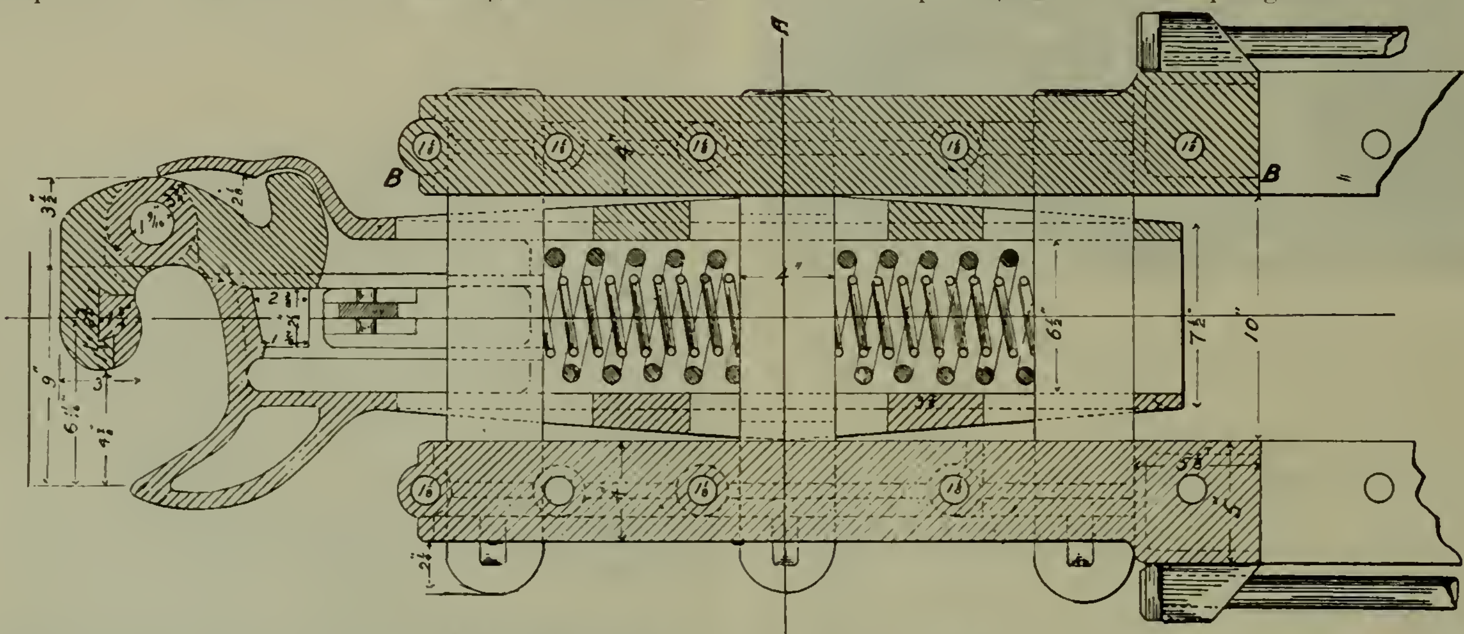


CALDWELL'S FEED WATER HEATER AND PURIFIER IN POSITION.

circulates around the flues. The pipe marked "steam" is connected with the dome of the locomotive boiler. The flues are usually made of brass or some non-corrosive metal equally as good, and being thin the live steam surrounding the flues brings the water in the flues up to a very high temperature, depending altogether on the steam pressure of the boiler. With 90 pounds of steam the water has been brought up to 315 degrees F. on stationary boilers. The water coming from the injector passes into the purifier at point marked "inlet"; then it travels down through the flues into the separator in the form of seven streams, as it leaves the seven flues, which forms a sort of spray. While the water is in this condition and at a very high degree of heat with the centrifugal separator running at a very high velocity of speed, the dissolution or disintegration takes place and the solubles are separated from the water, which falls to the bottom of the settling chamber in conformity with the laws of gravity. This separating chamber is from 25 to 50 degrees cooler than the intensifier which contains the flues. The difference in temperature aids in the dissolution and assists in separating the disintegrated solubles and retaining them in solution in this chamber.

Tandem Spring Draft Attachment

The accompanying line drawing shows a section of the entire coupler and arrangement tandem form, with buffer springs in place, inside of shank, an arrangement which allows the benefit of both springs on the impact and the pull. Each spring works independently of the other, and if one should break the other remains as a single spring. The shank is ribbed up in the head, the ribs continuing back into the shank, until they reach the spring, thus making it very strong back of the head at the point most liable to fracture. There are three bars passing through the draft beams and the shank 1 in. x 4 in., thus equalling a bar 12 in. x 1 in. to buff and pull on. These bars are of wrought iron or steel and pass through the draft beams with a wooden filler run to the bolster or through the iron transom. Beams for the tandem arrangement are less than 3 feet in length over all. The lugs on the side show a rod running from one end of the car to the other, connecting them together and relieving the strain on the bolts. Beams are to be used only where there is wooden underframing. They are not needed for steel framing or steel cars, as the coupler and draft rigging are attached to the intermediate beams.



Tandem Spring Draft Attachment.

The weight of each coupler is about 300 lbs. steel. This form, as will be seen, allows sufficient lateral play for automatic adjustment on sharp curves. The design shown herewith eliminates parts of the present riggings in use, such as yokes, followers, slides, check plates, tie straps, carrying irons, stirrups, bolts, nuts, etc. Doing away with these numerous wearing parts removes a source of constant trouble and expense, which is apparent at a glance.

Time is saved in removing or attaching couplers to cars, as there are neither bolts or nuts to be removed and but a few minutes needed to put the coupler in place.

The knuckle is self-opening and self-setting. The locking pin is locked down, thus preventing parting of cars. A wearing plate of steel on the face of the knuckle is supplied by the manufacturers when desired. This wearing plate saves largely in the maintenance of knuckles.

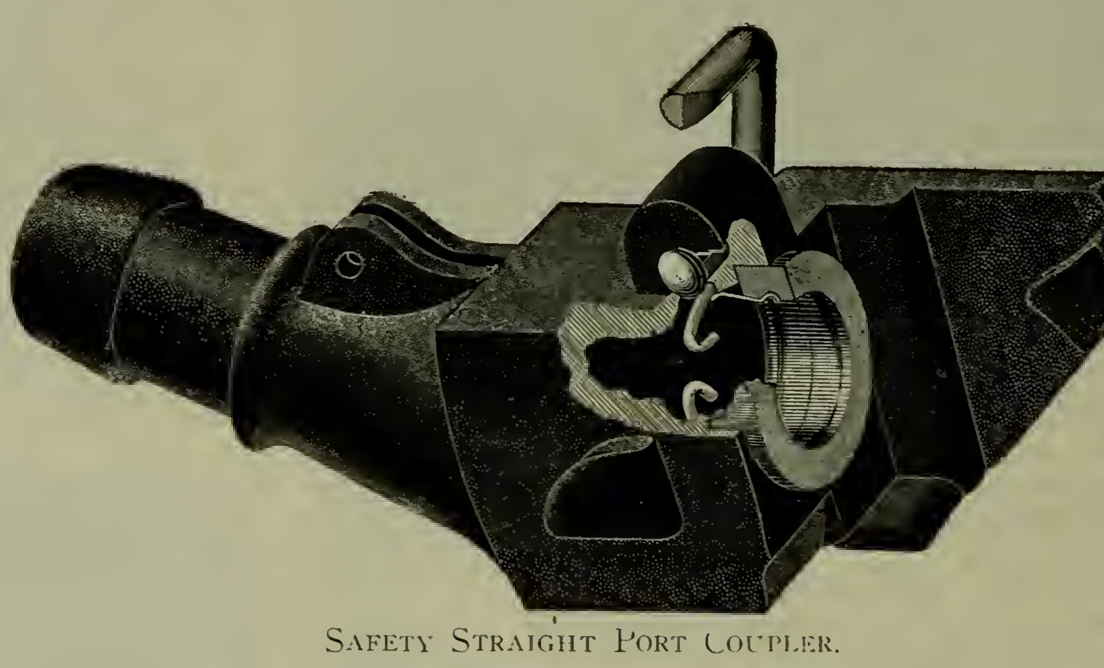
This device is manufactured by W. W. Worthington & Co., manufacturers and dealers in railroad equipment and special machinery, Engineering building, 114-116 Liberty street, New York City.

The New Safety Straight Port Steam Coupler

The question of steam heating has been receiving a great deal of attention for the past year from the mechanical men of various railroads and there is a tendency towards the use of a straight port steam coupler with a larger steam passage than the one in those now in use. Tests made a year or more ago by the Safety Car Heating & Lighting Co. prove that those who have decided to use a larger port coupler, have acted wisely and in order to meet the probable demands of the railroads, the safety people devoted themselves to perfecting a coupler that would make possible an unrestricted steam passage from the locomotive to the end of the train. This they have done without having to increase the size of the coupler head which makes it possible for them to couple the new coupler with a larger port, with a coupler of the present standard, through the use of a metal disc which is fitted over the gasket on the coupler with the larger opening. This new coupler of the Safety company which is called their Safety Straight Port Coupler No. 920, possesses a number of improved features.

The method employed for holding the gasket in the coupler is extremely simple. A worn-out gasket may be removed and a new one inserted without the use of any special tool and without the necessity of taking apart the coupling or going through any time-consuming operation. The gasket is locked in the coupler by means of a spring which constitutes a part of the complete gasket. This spring has inturned ends and the drawing together of these ends, combined with a slight pull when so drawn together, is all that is required to remove the gasket. To apply a new gasket, all that is necessary is a slight blow of the hand after the gasket has been placed in the recess. Although simple, this lock is positive and the gasket cannot lose out; at the same time the changing of the gasket is a comparatively simple and inexpensive matter.

A means of locking the couplers has been provided to meet the demand for such a device which exists in some localities. This lock is simple, positive and, being located directly over the center line of the gasket, operates in such a way that any tendency of the couplers to wind and thus become disengaged is obviated. This lock also prevents the opening up of the couplers upon sharp curves, due to stiff hose or incorrect location of train pipe. At the same time, it does not interfere in any way with the making up of the coupling; or the automatic uncoupling features, provided the use of the lock is dispensed with.



Safety Straight Port Coupler.

Guiding lugs have been added to the couplers, which addition is of itself a feature of much importance. These lugs facilitate coupling and assure that the gaskets will come together squarely and in line. At the same time, should it be desired to provide for the automatic breaking of the coupling, the presence of the lugs makes positive the automatic disengaging of the heads.

This coupler is made with a port measuring 1 7-16-in. in diameter (in order that a 1½-in. hose may be used), or with an opening measuring a full 1½ in. It is shown in the accompanying illustration.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

Ezra A. Page.

Our page is embellished this month with the portrait of Mr. Ezra A. Page, Foreman Painter, Laconia Car Co., Laconia, N. H., who is one of our new members having joined at the last convention.

Mr. Page was born at Tilton, N. H., Nov. 7, 1845. He says that "paint" is among his earliest recollections, as his father's paint-shop was his playground in stormy weather. He received a common school education and was put to learn painting at the age of fifteen. After his father's death, in 1885, he took to roaming and went to Manchester, N. H., where he worked at his trade until 1870, when he went to Laconia and did his first car painting for the "Ranlet Mfg. Co.," as the name of the concern was then called. His brother, T. Fred Page, being then foreman. In the winter of '73 and '74, business being dull there, he went to the Atlantic Car Works, Salem, Mass. (now extinct as a car concern), and obtained work as he says, of "that old war horse, Warner Bailey," who was then foreman there. Afterward Mr. P. returned to Laconia and remained until the spring of '75, when he joined the army of "tender feet" and struck out for the Pacific Coast, and obtained employment at the Central Pacific shops, Sacramento, Cal. (since called Southern Pacific), W. C. Fitch being then foreman painter, and he says he "had the pleasure of meeting President Fitch at the Boston convention last September." In 1881 he returned to Concord, N. H., and worked a short time for the then Concord R. R., Chas. Lang being foreman. The following year Mr. Page's health being poor, on account of shop confinement, he went to Laconia and carried on the business of house and carriage painting; and thus, being more in the open air, gained in health. He, however, sold out this business a few years ago to accept the position he now holds, being the successor of Mr. Edward Webb at that place, and hopes to be able to attend the Chicago convention in September.

Mr. Ezra A. Page.

Annual Shop Renovation

July has arrived, the month that usually marks the beginning of the dull season in the car paint shops in this section of the country, which lasts until October. Now is the time to put the shop and all its varied appointments in good trim for the fall's work. "In time of peace prepare for war." You have seen the need, we trust, of many things and changes during the busy season, but everybody has had too much to do to attend to it. "Now is the time to subscribe," as the papers say. The stock room will want a thorough overhauling. If you have allowed filth and paint to accumulate on the floor during the year (but we trust you have not), now is the time to get rid of it and clean the place up spick and span and to solemnly swear, with a hand on the constitution of the United States and an eye on our strenuous president's picture, that you will keep it so during the year to come. Do not say you haven't time. Take it! Set apart every Saturday afternoon and sanctify a man or two for this work and clean up. Throw away those old mixing kegs and tubs that weigh four times as much as they did when you first started to use them, by the thick accumulation of paint that has drizzled down their sides, and install some new ones. Order your white lead in 500-lb. kegs, as this writer does, and you will never want for a clean mixing keg or slop or skin tub. Buying white lead in 100-lb. kegs, or other small packages, is all right to the extent of that which you must ship to some other shop or point, but is a waste to use in the shop, as you are paying so much per pound for kegs and, besides, a larger keg with an iron ladle or spoon, is much handier to use this heavy material out of. If you will follow this advice in ordering lead you will have a new, clean mixing keg as often as wanted and there will be no reason to hold on to that old eye-sore that one sees the moment he enters the stock house. Have all mixing benches covered with zinc and the floor with galvanized iron, and, our word for it, it will be a simple problem to maintain both clear of paint, varnish, etc., and when the insurance inspector comes around with his advice about sand to strew the place with instead of inflammable saw dust to soak up the juices, he will simply be struck dumb with your tidiness and with admiration of you as a shop foreman and likely mention the fact to his superiors and yours also. You cannot afford to be slack in this direction. If you allow yourself to become so your position yawns for a more enterprising man and ere you are hardly aware of it he will be found in this broad land of ours and will slide into it and you will slip down and out.

Study orderliness about your entire shop, as well as the stock room, and have a place for everything and everything in its place and raise the —er— dust, if things are not where they belong. That fiend who knows no better than to be daubing paint around the shop where it does not belong, teach him better if he is teachable, otherwise fire him out and let him join the army of fence advertisers. Keep your shop windows clear of all paint (unless sprayed there by a spraying machine used on freight cars). Then wash them annually. Do not have any of those unsightly signs about the premises that seem to proclaim in nasty tones "This is the paint shop." Rather make it necessary for your superior officer to use this word of introduction as he goes around with his visitors. They'll scent it, no doubt, unless better ventilated than most of our make-shifts called shops are; but make it as pleasant for the eye and ear as possible, if the nose does have to be imposed upon. Do not be in too great haste to let your men all go just as soon as you have no equipment to paint or varnish. Hold on to some of them and let them fix the place up. Mix a barrel of good whitewash or some cheap paint, and set them at it and before you are through, the boss and his wife and all hands will be in and the exclamation points necessary to follow their conversation would bother a typesetter to find in his case.

The staging and other working appliances will also need looking over to see if they are safe for another year's work and with a view to repairs if they are not; for in some states there are stringent employers liability laws that involve the responsibility of the foreman and his assistant.

Receipts for Painting, Etc.

As a sample of the rot that usually finds its way into books of receipts for staining, painting, etc., we submit the following, clipped from a daily paper, for which it was written by request and signed with the initials of the writer. What oil, turpentine and whiting will do toward making an oak stain we leave the intelligent reader to conjecture.

"Surely everybody is going to stain their floors this spring time when they clean house, from the numerous requests I get for stains. Here is a reader who desires all three stains, oak, mahogany and rosewood, to see which she will like best and will first try the "oak stain." It is made by mixing a pint of boiled linseed oil, a gill and a half of turpentine, three tablespoons of whiting. The mahogany is made by mixing one pint of boiled linseed oil, a gill and a half of turpentine, three tablespoonfuls of whiting, a half teaspoonful of Bismarck brown, and one of Onaline black. The one that so nearly resembles hardwood and is dark as rosewood is mixed thus: A tablespoonful of burnt amber to a pint of boiled linseed oil or a little less oil if you prefer a lighter color. To prepare your floor for these stains take care. Don't use lye or strong soap to wipe them up, it leaves them clouded, but make a nice warm suds of rain water and pearline and wipe perfectly dry afterward. Let the stain get dry before walking over it and wipe the dust off with a little kerosene and woolen rag or old cheese cloths. These are all inexpensive excellent stains for floors and cleanly and healthy and hygienic."

A New Kinklet

Editor Railroad Paint Shop: I enclose herein for the good of the cause a new style of pounce pattern, intended to displace the pounce bag, in order to obviate the dust and other disagreeable features incident to the use of that heretofore necessary adjunct of the painter's outfit.

To make this, proceed as follows: Take a thin piece of pattern paper just twice as large as required for all the old style pounce patterns, fold it in the center and sketch the letter, or scroll, on one side and prick as usual. Next, fold back in the opposite direction and pounce the drawing on the opposite sheet, then trace with lead pencil or ink (this drawing is not intended to be pricked, but merely to serve as a guide in placing the sketch in proper position upon the work.) Next, take a piece of No. 1 sandpaper and rough the face of the sheet opposite to the unpricked pounce; this is done to take up and retain the whiting. Next, fold the paper back in its first position, put in a teaspoonful of whiting and fasten the edges together with mucilage, leaving a small space at the top right-hand corner for an occasional refilling. Keep this hole closed with a wire paper fastener, shake the whiting back and forth across the rough surface of the unpricked sheet, place the pattern in position on the work and tap gently with the fingers and "there you are."

J. H. Pitard,
Mobile & Ohio R. R., Whistler, Ala.

Note:—Mr. Pitard encloses a pounce-pattern about 4x5 inches, made in this new way, of the letter "L," antique Roman style. A printed reproduction here of this finished product would throw no additional light on the process of making it, and it is hardly necessary as the description given is sufficient to give an idea how to make it. It is simply two thicknesses of paper with the whiting in between the pricked one on the back and the traced one on the front, made tight all around, of course, except at one corner; and this opening is held tight with a fastener such as in use in the offices for holding letters and papers together at the corners. In other words, it is a flat paper bag, so folded down that it is no thicker than any ordinary pounce pattern. In fact no one would know any difference. We have tried it and it works all right. It seems to be an excellent idea, and is something entirely new to us at least. Try your hand at making it.—Editor, R. R. P. S.

Noting references in these columns of late to the illnesses and deaths of some of our members, our associate Frank F. Fisk, of the T., St. L. & W. Ry. at Frankfort, Ind., writes as follows, June 7, 1903:

"In looking over our Master Mechanic for June I note several deaths of members and some sickness and that just puts me in mind that this is my 38th day in bed with a scalded leg; came very near losing my left leg, but am in a sure way now of getting out on crutches in about two weeks. My son, F. A. Fisk, is looking after my interests while I am away. Hope to see you in Chicago."

We all hope for Frank's speedy recovery, and to see him at the Chicago convention in September. Too bad to lose a leg at any time, but especially now when it is hard to get passes to ride to conventions! He will have the sympathies of us all in his severe affliction.

Speaking about serious illnesses of foreman painters, Mr. T. C. Steele, of the Lyndonville, Vt., shops of the Boston & Maine (formerly at Springfield, Mass.), has been laid up for several months with "Neurasthenia," or nervous exhaustion. He was formerly a member of the M. C. & L. P. A. and his picture appeared in our columns.

Notes and Comments

All employes must tread the path of duty or general confusion will ensue. "He who is false to present duty," said Henry Ward Beecher, "breaks a thread in the loom and wil find the flaw when he may have forgotten the cause."

We learn that Mr. Frank Taylor, formerly with the Barney & Smith Car Co., and later representing Coe's Gilding Wheel, has been appointed to succeed the late Alexander Campbell as foreman painter for the Manhattan Elevated Ry., New York City. His many friends in our association will wish him the success in his new field that doubtless he will achieve.

No less an authority than Mr. Houston Lowe, vice-president of Lowe Bros. Co., Dayton, O., has said, in a paper lately presented to the Western Railway Club, that "no one can test the working properties of a paint as can the workman whose eye and hand and arm are skilled to practice. As to this feature, we abide by the decision of unprejudiced and competent workmen."

We learn that Mr. W. C. Fitch, president of the Master Car and Locomotive Painters' Association, who severed his connection with the Southern Pacific at Sacramento, Cal., sometime ago, where for many years he had been master painter, has established a paint factory at that place and is putting out a full line of paints. His many friends will wish him abundant success in his new venture.

Mr. John Stocks has been appointed to succeed Mr. E. Hartshorn as foreman painter at the Maine Central shops, Waterville, Me., effective July 1. As "Jack" came up under the tutorage of the editor of these columns and goes out from his shop to take this position as his first foremanship, of course we shall take an active interest in his welfare, and sometime will want to "round him up" at one of our conventions, when it comes near enough for "a starter."

The ever-enterprising firm of Sherwin-Williams Co., of Cleveland, O., is, we learn, preparing to erect a very modern paint manufactory in Montreal, Can. One hundred and twenty thousand feet of land on Atwater Ave. have been bought at a cost of $20,000. It is said that the building will cost $200,000. It will be erected on the lot next to their varnish factory already in operation there for seven years, which they have carried on in a rented property.

The sad news reaches us of the death of Mr. Edward P. Williams, vice-president of the Sherwin-Williams Co., Cleveland, O. He died at his home near that city, May 4. Mr. Williams had been in poor health since a year ago, and about Oct. 1 went to the John Hopkins Hospital, Baltimore, Md., for treatment, and so far improved in November as to give evidence of his return to business the first of the year. We made his acquaintance at our Detroit convention in September 1900, and learned to love and respect him.

The value of a M. C. & L. P. A. member came in in an unusual way lately. As president of the B. & M. Relief Association, the editor of these columns has other troubles. The widow of a late member of the relief association was located in Wilmington, Del., and her claim of $1,000 death benefit on her late husband must be settled; but such things cannot be done by mail. We sent the check and all papers in the case to vice-president Chas. A. Cook of the M. C. & L. P. A., who is foreman painter of the P., B. & W. shops there, and the promptness and accuracy with which he did the business entitles him to our gratitude and praise.

It is current that the firm of Elliot & Loomis, owners of the National Paint Works, at Williamsport, Pa., has been succeeded by the firm of Elliot & Cheesman. This dissolution comes after twenty-one years of successful business. Mr. Loomis lives in Brooklyn, N. Y., where he has extensive interests that demand his attention. They were pioneers in the manufacture of ready-mixed freight car paints, Mr. Loomis being the traveling salesman for many years, with whom we formed an agreeable acquaintance. He never forgot to mention our solicitude for his welfare, as years ago there was a man of his name who met with a serious if not fatal injury in a railroad accident in Pennsylvania, and we at once wrote to ascertain if it was he. Mr. Frank P. Cheesman, who succeeds Mr. Loomis, will have charge of the sales department, while Mr. Elliot will continue as manager of the works.

A novel incident happened in the paint shop stock-room of the B. & M. at Lawrence, Mass., recently. Sometime during the night (May 21) a quart can of aluminum paint exploded. The only harm was the loss of the paint and the general besmearing of the place with the contents of the can, which of course was dry next morning. The probable cause was naphtha in the paint and unusual hot weather, which generated a gas that was too much pressure for the tin can. Guess this will have to be kept on the ice hereafter or shipped in boiler iron. We never had such an occurrence before in over 30 years, and never heard of a can of paint exploding but once before, and that was a can of a substitute for white lead ("Ulesote") some 18 or 20 years ago in a hardware store in western Massachusetts.

"Practical Carriage and Wagon Painting" has just reached its third edition. This is a great compliment to both author and publisher, the former, M. C. Hillick, being employed at the Lehigh Valley shops at Sayre, Pa., under our associate, W. H. Dutton, and has been a writer for the trade press to good acceptance for many years. As Mr. Hillick has put his life in the vehicle paint shop, he is no theorizer, or mere space writer, but a practical man who knows what he is talking about. As for our friend Webb of the Western Painter, he knows a good thing evidently when he sees it, for he is the publisher of this work. Up-to-date within its covers, it is now ditto on the outside; for it bears the gilt imprint of an automobile on the cover. It contains 161 pages and is fully illustrated. Price $1.00. The Western Painter, 40 Dearborn St., Chicago, Ill.

The Car Foremen's Association

of Chicago

June Meeting

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, June 10th, 1903. In the absence of President Parish, Vice-President La Rue presided.

Among those present were the following:

Bates, G. M.	Jones, R. R.	Nulta, C. F.
Cook, J. H.	Kline, Aaron.	Olsen, L.
Delaney, A. G.	Kroff, F. C.	Richardson, Wm.
Downing, David.	Lau, W. C.	Stevens, C. J.
Endicott, G. T.	La Rue, H.	Senger, J. W.
Guthenberg, B.	Miller, Geo.	Terry, O. N.
Godfrey, J.	May, Nick.	Vansickle, M. B.
Hyde, C. W.	Morris, T. R.	Wharton, R.
Hagge, W.	McAlpine, A. R.	Warlick, Geo.

Mr. La Rue: I presume you have all read the minutes of the last meeting as published in the Railway Master Mechanic, and if I hear no objections they will stand approved as printed.

We have with us to-night some of the car foremen from Terre Haute, and it has been suggested that we take a recess for a few minutes to get acquainted with the gentlemen. If there are no objections we will take a recess of a few minutes and I will ask some of the members to introduce the gentlemen, that all may have an opportunity to become acquainted with them.

Secretary Kline: The following have made application for membership:

C. E. Brown, Car Clerk, B. & O. R. R., Garrett, Ind.

A. J. Cook, Car Repairer, B. & O. R. R., Garrett, Ind.

A. M. Depew, Car Inspector, B. & O. R. R., Garrett, Ind.

J. W. Eckhart, Assistant Car Foreman, B. & O. R. R., Garrett, Ind.

H. C. Elsner, General Foreman, B. & O. R. R., South Chicago, Ill.

Jacob Hollis, Piece Work Inspector, D., R. I. & N. W. Ry., Rock Island, Ill.

Charles R. Oberholtzer, Clerk, B. & O. R. R., Garrett, Ind.

C. C. Stiver, Car Inspector, B. & O. R. R., Garrett, Ind.

J. A. Weaver, Car Inspector, B. & O. R. R., Garrett, Ind.

H. Zeimer, Clerk, C., R. I. & P. Ry., Chicago, Ill.

Mr. La Rue: This brings us to the regular program of the evening, the first subject of which is: "An 80,000 pounds' capacity flat car has a coupler with a 5x6-inch shank broken in switching. Party doing the damage applied standard M. C. B. coupler with 5x5 shank. Owner requests defect card for wrong coupler. Should it be given?"

Mr. Humphrey (I. C. Ry., Louisville, Ky.): In my opinion this is wrong repairs and should be cared for by the road making wrong repairs.

Mr. Kroff (P., F. W. & C.): I think I would consider that wrong repairs, and it ought to be carded for.

Mr. Morris (C., M. & St. P.): I do not agree with Mr. Kroff. I do not think that a 5x6 shank is any stronger than a 5x5 shank merely because it is of larger diameter. I do not think there is any more metal in the shank, except the slight additional metal that goes to make up the 6-inch instead of 5-inch; but as to there being any more metal which adds strength to the shank I do not think there is. Furthermore I think there is an arbitration decision that covers that to a certain extent, No. 579, I believe. This refers to couplers with short shank and I think the decision goes on to say that it is not an M. C. B. standard. A 5x6 shank would not be an M. C. B. standard, and if all roads have to keep at the different points all these different kinds of couplers their stock would have to be made very much larger.

Mr. Jones (B. & O.): I am of the opinion that it is not wrong repairs, unless the car was stenciled showing that a 5x6-inch shank was standard to the car. We had a case with the U. P., and it was settled that as the car was not stenciled as being equipped with 5x6-inch shank coupler, a 5x5-inch was considered a standard coupler. There is no more strength in the 5x6 than in the 5x5 shank, and you are at liberty to use it, as it has the same strength as the 5x6-inch.

Mr. Kroff: I would like to ask Mr. Morris if he would not consider a coupler with a 5x7-inch shank stronger than a 5x5 shank. Where would you draw the limit. There are a good many cars of the heavier capacity which are equipped with 5x7-inch shank couplers, and if you are allowed to put in 5x5 shank I think you weaken the construction considerably. The line would have to be drawn somewhere.

Mr. Morris: In the first place, we are talking about a 5x6 shank, and in the second place a 5x7 may be, and it is, a different proposition. I think we ought to confine ourselves to the question of the 5x6 shank in place of the 5x5.

Mr. Godfrey (C., R. I. & P.): I am under the impression that a 5x5 shank coupler should be considered wrong repairs for that car. We should work with a view of keeping up what is standard to the car. I think a 5x6 shank would be right for that capacity.

Mr. Bates (C., B. & Q.): I believe this coupler question was up before the Master Car Builders some time ago, and so far as I know there was nothing done in regard to it, and as it now stands a 5x5 shank is an M. C. B. standard bar, and it seems to me that you can hardly consider this wrong repairs when the Master Car Builders' Association have adopted it as standard. Had they seen fit to increase the size of the shank for these heavy-capacity cars, it seems to me they would have done so, and as long as they did not do anything, I think you cannot consider it wrong repairs.

Mr. Olsen (C. & A.): I would like to ask the question if you consider a 7-inch oil box for a 60,000 pounds' capacity car proper repairs? The M. C. B. Standard 7-inch journal and oil box on a 60,000 pounds' capacity car that is not standard to the car. It is the same with a coupler with a 5x5 in place of a 5x6 shank.

Mr. Bates: I would like to ask Mr. Olsen if he ever saw a 7-inch oil box put onto a 5x9-inch journal?

Mr. Olsen: I do not mean a 7-inch oil box, but a 4x7-inch journal under a car with a 4¼x8 journal. Would you accept that as proper repairs because it is an M. C. B. standard?

Mr. Bates: For the information of Mr. Olsen I will say that the Master Car Builders' Association have adopted a standard 5x9 journal, a 4¼x8, a 4x7, and in making repairs you have got to use the proper kind of box for the different capacity cars.

Mr. Olsen: Have the Master Car Builders' Association adopted a standard coupler for 80,000 pounds' capacity cars? They have not, and as they have not, we must conform to the present construction of the car, the same as if you repair any other part of the car. You impair the strength of the car when you apply a 5x5 shank in place of a 5x6 shank coupler.

Mr. Morris: I would like to have the secretary read decision in Arbitration case 579.

Secretary Kline: This is a case between the St. Louis & San Francisco vs. Ft. Worth & Denver City Ry. On September 1, 1899, the Ft. Worth & Denver City Ry. Co. received its car home with the following improper repairs: One wrong coupler with 21¼-inch shank (should be 22½-inch shank), wrong clamp, clamp bolts, uncoupling rod and bracket, and was covered by St. L. & S. F. repair card dated August 20, 1899, issued at its Huntington shop. Claim was made on joint car inspector for joint evidence to cover improper repair, who replied that the only wrong repairs the Ft. W. & D. C. Ry. Co. were entitled to were the wrong clamp and clamp bolts. The papers were sent back and forth and the question was finally referred to the arbitration committee, who decided as follows: "The M. C. B. coupler applied had a shank 21¼ inches long, the standard length of the M. C. B. coupler. The fact that the car was received by the owning road without any damage having been done to it on account of the short coupler, and the fact that the coupler was an M. C. B. standard, and as foreign roads are not expected to carry M. C. B. couplers with odd length of shank to provide for conditions similar to that on the car in question, it is the opinion of the committee that the Ft. W. & D. C. Ry. Co. should withdraw its claim for improper repairs."

Mr. Morris: In the present case I believe the car arrived home with this coupler in, showing that it was not weak; it withstood the service it was expected to and I do not see any reason why it should be called wrong repairs. There is nothing to show that a 5x5 shank is weaker than a 5x6, and the fact that we have 100,000 pounds' capacity cars with 5x5 shank couplers is pretty good evidence to my mind that the builders and owners of the car considered them all right. I do not think there should be any objection to any railroad company taking advantage of that part of the rules which says that M. C. B. standard may be used when of sufficient strength, etc. This coupler was of sufficient strength to take the car home—perhaps it had been in there for some weeks.

Mr. La Rue: I do not agree with Mr. Morris. The Rock Island Company have a considerable number of cars of 80,000 pounds' capacity with 5x5 shank couplers. At the time these cars were ordered the question was discussed pro and con regarding the size of shank for the coupler and after a length discussion and considerable investigation it was decided to use the 5x5 standard M. C. B. coupler on account of the repairs, not really because we wanted it. It does not seem to me right that when a company goes to a heavier car, that company is bending its energies and spending its money to strengthen the car, and after they do that and they turn it out on the road and other companies apply couplers of weaker material. Now it does not look reasonable to me, nor it does look just, that the claim can be made that a 5x5 shank is just as strong as a 5x6 shank. While the ratio of strength may not be as great in proportion to the size, possibly that ratio will keep that coupler from breaking at some certain time. You can carry that argument to the 5x7 coupler. We certainly all know that a 5x7 shank is stronger than a 5x5 and if it is right to put a 5x5 shank in place of a 5x6 it is right to put a smaller journal in that the car calls for, in my opinion.

Mr. Lau (L. S. & M. S.): I cannot see why the capacity of a car should figure in the size of a coupler shank, the same as the journal. For example, the second car from the engine in a train may be a 60,000 pounds' capacity car and equipped with a 5x5 shank coupler, and the third car be an 80,000-pound car and equipped with a 6x6 shank coupler. Why should there be more strain on the 6x6 shank than on the 5x5 shank? It is my opinion that the coupler shank should not be compared with the size of the journal. If a 5x5 shank coupler is not heavy enough for an 80,000 capacity car, it is not heavy enough for a 60,000.

Mr. La Rue: In my opinion you are opening the way there for a great deal of dissension between owners of cars. I do not think that the question went far enough. I think the question of credit should have come in there.

Mr. Hyde (E. & T. H.): I have not been identified with the car business long enough to give an intelligent opinion on this case, but my views of this are in the same line. I think that every endeavor should be made to maintain the standards that railroad companies are adopting on their new and heavier equipment. In regard to the pulling strain on the couplers, possibly there is no difference in the strain on the different size shanks, but in the buffing shocks there is where the heavier coupler will stand, and I am of the opinion that it is wrong repairs to put a lighter shank coupler in a car that had formerly carried a heavier one, no matter if it was a 5x6 or 5x7-inch. Aside from that, if the copuler applied is 1 inch smaller laterally it will allow side play and may cause the coupler to uncouple from the next one on sharp curve. If you put in a wrong coupler I think you ought to put on a defect card.

Mr. Wharton (C. & N. W.): Of course you are all aware that the Northwestern system is a large one and we have a great many cars, thousands of them. We have 40,000 pounds' capacity, 50,000, 60,000, 70,000, 80,000 and 100,00 pounds' capacity cars, and the company has adopted one class of coupler and use it in all the cars; that is the Chicago coupler, and we put them in every car, making no discrimination in regard to the capacity of the cars. If we had to put a heavier shank coupler in the heavier cars we would be put to a great expense to distribute couplers over the system to put in the heavier capacity cars, consequently we use one class of coupler for all cars. In these larger couplers the metal may be distributed more than in the smaller ones. They may be thinned out some, and in looking over the different couplers I notice a great many are only ½-inch or ⅜-inch thick, and I think it quite possible that the larger bar may have really no more metal in than the lighter one. As far as putting a 5x5 shank coupler in place of a 5x6, I am decidedly in favor of not granting a defect card.

Mr. Morris: I would like to ask Mr. Wharton if he has more broken couplers in the heavier cars than in the lighter ones?

Mr. Wharton: I do not think we do.

Mr. Kroff: We have a good many cars with 5x7 shank couplers and a great many 5x5 shank couplers, and we do not order any 5x7 shank couplers, but we order in the neighborhood of 100 5x5 shank couplers each month. That will give you an idea of about how they stand over our way. I do not know that I have seen a coupler with 5x7-inch shank broken, except one that was in a wreck.

Mr. Morris: In making that statement, do you consider the greater number of 5x5 shank couplers in use?

Mr. Kroff: I certainly do. We have a good many cars equipped now with the 5x7 shank couplers.

Mr. La Rue: The question of strength of drawbar has been brought up. It does not seem to me possible that there is any mechanical engineer designing cars at the present time that would attempt to put the same amount of metal in a 6x6 shank that there is in a 5x5. I do not know what his object would be in doing it. Certainly when he adopted the 5x6 shank he certainly made provision for more metal, and before I came to the meeting I did not think there would be any discussion on the subject.

Mr. Morris: I will say this, Mr. President: I have used a good many 5x5 shank couplers in cars that originally had a larger shank coupler and there has never been any exception taken to it.

Mr. Bates: I can say the same with regard to the road I am with. I have seen quite a few 5x6-inch shanks broken on foreign cars, and not having any 5x6 shanks to put in we simply put in 5x5, and I have the first one to hear from yet. Besides that, we have several thousand cars of 80,000 pounds' capacity and all we use is a 5x5 shank. We have a few flat cars of 80,000 pounds' capacity with 5x6 shank, but we never take exception to a 5x5 shank when put in by foreign lines. A 5x5 shank is an M. C. B. standard, and I do not see how you can object to their being used.

Mr. La Rue: It is standard if it does not impair the strength of the car.

Mr. Bates: Supposing you have 80,000 pounds' capacity cars. If you saw fit to put in heavier axles than those required by the M. C. B. rules, would you have a right to ask for defect card for wrong axle if we put in one that is standard for that capacity car?

Mr. La Rue: That does not specify the size of coupler for the different capacity cars.

Mr. Bates: There is an M. C. B. standard bar for all cars, viz: a 5x5-inch shank. As Mr. Wharton says, for cars of 100,000 pounds' capacity they use a 5x5 shank coupler.

Mr. La Rue: As I stated before, a discussion was had at the time cars were ordered, and while no one discussed it but what was reasonably sure that a 5x5 shank is too light for an 80,000-pound car, I have no reason to change my mind since the cars were built, and I do not think it right. Of course this is only my personal opinion,, but when a railroad company is progressive enough to increase the strength of their cars I do not feel like putting a stumbling block in their way, because it has got to come. We have engines now that haul from 85 to 100 loaded cars, and you would not put a coupler in there that was only considered safe when the engines pulled 50 to 60 cars.

Mr. Morris: I think Mr. Bates' illustration about the axle a pretty good one. Just because a railroad company sees fit to increase the size of parts beyond the M. C. B. standard I do not think it should be considered a good reason for making other railroad companies live up to them. If a larger shank and stronger shank coupler is right for an 80,000 pounds' capacity car, then there ought to be that same shank coupler in all cars—40,000 and 60,000—because those 5x5 couplers which are supposed to be weak get the same shock, the same impact, when the 80,000-pound car comes against it as the heavier coupler in the 80,000-pound car. The Master Car Builders certainly went into this matter of strength of couplers very thoroughly and their tests were very thorough and I think that they provided for any kind of an impact that we can get at any time, and any lot of couplers is only as strong as the weak one, and if the 5x5 shank couplers have to be thrown out of all cars the heavier couplers should be put in the light capacity cars as well as the heavy. Just because it is an 80,000-pound car is no reason why it should have the heavier coupler, in my opinion.

Mr. La Rue: I agree with Mr. Morris that the heavier coupler should be put in all cars.

Mr. Kroff: While we may be located on the prairie where we do not have the heavier pull. I would like to hear from some of the lines in the mountainous district, where the heavy pulling on coupler is. And as to equipping all the cars with heavier shanks, it will require alterations in the draft timbers in order to apply these couplers with heavier shanks, or no doubt a good many roads would adopt them.

Mr. Bates: I think that is just the reason why the Master Car Builders left the standard as it was. I think every one will agree with me that the coupler shank has been strengthened by adding more material and using better material to overcome this trouble Mr. Kroff speaks of. A part of our road runs through a mountainous country and they are not having any trouble with the 5x5-inch shanks. They seem to be running along all right and we have not yet seen fit to change it.

Mr. Prickett (C. & E. I.): I favor Mr. Kroff's report very much in regard to heavier shanks. It is necessary to change the lug castings to put up that 6½x6½ shank. I have had some 6½x6½ shank couplers sent to me from the shop and I cannot get them in where the cars are equipped with lug castings. They are too heavy to go in there. I put up a pair of new draft timbers to-day in a car and I told my assistant foreman to put in one of the new couplers. He tried to get one of those couplers in but found they were too large. In the last 60 days I should say I have put up about 35 couplers in cars, and out of that 35 I had but one broken at the shank. They were either broken in the guard arm, or side wall breaks out, or something like that, and I have only had one coupler broken at the shank, with all the 80,000-pound cars and heavier tonnage in trains. I have seen our trains coming into the yard with 78, 80 and 85 loaded cars every day. I will say that two-thirds of the couplers we have removed in the last twelve months have had the guard arm broken off and I think the guard arm ought to be made heavier instead of the shank.

Mr. Jones: The B. & O. are using a certain class of coupler put up with a yoke, 5x5-inch shank and we have orders to keep track of the couplers removed and we have not removed a coupler yet. The C., L. S. & E. brings in cars with 6x6-inch shank and we very often find the shank broken off.

Mr. La Rue: Of conrse the question of material with which the couplers are made of will enter into the strength of them. There was a time when the malleable iron coupler was sufficient for all needs, but that time has gone by. A malleable iron coupler to-day, in my opinion, is not strong enough—nothing less than a good steel coupler.

Mr. Nulta (C. & E. .): I agree with Mr. Prickett, who also represents our line. We remove a good many couplers on account of guard arms broken off, and to my knowledge I don't think I have seen a coupler within the last few years with broken shaft, and in this respect don't think defect card should be granted.

Mr. Kroff: I would like to ask what is the M. C. B. standards we talk so much about. What are the principal parts which make the M. C. B. standards?

Mr. Morris: So far as we are concerned, all that is necessary to know is that they stand the tests prescribed by the Master Car Builders' Association. Of course the contour lines must agree with the drawings the Master Car Builders have adopted.

Mr. Downing (C., R. I. & P.): I look at this from the standpoint of the arbitration decision on $4\frac{1}{4}$x$7\frac{1}{2}$-inch journals on the R., W. & O. cars. If you put in an M. C. B. standard $4\frac{1}{4}$x8-inch journals you make wrong repairs. I would take the same stand on this. While the 5x5 shank is considered the M. C. B. standard, it spoils the original construction.

Mr. Morris: I do not see how anybody can make such a comparison between axles and couplers. The M. C. B. rules say what is the proper axle for certain capacity cars. It does not say what is a standard coupler for certain capacity cars. It gives only one kind of coupler for all capacity cars.

Mr. La Rue: As I understand it, the $4\frac{1}{4}$x$7\frac{1}{2}$-inch journals are in 60,000 pounds' capacity cars and when you put in a standard axle for that capacity you make wrong repairs.

Mr. Morris: There are several M. C. B. standard axles and one M. C. B. standard coupler. There is only one M. C. B. coupler, and an M. C. B. standard axle for each capacity car, and if you do not put in the proper axle you make wrong repairs.

Mr. Prickett: No $7\frac{1}{2}$-inch journal should be an M. C. B. standard.

Mr. Kroff: The way I look at this the M. C. B. standard is the contour lines, length, etc. It does not say what kind of a head you should have on that coupler at all, and I think the only question is whether a 5x6 shank is a stronger coupler than the 5x5 shank, and that is the only point I see in the question which should make it either right or wrong repairs.

Mr. Miller (C., R. I. & P.): I think inasmuch as the Master Car Builders' Association has adopted a standard size shank, 5x5-inch, they intended to have it used on all cars, inasmuch as they have not mentioned any other size or any other standard, that one standard should apply to all cars, and I do not believe that a card should be given in this case. It does not impair the strength of the car, as I understand it, and does not really harm the car in any way or change the construction of the car.

Mr. Bates: I have just looked over the rules and I find that it provides that "couplers of the vertical plane type, other than M. C. B. standards, replaced by an M. C. B. standard, and if any alterations are required the road that makes those alterations is at liberty to charge the car owner for making them." As I said before, the M. C. B. standard coupler has a 5x5 shank, it has contour lines according to M. C. B. drawings and is certainly qualified to do the work expected of it, and I do not see how you are going to make it out a case of wrong repairs when one of those couplers is used in place of a 5x6 shank. If you get some other car on your line with a different shank than an M. C. B. standard and happen to break it, you can put in an M. C. B. standard and make any repairs that are necessary to make the M. C. B. standard fit, and charge the owner for it. On the face of that it does not seem right to give an M. C. B. card when you put in a 5x5 shank in place of a 5x6 shank.

Mr. Morris: I would make a motion that in the present case the owner is not entitled to a defect card.

Carried.

Subject No. 2. A delivered B's refrigerator, loaded, to C, with end stove in, damage having been done by A, who applied his defect card for all defects visible from the outside. When car was returned to the owner delivering line was asked for defect card for additional damage at the end, which could be discovered only by inside inspection. Should card be furnished?

Mr. Humphrey: I think this card should be final, as it would be as fair for one company as the other, on the grounds that the car probably had old cracks in sills, and it would be unjust to go back to A for an additional card. This would leave too much room for advantages to be taken of the carding road.

Mr. Cook (C. B. T. Co.): I think the party partially carding for the car should furnish additional card for defects which were probably all caused at the same time.

Mr. Morris: It seems to me that Mr. Humphrey's contribution presents one side of the question which ought to be taken into consideration. I believe something to the effect that advantage would be taken of the later inspection. Still the other side has a pretty strong case. If I damage one of your cars when it is loaded, breaking in the end, and I card it for what I can see, I am assuming responsibility for that damage—all of it. If, upon later inspection, inside parts—ice boxes or whatever it may be—are found to be further damaged, I think it a hardship on the owner to make him stand it. I think we ought to consider that the owner would be honest in asking for what is right, although some of us have had experience the other way. However, I think the thing would be handled properly. I think the man who carded the car would like to be represented when the additional defects are discovered, for his own protection. It seems to me a little bit difficult to get at to make it satisfactory for both parties, still there is a question of equity there that ought to be considered in preference to anything else. There is some question as to just the method of settlement to be arrived at, still the main question is that I damaged the car and should pay for it.

Mr. Richardson (A. C. L.): On the line I represent, when car is received with M. C. B. defect card that does not cover all defects, such as insulation paper, inside lining, tanks, etc., we make out joint evidence slip for additional defects and send it into the office, and I think they forward it to the road that issued the card, for additional defect card. I think the road that issued the card ought to card for the additional defects. There are a good many things in a refrigerator—inside lining, tanks, etc.—that cannot be seen from the outside of the car.

Mr. Prickett: I should like to ask how long it was after this defect card was put on before this other damage was discovered.

Mr. Morris: I would say, as a member of the committee on subjects, I believe it is understood the car had made a trip of perhaps 400 or 500 miles east or west. That would be a fair presumption, anyway.

Mr. Prickett: That would leave a chance for some one else to do the additional damage.

Mr. Olsen: I have handled a good many of that kind of cars with defect cards and without them. It seems to me reasonable to assume that a party that issues defect card for seven end sheathings, for instance, broken in, would assume responsibility for two tanks stove in, insulation broken, paper torn, although he could not see it until the car is empty and it was found out afterwards. In cases of that kind I have had occasion to go and see it myself, make a joint inspection and send that in with the defect card to the road that issued it and ask for additional card, and we always get it. I do not think that it is fair to hold the intermediate road that just handled the car for the additional defects, as he had the same record, seven end sheathings broken in, and should not be asked to pay for the additional damage when the car is carrying A's defect card for seven end sheathings. I do not see how there can be any question of it at all. It should be left to the judgment of the people looking after that end of the business.

Mr. La Rue: Don't you think that the defect card should be made out covering all the defects?

Mr. Olsen: I do not think so for the reason that seven end sheathings can be stove in without damaging the ins[illegible] and if the owner found a defect card on the car covering damage to inside parts, he might make a bill on it, although he did not make any repairs. I think it should be left to the party delivering the car and the owner to say what damage is done and then for the party that delivered the car home with the joint evidence of the receiving road to get additional card. That is the way most roads handle it here in Chicago, I believe—at least that is the way the road I am with handles it.

Mr. Morris: I think a pretty fair way to get around that would be to have a joint inspection when the car gets home, showing the additional damage, the joint evidence card to be signed by two parties who saw the car, and if each one is inclined to be fair I do not believe there should be any trouble about it.

Mr. Cook: In cases of this kind that we have had, for instance an eastern road is not represented here and we need additional defect card, we have simply got a list of the defects and got the delivering line to verify it, and we had no trouble whatever in getting additional card from the road that applied the defect card.

Mr. La Rue: I think the joint evidence of C and B should satisfy A to give the additional card. C the delivering line and be as the owner—the joint evidence of these two ought to satisfy the party that issued defect card that this additional damage was done at the same time.

Mr. Kroff: I think if the damage amounted to a great deal it would be proper to make joint inspection, and if necessary make out joint evidence if the road that issued the card was not represented on the joint inspection. I do not see any question here or why there should be any trouble in getting card for the additional defects from the road that issued the card.

Mr. Prickett: We have had several refrigerators lately on our line and I have always let the cars go home to the owner and when he tears out the siding and tanks and felt he generally calls on our inspector at the yard to make joint inspection of it and whatever conclusion they reach in the matter of defects we give them a card. I think that is the proper way to do—hold joint inspection of the damage and the road that damaged the car should assume responsibility and issue card for the defects.

Mr. La Rue: Supposing you are not represented at the yard—that this car was delivered by the terminal. Would you accept the joint evidence of the owner of the car and the representative of the terminal? Would your company give card on the evidence of the terminal man and the owner of the car?

Mr. Prickett: Yes, sir; I would.

Mr. La Rue: Supposing your road came no further west than Pittsburg. You damaged the car and put your defect card on for what defects you could see. Supposing it was a Swift car handled through Chicago and delivered to the owner by the terminal. Would you, at Pittsburg, accept the joint evidence of the terminal inspector and the owner and give a defect card for the additional defects they found on the car?

Mr. Prickett: I view of the fact that I had put my defect card on that car, then I would have to take the decision of those two parties and issue this card.

Mr. Bates: I think about the same as the rest, that B should get joint evidence, signed by both himself and C, and present it to A and request A to furnish card, and I think A ought to recognize the joint evidence and furnish card for any additional damage that could not be seen from the outside.

Mr. Miller: I should like to ask, suppose the car was dismantled 100 miles from the point of delivery. How could you get joint evidence in that case?

Mr. La Rue: The delivering road knows there is an M. C. B. defect card on the car. That is corroborative evidence when he is asked to make joint inspection.

Mr. Miller: But the car is not repaired at the point where it is received by the owner. It is taken 100 miles away and the delivering line has no opportunity to make joint inspection when the car is repaired. In that case you cannot get joint evidence.

Mr. Bates: In that case I should say that it would be the duty of the owner to take it up with A direct, without getting joint evidence card, and I think he would get redress just as well providing he made the case plain enough, showing that the defects all existed at the same end.

Mr. Morris: I would make a motion that the proper course to pursue would be for the owner to get joint evidence card, signed by himself and the delivering line, and present the same to the party who issued the defect card and ask them for additional card.

Carried.

Subject No. 3.—A's car was destroyed on B's road. Trucks were returned to the owner, B having used M. C. B. standard journal boxes, bearings and wedges, which were not standard to the car. If M. C. B. defect card is given for wrong repairs what credit should be allowed?

Mr. Humphrey: I think credit should be allowed for second-hand material.

Mr. Lau: Why should card be issued for wrong repairs if M. C. B. material is used and fits properly?

Mr. La Rue: Why should not card be issued?

Mr. Olsen: I think this last subject on the program is just the same as the first. If these journals and brasses are standard to the car, why should not the 5x5 coupler be standard to the car? It is M. C. B. standard material in either case.

Mr. Bates: If these M. C. B. standard parts fitted in the truck then I would say that no defect card should be given but if the road that applies these M. C. B. standards is foolish enough to give a defect card, I think the stuff ought to be scrapped on them.

Mr. Olsen: I did not mean to speak about the scrapping part of it being the same in the two cases. We have decided that an M. C. B. standard coupler shank was all right on an 80,000 pounds' capacity car—that the 5x5 shank was all right. Why is not an M. C. B. standard oil box in a truck standard.

Mr. La Rue: The handling of trucks is entirely different than the rules of interchange of cars. The rules say that trucks returned should be repaired to the satisfaction of the owner, or defect cards given. That does not enter into this question. It says: "If M. C. B. card is given for the wrong repairs, what credit should be allowed?" He has given a defect card now, then he has applied new journal boxes, bearings and wedges—that is the supposition of the case; now, what credit should be allowed when he takes them off?

Mr. Olsen: I do not think he should ask for any more credit than second-hand material.

Mr. Kroff: I would like to ask Mr. Olsen under what rule he would give second-hand credit?

Mr. Olsen: Under the rule that after material has once been applied it is second hand, no matter whether they are used or not. If you put in a pair of wheels and only move the car from one track to another they would be second-hand wheels when taken out. The same rule would apply to these oil boxes, brasses and wedges.

Mr. Hyde: I think that the party repairing the truck should give credit for scrap material only.

Mr. Kroff: I think the same. There is nothing in the rules showing that you should allow second-hand credit for those parts, that I know of.

Mr. Morris: I would like to ask Mr. Kroff what he would do in case of two of his 60,000-pound trucks were returned with M. C. B. material, in view of the fact that his 60,000 capacity oil boxes, brasses and wedges are not M. C. B. standards?

Mr. Kroff: If a party issues an M. C. B. defect card for wrong oil boxes, brasses and wedges, it should be scrapped, under the M. C. B. rules.

Mr. La Rue: Would you actually throw that material into the scrap?

Mr. Kroff: I do not know anything about that. You might ask me whether I would throw wrong material in the scrap. I do not know that that applies to this case. What I would do is what the rule says and what the card calls for. That is my idea of what I would do under those conditions, when M. C. B. defect card is issued for wrong material, unless it is brake beams or couplers which the M. C. B. rules provide for, or M. C. B. axles, I would give proper credit.

Mr. La Rue: Remember, this is not a case of car delivered in interchange, but a case of trucks delivered home. There are rules and regulations which govern each particular case. The question in this case is merely a case of credit when M. C. B. standard material is taken off.

Mr. Lau: I do not see why it is not the same thing as a car delivered home. If the material fits the truck and is suitable for the car, M. C. B. material, it should go without defect card.

Mr. La Rue: It says here: "Not standard to the car."

Mr. Nulta (C. & E. I.): We have a certain series of box cars equipped with journal boxes that require a (D 137) M. C. B. brass. Then we have another series of same capacity (60,000) 4¼x8 journals that require an M. C. B. style of brass, but not M. C. B. We have had occasion to remove from under our cars wrong oil boxes covered by M. C. B. defect card. We would hold this box till we had occasion to apply it to a car the owner of which carded this box to us as wrong material, while we in turn would bill him for second-hand material. This I consider an injustice. In my opinion second-hand M. C. B. material could be used on all foreign lines on foreign cars, and I believe we should allow credit for second-hand material in cases of this kind.

Mr. Miller: I believe that scrap credit should be allowed on this. In the first place, a road destroying a car has the trucks and there is no hurry about getting them home, and they had the privilege of sending for standard material so as to make proper repairs. Their not taking adavantage of that as provided in the rules, they cannot expect anything but scrap credit. Just as soon as you commence to allow second-hand credit for wrong material used you do not know where to draw the line, and I believe the safest plan would be to allow scrap credit. I believe 75 per cent of the wrong material used that is removed is used again. In that case you would not care whether you allowed second-hand credit or scrap.

Mr. Bates: As I view this case, I do not see that you can do anything but allow scrap credit for these journal boxes removed for the reason that there is no provision made in the rules under which you are obliged to allow second-hand credit for this material. I think the case comes under Rule 118, which says: "If the company on whose line car is destroyed elects to rebuild either body or trucks, or both, the original plan of construction must be followed and the original kinds and quality of material used." I think that is pretty plain. I think as long as a defect card was furnished there is nothing for the owner to do but allow scrap credit for the material removed.

Mr. Morris: I do not see why these oil boxes, bearings and wedges were applied to the car at all. In the first place, they ought to have corresponded with the owner and made some settlement. As far as that goes, the trucks could have been returned without oil boxes and card given for missing ones, which would have been very much cheaper, it seems to me. As to what two or three gentlemen have said about giving scrap credit only, it seems to me that would be the proper way, if nothing more than a penalty on the road that applies them and for the very poor judgment shown in the matter.

Mr. Kroff: I would like to ask whether this company that received the trucks had M. C. B. boxes as being standard to any of their equipment? If they have, of course they could use them on their own cars, but if they had no cars equipped with M. C. B. boxes as standard, I do not see why they should allow anythiny else but scrap. They would have no use for them. They could not wait until a foreign car came along so they could use this material.

Mr. Bates: Under Rule 57 you can use an M. C. B. standard in repairing damaged cars and if the boxes fit they should be accepted by the owner, but if the party that puts on an M. C. B. box is foolish enough to give M. C. B. defect card there is nothing to prevent the owner from making bill, because the arbitration committee have decided that where any road has given a defect card, even though they did not have to give it, they have to stand the expense of the bill.

Mr. Olsen: According to the way I understand this question it is simply a party giving defect card regardless of what the defects are, or giving a defect card where he did not have to give it. They have no redress. If he is foolish enough to give defect card for defects he is not responsible for he ought to pay the penalty for it, and if anything pay more.

Upon motion it was decided that scrap credit only should be allowed.

Meeting adjourned.

The Car Foremen's Association

of Scranton

June Meeting

On Saturday evening, June 13 the above association held its regular monthly meeting in the R. R. Y. M. C. A. Hall, Scranton, Pa., President R. B. Rasbridge in the chair. Present, 45.

Mr. Rasbridge: The first order of business is the reading of minutes of the previous meeting; inasmuch as they have been printed in the Railway Master Mechanic, if there are no objections we will dispense with the reading and approve them as printed.

Mr. Burnett: I have the following applications for membership:

H. A. Flynn, Airbrake Instructor, Wilkes-Barre, Pa.

S. B. Keys, Agent Consolidated Car Heating & Lighting Co.

D. E. McMurtree, Foreman Painter, H. & B. R. M. Co.

Mr. Rasbridge: As these names have come before the executive committee and passed upon by that body, we will consider these gentlemen members of our association. Our first subject on the program to-night is a paper on "The High Speed Brake," to be read by Mr. P. J. Langan, traveling airbrake inspector of the D., L. & W. R. R. He not being here, we will pass on to the next subject, which is: "A receives from B one of A's cars which had been repaired by B. In making repairs B used siding with a different bead. A demands defect card for wrong repairs. Is he entitled to it?"

Mr. Fuss: There is no question of standard entered into the question. I understand at the last meeting of the Master Car Builders' convention a standard was adopted of 3¼-inch and 5¼-inch. I would claim that if 3¼-inch and 5¼-inch siding was used that it would be standard, although it might not be of exactly the same bead. I should think that if it was a standard siding of the standard width that the company whose car was repaired had very little kick coming, even if the bead was different. However, I suppose, according to the rules, the bead not being standard to the car, they could claim defect card, but I think it is an unjust demand.

Mr. Rasbridge: Taking the question into consideration, it appears the only thing in question is the bead, there being no mention made of different widths. In making repairs to car B used siding of a different bead. A demands card for wrong repairs. The question is: Can A hold B responsible for applying the different style of bead?

Mr. Stuckie: I do not consider that there is any such thing as wrong repairs in bead, because the bead has nothing to do with the wear and tear of the car; furthermore, it is a standard material. It is M. C. B. material, and you cannot find it in the rules where bead is mentioned.

Mr. McMichael: I do not think you will find an arbitration committee in this country that would give him a card. If it is the same kind, or fully as good as the material formerly on the car, I do not think A is entitled to the card.

Mr. Fuss: A great majority of the roads, when they get new box cars, take considerable pride in them and try to keep them looking as well as possible. For instance, a company has a car with a V-shaped bead, and some other road damages the siding of it in two or three different places and puts on another kind of bead. Now, it alters the appearance of the car. While the material may be the same, and perfectly satisfactory in all respects, yet it is not the same, and the car is marred. We might say, for instance, that a car having a 4x8 stringer is repaired by a foreign road who puts in a 4½x8. They could claim defect card. But that is not standard to the car. There is a rule in the M. C. B. code which states that work must be done standard to the car, or words to that effect, and I think that they could demand defect card. I know in one case at Ashley a company demanded a defect card. There was a cypress siding on the car and we used a different bead. They claimed defect card and we were instructed to issue it.

Mr. Rasbridge: If there are no other remarks to be made on this subject, we will consider it closed and go on to the next, which is: "Responsibility for lamps and tools missing in passenger cars offered in interchange."

I will state that it is our practice, when possible, to examine the interior as well as the exterior of passenger equipment in regard to the lamps and tools, and if we find a car is equipped with tool box and the tools are missing at that time we demand defect card for the same, or have an understanding with the delivering road that these tools are missing, and we accept the car on record. In case anything comes up that record stands. If we should make delivery of that car to another line and we are obliged to issue our card, we can go back to the road that delivered the card to us and demand offset card. Personally I think it is a good idea whenever you have lamps, tools and other fixtures in a car to have an interior inspection made, and satisfy yourself of the condition of the car. Very often you get foreign passenger equipment on your line where you find lamps, etc., removed. Our experience has been such and we found where the racks have been removed. Now, if we did not satisfy ourselves as to the condition of the car when accepted it, likely a dispute as to the responsibility would have arisen. I think it is a good idea for every road to know for a certainty the condition of a car, both as to the interior and exterior. When you return the car to the delivering road you will then be in position to settle for any material that is missing or damaged at that time.

Mr. Wilson: I do not think Mr. Rasbridge's theory will hold good. We have connecting lines offering cars to us at times that are sealed—for instance, express cars—and we cannot open them. The car goes back and we ask for defect card covering missing material. What are you going to do about that?

Mr. Rasbridge: I said, when possible, to make an interior inspection.

Mr. Fuss: When an express car is sealed we class it as a freight car. Under the rules they would come under the head of concealed parts. For my part I think the delivering company should be responsible for lamps and tools missing. If not, who would be? Somebody should be responsible. If a delivering company's car should come on line of the C. R. R. of N. J. in good condition and lamps were stolen out, an axle or saw missing, etc., I think the delivering road should stand for it. It is not reasonable to expect the Central to pay for the loss of same. The delivering company in my opinion should be responsible for tools, lamps, etc., missing.

Mr. Rasbridge: At our last meeting we had the following subject up for discussion: "A receives from B one of B's cars with a cut journal. B offers to card for the same, but A demands a card for two cut journals. Is A entitled to a card for two cut journals when only one has been cut?" The association did not go on record as to what they thought would be the proper demand.

Mr. Fuss: I move you that it be the sense of the meeting that A is entitled to card for only one cut journal.

Seconded by Mr. Wilson and carried.

Inasmuch as the principal subject on the program was "The High-Speed Brake," and Mr. Langan failing to appear, the members were somewhat disappointed and it brought the program to a speedy termination. However, the balance of the evening was taken up with several lively topical discussions on various car matters, after which the members indulged in a general handshaking and social good time.

R. W. BURNETT, Secretary.

American Railway Master Mechanics' Association

Abstract of Reports

PISTON VALVES.

Committee: F. F. Gaines, chairman; R. P. C. Sanderson, F. H. Clark.

From the replies received to the circular of inquiry sent out by the committee, it would seem that the type of valves more generally favored is either the hollow internal admission or hollow external admission, and while there is a fair proportion of solid internal admission valves there are very few solid external admission valves in use unless we consider the piston valve used on the Vauclain compound as being of this type. In classifying replies it has been considered that this valve was of the hollow external admission type, and was classed by all answering the circular as such. While hollow as regards construction, it is not so in the sense that steam may circulate from end to end, and that it is unbalanced as regards the area of valve stem when not equipped with extension through front head. As to which type is believed to be the most economical very few expressions of opinion have been given, the experience generally having been confined to one type of valve. There are, however, some exceptions to this, the Boston & Maine road stating that for economy, as regards steam distribution, the hollow internal admission valve or the hollow external admission valve is preferable, as the steam passages are freest with these types, and for steam consumption the inside admission valve appears best, although no reason for the choice between the solid and hollow valves in this respect is seen. The first cost depends largely on the kind of packing rings employed, the outside admission valve costing somewhat more on this particular road on account of having to make valves, valve cases and packing rings of different sizes at the front and back ends of valve, due to equalizing the two ends of the valve stem. For maintenance they prefer the inside admission hollow valve because but one size of case is required, one size of packing ring to be kept in stock, and the metallic valve stem packing wears much longer. Also the valve is more easily removed and there seems to be less wear on the entire valve gear on inside admission valves.

The D. & H. Co. state: "In the spring of 1902, Messrs. Campbell and DuBois, seniors of Cornell University, made a comparative test in freight service of Class E-2 and E-3 engines. The engines were laden proportionately to tractive power. Deductions gathered from this test show a saving on the piston valve engine of 1.8 per cent due to valve. The piston valves were new, and the slide valves were recently shopped." While not so stated, this economy is apparently due to steam distribution, and as the percentage of gain is so small it is questionable if, after the elimination of errors of observation, there would remain any advantage. Several other roads express preferences, but without giving reasons so fully.

As regards the ratio of diameter of cylinder to cylinder of valve both in simple and compound engines there seems to be a large variation between the maximum practice and the minimum practice. In simple engines the ratio varies from 1.66 to 2.1. For the Vauclain compound system the high pressure varies from 1 to 1.38, and for the low pressure cylinder from 1.67 to 2.30. The variation in the other types of compounds it not so marked, due to fewer replies being received concerning these types. It is the opinion of the committee that the lower ratios indicate the better practice and that the higher ratios should only be used on freight and switching engines.

Under the head of "Provision for Relief," the methods of obtaining relief from water and extra pressure is generally provided for by relief valves in cylinder heads. In some few cases there are, in addition, by-pass valves, relief valves in steam chests and on the compound engines, relief valves in low pressure ports, and on the end of a hollow valve stem. There is one exception to the above, offered by the Southern Pacific. As regards the value of the various types of relief valves from water it is not thought that the valve in cylinder head fulfills its function in the manner that it is expected to. It has been the experience of one road that these valves, after being in service for a short time, corrode, or through other causes fail to lift at the pressure at which they are set, and that they are of but little value as relief from water in cylinders. As to relief when drifting, very few of the by-pass valves or relief valves are thoroughly successful where the speed is high. It is possible that the circulating pipe previously referred to will do this to a greater extent than the other devices. Referring to the reply of the Southern Pacific Company, and quoting: "The circulating pipe shows an arrangement that not only takes care of compression and surplus moisture, but will also take care of temperature of cylinders when drifting. It takes care of the partial vacuum that is responsible for incandescent hot gases of smoke box entering cylinders through the exhaust nozzle. The piston valves in constant use for the past two years with this circulating device are in perfect order today, with little if any indication of wear. The cost of caring for the piston valves during this time has been nothing more than that of bushing the front end horn or guide when engines were shopped."

No affirmative replies were received to the question as to use of piston valves with collapsible packing rings, although it is known that such valves are in use on two roads, and that on both of these roads their service has been very satisfactory. The theory of this type of valve is that steam pressure being admitted through cavities under the packing rings, sets them out against the valve cage, but that when they are so set out, due to the different angles of the different rings composing the packing, they lock in this position and the valve practically becomes a plug valve. It will be generally conceded that the plug valve has some advantages over the other types, and that its great disadvantage is due to the wear of valve and bushing so as to gradually permit steam to pass between. It would seem, however, that this type of valve, being adjustable, would overcome this objection.

Various types of packing rings are in use, as well as rings of the same style varying greatly in their dimensions. The rectangular cast-iron snap ring, together with the cast-iron "L" ring, appears to be used in the majority of cases, while for the rectangular rings about ⅜ by ½ inch and for "L" rings ⅝ by ½ inch seem to be the prevailing sizes. In some few of the valves provided with followers heavier rings are used, and it is questionable if the prevailing practice is not too light rather than too heavy. As regards the various advantages of the rectangular and "L" shaped rings, it would seem that the rectangular rings generally have the advantage of strength, longer life, cheaper cost and cheaper maintenance, while to offset this, the "L" ring, especially on high-speed engines, gives a very much better port opening with less wire drawing off steam. The "L" ring naturally has a greater unbalanced surface than the rectanfular ring and it is the experience of one road that it wears both itself and the chamber very much more rapidly than the rectangular ring. Your committee believes that in most designs the extension part of the "L" ring projects too far. As to the efficiency or economy of various types of rings, only one road has any data, the Chicago, Milwaukee & St. Paul, which operated a test of two valves, one having the test packing rings on one side and the other having ordinary packing rings on the other side. From the indicator cards taken it would seem that the steam distribution appears as good on one side as on the other, while they report that this bushing and ring have been in service on the right side of the engine for one year, the left-hand side being equipped with the regular bushing and rings. An examination made about a month ago shows that the valve having diagonal bridges and the broad ring was in perfect condition and had all the appearances that would indicate another year's service without repairs, while the opposite side, having the regular type of rings and bushings, had to have chamber rebored and new rings applied; the service thus far obtained from the bushing with the diagonal bridges and the broad ring packing seems to be very favorable. The general practice as regards the number of rings per end seems to be two rings, although there are several exceptions where three rings are used.

Relative to exhaust effect, the Chicago, Burlington & Quincy states as follows: "We have made experiments on valve friction of internal admission piston valves of both hollow and solid types. With the solid valve, cards taken show that at slow speed there is an excessive push forward on the valve when exhaust first opens. With the hollow type of piston valve we get more uniform pull than with the solid type. However, with the end of the valve travel there is a sudden increase of pull which corresponds to the point of exhaust opening."

The Boston & Maine states as follows: "We have made no test on piston valves for friction. We observed that when our first consolidation engines arrived, they soon began to sound badly out of square, the indicator diagram showing that the valves were not cutting off equally, yet no discrepancies could be found in the valve setting or motion work. The defect was attributed to the removal of pressure from back end of the valve by the valve stem, the greater pressure on the front end keeping the slack all taken up in one direction and allowing valve to keep as far back as possible. This condition existed for speeds up to thirty miles per hour, above which, apparently, the inertia of the parts overcame the unbalanced force. The inequalities of the exhaust sound increased with increased slack in the motion work. The trouble was overcome by enlarging the back head of the valve by an area equal to area of the valve stem." Your attention is called to the other method of eliminating this difficulty by the use of an extended valve stem.

No experiments seem to have been made with a view to determining the steam lost due to worn rings, and judging from remarks made at the topical discussion on this subject at last year's meeting, it would seem that there is a wide variation of opinion as to the amount of this loss. One road states that while having made no accurate tests to determine the steam loss due to wear of packing rings, two of the Master Mechanics who had made shop tests on this point, are of the opinion that the rings can easily represent a loss of fifteen per cent over steam consumption with rings in first-class condition. It undoubtedly varies, due to several conditions—the type of ring, the size of ring, the type of valve and the length of period between reboring of valve chamber casings and application of new packing rings. One road states that where piston valves are used on engines, when on account of heavy grades there is a long drift, the frequent reboring of valve casings is economical in the long run as preventing broken packing rings and blowing.

Only two roads replying to the circular acknowledge having had any experience with the new type of American balance slide valve. One of these states that two engines are equipped with most excellent results. The other has had four engines equipped for about a year's time, and, with the exception of some minor difficulties in the start which were later overcome, the results have been very good. The valve has both double admission and double exhaust features, and while no indicator cards have ever been taken to show how much has been gained by this feature, there can be no question but that it is an appreciable factor. Your attention is also called to the fact that with this type of valve, all balancing parts are stationary and not subject to wear, and that in two different ways a very short steam port may be obtained. One of these is by making wide shallow exhaust cavity in cylinder and obtaining a short steam port. The other method by which this can be accomplished is to use inside admission, as there is nothing in the way of balancing this valve equally as well for inside as for outside admission, although it is believed the latter has not yet been tried. Notwithstanding the large size of this valve as illustrated, in connection with 210 pounds of steam, the engine can be handled with a full throttle with ease, showing that valve is perfectly balanced. It also has the advantage of providing for relief from over pressure in the cylinders by lifting in the same manner as the ordinary slide valve, and on account of the double exhaust feature there must be considerable decrease in back pressure, which is evidenced to a certain extent by the very short, sharp exhaust.

The replies as to the chief advantages of piston valve seem to be fairly uniform and consist, in the main, of better balancing, which includes ease of handling and decrease in wear and tear of motion work. In addition, some replies give less cylinder clearance, better steam distribution, less cost of maintenance, shorter steam passages, decreased back pressure, better distribution, larger port openings; and on the four-cylinder compound the fact that the piston valve really takes the place of the two valves, in that it distributes the steam to both high and low pressure cylinder, greatly simplifies the motion work and the number of parts. It is questionable if all the advantages claimed are real and tangible, as it seems that some of these attributes can be obtained equally as well or better with other types of valve. It would seem that the question of lubrication is not a settled one. The reply of one road states that where engines with piston valves have to drift for long distances the question of properly lubricating the piston valve becomes a very serious problem, and it is hoped that a discussion of this paper will bring out some more definite information on these points. It would seem that the reason for the growing favor in which the piston valve is held is due largely to reasons as given by one of the roads in reply to the circular, as follows: "Our reasons for taking up the piston valve are that with the increased size of engines and steam pressure the ordinary balance 'D' slide valve increases in size proportionately, and while we may balance the valve in the same ratio as the valves on the smaller engines, the difference in unbalanced surface increases with the size of the engine. This increases the wear on the valve and link motion, eccentrics and straps, and increases the work necessary on the part of the engineman to handle the engine." The foregoing reasons probably cover the situation, the Lake Shore stating that on a very careful test an economy of about five per cent was shown, which they considered due to back pressure and perhaps slightly to decrease of amount of compression.

Among the defects, as given for piston valves, the most general are difficulty in lubrication and maintenance of relief valves, broken packing rings, edges of grooves in spool breaking, liability to blow, inability to keep steam tight and excessive wear of bushings at short stroke. In addition to this, the Lake Shore calls attention to the fact that it finds in connection with the piston valve, considerable trouble with main driving box. This is also the experience of another road, it being found that main driving boxes wear very rapidly so as to have side play and pound, making it necessary to rebore very frequently. In a letter to the committee, which the author did not desire to have published in connection with his signature, the question as to lubrication when drifting is brought up, and he states that on the road with which he is connected it is a very serious problem to lubricate the piston valve under such conditions.

In reply to question as to with which type of valve the wear and tear is greatest, the majority of replies state that it is less on the piston valve. One road qualifies this by saying that it depends on conditions, and that if the latest type of balance valve is used the wear and tear is decidedly less with the slide valve. Another road states that it is about equal, while many give no opinion whatever, and one road states that the wear and tear is much greater on the piston valve.

Only one road replies as to the efficiency due to worn rings for varying mileages, the Burlington & Missouri River Railroad in Nebraska stating that if the piston valve is not up properly and regularly inspected there will not be any appreciable loss after making forty-five thousand miles, but otherwise the loss through leakage of steam will be so noticeable after making fifteen thousand miles that the engine would not be in very good condition.

As to which of the rings are most responsible for decreased efficiency due to wear there seems to be a decided difference of opinion. Some roads state the exhaust ring and some other roads state the steam ring, while the majority state either no data or no opinion.

Four general designs of bushing seem to be in general use—the continuous bushing with straight bridges, the continuous bushing with diagonal bridges, sectional bushing with straight bridges and sectional bushing with diagonal bridges. There does not seem to be any decided opinion as to which is the better type. In connection with the continuous bushing, an interesting suggestion is contributed by the Chicago & Northwestern Railway, in which they state that they prefer a single bushing and one having the fits at the two ends slightly different so as not to have to force the bushing the full length of cylinder. The use of the diagonal bridges probably reduces the liability of broken packing rings, and also will probably give a little more wear, but it is questionable if the increased cost over the straight bridge warrants the use of this type. With simple engines using the piston valve the general preference seems to be for two bushings, one at either end of the piston valve chamber, although there are several cases where the continuous bushing is used on the simple engine. With the compound engine it becomes desirable on account of the number of ports to use the continuous bushing, and this type is used exclusively on the Vauclain compound piston valve.

In a majority of cases a knuckle joint or Scotch yoke is used. In some cases, however, it is not used where the valve stem is long. There seems to be no doubt that for best results with wear of packing rings and valves some device should be used so as to remove all tendency for valve wearing within the valve chamber, and to resolve all force acting on the valve into one parallel with the valve stem.

On the later compound engines with the piston valve, of the Vauclain type, a hollow valve stem with extension for relief valve supported in both front and back heads seems to be generally used. In simple engines in some cases an extension is also used, but the opinion that same is necessary is not general, it being stated that equal results are sometimes obtained without the extension.

From the replies to some of the questions it is very evident that little or no data is available on some of the subjects brought up in connection with the piston valve. Your committee, therefore, recommends:

First: That tests be made to determine the amount of loss of steam due to worn packing rings. Such tests should include the various types of rings illustrated in the report.

Second: That tests be made to determine whether the steam or the exhaust ring are the most responsible for the decreased efficiency due to wear.

Third: That the question of proper lubrication of piston valves when drifting be more thoroughly investigated.

Fourth: The attention of the committee being called to the question of valve setting in connection with the piston valve, after it was too late to include it in the circular, by one road stating that with indentical valve motions, to obtain equal work, modifications in the piston valve setting must be made, it is suggested that further investigation be made along this line.

ELECTRICALLY-DRIVEN SHOPS.

Committee:—C. A. Seley chairman; H. H. Vaughn, T. S. Lloyd, F. W. Demarest, L. R. Pomeroy.

The designer of a new railroad shop at the present time, in arranging for the generating station and power transmission, is primarily confronted with the problem of deciding which system of electrical power shall be used—the alternate or direct current. Each has its strong advocates who can advance numerous points in favor of their preferred system, and the question is frequently complicated by local conditions to an extent which makes a decision extremely difficult. It may be necessary to combine in the power plant for the shop a generating station for furnishing current for light or power to other property, passenger depots, freight houses, car repair plants, and similar uses which are located at a considerable distance. For such purposes alternate current is recognized as being an economic necessity, the cost of copper required to transmit the energy by a low-voltage, direct-current system being practically prohibitive. In another instance the converse of this may be the case: in place of the power plant being required to transmit power to a distance or furnish current for uses other than shop operation, it may receive its power from some outside source, in which case it becomes merely a transforming station to convert the current transmitted, which it may be assumed is a high-potential alternating current, into a form suitable for distribution around the shops. In either case the conditions are identical in one respect: alternating current is necessarily used in the power plant; and in both cases also direct current can also be furnished for shop purposes if desired, either by the use of rotary transformers or motor-generator, or, in the first instance, by the installation of direct-current generators for shop use separate from those used for the long-distance transmission.

On the other hand no long-distance problems may interfere with the choice of a system, the power plant may be entirely used for furnishing energy for a group of shop buildings sufficiently near together to make a low voltage reasonably economical, and whichever system is used is selected solely with reference to its presumed advantages for shop driving.

The above instances represent the effects of local conditions, and while they may be modified in the first examples by the proportion of the total power required for shop or outside purposes there are evidently two possible general conditions to consider: First, where it is necessary that alternate current be present in the power house; second, where it is not necessarily present.

Now, whichever of these two conditions confront the designer there is one important fact which affords the problem in the present stage of the development of the alternate-current motor, namely:

That if electrical speed control is desired direct current must be used for driving those tools on which it is employed. Assuming, therefore, for the moment that it is immaterial which system is used for the operation of cranes, transfer tables and driving machinery in groups or constant speed tools, the really important question to be decided is whether or not electrical speed control in some form or other is desirable. A number of articles on this subject have been written, and they are all worthy of careful perusal and study; but the main question is whether the extra investment necessary is justified by the results obtained. There is no doubt that practically all those connected with shops in which some form of electrical speed control has been installed will speak very favorably with respect to its convenience and the economies resulting from its use, but it certainly entails an extra expense and it is necessary to demonstrate that the benefits received are sufficient to outweigh the additional cost. Usually the possible economies are referred to, but a preferable method is to find what increase in output is necessary to compensate for the investment, and then discuss whether it may be confidently anticipated that this increase will be obtained. This method of reasoning, which is equally as sound as the other, will be found to fit the case considerably better. It is difficult to obtain figures from which the additional cost of electrical speed control can be definitely determined, and no attempt has been made to obtain them from the various members of this association, although it would be most valuable if they could be furnished in an intelligent form for the proper discussion of this question. For this report the cost figures of the Collinwood shop of the L. S. & M. S. Ry., in which the Crocker-Wheeler multiple voltage system is employed, have been carefully analyzed, and while the results are not accurately applicable to other shops in which the number and character of the tools may vary, and the method of speed control be different, yet remembering that the larger tools in all locomotive shops have a fairly close similarity and that the tools of each description are employed in about the same proportion, it is fair to assume that, while there would be a variation, it would not be important in the gross result, and this assumption will be confirmed by an inspection of the figures.

To ascertain what percentage of increased output must be obtained to justify the application of electrical speed control it is first necessary to formulate the factors that determine the cost per annum of operating a tool. These are as follows:

1. The direct labor charge per diem.
2. The indirect labor charge, including what are generally known as shop expenses, superintendence, power, lighting, etc.
3. Interest and depreciation charge on the cost of the tool.
4. Interest and depreciation charge on the proportion of cost of machine shop and power plant, including generators, etc.
5. Interest and depreciation charge on switchboard, balances, wiring, motors and controllers, etc.

Of these factors the only one affected by the use of electrical speed control is No. 5, the others being independent of it. The value of them has been estimated for the locomotive shop at Collinwood from the actual figures of the cost of construction as follows:

1. The direct labor for three hundred days at $2.80 per diem is $840 per annum.

2. The indirect labor charge may be taken at twenty per cent. This figure is fairly representative of railroad shop practice.

3. Interest may be taken at five per cent, depreciation at ten per cent. This figure may be considered high, but if rate of depreciation is lowered it makes less output necessary to earn the investment in the installation of speed control, and it is desired to be on the safe side. At Collinwood there were thirty-eight tools equipped with M. V. control, total cost $89,644.34, an average of $2,360 per tool. Fifteen per cent of this sum is $354, the annual charge per tool for this item.

4. The proportionate cost of the building that can be charged against any tool is more or less of a guess; but it is a real charge without question. At Collinwood, where locomotive erecting machine shop and boiler shop are under one roof, and the only figures available are the total costs of the entire building the fairest way is to find the cost per cubic foot of shop and thus determine the cost of the machine shop itself, dividing this among the various tools in proportion to their cost. This is not exactly correct, but as the more expensive a tool is the more floor space it occupies and the more room is required around it, this method is as fair as possible, and on this basis the cost of the shop, including buildings, heating and lighting aparatus (outside of power plant), cranes, etc., is equal to $1.03 per $1 cost of tool. The proportionate cost of power plant is fairly arrived at by dividing the cost of the plant by the horsepower of output, and charging this against the tools in proportion to their consumption. At Collinwood the total cost per horsepower of output is $86, and as the actual consumption of the M. V. tools is 70 horsepower the amount invested for their operation is $6,020, or $158.50 per tool. The total investment under this heading is, therefore, $2,430 plus $158.50 per tool. On this amount interest may be charged at five per cent and depreciation at six per cent, the life being longer than for tools, the total annual charge per tool thus being $284.73, say $284.

5. This item is separated from No. 4 as it includes all charges that vary according to the system of control employed. It includes numerous small items as follows:

(a) Proportionate part of cost of switchboard and 220-volt feeders in ratio of horsepower consumption of M. V. tools total, $1,226.

(b) Prorated cost of M. V. portion of switchboard, M. V. transformer and inside feeders in proportion of M. V. tools in machine shop to total, $2,821.

(c) Cost of wiring M. V. tools. This is not by any means an easy figure to determine, but has been estimated very closely by obtaining the total cost of labor and material for wiring all tools in locomotive shop, exclusive of the feeders to distribution boxes, and dividing the labor by the number of tools wired and the material by the horsepower of tools wired. To allow for M. V. tools each of them is counted as two tools wired and as being of double the rated horsepower. In this cost there was also included the power wiring in each erecting pit, each pit considered as representing one tool of five horsepower, which is very closely correct. The result of this calculation is that it cost $4.80 per horsepower for wiring material, $18.30 per unit tool for wiring labor.

As there were thirty-eight M. V. tools with a total rated horsepower of 270 these amounts are as follows:

38 tools wired at $36.60	$1380.80
270 x 2 horsepower at $4.80	2,592.00
	$3,972.80

(d) The cost of motors actually used on the tools, including controllers, etc., $12,150.

The total cost of item No. 5 is, therefore:

(a)	$ 1,226.00
(b)	2,821.00
(c)	3,972.80
(d)	12,150.00
	$20,169.80

This amount is considered to be subject to five per cent interest and ten per cent depreciation as in the case of the tools themselves, the annual charge thus being $3,025.50, or $79.70 per tool.

Recapitulating the above the average annual cost for operating thirty-eight multiple voltage tools based on the Collinwood construction accounts would be:

Item 1	$ 840.00
Item 2	168.00
Item 3	354.00
Item 4	284.00
Item 5	79.70
	$1,725.70

Now, if the multiple voltage had not been employed the only change in the cost of the plant would have been in item 5; the subdivision costs would become as follows:

(a) There would be no change, it remains		$ 1,226.00
(b) This cost is avoided without corresponding change.		
(c) The cost becomes:		
38 tools at $18.30	$ 690.00	
270 horse power at $4.80	1,296.00	
		1,086.00
(d) The cost of motors required on the various tools including starting boxes		7,200.00
Total		$10,412.00

Fifteen per cent of this amount is $1,561.80 or $41.10 per tool per annum.

The total cost of operating a tool is thus $1,725.70 with electrical speed control, against $1,687.10 when driven by constant speed motors, or an increase of 2.24 per cent. In other words it is only necessary to obtain an increased output of 2¼ per cent to justify the extra expense.

There is little doubt that any one who has been connected with a shop in which some such system has been employed would hesitate for a moment in stating that a saving is obtained many times that required to equal the additional cost, to say nothing of the increase in output, but there are objections to the method usually employed in giving the reasons for this economy which is based on the assumption that the production of a tool is proportioned to the cutting speed of the work. It is true that in the average belt-driven tool the changes of speed usually vary by increments from forty to fifty per cent, but it does not follow that the work performed need vary in any such ratio. In any given material with the same cutting tool, which is being operated to its capacity, the amount of metal that is removed in a given time depends on three factors—the cutting speed, the feed and the cut. These factors are not independent, but with a given feed and cut the tool will stand up satisfactorily at a certain speed, with a different feed and cut the maximum practical cutting speed will vary, and so on. The law connecting these three factors is not yet properly determined, and will probably vary for different materials. This much, however, can be stated, that for medium steel, such as that used for driving axles, crank pins, etc., the amount of metal that can be removed per minute with the same depth of cut and with feeds varying from 1-8 to 1-20, the speed in each case being adjusted to the limit of the tool, does not vary fifteen per cent. This may not be the case so closely with other materials, but it is certain that variation in the feed affects the permissible cutting speed in every case, and within the limits of a speed variation of forty per cent it is possible to so adjust the feeds and cuts so that the amount of metal removed per minute is substantially the same. It might be stated, therefore, that, theoretically, it is unnecessary to have small and easily made variations in speed, but there is another and more important side to this question, the practical one of how to get as nearly as possible the maximum product from a tool. If a machine were employed steadily upon work in which the material were of uniform hardness, and the dimensions of the pieces the same, it would probably be possible to get the same output when the speeds vary by forty per cent steps as when they vary by ten per cent by the adjustment of the feeds and cuts, but even assuming this to be exactly true, it is a condition that does not obtain in the majority of machine shops, and is practically absent in railroad shops. While machines may be classified as to the work they perform, this work varies quite a little in its dimensions on account of the various forms and sizes of the parts used on different classes of engines, and the materials employed are also subject to considerable variation in their cutting qualities. How is the output determined in such a case? With a belt-driven tool the machinist sets his feed at what he considers is right and runs his tool at a certain speed. He may try the next speed higher, which is an increase of say forty per cent, and finds it too high. The result will be that he returns to the original speed and the work proceeds at that rate. It might be possible to use a larger feed, but it is very liable not to be done, and indeed outside of a few lathes, feed changes can not be made rapidly and easily and in many tools are too coarse to be effective. The speed change, when made by belt cones, takes a certain amount of trouble and is very likely not made as often as advisable. In general, it is difficult to adjust an ordinary belt-driven tool to the best cutting conditions, and it may be taken at the best to run as nearly as the cones allow, say within twenty to twenty-five per cent of the maximum on the average. Compare this with a tool having electrical speed control. The work is being cut at a certain speed; by the movement of a lever placed conveniently to his hand, the machinist can increase the speed by from ten to twenty per cent up to the point at which it is found possible to run. There is no exertion involved, no time wasted, and, in fact, there was no real exense for not operating the tool at its proper speed. If the work has two or more diameters, it is a matter of a second or so to change to the suitable speed. If the material is harder than usual the speed reduction is simply that necessary to meet the condition and not twenty-five or very likely forty per cent more, as may easily be the case on a belt-driven tool. There the man will not be found to shift the belt whenever a change is necessary, and he can hardly be expected to do so: with electrical control the change is so easily made that he should and can be expected to attend to it. With reasonable encouragement and intelligent control it is fair in this case to assume that on the average the machine can be run within ten to fifteen per cent of the possible speed, giving an increased output theoretically of at least ten per cent and in practical working a great deal more, from the closeness of the speed control alone, to say nothing of the saving of time in the manipulation of the machine resulting from this system. On wheel lathes, there is a special advantage, that when one or two hard spots occur in a tire, the machine can be slowed over these spots and the speed restored for the balance of the circumference; this feature is not very important to the shop as a whole, but it is quite important on that particular tool.

Another advantage of speed control is the opportunity it affords for a practical system for setting cutting speeds. As above mentioned this is for any material dependent on the feed and cut, but in the majority of cases in locomotive shops the variation in cut on similar classes of work is not important. Now, by adopting a uniform feed for all roughing work or two uniform feeds, one for heavy and one for light work, the most important variable is eliminated and the speed proposition becomes comparatively simple in place of being exceedingly complicated. The depth of cut is of minor importance within the limits in which it usually varies and by standardizing the feeds it becomes possible to estimate very closely what speed should be employed on different materials and obtaining a satisfactory output is correspondingly feasible. In such a system it is obvious that the ratio of the actual to the possible product depends on the closeness with which the speed can be regulated, and as a difference of ten or fifteen per cent in the speed is sufficient to ruin a tool in a few minutes or allow it to run for an hour or more it is evident that it should be controlled by at least that variation.

In general it may be stated that while close electrical speed regulation may not be theoretically necessary, it presents a practical method of increasing the output from shop machinery that can not be approached by the old belt and cone pulley, and that this increase in output should largely outweigh the slight additional cost, and in any shop where this small increase in outlay can be made in order to effect a substantial economy in operation, in other words, in any shop that is laid out on reasonable business principles, some form of speed control should be applied.

If this proposition is assented to, the use of direct current to a greater or less extent follows as a matter of necessity in the present state of the electrical apparatus, and the point next necessary in the present state of the electrical art, for no contractor is yet prepared to figure on A. C. variable speed apparatus, and the point next necessary to determine is the extent to which it is advisable to apply this principle. The factor affecting this chiefly is the extent to which it is commercially advisable to direct-connect tools. If it were decided to direct-connect all tools, an inspection of the figure above presented will show that the limiting factor affecting the application of speed control is not the size of the tool, it is the wages of the operator; the smaller the tool and the less the horse power required to drive it, the less is the additional expense of applying electrical speed control and there is consequently but little difference in the increase in output required to compensate for the additional investment. On a tool costing $500 and requiring three horse power to drive it, the items calculated as above are as follows:

Item No.	With Speed Control.	Without Speed Control.
1	$ 840.00	$ 840.00
2	168.00	168.00
3	75.00	75.00
4	66.00	60.00
5	69.00	34.50
Total	$1.218.00	$1,183.50

a difference of $34.50 or 2.8 per cent.

The wages of the operator are thus the most important factor, as if, in the case of this tool, they were decreased to one-third the amount the increase in output required would become 5.2 per cent even at that figure; however, the difference would render the question one of the type of tool and general convenience, and the extent to which direct-connection is advisable is thus the most important. At Collinwood tools were direct-connected for three reasons:

1. Where they were located under cranes to allow of their being placed in the most convenient positions and to avoid countershaft supports interfering with the crane service.
2. On tools above three horse power where the advantage of speed control were considered sufficient to justify it.
3. Where tools were in isolated positions and expense of line and countershafting would exceed cost of applying motors.

The remainder of the tools in the machine shop, 103 in all, are group-driven, and the cost of installing these tools has been analyzed to show how it compares with the cost direct-connected on one assumption, namely: that no additional price would be demanded by the jobbers in supplying their tools with suitable attachments.

The 103 tools are driven in eleven groups, the total tool horse power being 242.5; to drive these tools the group motors have a total of 202.5 horse power, which is larger perhaps than necessary, but was considered advisable.

The cost of the driving arrangement was as follows:

Eleven group motors	$ 4,550.00
Wiring eleven motors at $18.30	191.30
Wiring 202½-horse power at $4.80	972.00
Countershaft supports, line shafts, pulleys, etc.	6,667.00
Belting	3,881.00
	$16.261.30

Had these tools been direct-driven cost would have been as follows:

One hundred and three motors	$12,340.00
Wiring 103 tools at $18.30	1,884.90
Wiring 242 ½ horse power at $5.40	1,164.00
	$15,388.90

This result may appear surprising, but it is even more favorable to the direct-driven estimate than it appears. The roof construction must be appreciably heavier when it is expected to support countershafting than would be the case if simply required to cover the building. Additional members must be incorporated, but this expense we are not in a position to estimate at present. Then no charge is made against belt-driven tools for belt shafters and the cost of applying the belting, which for 103 tools is quite an expense. It would be interesting to obtain figures on the cost of maintenance of belting in this connection. The cost at Air Line Junction shop, a woodworking plant on the L. S. & M. S., has been obtained and found to be twenty-five per cent per annum for material alone. This expense would certainly be less in a machine shop, but can be safely estimated to be equal to the increased amount of repairs to the motors. To enable these figures to be fairly understood it should be stated that at Collinwood the countershaft supports are 6-inch channels, bolted together by separators and bolted to the under side of the roof structure, which was arranged to permit of this without drilling any holes for bolts or other fastenings. The structure on the whole is, therefore, not expensive, and if a cheaper form of support had been adopted the influence in the total cost would not have been sufficient to make belt connection the cheaper. These costs it must also be understood refer to a machine shop, where the tools are closely placed and group-driving appears in its most favorable light. In a wood mill or boiler shop, where tools are widely placed, a very rough estimate will show the economy of direct-connection, as in such a case it is far cheaper, to say nothing of the saving in power by not running long and heavy line shafts to drive a few tools intermittently.

The whole question is up to the machine tool builders. If they can furnish tools which can be direct-driven for the same price as when belt-driven, which is largely a question of preparing their designs to meet the demand, then it will cost no more to direct-drive tools than it does to belt-connect them in groups, and when this can be said the advantages of individual driving will make this practice preferable. It is not necessary at this time to go over the many desirable features of this system of power distribution, the flexibility it allows in shop arrangement, the absence of belts and overhead line and countershafting, and other economical advantages will certainly lead to the use of direct-connection unless the cost is prohibitive, and it would certainly appear from the above discussion that with the adoption of machine tools, the introduction of suitable designs, not only will this not be the case, but that the converse will be true. While it is at this time impossible to make that statement, yet it can be said that direct driving should certainly be employed so far as it is not rendered prohibitive by the cost of motor application, and it would then follow from the earlier portion of this report that electrical speed control should also be largely employed.

There are at present in use a number of different systems of electrical speed control, all of which are probably satisfactory in operation. They have had in the past one decided feature by which they might be classified, the extent to which it was thought necessary to vary the speed of the motor, some systems employing a speed variation of 1 to 2 or 4, others a decidedly larger range of from 1 to 5 or 8. The question is one of the size of motor desirable to employ to drive any given tool and is thus partly commercial, the larger motor required for a wide speed variation being of course more expensive, and partly one of convenience, the smaller range systems requiring additional gear trains on many tools which can be avoided by increasing the speed variation of the motor, and conversely the large motors are inconvenient to apply and occupy valuable room in the shop. It may be safely stated that this question is being gradually settled as experience is developed and that a range of 1 to 3 or 4 will be very generally agreed on as the largest it is advisable to obtain by electrical means.

This range is being now obtained under two distinct systems, one in which three wires are used, giving voltage in the ratio of 1 to 2, the other, in which four wires are used, giving voltages in about the ratio of 1, 1 1-3, 1 2-3, 2. It would be possible, of course, to obtain three combinations of voltages by the use of three wires, but there would be but little advantage in this unless a greater speed range than 4 to 1 is required and so need not be considered. In both these systems intermediate speed between those at which the motor runs under normal conditions at the various voltages is obtained by the use of field and armature resistance, the difference between them thus becoming the extent to which this form of control is employed. There is, however, a considerable difference between the results obtained by field and armature regulation; the former does not affect the speed-maintaining qualities of the motor, and the extent to which it is advisable to use it depends in its effect on the commutation and internal losses of the motor. Armature regulation, on the other hand, depends on its stability on a uniform load being carried by the motor, a condition that does not obtain in machine tool driving. If sufficient resistance is introduced into the armature circuit to reduce the speed twenty per cent at full load, the speed will be but lightly reduced at no load, while if the motor is working at one hundred per cent overload, as it may easily be doing for short periods, the speed will be reduced approximately forty per cent in place of twenty per cent. Such a condition is frequently found in practice and it is doubtful whether regulation of speed by armature resistance should be allowed to a greater extent than eight or ten per cent on account of this action. This does not apply to motors operating cranes or similar machinery, and on account of this action by which the voltage across the motor terminals is reduced when any heavy loads are taken, the use of a certain amount of armature resistance may be recommended on planers and other tools in which a large amount of power is taken at the instant of reverse. On a test of a 42 by 42 inch planer, at the Collinwood shops, it was found that the introduction of resistance equal to twenty volts at full load reduced the current taken at the instant of reversing fifty per cent, without seriously affecting the speed during the cutting stroke. As this class of tools is the one giving most trouble when direct-driven, it would appear advisable in all cases to insert a small amount of resistance in the current to obtain this action. In general, however, the above remarks hold good, and a variation of ten per cent is the limit to which this class of regulation should be used, or the speeds obtained by it will not be reliable.

On the 3-wire system it is therefore necessary to obtain the speeds intermediate between those obtained from the direct voltages, by field regulation up to a point that is within ten per cent of the higher voltage speed, or, in other words, a speed variation of eighty per cent must be obtained in this way. This was previously thought impossible, the maximum practical increase in this method having been assumed to be about thirty to forty per cent. During the past year or so, motors have, however, been developed that allow of this amount of regulation and with this improvement the 3-wire system becomes a serious rival to the 4-wire.

Again, the 4-wire system affords, under the majority of conditions, greater power from the same sized motor than does the 3-wire. If the motor is large enough under all conditions this is not important, but in a great many cases it will be found that unless motors are all installed that are of ample size, which means a relatively expensive plant, all the power that you can get out of a motor is a good thing to have and this feature must be taken as an advantage in favor of the 4-wire system. On the whole this discussion is rather in favor of the latter, but there are some other points on the side of the 3-wire that should not be overlooked. While requiring specially designed motors in place of the standard motors that are used on the 4-wire system, it is possible to so arrange the generators that the plant is independent of the operation of a balancing set. This would be a very considerable advantage, as, while a balancing set gives no trouble whatever in operation, if any accident should happen to it all tools dependent on the intermediate voltages for their operation would be put out of service, and in a large plant it would appear desirable to install it in duplicate. The 3-wire system also simplifies the lighting problem to a certain extent and affords what is practically a 3-wire system for that purpose. Your committee in general feels that on this subject the time is not ripe for any definite statement: the two systems referred to are both coming into use and their merits will be decided on the field of service. The chief features on one side and the other appear to be, the use of a special motor and one extra wire on the one side as against a standard motor and two extra wires on the other. There does not seem to be any great advantage in cost on one side or the other so far as investigation of the regular prices can determine where the cost of wiring is considered, and apart from this question, which is, perhaps, the most important one in the long run, the points deserving careful attention in considering the design of a plant would be the capacity of the motors offered for standing overloads so far as both heating and commutation are concerned, the speed of the motors at the maximum, which for equivalent cost it is desirable to keep equally low, the controller employed, the latter being quite an important detail of the apparatus, and the elimination of armature regulation beyond the limits referred to.

Beyond this discussion as to the system to be adopted for machine shop driving which is decided by the above considerations, your committee does not feel that it desires to open the question of direct versus alternate current for purposes in which speed control is not required, believing that since technical discussions on this subject before societies of electrical engineers do not appear to have ever been productive of any definite results, it is hardly worth approaching from the standpoint of those who are not electricians, and would leave it to the question of convenience and local conditions by which it is so strongly affected after the driving of the locomotive machine shop has been disposed of.

RECENT IMPROVEMENTS IN BOILER DESIGN.

Committee: D. Van Alstyne, Chairman; G. R. Henderson, T. W. Demarest, O. H. Reynolds, John Player.

Progress in boiler design may be said to be along the lines, and in pursuit of, increased efficiency as a steam generator, rather than in perfection of constructive details which affect first cost and that of maintenance. Your committee, believing that a graphic representation would convey a clear conception of the present status of boiler construction, has selected some examples of the product of 1902-3—both American and foreign—for the different classes of service, which embrace designs for bituminous, anthracite, and lignite coals, and also oil, for fuel. The accompanying table furnishes particulars of heating surface for each boiler, as well as other points that will make comparisons of interest.

For illustrations see Figs. 1 to 15.

The most prominent feature of design to attract attention are those of heating surface and grate area. Professor Goss pretty nearly exhausted the boiler-power question when he said: "The maintenance of pressure in the cylinders demand steam from the boiler, and the limit of cylinder work is reached when the boiler can no longer meet the demands made upon it." This is all fundamental, though recent, but is in strong contrast with the old order of things where cylinder dimensions alone signified a powerful engine.

The boiler of 1903 is designed with special reference to well-defined conditions, in which the horse-power involved is provided for by a heating surface and grate area, of proportions that are expected to unfailingly supply the cylinders. That these expectations are fully met is attested by the performance of the latest engines.

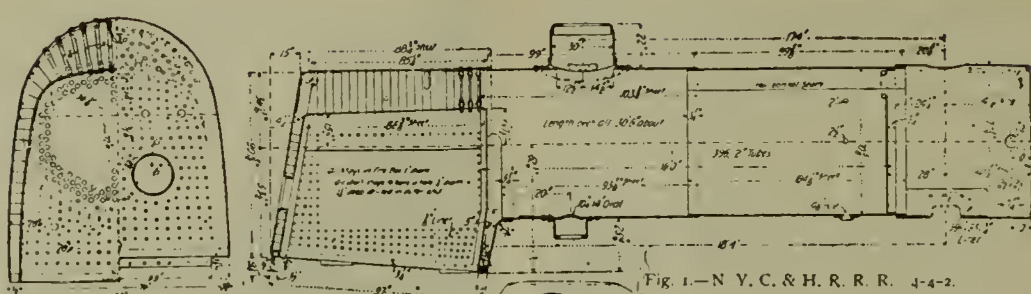
The wide fire box which is rapidly becoming recognized as a standard form of construction, is responsible for the extraordinary length of tubes on engines which, on the 4-6-2 type, reach a length of 20 feet in some cases, made necessary by placing the wide fire box at the rear of six-coupled 80-inch wheels. Foreign builders are regarding with favor the trailing truck design, since they gain a grate area impossible of attainment in the older form of passenger engines, and to this is due the appearance abroad of the 4-4-2 4-cylinder compounds of the Baden State Railway, with 42 square feet of grate, and others. The De Glehn 4-cylinder balanced compound is also of the 4-4-2 type, although it has not the fire box extending over frames, but the design of engine lends itself to such construction which will doubtless be seen on future engines of the De Glehn type.

A reference to the table herewith will show how extensive has become the tendency to increase heating surfaces for the new conditions, over those recommended in the report submitted to this Association in 1897. The ratio of fire-box heating surface to total as given therein was ten per cent. The large fire-box heating surfaces shown are five per cent and under in some instances, for which the enormous number of tubes is responsible. This is plainly evident in the Chicago & Alton 4-6-2 engine, which has the lowest percentage of fire box to tube surface among the passenger engines. This engine was designed for an especially exacting work which demands an unfailing boiler power. The New York Central 4-4-2 engine has demonstrated the necessity of a boiler with unlimited steam capacity, in numerous performances with a total load of engine and train of more than 730 tons at speeds of over fifty-five miles an hour.

It will be noted that the foreign engines have a ratio of fire-box to tube surface more nearly in harmony with the work of the committee referred to. The 4-4-2 De Glehn 4-cylinder balanced compound engine of the Northern Railway of France has made a record for development of a high horse-power on a very small heating surface, contending with 0.5 per cent grades at a speed of seventy-four miles an hour, with 295 tons of engine and train. More than 1,500 De Glehn engines are now in service. The 0-10-0 3-cylinder simple engine of the Great Eastern Railway has boiler proportions of the greatest magnitude of any of the foreign engines, having been designed for suburban passenger service in which stops are numerous, and with a gross load of 414 tons. This work requires the engine to accelerate quickly, therefore the small wheels and large boiler, the latter feature being an innovation in English design.

The London & Southwestern Railway has more than one hundred of the Drummond water-tube boilers in service, and it is stated that all locomotive boilers of this road are now being fitted with cross water tubes. Under this system, the fire-box heating surface is increased nearly one hundred per cent by means of the water tubes, and equals 30.8 per cent of the total. This would appear to be a practical illustration of the ancient proposition, that the higher the percentage of fire-box heating surface to total heating surface, the greater the evaporative only, has been designed by Mr. Riegel of the American Locomotive Company. This system contemplates two nests of water tubes extending from center of crown sheet diagonally down to side water spaces, by which it is claimed to be possible to get efficiency of the boiler, a logic that remains to be controverted. A boiler of this character, but with water tubes in the fire-box over 1,800 square feet of efficient heating surface in the fire boxes of the larger types of engines, making a total heating surface of over 6,000 square feet. There is no doubt of the necessity of such a design, since fire boxes have about reached the limit of size, both from a clearance standpoint as well as that of operation. There is no record of any construction of this idea.

Superheating of steam is attracting considerable attention abroad, particularly on the Prussian State Railways, where seventy engines are fitted with the Schmidt system of superheating. In addition to these the Schmidt principle is in use on the Alsace-Lorraine State Railways, the Belgian State Railways, the Moscow-Kasan Railway, the Southern Railway of Italy, and the Munich Suburban Railway. In this country the same



Section of F tubes.

Fig. 1.—N. Y. C. & H. R. R. R. 4-4-2.

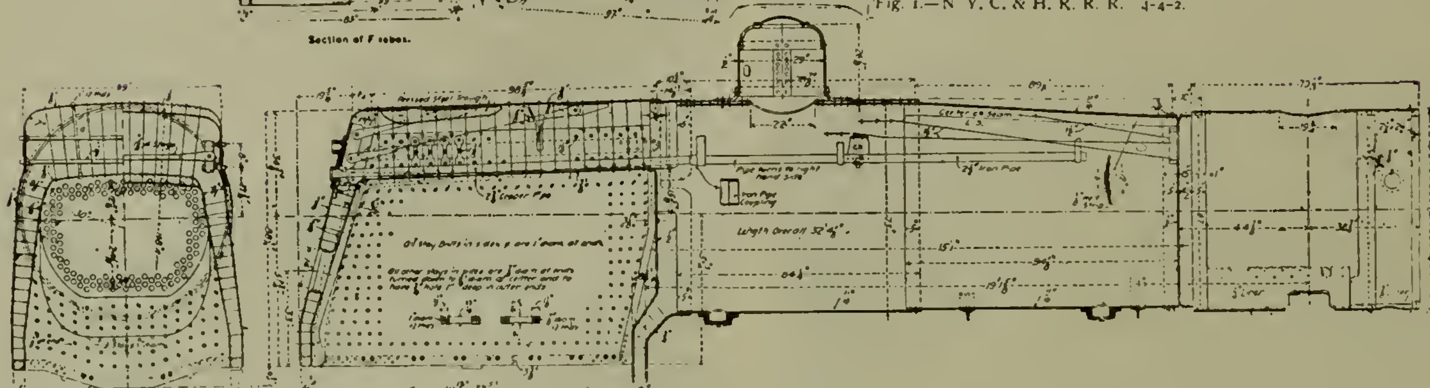


Fig. 2.—Pennsylvania R. R. 4-4-2.

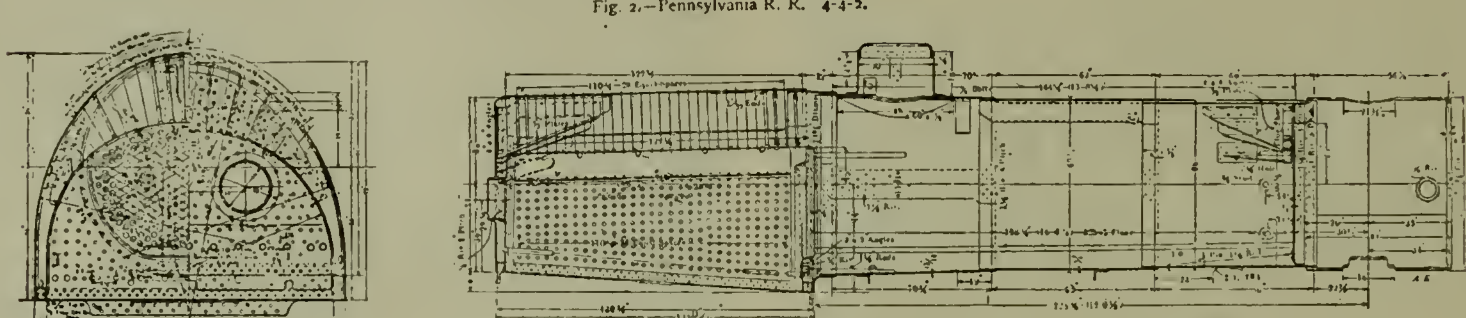


Fig. 3.—C. R. R. of N. J. 4-4-2

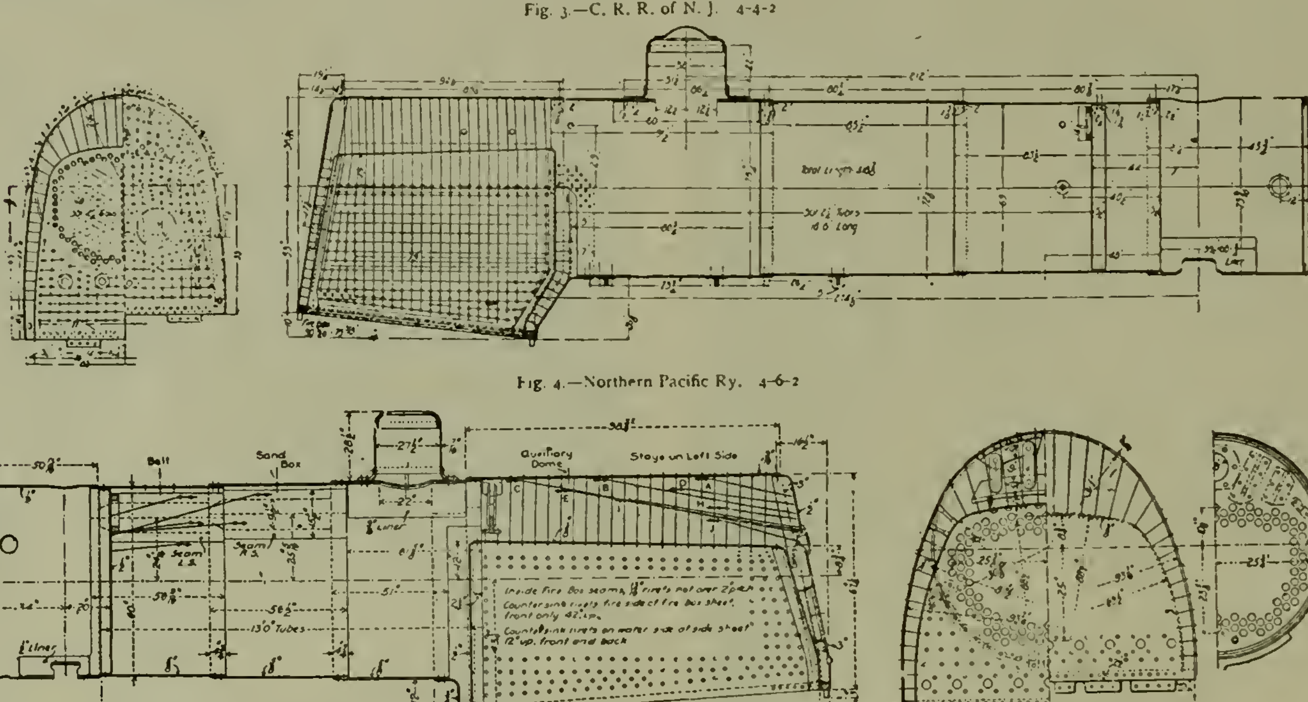


Fig. 4.—Northern Pacific Ry. 4-6-2

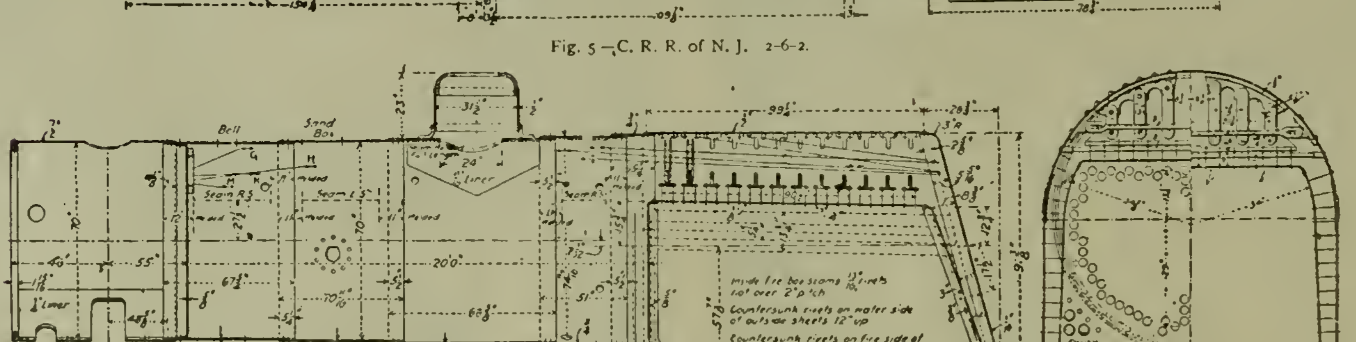


Fig. 5.—C. R. R. of N. J. 2-6-2.

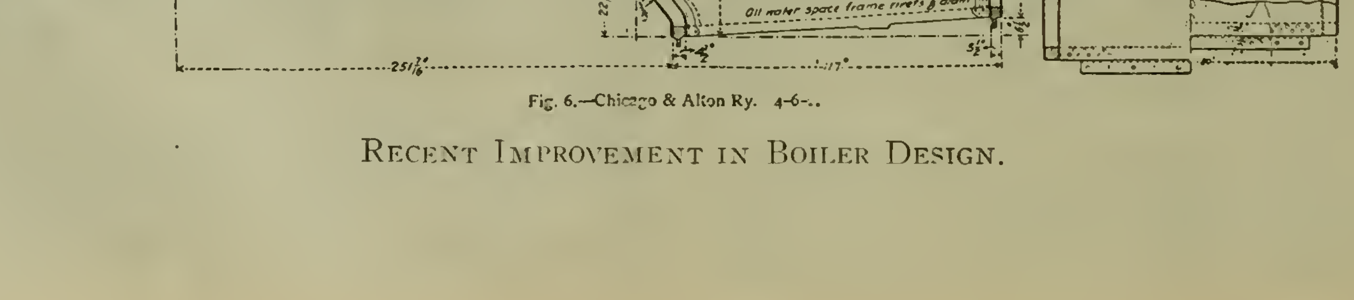


Fig. 6.—Chicago & Alton Ry. 4-6-.

RECENT IMPROVEMENT IN BOILER DESIGN.

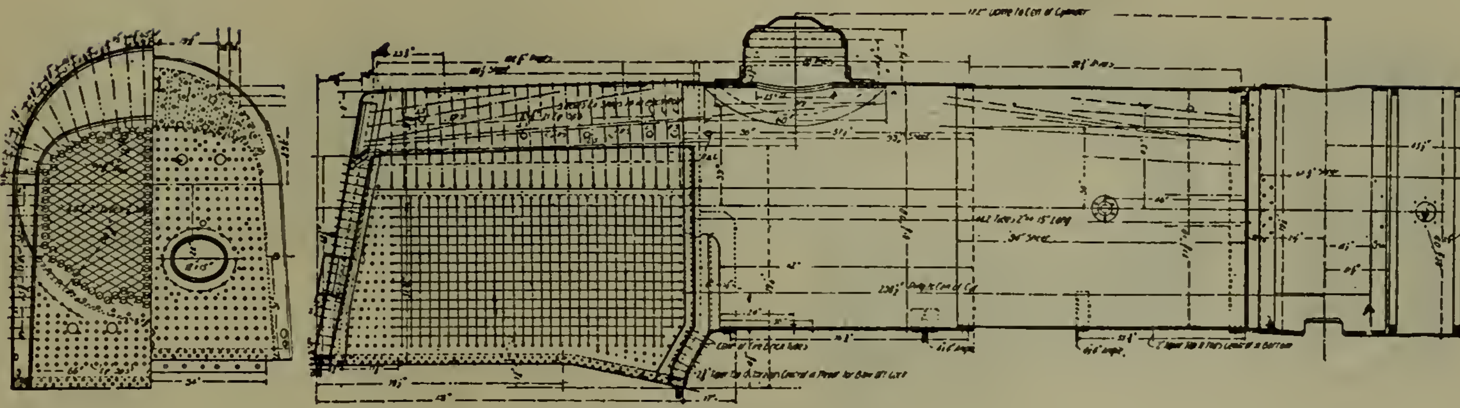


Fig. 7.—C. B. & Q. R. R. 2-8-0.

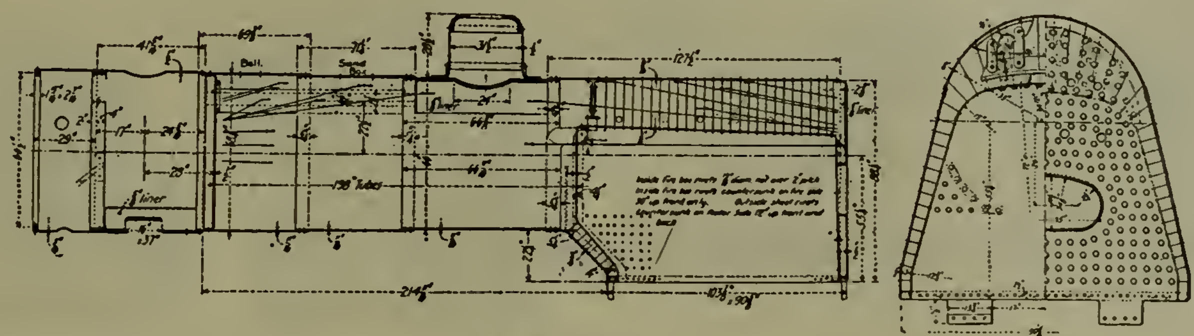


Fig. 8.—B. W. & C. F. Ry. 2-8-2.

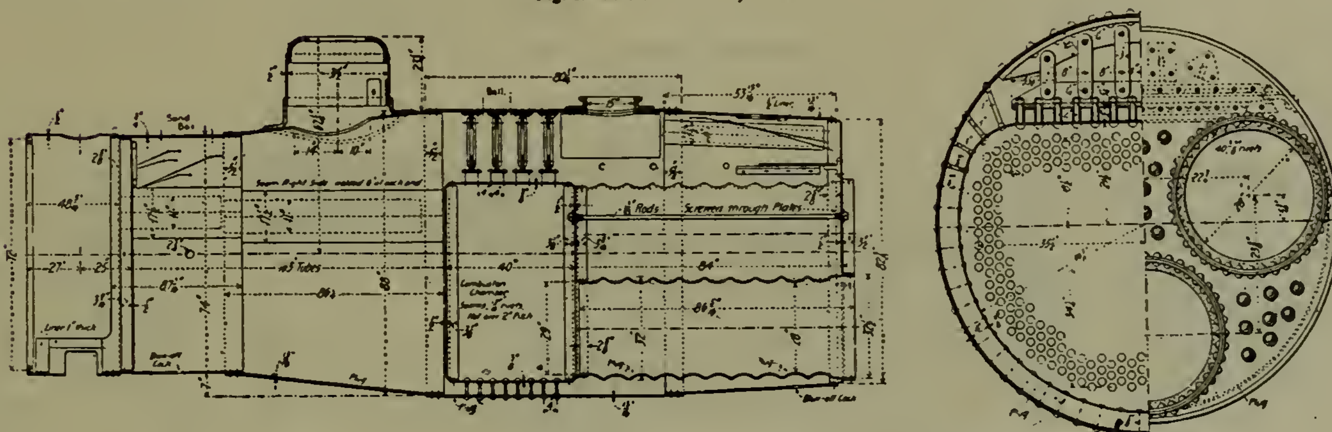


Fig. 9.—A. T. & S. F. Ry. 2-8-0.

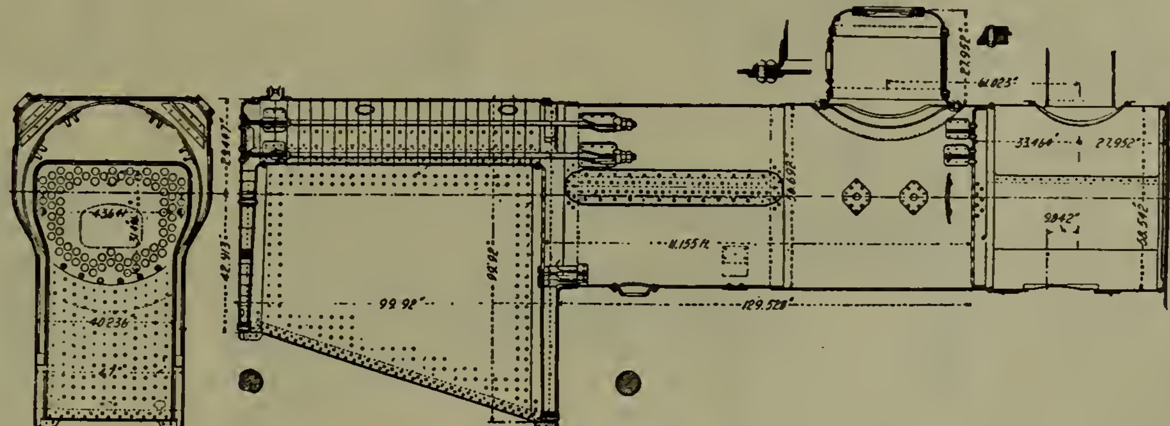


Fig. 10.—P. L. & M. Ry. 4-4-0.

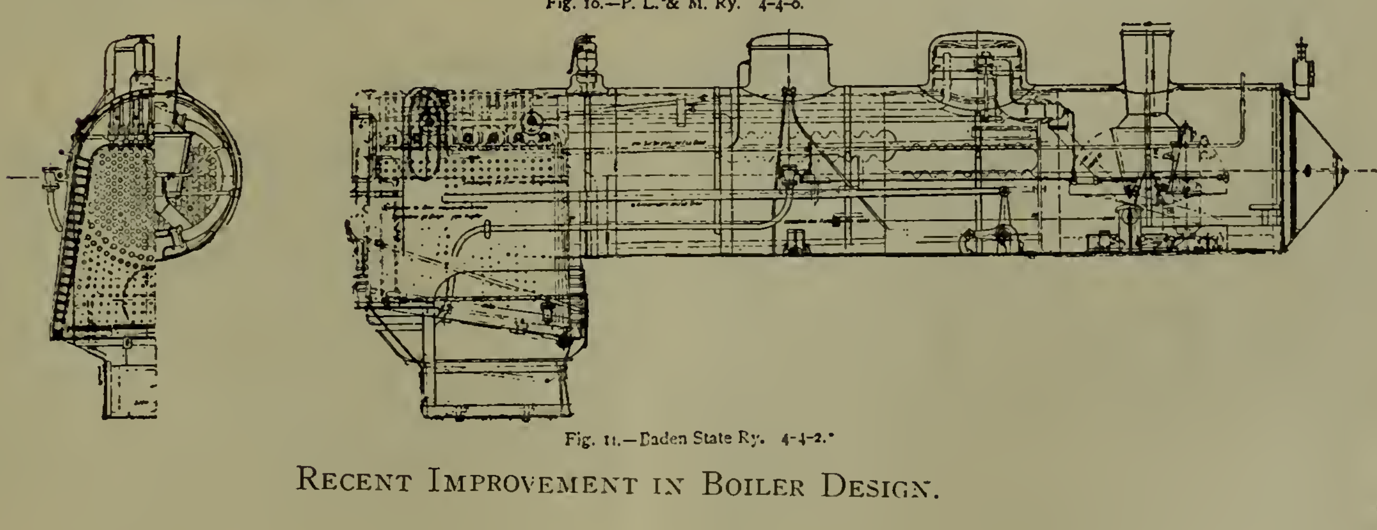


Fig. 11.—Baden State Ry. 4-4-2.

RECENT IMPROVEMENT IN BOILER DESIGN.

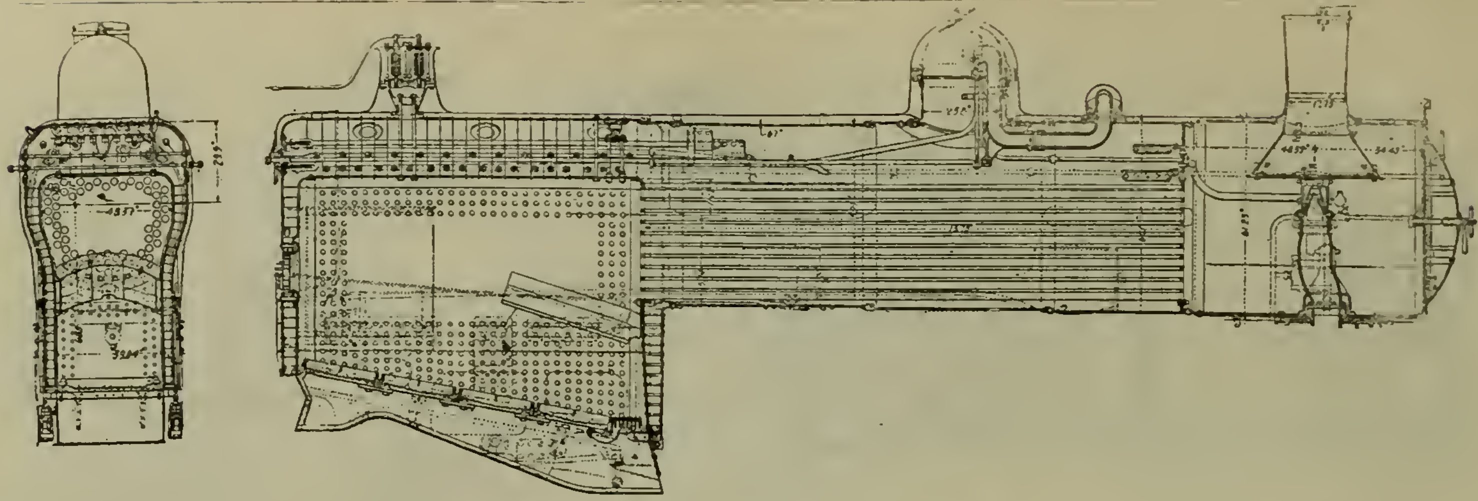


Fig. 12.—Northern Ry. of France. 4-4-2.

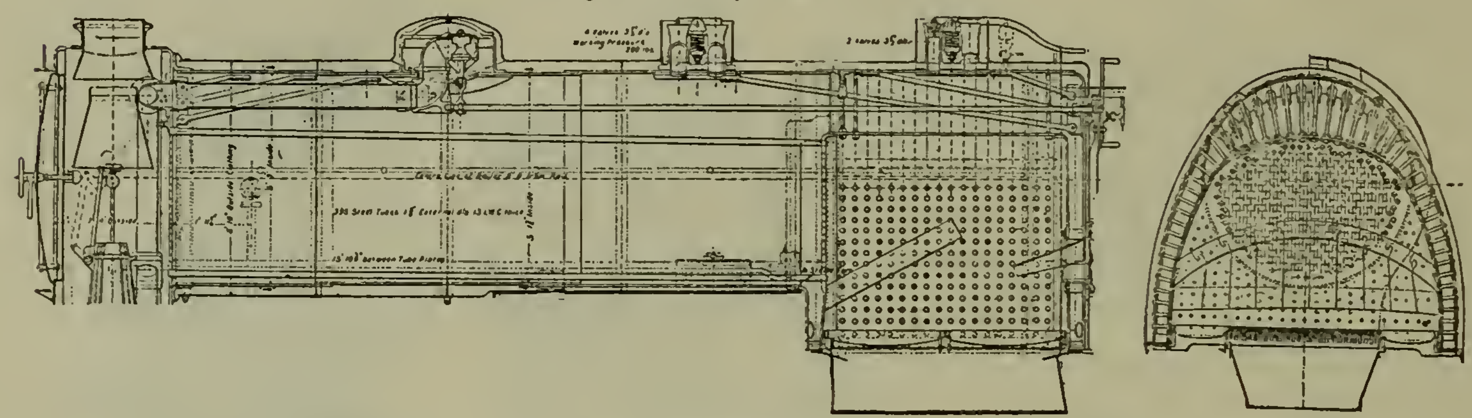


Fig. 13.—Great Eastern Ry. 0-10-0.

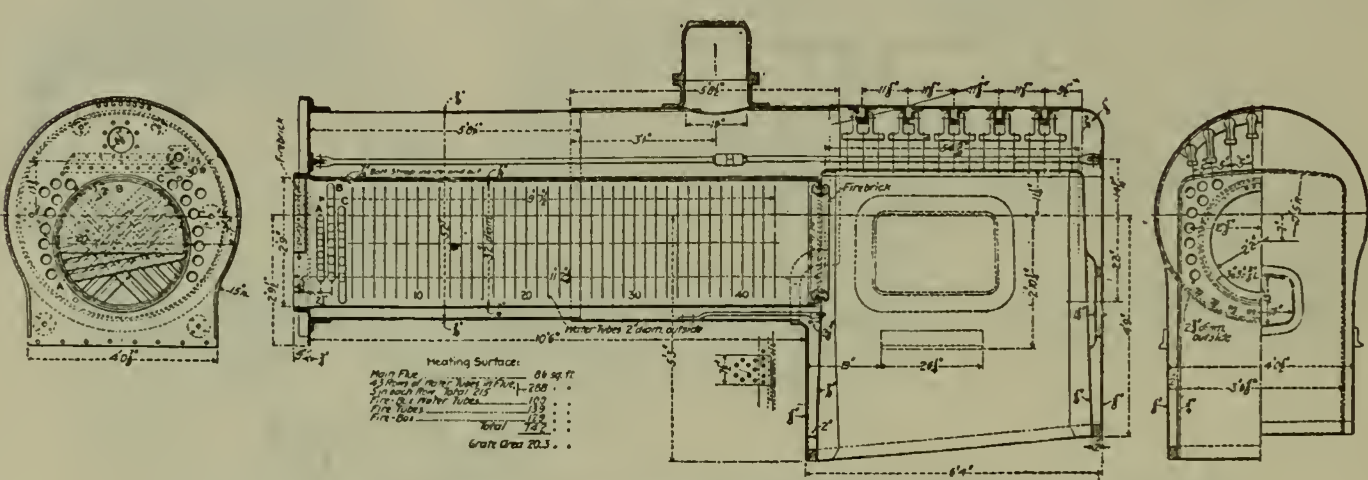


Fig. 14.—London & Southwestern Ry. Drummond Water Tube Boiler.

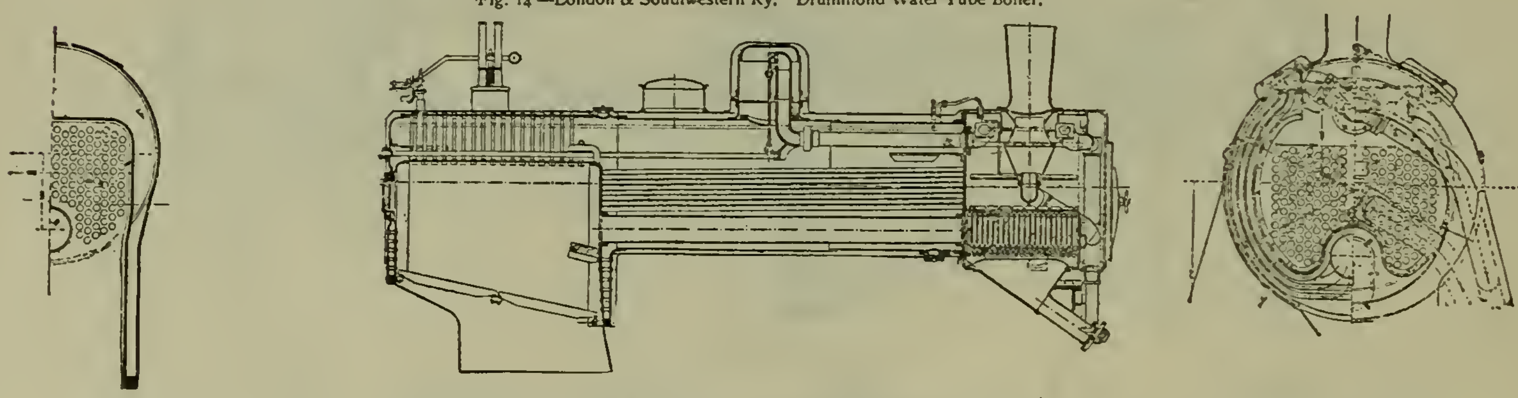


Fig. 15.—Prussian State Rys. Schmidt's Superheating System. 4-4-0.

Recent Improvement in Boiler Design.

superheating device is in use on the Canadian Pacific, and the American Locomotive Company is now constructing another engine similarly equipped for the same road. It is understood that there are also five of these engines under construction by the Pennsylvania road. Very glowing accounts of the performance of Schmidt engines, by an American engineer who has recently returned from Europe, would imply that there were economies in superheating of steam for locomotives.

Even with the successful overcoming of resistance at continuous high speeds there is a question among some officials that, while we have ample heating surface, it may not be in the right place, or, in other words, it is possible that we have too much heating surface in the wrong place; that is, are not too many tubes used, and would not a boiler furnish an equivalent or a higher evaporation with a lesser number? There appears to be good reasons for questioning the efficiency of a multitude of tubes, among which are the following for reducing the number: A better circulation due to the wider spacing of centers; a reduction of liability to leakage, and longer life to tube sheet due to the greater section of material between holes. It is not apparent that there are any very serious difficulties to surmount in making tests that will demonstrate to what extent evaporation and cost of maintenance is affected by a wider spacing of tubes. Such experiments would definitely decide whether the practice of encroaching on circulation space with tubes is conducive to an economical evaporation, and in addition would no doubt incidentally furnish some needed light on the effect of a higher ratio of fire box to tube heating surface under the new conditions. Restricted water spaces around the fire box are well known to be inimical to a proper circulation, as well as dangerous to the sheets, and the same effects are known to operate at the fire box ends of tubes. The wide fire box has shown a marked tendency to crack at the sides, and as a remedy it is proposed to make the fire box ring 4½ inches wide on some engines now under construction.

In bracing and staying there is little to be recorded as new. In joint construction the welt type is said to be improved to an efficiency of 90 per cent of the solid plate, and welding of

TABLE No. 1

Name of Road	Road Number	Type of Boiler	Outside Diameter of Front Ring	Outside Diameter of Throat Ring	Space Above Crown Sheet	Dome Depth & Diameter	Dome Ahead of Back Flue Sheet	Fire Box Length & Width	Fire Box Depth Front & Back	Water Space at Mud Ring Front & Back	Water Space at Mud Ring - Sides	Water Space at Crown Sheet - Sides	Depth of Throat Sheet	Cen. Bottom Tubes to Bottom of Mud Ring	Door Opening Depth & Width	Location Check Valve Back of Front Flue Sheet	Mud Ring Single or Double Riveted
D M & N	1																
N Y O & W	2		78	80 1/8	23 11/16	23 1/2 x 30	114	119 1/2 x 105	62 3/8	4	3 1/2	5 1/2	6	14 1/2	12 x 24	10	S
C M & St P	3	St. top W F B	73 1/2	75	24	19 1/2 x 31 1/2	31	102 x 65 1/4	69 / 56	4 / 3 1/2	3 1/2	5 1/4	20	26 1/2	18 D	45 1/4	D
D S S & A	4	St. top W F B	78	81 1/2	22	19 x 32	32 1/2	126 x 41	79 / 75	4 / 3 1/2	3 1/2	7	21 1/4	28	15 x 18	26	D
T H & I	5																
B & M R in rec	6	St. top W F B	66 3/8	69 1/2	20	27 5/8 x 28 1/2	43	84 x 72	66 1/4 / 63 1/4	5 / 4	4		18 3/4			33 3/4	O
D L & W	7	Wootten	70 1/2	74	20	22 x 30	107	126 x 108	62 / 54 1/2	4 / 3 1/2	3 1/2	8	9	18	15 x 34	22	S
U P	8	Belp. W F B	76	84	24	21 x 31 1/4	38 1/2	123 x 40 1/4	84 1/2 / 77	4 / 4	4	6	27 9/16	32	14 x 17	40	D
C B & Q	9	St. top W I B	65 1/4	69 1/2	20	27 1/2 x 28 1/2	56	84 x 72	66 1/2 / 63 1/4	5 / 4	4		18 3/4			34	O
P & R	10	St. top W F B	66	67 1/2	19	17 3/4 x 32 1/2	27 1/2	114 x 60 1/4	66 / 63 1/2	3 1/2 / 3 1/2	3 1/2	5	19 1/4	22	16 x 20		S
L S & M S	11 F	C. T. wag. top W F B	68 3/8	78 1/2	22 3/4	16 3/4 x 31 1/4	39	99 1/8 x 62 1/4	69 / 56	4 1/2 / 3 1/2	3 1/2	5 1/4	14 1/4	22 5/8	13 1/2 x 27 1/4	13 1/2	D
L S & M S	11 P	C. T. wag. top W F B	66	74 1/2	20 1/2	16 3/4 x 31 1/4	72 1/2	84 1/8 x 83 1/4	68 / 68	4 / 3 1/2	3 1/2	4 1/2	15 9/16	21 3/4	13 1/4 x 27 1/4	13 1/2	D
H & St J	12																
Southern	13	St. top W I B	76 3/4	80	21 1/8	16 3/4 x 32 3/4	38 3/4	107 1/8 x 71 1/4	74 1/2 / 59 1/2	4 / 4 1/2	3 1/2	5	18 1/4	21 3/4	16 x 20	18 1/4	D
Mich Cen	14																
B & A	15																
C & E I	16	St. top W F B	70 1/8	71 5/8	19	20 x 33	51	96 x 75 1/4	71 / 57 1/4	5 1/2 / 3 1/2	3 1/2	5 1/2	18 1/16	23 1/4	2 / 15 0	12 1/2	D
S A L	17																
L & N	18																
C G W	19	C. T. wag. top W F B	70 1/8	81 1/8	23	17 x 31 1/4	39 1/4	95 x 73 1/4	73 1/2 / 62 1/2	4 / 4	4	6 1/2	18 7/8	22	2 / 14 x 17	25 3/8	D
P & L E	20	St. top W F B	76	77 5/8	25 1/8	20 x 33 1/8	38 1/2	108 x 68 7/8	70 1/4 / 61 3/4	4 / 4	4	6	18 1/2	22 3/8	16 x 20	49 3/4	D
C C C & St L	21	C. T. wag. top W F B	72 1/16	81 1/8	22	11 3/4 x 31 1/4	39	107 x 75 1/4	78 / 65 1/2	4 / 3 1/2	3 1/2	5	21 13/32	25 1/4	13 1/4 x 27 1/4	20	D
S P	22	St. top W F B	76 11/16	80 1/4	18 3/4	19 x 33 1/8	33	108 1/8 x 72 1/2	73 1/2 / 64 1/4	4 / 3 1/2	3 1/2	5 1/2	13 1/8	24 3/16	13 3/4 x 16 3/4	8 3/4	D
C A	23																
G N	24	Belp. W F B	74 1/8	77 3/8	21 11/16	22 x 32			77 / 69 1/2		3 1/2		28 5/8		2 / 16 0		O
N Y C & H R	25	St. top W F B	72 1/4	73 3/4	19	19 x 31	46	96 1/8 x 75 3/8	80 1/4 / 69	4 / 3 1/2	3 1/2	5 1/2	25 15/16	31	2 / 15 0	20	O
C & N W	26	C. T. wag. top W F B	66 5/16	74	23	19 x 31	36	102 1/8 x 65 1/4	72 1/2 / 56 1/2	4 / 4	4	6 1/2	19 27/32	27 19/32	2 / 14 x 16	27 1/4	D
C R R of N J	27																
C P R	28	Belp. W F B	62 1/8	73 1/2	24 1/4	30 x 27 1/8	36 13/16	109 7/8 x 44 5/8	66 1/2 / 53	4 / 3	3	5	23 7/16	29 7/8	14 x 18	39	D
C P R	28	Wag. top W F B	66 1/2	75 1/8	22 5/8	32 1/2 x 31	36 3/8	114 x 41 7/8	73 1/2 / 55 3/4	4 / 3	3 1/2		22 9/16	27 1/2	16 x 24	39	D

Name of Road	Mud Ring Corners Scarfed or Butted	Mud Ring Corners Rad Inside at Ring	Side Sheet Thickness	Crown Sheet Thickness	Door Sheet Thickness	Front Tube Sheet Thickness	Back Tube Sheet Thickness	Stay-Bolts Diameter	Stay-Bolts Pitch	Tubes Number	Tubes Size	Tubes Length	Tubes Pitch	Crown-Stays Diameter	Sling-Stays No. Rows in Front	Slope of Grate	Slope of Back Head	Slope of Crown Sheet
D M & N																		
N Y O & W	S	1 1/8	3/8	3/8	3/8	5/8	1/2	1 / 12 Th	4	362	2 1/4	14 9	2 99	1	2	7	0	0
C M & St P	S		5/16	3/8	3/8	1/2	1/2		3 3/4	317	2	14-6	2 76	1	2	11 1/2	0	2 1/2
D S S & A	S	1 3/4	3/8	7/16	3/8	5/8	5/8	1	4	398	2	13 11	2 75	1	2	0	0	4
T H & I																		
B & M R in rec	B	1	3/8	3/8	3/8	1/2	1/2	7/8	4	272	2 1/4	17-1 1/16	2 92	1 1/8	1	0	18	3
D L & W	S	2 1/2						1	3 3/4	350	2	14-0	2 69	1	3	7 1/2	0	0
U P	S	1 1/4	3/8	3/8	3/8	3/4	5/8	1	3 3/4	382	2	13-10 3/8	2 94	1	0	0	0	7 1/2
C B & Q	B	1	3/8	3/8	3/8	1/2	1/2	7/8	4	272	2 1/4	18 3 11/16	2 92	1 1/8	1	0	18	3
P & R	S	5	3/8	3/8	3/8		1/2	1	4	272	2	14 0	2 11	1 1/8	2	3	0	2 1/2
L S & M S	S	1	3/8	3/8	3/8	3/4	1/2	1	3 1/8	344	2	15 6 3/8	2 78	1	4	10	0	3
L S & M S	S	1 1/4	3/8	3/8	3/8	3/4	1/2	1	3 3/4	265	2 1/4	19-0	2 97	1	4	0	20	0
H & St J																		
Southern			3/8	3/8	3/8	1/2	1/2	1	4	443	2	14-6 1/2	2 69	1	3	12	20	3
Mich Cen																		
B & A																		
C & E I	S	2 1/2						1	3 3/4	369	2	16 0	2 69	1 1/8	3	11 3/4	13 1/2	2
S A L																		
L & N																		
C G W	S		3/8	3/8	3/8	3/4	5/8	7/8	3 3/4	352	2	16 8 1/8	3	1	3	6	20 1/8	3
P & L E	S	3	3/8	7/16	3/8	1/2	1/2	1	4	402	2	14 9	2 625	1	3	5 1/2	15	3
C C C & St L	S	1 1/8	3/8	3/8	3/8	3/4	5/8	15/16	3 5/8	376	2	14 5 1/8	2 99	1	3	9 1/2	21 11/32	3
S P	S	2 1/2	3/8	3/8	3/8	1/2	1/2	1	4	442	2	14-9 1/8	2 69	1	5	6	0	3
C A																		
G N	S	2 3/4	3/8	7/16						331	2					6	0	3
N Y C & H R	S	2 1/8	5/16	3/8	3/8	5/8	1/2	1	3 3/4	396	2	16 0	2 60	1	3	9 1/4	15	2
C & N W	S	2 1/2	3/8	3/8	3/8	1/2	1/2	7/8	4	342	2	16 0	2 69	1	4	13	12 1/2	3
C R R of N J																		
C P R	S	2	5/16	3/8	3/8	5/8	1/2	1 1/8 / 11 Th	4	255	2	12 11 1/16	2 69	1 1/4	2	6	0	7
C P R	S		5/16	3/8	3/8	5/8	1/2	1 1/8 / 11 Th	3 3/4	328	2	13 3 1/4	2 49	1 1/8	2	11 3/8	22	5 3/4

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joints is said to be satisfactorily done, both on dome sheets and longitudinal joints, the latter, however, not continuous but at ends only.

The reason for the increase of heating surface being one of boiler power to meet the greater demands of the cylinders, it is plain that the question of design should have direct reference to the amount of water evaporated by each square foot of heating surface per hour. If the heating surface is designed for the work to be done, that is, on a horse-power basis, then the problem becomes one of design for specific conditions. In that case the facts entering into calculation are:

(1) Resistance to overcome.
(2) Horse-power required.
(3) Water consumption per horse-power hour.
(4) Water evaporated per square foot of heating surface per hour.
(5) Evaporative value of one pound of coal.
(6) Grate area to accord with calorific value of fuel.

This process has to do with actual values only, eliminating all factors of doubtful utility.

The following conclusions are deduced from replies to a circular of inquiry sent out by the committee:

Those roads having very little trouble with old boilers are having very little more with modern boilers, and those which have always had a good deal by comparison, are having a good deal more with their modern boilers. Poor water is evidently the chief cause of boiler troubles, though it is evident that poor coal, severity of service, contracted water spaces, etc., contribute to an aggravation of the trouble. It would appear also that in poor water the incrusting solids are not always the governing factor, but that other solids also have their effect in producing cracked side sheets and leaky flues.

One horse-power for three square feet of heating surface seems to be about all that can be safely relied upon as a regular performance with water ordinarily found in the Middle and Western States, but this can be improved upon where water is of better quality.

There seems to be no question but that the wide grate is at least ten per cent more economical than the narrow, in burning bituminous coal, but that its economy while running is to some extent offset by its comparative waste of coal while standing idle on side tracks or at terminals, and this waste appears to increase proportionately to the increase in grate area.

No concluson could be made as to the maximum grate area which a fireman can economically fire, but it no doubt depends on the quality of the coal, and for a clinkering coal would appear to be in the neighborhood of 45 square feet.

Treating water in locomotive tenders is undoubtedly beneficial, provided it is followed up with frequent blowing down and washing out, in that it retards the formation of scale and overheating. The quality of the water may be so poor, however, as to require so much soda ash or other reagent and hence so much washing out that the good effects of the soda ash are offset by the bad effects of too much washing out.

The correct method of treating water appears to be in station tanks, so that solid matter does not get into the boiler, but even by this treatment there seems to be danger of making the water so alkaline as to foam badly.

The committee would judge that there is materially less trouble from broken stay bolts and cracked side sheets with the wide fire box than the narrow, but about the same amount of flue trouble, although several roads state that they have decidedly more leaky flues in wide fire boxes. The general opinion is that the deeper fire box over trailers is more satisfactory than the shallow box over drivers.

In general there is no increase in foaming or priming in high-pressure boilers, but the committee would recommend as much steam space as is possible to get and a comparatively high dome.

The committee would also recommend that unless water is

AMERICAN LOCOMOTIVES.

Fig	Builder.	Built.	Railway	Type	Boiler Pressure, Lbs.	Cylinders, Diameter and Stroke, Inches.	Diameter Drivers, Ins	Weight on Drivers, Lbs.	Weight, Total Lbs.	Heating Surface Firebox, Sq. Feet.	Heating Surface, Total Sq. Feet.	Tubes, Number.	Tubes, Length Feet and Inches.	Grate Area, Sq. Ft.	Per Cent of Firebox to Total Heating Surface.	Fuel.
1	Am Loco Co	1901-2	N Y Central	4-4-2	200	21×26	79	95,000	176,000	180	3,505	396	16	50	5.1	Bit. Coal
2	Am Loco Co	1902-3	Penna R R	4-4-2	205	20½×26	80	109,000	176,000	166	2,640	315	15-1	55.5	6.2	Bit. Coal
3	Am Loco Co	1902-3	C R R of N J	4-4-2	210	20½×26	85	99,400	191,000	174	2,967	325	16-6	82	5.86	Fine Anthracite.
4	Am Loco Co	1902-3	Nor Pacific	4-6-2	200	22×26	69	134,000	202,000	175	3,462	301	18-6	47	5	Bit Coal.
5	Bald Wks	1902-3	C R R of N J.	2-6-2	200	18×26	63	108,000	165,000	137	1,832	249	13	54.5	7.47	Anthracite.
6	Bald Wks	1902-3	Chicago & Alton	4-6-2	220	22×28	80	141,700	219,000	202	4,078	328	20	54	4.95	Bit. Coal.
7	Am. Loco Co.	1902-3	C B & Q	2-8-0	210	22×28	57	187,000	208,900	195	3,827	462	15	54	5.	Bit. Coal
8	Bald. Wks	1902-3	B W & Gt Falls	2-8-2	200	14+24×26	50	128,000	166,900	174	2,496	270	16-6	56	6.97	Lignite.
9	‡Bald Wks	1902-3	A T & S F	2-8-0	210	17+28×32	57	191,400	214,600	105	4,266	652	13-7	....	3.86.	Oil.

FOREIGN LOCOMOTIVES.

Fig	Builder.	Built.	Railway	Type	Boiler Pressure, Lbs.	Cylinders, Diameter and Stroke, Inches.	Diameter Drivers, Ins	Weight on Drivers, Lbs.	Weight, Total Lbs.	Heating Surface Firebox, Sq. Feet.	Heating Surface, Total Sq. Feet.	Tubes, Number.	Tubes, Length Feet and Inches.	Grate Area, Sq. Ft.	Per Cent of Firebox to Total Heating Surface.	Fuel.
10	*P L & M Wks.	1902-3	Paris, Lyons & M	4-4-0	213	13⅜+21¼×25⅞	78¾	74,800	99,400	129	1,934	150	11	26	6.7	Bit Coal.
11	Von Borries	1902-3	Baden State.	4-4-2	235	13⅜+22⅞×24⅛	82⅝	70,500	163,700	145	2,260	279	15.9	42	6.37	Bit. Coal
12	• De Glehn	1902-3	Nor Ry of France	4-4-2	228	13½+22×25.2	80¾	71,200	142,100	167	2,275	126	13.9	29.6	7.34	Bit. Coal
13	†Holden	1902-3	Gt Eastern	0-10-0	200	18½×24	54	134,400	134,400	131.7	3,010	395	15-11	42	4.37	Bit. Coal
14	Drummond	1902-3	London & S W	Drummond Water-Tube Boiler						229	742	No Data	No Data	20.3	30.8	Bit Coal.
15	Borsig Wks	1902-3	Prussian State	Schmidt's Superheating System												

‡ Tubes, 1¾-in. *Four-cylinder compound. Serve tubes 2½-in.
• De Glehn and Du Bousquet 4-cylinder balanced compound. Serve tubes 2¾-in.
† Holden's 3-cylinder simple suburban engine, 10 coupled.

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exceptionally good, the width of mud ring be not less than four inches and the space at crown sheet not less than seven inches, believing that it will result in much longer-lived side sheets and considerable reduction in broken stay bolts.

A large majority of the replies express a preference for ⅜-inch side, door and crown sheets, and ½-inch flue sheets.

Double riveting mud rings, scarfing sheets at corners and an inside radius at ring of two to three inches appears to overcome all trouble from leaky mud rings.

A considerable majority of replies consider one door sufficient for wide fire boxes, and where there is trouble from door sheets cracking, the most satisfactory method of flanging appears to be to flange both sheets out, the inside sheet to have large radius.

A considerable majority of roads appear to use drop grates and the need of them no doubt increases with the tendency of the coal to clinker.

Flexible stay bolts are still in the experimental stage and the committee would refer to the topical discussion on the subject in 1902 Proceedings, page 378.

The economy of the brick arch seems to be unquestioned, especially in deep fire boxes, but in shallow boxes and those subject to leaky flues, it is not so much favored. Water tubes are the favorite means of supporting brick arches where the water does not cause them to give trouble. Where water is poor the supporting of arches on angle irons or studs in side sheets is preferable.

In general, the committee is of the opinion that the large, high-pressure, wide-grate boiler can be designed to give very little more trouble than the old-style low-pressure boilers, even where poor water is used, except as regards flue trouble, which appears to be quite general and with most roads quite serious. Wide water spaces around fire box will prevent cracked side sheets and broken stay bolts to a large extent; good design will stop door-sheet and mud-ring trouble; wide bridges will prolong the life of flue sheets. A large number of flues, closely spaced, severity of service, poor water, contracted steam space, shallow depth below flues have retarded circulation to such an extent that flues and back-flue sheet are frequently and highly overheated. Wide fire boxes, poor coal and poor firing admit large volumes of cold air against overheated flues and sheets and the wide range of temperature to which flues are subjected loosens them circumferentially and draws them in and out longitudinally. Flues are frequently found so loose that they can be shaken in the sheet. Short pieces of flue rolled into a piece of ½-inch fire-box steel in the usual manner, heated to a dull red and suddenly cooled, require a considerable number of heatings to make them loose.

This is not exactly a parallel case to flues in a boiler, but the conditions are somewhat similar.

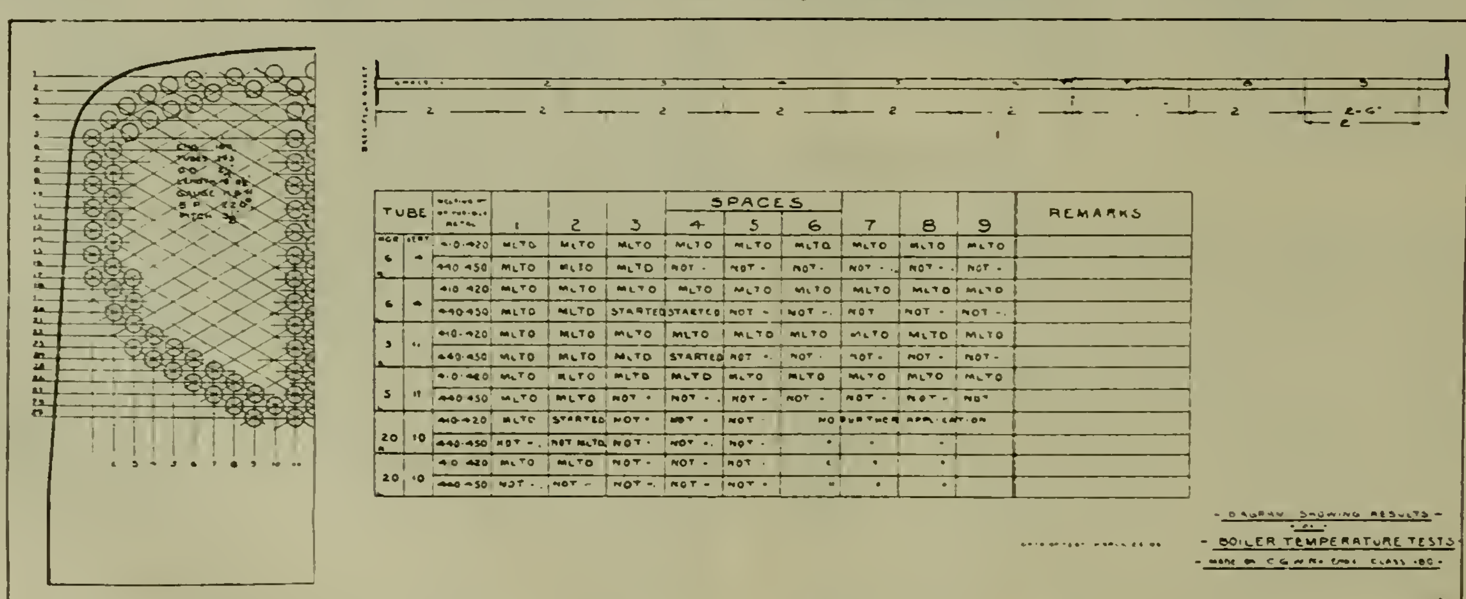
An experiment was made to determine the temperature surrounding flues by plugging certain flues at both ends with asbestos and placing asbestos plugs two feet apart throughout the length of the flue with two pieces of fusible metal in each space, one piece melting at 410 deg. to 420 deg. and the other from 440 deg. to 450 deg. Fahr. The results are given in Table No. 3, and show that the temperature surrounding flues was considerably above the temperature of saturated steam at 220 pounds at the back end and in the case of upper flues it was higher all the way through.

If the surrounding temperature is so high in a flue thus plugged it must be still higher about flues through which fire is passing, and it is probable that the temperature at flue sheet is very much higher. There is no evidence to prove that a flue will not stand a considerable amount of overheating without leaking, but it would appear that those that are leaking are subjected to too high and too great a range of temperature.

It is only necessary to have a sufficient body of water against side sheets to reduce cracked side sheets and broken stay bolts to a minimum. It should follow that flues can be spread far enough apart to stop their leaking, but the spreading of flues reduces the heating surface very rapidly, and the widest spacing the committee has knowledge of, namely, 3½-inch centers for 2-inch flues, has not cured the trouble.

In conclusion, the committee would recommend the appointment of a committee for the ensuing year to further investigate the question of leaky flues.

TABLE No. 3.



Recent Improvement in Boiler Design.

EFFECTS OF TONNAGE RATINGS ON THE COST OF TRANSPORTATION.

An Individual Paper by C. H. Quereau.

For some time before the ton was substituted for the car, as a basis for loading freight engines, the fact that the car was an unsatisfactory unit was recognized by those who gave the subject careful attention. It required but little investigation of the cases of stalling and doubling and unsatisfactory runs to develop the fact that a considerable proportion of these cases were caused by overloading, because of an unusual proportion of high capacity cars. This called attention to the fact that the car, as a unit of weight and resistance, was a variable quantity with a constantly increasing value, so that, though the engines were nominally given the same train, it more and more frequently happened that they were loaded beyond their capacity, resulting in annoyance and expensive delays.

The cause of the difficulty having been determined, it naturally followed that a unit of constant weight, the ton, was substituted for the car. Notwithstanding the almost self-evident correctness of the facts and reasoning which resulted in the use of the ton as a rating unit, there was a quite general opposition to its adoption on the grounds that, though correct in theory, it would not work out in practice; the conductors and yardmasters already had too much to do without being burdened with more clerical work; the extra expense would more than offset the savings; or the trouble lay with the train and enginemen instead of the ratings.

The superiority of the ton to the car as a unit of train rating is due not so much to the fact that it has a constant value as a unit of weight, as that it is a much more accurate measure of train resistance. Soon after its adoption the discovery was made that the ratio between train weight and train resistance is not constant, which led to a scientific investigation of the facts by means of dynamometer car tests. These showed that the greater the gross weight per car, the less the resistance per ton; that the heavier the adverse grade and the slower the speed the less this difference is.

There have been indirect savings in operating expenses, due to the use of tonnage ratings, which are not always considered. I refer to the use of the ton-mile basis for statistics, which naturally followed the introduction of tonnage ratings. Previously the almost universal basis of motive power statistics had been the engine-mile. Because the engines made more miles per ton of coal the lighter the train, there was a constant effort on the part of Master Mechanics and engineers to haul as light trains as possible in order to improve their records, which no doubt in a measure neutralized the efforts of the transportation department to handle as heavy trains as possible, and undoubtedly increased the cost of transportation somewhat, when compared with the possibilities, and was a source of constant friction between the two departments. The ton-mile basis for motive power statistics changed all this, because it was soon demonstrated that the heavier the train, within reasonable limits, the less the cost of coal, wages and repairs per ton-mile, and, therefore, it was to the interest of the motive power men to haul as heavy trains as practicable, thus harmonizing the interests and efforts of the employes of both the transportation and motive power departments. It would be impossible to say just what economy was produced by this change in the basis of motive power statistics, but that it was real and considerable in gross amount there can be no doubt.

The ton-mile basis also corrected a number of erroneous conclusions, resulting in a clearer understanding of cause and effect, which no doubt led to economies. A few illustrations will probably make this point plainer than an extended description. The figures given are actual records.

TABLE I.

	March, 1896.	1897	Increase Per Cent.
Average miles per engine	2,282	2,289	0.3
Average ton-miles per engine	782,213	972,486	24

Had there been no ton-mile statistics there can be little doubt the conclusions would have been drawn that the average work done per engine in the two years was practically the same. The ton-mile figures show this conclusion would have been wide of the mark and misleading, and also demonstrate that in this case the use of tonnage ratings increased the work done by the engines twenty-four per cent, as the class of locomotives was practically the same in the two years.

Judged by the results on the engine-mile basis the branch freight engines were using only twelve per cent more coal than those on the main line. This record was considered very satisfactory indeed so far as the branch was concerned, as there were a considerable number of heavy grades and curves on it, while the main line was comparatively level and straight, and the conclusion was naturally drawn that it was not much more expensive, so far as fuel was concerned, to operate a mountain district than one on the prairie. But as soon as attention was directed to the figures based on the ton-mile it became evident that the heavy grades and curves of the branch required three and a quarter times as much coal as the main line to do the same amount of work.

TABLE II.

DIVISION D — JANUARY, 1896.

	Miles to Ton of Coal.		Coal per 100 Ton-miles.	
	Lbs.	Per Cent.	Lbs.	Per Cent.
Main Line, Freight	16.6	100	20.79	100
Branch, Freight	14.8	112	67.93	327
Main Line, Freight	16.6	193	20.79	100
Main Line, Passenger	32.1	100	33.09	159

In comparing the relative cost of fuel in freight and passenger service, using the engine-mile as a basis, the almost inevitable conclusion was that freight engines used nearly twice as much as passenger engines, but when the basis of comparison was the ton-mile it became evident that the cost of fuel was practically sixty per cent greater in passenger service.

It is very generally assumed that the maximum tonnage a locomotive can handle at a speed of about ten miles an hour is the most economical. I venture to differ from this opinion and will first consider the matter as applying to the conditions which have prevailed throughout the past winter, during which time there has existed practically a freight blockade. Under these conditions the paramount issue, to borrow a political phrase, is to handle the business offered and to keep it moving almost regardless of cost; in short, to handle the largest possible number of cars with the power and facilities available.

For the sake of argument and illustration Table III is presented. It applies to two divisions, the first one hundred miles and the second two hundred miles in length; and is based on the following assumptions: First, that it requires four hours to get an engine from its train to the roundhouse, clean its fires, give it necessary repairs, furnish the necessary supplies and have it on its train again; second, that a train of forty cars will allow an average speed of ten miles an hour; third, that a reduction of the train from 40 to 35.2 cars, or twelve per cent, will permit an increase in the average speed to fifteen miles an hour.

TABLE III.

	100-Mile Division.		200-Mile Division	
Speed, miles per hour	10	15	10	15
Hours between terminals	10	6.67	20	13.32
Hours at terminal	4	4	4	4
Hours for one trip	14	10.67	24	17.32
Trips in thirty days	51.4	67.5	30	41.6
Cars hauled per trip	40	35.2	40	35.2
Cars hauled per month	2056	2376	1200	1464
Gain in cars handled per month		320		264
Gain in cars handled per month, per cent		16		22

These figures show an increase of from sixteen to twenty-two per cent in the number of cars an engine will handle per month due to a decrease of twelve per cent in the number of cars handled per train, and that the longer the division the greater the increase. Some may question the fact that this reduction in tonnage rating will allow the increased speed claimed, but I am confident those who have made the test will be least inclined to disagree with the statement. When one considers that, though there will be a greater number of trains to meet and pass because of the fewer cars per train, the lighter trains will not only make better time between stations but will also undoubtedly lose very much less time waiting at stations for other trains, because the heavier trains will frequently wait rather than take chances of making an advanced meeting point for lack of a few minutes, it seems likely the lighter trains will make even better running time between terminals than shown in the tables.

This conclusion was amply confirmed by personal experience during a period covering a couple of months during a series of locomotive tests in heavier freight service, when the time lost waiting at stations for other trains frequently reached forty-five per cent of the total time between terminals. This experience was had on a road which was single track for three-quarters of the distance over which the tests were made. If these conclusions are justified for a single-track road it would seem logical to assume there would be less room for doubt on a road having two or more main-line tracks when there would be fewer trains to meet and pass.

It seems evident from this discussion that when business is such that locomotives available are insufficient to handle it, freight blockades are imminent, and the tonnage ratings are such that locomotives available are insufficient to handle it, number of cars handled per locomotive per month can be considerably increased by reducing the tonnage ratings slightly, thus allowing an increase in the speed and increasing the efficiency of the engines.

This suggests the thought that, inasmuch as the number of cars handled per month can be increased by reducing the maximum tonnage ratings, it is possible this reduction of ratings may result in decreasing the cost per ton-mile, and an investigation shows that this will probably be the result, at least during the seasons of unusually heavy business. As already indicated it is almost inevitable that trains which have the maximum tonnage will much more frequently remain on sidings rather than take chances of making advanced meeting points than would be the case if the tonnage were somewhat smaller, because the chances of the heavier trains breaking in two on pulling out of sidings, of their failing to make a meeting or passing point against a superior train because of bad weather conditions or dragging brakes, are much greater than their larger tonnage would indicate at first glance. We would, therefore, expect the wages paid for overtime and the cost of fuel wasted on side tracks and in taking and leaving sidings, and the cost of car and engine repairs to be more than proportionally greater for the heavier tonnage. Unfortuuately it is nearly impossible to obtain accurate statistics to show whether this conclusiou is warranted or not, but there are a few figures available which, while not directly applicable, may serve as guideposts.

The following figures give the percentages of overtime paid engineers aud firemen in relation to their total wages during June, when there was no special rush of business and the engines available were ample to haudle it easily, and during September, when the power was taxed to its utmost capcaity:

	Div. A.	Div. B.
June—Overtime, per cent of total wages........	1.8	2.0
September—Overtime, per cent of total wages..	5.3	4.6

The above shows conclusively that the overtime paid increased from two to three times as much as the business done as determined by the wages paid enginemen. It does not necessarily follow that all the increased percentage of overtime was due to maximum tonnage ratings, but there can be little room for doubt that, had the tonnage ratings been moderately reduced the increase iu overtime would not have been so much heavier thau the increase in business done, and it seems a fair inference that the cost of wages for train and engine crews, and to this extent the cost of transportation, was heavier per ton with maximum ratings than though these had been reduced so as to allow a somewhat higher average speed.

The reasons which make it seem more than probable that a reduction of maximum tonnage ratings would decrease the cost of wages per ton-mile apply with equal force to the cost of fuel; not that the cost of fuel while running would be much, if any, greater per ton-mile with the maximum tounage, but that the longer delays on side tracks, the longer hours for the train and engine crews and the damage done the fire while pulling out of side tracks with the heaviest trains would result in a greater cost of fuel per ton-mile. As to which cost, wages or fuel, would be increased the greater amount would depend on the cost of fuel and the couditions for which overtime is paid.

I believe that the discussion and facts given warrant the conclusion that tonnage ratings which limit the average speed of freight trains to ten miles an hour, or less, result in a greater cost of transportation and decreased earning power for motive power than ratings which allow a somewhat higher speed. If this conclusion is accepted it follows that such maximum tonnage ratings produce a higher cost of transportation than is necessary and that the subject is well worth extended, careful and scientific investigation.

The adoption of tonnage ratings for freight trains has reduced the cost of transportation by increasing the average trainload: by reducing the cases of doubling and overtime; by furnishing a basis of common interest for the operating and motive power departments to handle full trains, and by furnishing a fairer basis for judging operating and motive power efficiency.

It seems, however, evident that, as is usual when any new plan has proved beneficial, the pendulum has swung to the opposite extreme and the maximum tonnage ratings are, as a rule, greater than the most economical ratings. At least the evidence at hand warrants systematic and scientific investigation.

Master Car Builders' Association

Abstract of Reports

OUTSIDE DIMENSIONS OF BOX CARS.

Committee: Joseph Buker, Chairman, W. P. Appleyard, G. W. Rhodes.

At the 1902 convention your Committee ou Outside Dimensions of box cars, in its report recommended for adoptiou as standard certain external dimensions for box cars which, it thought were sufficiently strong for cars of the internal dimensions adopted by the American Railway Association, aud presented also a few details for car framiug to meet those external dimensions. The report, after some discussion, was referred back to the committee with instructions to report this year on a system of framing for boxcars, with iuside and outside dimensions as referred to in the report, leaving out of consideration the framing of the car below the floor.

As was well said at the convention last year, the association can very wisely be conservative in adopting a standard framing for box cars, but at the same time we should be making some progress to that end. With this thought in mind, the committee presents a design of box car which conforms to the inside dimensions as adopted by the American Railway Association, and yet is within the outside clearance dimensions as suggested by your committee last year, and solicits the freest criticisms. If we are to finally arrive at a standard car (and it is believed such is the desire of our members) it will only be after all objectious are cleared away, and to bring out these objections is the first object of this report; we can then get together and adjust our differences.

The inside measuremeuts adopted by the American Railway Association are: 36 feet long, 8 feet 8 inches wide and 8 feet high.

Your committee last year recommended 9 feet 7 inches over the eaves, and 12 feet 6¾ iuches in height from top of rail to upper edge of eaves for cars set on high trucks (4 feet to top of floor).

With 8 feet 6 inches as the inside measurement and 9 feet 7 inches over the eaves, we have 13 inches for car framing. The design in view limits the inside lining and outside sheathing to 13-16 inch each, the width of posts to 3 inches each, air spaces to ½ inch each, fascia to 13-16 inch each and roof overhang 9-16 inch on each side, which conforms to the recommendations made last year.

Assuming the side and end sills to be of wood, the pockets for posts and braces for the sides of the car are made with lips, overhauging inside of side sill and held in their places by cleats nailed to the sill and running from pocket to pocket. The corner, end post and brace pockets are made with a tenon to fit mortise cut into end sill. The object of this is to get a better beariug for base of posts and braces to withstand outward pressure from the lading than can be gotten with pius cast on the pockets and fitted into holes bored into the sills, as is not unusual.

The caps for top of side posts, corner posts, end posts and braces are also made with a lip to overlap the side and end plates respectively, and instead of using pins cast on the caps to keep caps from moving endways on the plates, the plates are gained ½ inch to receive the caps.

This course was pursued with the caps with the same object as given for the pockets. The overlapping lips on the caps are used ou the American Railway Association standard car, built by the Illinois Central Railroad, but only on the end posts.

The side braces are stiffened with angle iron for braciug and at the same time to protect the braces from outward pressure from the load, the augle irons extend the full length of braces. The pocket and cap have walls to keep brace in place.

The posts over bolster are stiffened with two ⅜-inch plates extendiug the full leugth of the posts and securely bolted to same to keep post from buckling outward, and thus giving a stiffer post for trussing the plate to the sill.

Assuming that two-thirds of the load is against the side of the car, then it is quite necessary that the tie rods should be equivalent to one-half of this in tensile strength to keep the side in positiou, and as many carlines used as rods to act as stops between side plates. The above assumption is based ou loading the car with grain.

The end posts are strengthened by plates securely bolted to the posts and extending their full length, fitting into pocket and caps similar to side post and braces, and having a rod run through them, thus tying the end sill and plates together. The end braces extend from sill at eud post to plate at corner post, fitting iuto the post pockets and caps.

To strengthen the corners at side and end plates, corner irons are placed inside and outside over sheathing and bolted together. This construction is applied at corners over each belt rail. Rods are used to tie side plates to end plates aud corner posts to corner posts at each belt rail. Corner posts are also tied to side framing by rods at each belt rail, connecting with post above bolster. To assist in stiffening ends of car a truss is placed between first and second carline and side plate of each end, with two rods, each connecting two end plates.

Box cars, as is well known, are subjected to severe service by being loaded with rails, ties, lumber, logs, etc., which, owing to rough handling, readily shift, resulting in damage to their ends. Many complaints are made of their sides bulging. It is believed that the use of the form of framing herewith presented will prevent to a large degree damage of this character.

As stated in the introduction of this report, it is hoped that the plans shown herewith will excite the fullest criticism; they are not presented for adoption as a standard or recommended practice. If you think they are faulty, your committee wishes to know wherein the fault lies and the reasons for your belief. If you have any suggestions to make, the committee would be pleased to receive and consider them. It is believed that a standard box car is feasible and advisable, but it can only be brought forth after all differences of opinion have been explained away.

The committee would confirm the recommendations of last year's committee regarding the adoption of certain dimensions as standard, as follows:

1. That the inside dimensions of box cars as approved by the American Railway Association, namely, 36 feet long, 8 feet 6 inches wide and 8 feet high, be submitted to letter ballot for adoption as standard.

2. For box cars on high trucks (4 feet to top of floor):
Height, top of rail to upper edge of eaves.....12 ft. 6¾ in.
Width at eaves, at above height, maximum.... 9 ft. 7 in.
be submitted to letter ballot for adoption as standard.
3. For box cars on low trucks (3 feet 6 inches):
Height, top of rail to upper edge of eaves.......12 ft. ¾ in.
Width at eaves, at above height, maximum.... 9 ft. 7 in.
be submitted to letter ballot for adoption as standard.
4. That the words and letters, "Standard 12 ft. 6¾ in. by 9 ft. 7 in.," be stenciled in three-inch letters on the end fascia boards on all cars built to these dimensions.

STANDARD REQUIREMENTS FOR HIGH SPEED FOUNDATION BRAKE GEAR FOR PASSENGER SERVICE.

Committee: F. M. Whyte, Chairman, F. H. Clark, R. N. Duborow, J. W. Luttrell, C. A. Schroyer.

Following are the fundamentals of the design:

Braking power to be 90 per cent of the light weight of the car.

Equalized pressure in brake cylinder, sixty pounds per square inch.

Maximum pressure in brake cylinder, eight-five pounds per square inch.

Maximum stress in levers, 23,000 pounds per square inch.

Maximum stress in rods, except jaws, fifteen thousand pounds per square inch; no rod to be less than ⅞ inch in diameter.

Maximum stress in jaws, ten thousand pounds per square inch.

Maximum shear on pins, ten thousand pounds per square inch.

Diameter of pins to provide a bearing value not to exceed 23,000 pounds per square inch.

The reduction of stresses in rods, levers and jaws due to friction of the foundation brake, and the reduction of braking power due to the same cause and to the action of release springs, were neglected because it was considered to be too difficult to determine their value even with a fair degree of accuracy.

The committee did not know the weight of the lightest car carried on six-wheel trucks nor the weight of the heaviest, therefore it was assumed that if cars weighing 80,000 pounds to 137,000 pounds were properly provided for then the actual limits of weight would be provided for very satisfactorily. The higher limit of 137,000 pounds was decided upon because certain pins and other parts would need to be increased in diameter in order to fulfill, for heavier cars, the fundamental conditions prescribed in the foregoing. The brake rigging designed for the cars having six-wheel trucks can be used to brake a car weighing 137,000 pounds to 87.5 per cent without exceeding the maximum stress prescribed.

The committee submit schedule "A-1" for cars weighing 80,000 to 100,000 pounds and schedule "A" for cars weighing 100,000 to 137,000 pounds and having six-wheel trucks; the difference between these schedules is that a sixteen-inch brake cylinder is to be used for schedule "A" and a fourteen-inch brake cylinder is to be used for schedule "A-1," otherwise they are the same. The location of the fulcrum hole in the cylinder lever is made to vary by quarters of the inch to suit the weight of the cars, but only one fulcrum hole shall be drilled in each lever.

With schedule "A" there should be used a brake beam suitable for a load of 28,000 pounds, and with schedule "A-1" there should be used a brake beam suitable for a load of 22,000 pounds imposed at the middle of the beam.

Before deciding to recommend a uniform size of levers, rods and pins for all cars with six-wheel trucks and weighing from 80,000 to 137,000 pounds there were laid out two brake riggings in accordance with the fundamental data decided upon. One rigging was designed for cars weighing from 80,000 to 100,000 pounds and the other for cars weighing from 100,000 to 133,000 pounds and the weights of the parts for each were calculated. It was found that the difference in the weights for the body parts was 57½ pounds and the difference in weights of parts for two trucks was sixty-seven pounds, a total of 124½ pounds for one car. It was considered that economy would result from the use of one set of levers, rods, jaws and pins for all cars having six-wheel trucks and weighing from 80,000 to 137,000 pounds, instead of using two sets of levers, rods, jaws and pins for such cars, and the recommendations correspond with this idea.

The greatest weight of cars equipped with four-wheel trucks was taken as 90,000 pounds. As for the cars having six-wheel trucks, two brake riggings were first designed, one for cars weighing from 50,000 to 70,000 pounds and one for cars weighing from 70,000 to 88,000 pounds and the differences in weights of parts were, for body parts 35 pounds, and for parts for two trucks 42 pounds, a total of 77 pounds. Therefore it was considered desirable to recommend one system of levers, rods, jaws, and pins for all cars weighing from 50,000 to 90,000 pounds and having four-wheel trucks.

The brake rigging designed for cars weighing 88,000 pounds can be used to brake a car weighing 90,800 pounds to 87.4 per cent without exceeding the maximum stresses prescribed.

Schedule "B-1" is for cars weighing 50,000 to 70,000 pounds and having four-wheel trucks, and schedule "B" is for cars weighing from 70,000 to 90,000 pounds and having four-wheel trucks, the differences between the two being that a fourteen-inch brake cylinder is to be used with schedule "B," cars weighing 70,000 to 90,000 pounds, and a twelve-inch brake cylinder is to be used with schedule "B-1," cars weighing 50,000 to 70,000 pounds; also that with schedule "B" there should be used a brake beam suitable for a load at the middle of 28,000 pounds, the same as for schedule "A," and with schedule "B-1" there should be used a brake beam suitable for a load at the middle of 22,000 pounds, the same as for schedule "A-1."

The proper braking power or the weight of car is obtained by the location of fulcrum hole in the cylinder lever.

Schedule "C" needs only a few words of explanation. It was designed for cars weighing 50,000 pounds and less and equipped with four-wheel trucks. A ten-inch brake cylinder is to be used with this schedule and a brake beam suitable for a load at the middle of 15,200 pounds.

For all the schedules suggested there will be required a total of eight different pins; one of the pins is a present M. C. B. Standard. Of the eight there are four different diameters. The pins are numbered.

There are ten different rod jaws required for all the schedules and these are made of four different sizes of iron.

It would be desirable to have marked on the two ends of cylinder levers the distance from the fulcrum hole to each of the outer holes. Of course, these distances can be measured easily and one of the reasons for recommending that the location of the fulcrum hole vary by ¼-inch spaces was to facilitate such measuring, but it would be convenient to have the lengths stamped upon the levers.

The committee recommends that the light weight of car be stenciled on each car. The cross frame tie, when exposed, furnishes a convenient place on which to show the weight, but when this place is not available some other means should be provided. In addition to this the length of the cylinder end of the cylinder lever should be shown so that no calculation would be necessary to determine the proper cylinder lever for the car.

It may be found desirable by some railroad companies to mark each lever in a manner to indicate the schedule to which each belongs and the location of each in the brake rigging.

There have been brought together in Table I the distinctive data of each schedule so that by referring to the table there can be found quickly the correct schedule for any particular car.

TABLE I.

Schedule Designation.	Light Weights of Cars. (Lbs.)	Type of Truck.	Size of Brake Cylinder.	Maximum Load at Middle of Brake Beam.
A.	100,000 to 137,000	6-wheel	16 inches	28,000 lbs.
A-1.	80,000 to 100,000	6-wheel	14 inches	22,000 lbs.
B.	70,000 to 90,000	4-wheel	14 inches	28,000 lbs.
B-1.	50,000 to 70,000	4-wheel	12 inches	22,000 lbs.
C	50,000 and less.	4-wheel	10 inches	15,200 lbs.

SIDE BEARINGS AND CENTER PLATES.

Committee: T. W. Demarest, Chairman; A. E. Benson, J. W. Luttrell, G. N. Dow.

Your Committee on Side Bearings and Center Plates was continued from last year with instructions to report on:

1. A design of center plate, with a view to adopting dimensions for standards and recommended practice.
2. The location of side bearings.
3. Uniform relation between center plate and side bearing.
4. The merits of anti-friction side bearings for relieving the center plate from part of the load.
5. Will the use of anti-friction side bearings diminish the resistance between the wheels and rails?

The principal problem before the committee was to endeavor to obtain such information as would enable it to recommend to the Association such a design of center plate as would apparently generally meet the conditions. In order to determine this, the testing machine in use last year was reconstructed and a large number of tests made.

A resume of the method of conducting tests and results is as follows:

CENTER PLATE AND SIDE BEARING TESTS.

These tests had as their object the following:

1. The determination of the best material.

To this end, plates of the dimensions shown on Plate "A" were made of cast iron, unannealed malleable iron, malleable iron and cast steel. A plate with an extra forty-six square inches was used to represent pressed steel.

2. The determination of the best condition for the given metal.

To obtain this, the different plates "A" were tested, rough, smoothed and roughly fitted on the emery wheel, and machined. The machining consisted of facing the plates off in a lathe with the least possible diminution of area.

3. The effect of lubrication.

Where possible all plates were tested lubricated.

4. The best shape.

For this purpose the "Klohs' plate," the Spherical plate and the special plate used on P. R. R. passenger cars were selected.

5. The comparative value of plates of special design.

For this purpose three plates were used: the Pittsburg & Lake Erie ball bearing, a flat plate without center pin and the Baltimore ball bearing.

6. The determination of the best size.

For this purpose five plates of various areas, of the same shape of Plate "A," were used.

The following side bearings were tested:

Cast iron rubbing on cast iron, the frictionless roller, and the Baltimore ball bearing. Other forms would have been tested but for the limitations of the machine.

The machine used consisted of a vertical head in which was set a forty-ton hydraulic jack working against a movable lower head, the lever beam and the upper head. The upper head was composed of several layers of steel and wood in two parts, separated by four 19,000-pound capacity springs to allow of adjustment. The beam was swung back and forth by two six-inch air hoists; to these indicators were attached, and the cards taken thereon gave the basis for the calculations.

For the center plate tests the beam swung about the center line of the head, giving a lever arm of 113¼ inches. For the side bearing tests a center was provided twenty-five inches from the center of the machine, or the usual distance from the center pin to side bearing, the lever arm in this case being 138¼ inches. The travel of the beam was sixty-seven inches each way or 34 deg. for center plates and thirty inches or 12 deg. for side bearings. This movement is, of course, greater than would be met with in service, but as few of the conditions of service could be provided for in a test of this nature, it was thought best to use this exaggerated movement in order to obtain the greatest possible effects of the friction. As will be seen later, there were a number of plates from which no results were obtainable, even under these exaggeratd conditions. Two pair of center plates and side bearings were used, in every case one pair being below the beam and one pair above. The upper plate of the lower pair and the lower plate of the upper pair were bolted to the beam. The other plates were prevented from swinging by guides bolted on either side of the heads. The pressure was measured by a 6,000-pound capacity hydrostatic gauge connected at the base of the jack. The maximum pressure was thus limited by the capacity of the gauge. In making a test preliminary cards were taken for each plate under the special condition desired, without any load but that of the plates and the beam. These cards were assumed as giving the friction of the machine and this friction was deducted from all cards. This worked very satisfactorily, the friction in almost every case showing the same, or with but small variation, and, moreover, it divorced one condition from all the rest and confined any possible error of observation to but one case. Four cards were taken for each load and the results given represent the average of the four except in a few cases where it was found impossible to obtain all of the cards desired.

The formulae used were as follows:

Pull at the end of lever -P- equals mean height of card minus mean height of friction card, times scale of the spring, times area of the piston. Constant of the machine, Kc for center plates, Ksb for side bearings, equals length of lever arm in inches divided by the lever arm of the flange thrust (thirty-three inches), times the number of plates (pairs) in the machine. Pressure on the wheel flange -Pw- equals pull at the end of lever times the constant of the machine, or:

$$P = (M.\ H. - F)\ \text{Scale of Spring} \times A$$
$$Kc = 113\tfrac{1}{4} \div (33 \times 2) = 1.716.$$
$$Ksb = 138\tfrac{1}{4} \div (33 \times 2) = 2.095.$$
$$Pw = PxK.$$

The speed of the swinging beam was kept as uniformly low as possible as a slight increase of speed made a very perceptible difference in the cards. The increase in the size of the card, and consequently in the theoretical flange thrust, can —readily be seen is due entirely to the speed, as the load and other conditions were the same, the cards being taken within five minutes of each other. The friction of the machine is not considered here, but that would, of course, be equally dependent on the speed and could with certainty be considered as proportionately greater. The friction was not taken at high speed on account of the impossibility of making such high speed without a load and not endangering the apparatus. The lubricant used was a thick brown grease manufactured by the Galena Oil Company. The entire card was not used in obtaining the mean height, as there was considerable lost motion in the heads. So a point was taken where the actual friction of the plates began. This method removed from the calculations in a large measure the inertia and friction of the machine. While a large number of cards were taken, about 3,800, and the plates were tested under conditions that they would not have to meet in service, some more favorable and some more unfavorable, it is very evident that only the first step has been taken in the solving of this important problem. The variation in the results is, in many cases, too great and irregular to justify any hard and fast statement of facts. The important feature of the test, while not overlooked, was, from the nature of the tests and the manner of conducting them, all but disregarded, and this was the very important question of the percentages of areas in contact, and the effect on the friction. It was attempted to obtain this in the series of tests with different sizes of Plate "A," but the wide variation in the results obtained in these tests do not permit of any close or accurate analysis. These results are also impaired by the fact that, even with the machined plates, the areas of contact were not the same in both pairs of plates in the machine at the same time, and the almost certain unreliability of estimating or measuring the very irregular areas of contact. Another reason for disregarding this feature of varying areas of contact was the desire to test and report on the plates under the same conditions that they would be applied in service, in the present state of our knowledge and practice. The effects of lubrication can not be disputed and are in the main borne out by the figures submitted, there are still wide, in some respects startling, exceptions. For example: in the case of the Klohs' plate, smoothed and fitted, the lubricated plate gives a higher flange pressure than the dry plate; yet these tests were made with the same plates and on the same day, the test lubricated immediately succeeding the test dry, which was not always the case, as explained in the notes. Another feature that will be observed on reading the notes was the rapid and at times the complete disappearance of the lubricant under comparatively low pressures. This was more noticeable in the plates where the bearing was in spots. The lubricant in these cases appearing to be crowded away from the points of contact. A drop in the flange pressure will be noted in almost all the cases of lubricated plates at 15.08 tons, to 20.1 tons load. This is accounted for by the fact that the plates were relieved from the load and examined, and in some cases regreased at these points. This allowed a readjustment of the conditions and gave opportunity for the redistribution of the lubricant, although this was avoided as far as possible in the majority of cases. The results of this readjustment should be borne in mind when considering the effects of lubrication for the conditions of service, as this readjustment is constantly taking place, when a car is in motion, owing to the jarring and slight vertical motion. This process of readjustment that prevails in service removes these tests in a very large degree from bearing very strongly on service conditions, and adds to the laboratory features of the test.

The cutting or abrading of the surfaces of the plates was not well enough defined, as to condition of the plates and character of the metal, to justify any conclusions being formed as to the best metal or shape from this source. The elements present in service, of dust and readjustment, would in any event materially modify any conclusions that might be reached on this point. The dust acting as a pad or even as a lubricant, although increasing the wear, and the readjustment tending to displace the hard scale and particles of metal noted as forming in the grooves.

Another thing to be noticed is that a very large proportion of the friction is directly attributable to the action of rough places and fins on the castings and also to the imperfect fitting of the male and female plates.

In the tests for best metal the chilled cast iron or rather the unannealed malleable iron showed to the best general advantage. The conclusion from this being that the harder metal showed the least friction on account of its resistance, not only to cutting, but also to wear. This plate was not machined for various reasons. The high results in proportion to the rest of the malleable plate machine, not lubricated, can be attributed to the cutting off of the malleableized skin and exposing the softened metal underneath. In general, the malleable plate showed next in value.

The tests for best shape do not give results that are very conclusive. Taking smoothed, no-lubricant tests as a basis, as this would be the condition of a rough plate after a little wear and as ordinarily used under freight cars, in so far as these tests go we must conclude that the flat Plate "A" is of the best shape. The only question as to the best plate in this series is as to whether the Baltimore ball-bearing plate would stand up under the rough usage of service, and a test of that character is the only one to determine this question. Both ball-bearing plates show to a great advantage as compared with the rest.

SIDE BEARINGS.

These tests are not as full as they ought to have been; but, owing to the construction of the machine, a bearing working on an angle could not be satisfactorily tested. The best one of the three tested was undoubtedly the frictionless roller bearing, but even this leaves much to be desired, when compared with the results obtained on the center plates. The Baltimore ball-bearing device might have showed to a better advantage if its construction had not been defective.

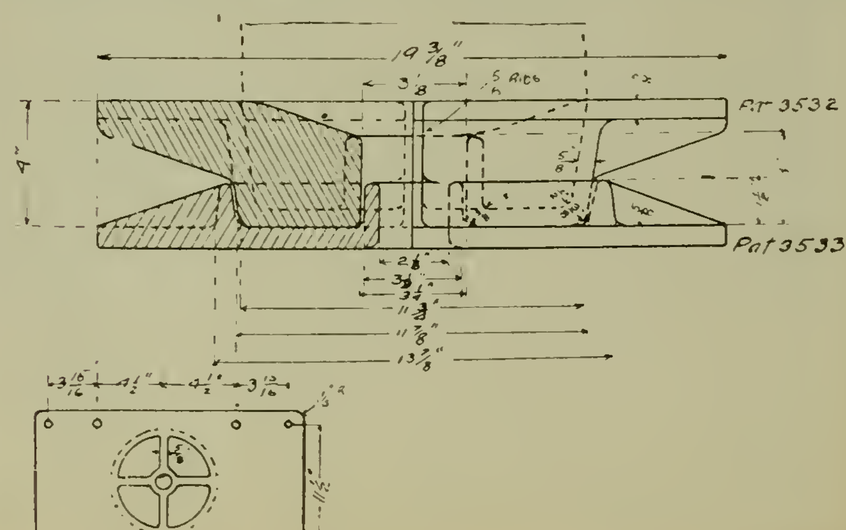


Plate A

Top & bottom for all centre plates

In summiug up the results obtained, the miuimum flauge resistance was obtained from the flat plate, "Form A," of chilled cast iron. The projected area of this plate was 100.14 square inches. In order to determine the best size of this plate, six different plates were constructed, ranging iu area from 100.14 sq. in. to 46.793 sq .in. The results obtained are so close that it is difficult to say which will be the best area to adopt. Apparently the flat plate with an area of 86.738 square inches, using as a basis a smooth casting, no lubrication, gave the best general results, and a flat plate of this description is recommended to the association as the standard form of center plate.

It will be uoted also that two ball-bearing center plates were tried. These center plates gave such remarkable results that there cau be no question of a reduction iu flange resistance by their use. One road has been using for a number of years now a ball-bearing center plate, and in so far as durability is concerned the plates are reported as giving entire satisfaction. It is recommended to the association that during the coming year the members equip a number of cars with ball-bearing center plates, in order to ascertain more fully their durability.

A number of side bearing were also tried, but these experiments could not be completed, as, in order to test the differeut makes, it would have been necessary to reconstruct the machine, which time would not permit. In so far as the tests were carried out, however, the results iudicate much less flange resistance with the roller side bearings than with the ordinary flat cast iron plate. On account of the inability to thoroughly test out the side bearings, the recommended distance from center of center plate to center line of side bearing was not obtained. Replies from various members of the association indicate this distance to run from 24 to 32½ inches. In the tests as conducted the distance was taken as 25 inches.

While the coumittee recommends to the association a standard form of center plate, as Plate "A," there is uo doubt in the minds of the committee that if the ball-bearing center plates and side bearings are durable in service a very greatly decreased flange resistance will be obtaiued.

TESTS OF M. C. B. COUPLERS.

Committee: R. N. Durborow, Chairman; W. P. Appleyard, Joseph Buker, W. S. Morris, F. H. Stark.

Your committee reports that the change made last year to strengthen the contour gauge frames and which change has been adopted by letter ballot, has proveu very satisfactory. Two of these revised gauges have been used for six months without any springing, distortion or breaking in any way. One of them was used to gauge 18,997 couplers and the other to gauge 35,000 couplers, which in itself is sufficieut to show that the gauge as now designed should give entire satisfaction.

At the last convention your Coupler Committee was authorized to modify the testing machine to be furnished by the Association to Purdue University in such a way as to make it generally available for the testing of draft rigging, axles, etc., as well as for couplers. This has been done, and in addition your committee has taken the liberty of making soue changes in the way of improvements. These changes have been made with a view of gettiug a better jerk test, as well as strengthening various parts and reducing their number. The machine is now under construction at Altoona and will be complete and ready for shipment in a very few days. The cost to the Association will be approximately $2,500.

The new arraugement for jerk test requires only one coupler, instead of two for each test. The coupler holder has been changed and consists of one large holder with bushings for the two sizes of coupler butts, instead of a differeut holder for each size. In place of the bolts through the butt of the coupler, a strap is used, which, by its own weight resting on slightly beveled faces of holder, prevents the arms of the holder from spreading. For origiuating and the perfection of this arrangement of holder the Asosciation is indebted to the McConway & Torley Co., who have used it for some time on their testing machine and have proved it to be an advantage over the present method. It will be noted that the new jerk test arrangement still further reduces the number of parts of the machine by only requiring one set of these holders, bushings, etc. It at the same time clears the one side of the machine of all overhead rigging, thus allowing more room for lifting the yoke into place, and in every way making a much safer and easier test to operate. An 8 in. by 12 in. banded oak block about 28 or 29 inches long, placed under the yoke, serves to protect the parts when the knuckle breaks, and will also save lifting the yoke into place for a second test.

All the cast parts of the machine have been giveu a pattern number and the drop weight has been changed from a casting to an open-hearth steel forging. This change is an important one which was brought about by the breaking of several of the annealed steel casting heads at Altoona and the consequent danger involved. The new design shows a plain forging through which a large hole is cut to reduce its weight. A link slot extends through the top to the large hole and the link provided with shoulders to maintain it in a suitable position for the hook. Your committee has consulted with Professor Goss regarding these changes for the Purdue machine, and with his entire approval proceeded to construct the machine accordingly. However, on account of some of these changes beiug in the nature of an experiment and the cost being considerably less to equip the machine in this way, your committee recommends that the Association meet any additional expense that might be necessary to make the machine entirely satisfactory.

The machine when shipped will have had all the parts fitted, including the entire equipment, except that no means for raising the weight will be provided. Your committee understauds, however, that a hoisting engine will be furnished for this purpose by the university. The equipment will, of course, include the two air reservoirs, air hoist and valve, also the parts ueeded for the draft gear test shown with the draft gear report of last year, which cousist of a cast-iron base block upon which the draft gear rests, a cap casting to which the gear is bolted, and two forged steel dummy butts. Two small forgings will also be furuished with meaus for holting them into large hole in the drop weight, in order to increase it to 2,000 pouuds for rail testing. The auchor bolts and plates have been sent to Purdue and the foundations are uow being prepared by the university.

SEPARATE KNUCKLE TEST.

The necessity for some satisfactory test in buying separate kuuckles has long been recognized by your committee, and they now present an arrangement which is still experimental, but which promises to give good results. The geueral arrangement consists of a large housiug in which the knuckle is held by various blocks and liners iu two different positions for a striking aud a jerkiug test. A steel striker extendiug through the top of housing delivers a blow from the drop weight to the knuckle. This block fits down between the base castings of the machiue and both serve to raise the knuckle testiug attachment to a good height for working around it and also allows the knuckle test to be made without removing the base castings and columns from the anvil. If the kuuckle test is to be made after an axle test, the base block can just as readily be set in between the axle supports, or the housing may be placed directly on the anvil cleared of all other attachments. This is an advantage, as considerable time is always consumed in changing the heavy parts of the machine for the different tests.

In the knuckle striking test the back block and knuckle supports are placed inside the housiug against the back and sides. The knuckle is dropped iu between the supports and held by inserting a pin through the hole in the housing. Adjustment of the knuckle is then made by means of liners between the back block and the knuckle supports, and the knuckle supports are theu lined up tight against the hub of the knuckle. Fitting pieces made to suit each type of knuckle are slipped in back of the tail for it to butt against, as the striker is driven down on the face of the knuckle. The knuckle blocks may also be put in against the back of the knuckle, although the thrust is not in this direction, as in the jerk test.

The Pennsylvania Railroad has constructed one of these attachments for the Altoona machine, but it has hardlly been completed long enough for your committee to give any definite results from its use any more than to state that in the few tests conducted the arrangement and adjustment of it proved to be quite satisfactory. The knucles would break through their weakest section, either through the hole or across the tail, some standing a test of only two blows at 5 feet, while others did not break with less than three blows at 5 feet and eight blows at 10 feet. It is, therefore, easily seen that a knuckle of poor design or made of weak material can easily be discovered by this method.

In the jerk test the knuckle is put into the housing in the reverse position aud then adjusted as in the striking test, except that the tail is lined out to the proper position by the striker blocks, and if necessary on account of its design, by a fitting piece, to furnish it with a bearing corresponding to the locking surface afforded iu the coupler head. It will, therefore, be seen that a test very closely resembling service conditious can be obtained for any knuckle, but a little more time will be necessary in order to discover and correct any weakness in design or difficulty in operation. The pattern for the housing the Pennsylvania Railroad has offered to any oue of the Associatiou who may desire it, which your committee hopes will lead to a uumber of these attachments being built, aud considerable testing along these lines during the coming year, whereby sufficient data will be available from which to recommend a separate knuckle test for the specifications in our next report.

SPECIFICATIONS.

Experience has shown that the coupler specifications are not as generally followed as is desirable for the general good of the Association.

Experience has also shown that specifications reach perfection by gradual modification and growth, and must be changed from time to time to keep pace with improvements of the art. With this end in view your committee has carefully revised the existing specifications in order to obtain more logical sequence in tests and greater condensation in wording; and therefore your committee suggests the appended specifications in lieu of those now in use.

The first paragraph of the proposed specifications requires the couplers to be made of steel and thus disposes of the malleable iron coupler. It also states that couplers should not be paiuted. which your committee thinks is an unnecessary process, and one without which a much better inspection can be made.

Section No. 3 allows ⅛ inch vertical play between the knuckles and bars, instead of 1-16 inch. This amount seems to be required to insure absolute interchangeability. Section No. 5 allows the pivot pin holes to be 1-16 inch larger than the piu, instead of the 1-32 inch allowed by the present specifications, which seems to be more in accordance with what can be obtained in practice. This lost motion in both these cases is, of course, kept as small as possible by the manufacturers in order to prevent the pin from bending and to increase the strength of their coupler, yet some of the manufacturers request the additional allowance.

Experience with the present M. C. B. label has shown that it is very difficult to cast raised letters and numbers on steel, and as your committee does not favor the buying of couplers on time specifications, it is recommended that the label be omitted and that the coupler be marked according to paragraph 7. The date of casting can be obtained, if desired, from the serial number.

The clause pertaining to minimum weights of couplers and knuckles has also been omitted, for the reason that it is of no use in determining a good coupler or poor material, and as strength is desired regardless of weight, we think this clause can well be eliminated.

In the striking test and for a 5 in. by 5 in. shank coupler in the guard arm test 1⅞ inches is allowed for the distortion of the center-punched line, instead of the 1 inch allowed by the present specifications. This figure has been averaged from a large number of tests, and seems to be nearly in accordance with what can be obtained. An analysis of a large number of tests has also shown that 7-16 inch distortion of the guard arm should be allowed, instead of ⅜ inch in the guard arm test.

In the striking and the jerk tests more allowance is given to the manufacturers by permitting a retest if the couplers, before failing, stand the first blow at 10 feet instead of the second blow at 10 feet, which your committee believes to be too near the maximum requirement.

In these specifications your committee has not considered the proposed method of making the jerk test, but hopes that a little more experience with this arrangement will warrant the use of but one coupler.

It is thought desirable, however, to add to the requirements of the present jerk test for a clause stating that the knuckle must not open more than ¾ inch from its original position after the third blow at 10 feet.

Section No. 10 is made to include the guard arm test which is not embraced in the partial failure clause of the present specifications. This test is included for the reason that the failure of the guard arm should not condemn the other parts of the lot of couplers which this bar represents.

Your committee believes that the proposed specifications can be justly enforced and that the manufacturers can comply with much greater facility.

The recommendations concerning uncoupling attachments made at the last convention by the Committee on Standards and referred to your Coupler Committee have been under consideration and a circular of inquiry has been issued, with the result that answers representing ten railroads have been received in favor of extending the uncoupling lever to both sides of each end of the car, while nine are unfavorable to the long lever involving additional expense and increased difficulty to keep in repair. The lever handle should extend beyond the end of the end sill, since an occasional cornering of cars always bends them when applied in the usual exposed positions, and often there is not sufficient space to operate the lever from the inside of a sharp curve, nor from the opposite side with an extended lever, if the end sills are close enough to prevent the handles from being lifted. When the lever is used with couplers which require the lock to be supported by the uncoupling rod resting upon an inclined ledge, your committee recommends that an allowance be made so that there may be at least ¾ inch variation in the length of the uncoupling chain. Your committee thinks, however, that some steps should soon be taken toward singling out the best of the great multiplicity of couplers, and recommends that the process be started by specifying for new equipment only such couplers which have a lock set within the head and which do not depend upon the uncoupling lever to hold up the lock. This latter method, which depends entirely on the lift rigging being in exact adjustment, we think has been superseded by much better methods within the head of the coupler. The vote on the extended lever question seems to be so evenly divided that there is no decided choice among railroad officials; however, as a result of inquiry among the men who handle the cars, the opinion seems to prevail that the lever should operate from both sides at either end of the car, thus affording more protection to the men. Also considering the facts that some couplers can be parted more easily than others, and as there are often strains existing between cars that allow the one knuckle to be opened more easily than the other, and that some couplers have knuckle kicking devices, while others have not, your committee recommends that the arrangement which gives the man two chances to cut or couple the cars where with the single lever he has but one, should be used in connection with all freight equipment; that the railroads work along these lines in fitting up their various classes of cars and that, after a wider experience with the different kinds of arrangements, several of the best should be singled out and made standard. The following occurs as a suggestion, that instead of extending one long lever across the end of the car, two short levers might be more easily made and operated and have less tendency to become inoperative, due to a slight bend, which is so often the case with a long lever extending through three brackets.

At the convention last year it was "Resolved, That the Master Car Builders' Association recommends to its members, in purchasing M. C. B. couplers, that they specify that the link slot and link pin hole in the knuckle shall be omitted, and in that connection that the standing committee on couplers shall make an inquiry and report to the convention next year the results obtained by that change."

Of the twenty-one railroads that responded to the circular of inquiry nineteen have been using the solid knuckle and are very much in favor of making it standard; one road reports no experience with it and the other suggests that the slot be abandoned but the pin hole retained.

The only objection to taking definite action in this matter heretofore has been in the difficulty of handling cars around sharp curves and on and off floats at tide water. Your committee has been experimenting in this direction for some time past and has selected an auxiliary device for this purpose which seems to meet all the conditions about as well as can be expected.

It has been with a full realization of all conditions and complications that your committee has been experimenting and analyzing the various phases of this subject, and they have come to the conclusion that there always will be sharp curves and that it seems almost impossible to allow the coupler to swing enough to take care of this excessive lateral motion which exists everywhere and which is doing as much as anything else to damage our couplers and cars. We can also safely say that there always will be some trouble coupling automatically the various kinds of couplers on the different lengths of cars at these short turnouts and reverse curves, no matter how much these curves are reduced; all of which means that all kinds of coupling and shifting operations can not be done in an entirely automatic manner and that some device must be available which will afford ample protection to the men and at the same time allow the use of the solid knuckle. Whether or not we can get a better device remains for the future, but one selected which may not be all that we would like to have it, your committee thinks they have something that meets all the emergency conditions which are apt to be presented, being a practical and safe device which permits at this time a definite stand in recommending the solid knuckle as a standard of the Association for all couplers. Application for patent for the auxiliary coupler has been made by the Pennsylvania Railroad and, if granted, the device will be turned over to the M. C. B. Association for whatever use it may prove to be to them.

CHANGES IN M. C. B. COUPLER CONTOUR.

This subject was suggested by your committee in the report of last year in connection with "Increased Dimensions of Coupler Heads," and as was therein stated, the abandonment of the link pin holes and the link slot will transfer almost the entire breakage of the knuckles to the knuckle pin hole, and that the lugs are the weakest parts of the bar. Your committee believes that increased strength at both of these places will be much better obtained by an increase in section rather than in depth, since the metal around a deep hole will tear at the point of greatest shear as readily as it will around a hole of less depth of the same section. The present contour was designed for very much lighter service than it is now compelled to stand, and there is a limit to the additional strength that can be obtained with the present contour by improving the material in the coupler. Great advances have been made by these methods during the last few years, but your committee now believes that the manufacturers are furnishing the strongest coupler that can be produced with the use of the old contour lines, which means that we must look to the only alternative for allowing the coupler to grow—that of increase in size. Drawbar lug failures will increase to even a greater proportion than is now the case. Pins become bent, which is one of the principal causes of lug failures, or the pin breaks off in the middle and the lower part drops out, which is largely responsible for the greater number of failures of the upper than of the lower lug. We need stiffer and stronger pins, which means increased section. We also need more metal around the pin, both in the bar lugs and in the knuckle, and this means increased section and a change in contour. If the present steel couplers give as good service under the increasing loads as have the old iron couplers, many of which have been running five or six years, it would seem that it might be at least five years before another change could be entertained. On this account as much change as possible should be made each time and the two gauges for new and worn contours be altered as may be found necessary. The two distinct features involved in the proposed contour are, first, that the knuckle is made more hook shaped and, second, that about 3-32 inch is gained across the contour at the pivot pin hole; in other words, the metal is taken from the front end of the knuckle, where it is not needed, and placed so as to increase the section across the pivot pin hole.

The couplers furnished under this specification must be made of steel and in accordance with the best foundry methods and must not be painted.

1. Couplers will be subject to the inspection and test of the aobve named company as to their mechanical workings, general condition and strength. The tests and inspection will be made at the place of manufacture, where assistance and labor necessary to make satisfactory and prompt inspection and shipment must be furnished free by the manufacturer. The testing machine and gauges approved by the M. C. B. Association must be used in the test and inspection of couplers.

2. Couplers will be ordered as far as practicable in lots of one thousand; for each one thousand ordered the manufacturer shall furnish 1,015, and in the event of additional couplers being required to carry out the prescribed tests, they shall be furnished free of cost by the manufacturers.

3. Bars, knuckles and locking pins or blocks must be accurately made to gauges furnished by the manufacturer. These gauges must govern all dimensions representing fitting surfaces, thereby insuring absolute interchangeability and freedom of motion between the assembled parts without further adjustment or machining. When assembled, knuckles and locking pins or blocks must work freely, but the lost motion between knuckles and bars must not permit more than ⅛ inch vertical play, or between knuckles and locks must not permit the knuckle to drop forward

beyond the proper contour line, but ¼ or ⅜ of an inch lost motion in opposite direction is desirable.

4. Couplers must conform to M. C. B. contour lines and must have a lock set within the head of the coupler. They must couple and uncouple with each other (with either or both knuckles open) and also with the master or sample coupler; they should lock easily when the knuckle is pushed in by hand. They must, unless written permission to the contrary be given, have steel pivot pins 1⅝ inches in diameter of sufficient length to permit applying a ⅜-inch cotter pin through the pin below the coupler lug. Pivot pins, after having the heads struck up, must be properly annealed.

5. Bars and knuckles shall not be accepted if distorted by improperly matched flasks or any other defects due to molding. They must be free from injurious shrinkage cracks, flaws, checks, sand, sand holes or blow holes. The holes for pivot pins in lugs of bars and knuckles should be drilled or, if cored, must be broached out, and must not be more than 1-16 inch larger than pin. The holes must be parallel to the face of the bar or knuckle and at right angles to the axis of bar or knuckle. As many bars and knuckles as possible must be cast from the same heat of steel. All parts must be well annealed throughout.

6. The pulling and contact faces of coupler and knuckle must be clean, smooth and at right angles to axis of the bar. The dimensions of butt and shank must be within the limits of variation shown by the company's drawing.

7. The name of coupler must be legibly cast on the top side of head of the bar. Each knuckle and each drawbar must bear a serial number legibly stamped or cast upon it. The knuckle must also bear the name of the coupler and the manufacturer's name or identification mark legibly cast or stamped at some point where it will not be worn off.

THE SAFETY APPLIANCE ACT.

Address of M. E. A. Mosely, Secretary of the Interstate Commerce Commission.

In August last the United States Circuit Court of Appeals for the Eighth Circuit announced a decision in what is known as the "Johnson Case," with which you are undoubtedly familiar. It was an action for personal damages, in which the court upheld a judge who had instructed the jury to return a verdict for the defendant railroad. Johnson lost his arm while attempting to couple an engine equipped with a Janney coupler to a dining car which was equipped with a Miller hook. One question involved in this case was as to whether or not the dining car was actually engaged in interstate commerce when it was being turned (in Utah) preparatory to going back to California, across the state line; but the question that is of paramount interest is whether it was not a violation of the Safety Appliance act to send a man between the car and the locomotive to attempt to couple a Miller with a Master Car Builders' type of coupler. The Miller will couple automatically by impact when used with one of its own kind, and, as we all well know, the same is true in regard to the Master Car Builders' type of coupler; but when it is undertaken to couple a Miller hook to a Master Car Builders' type of coupler by impact, the impossibility of doing so is clearly apparent. The court, however, held that as the dining car was equipped with a coupler which was automatic in connection with others of its kind, the law had been complied with, holding that "there is nothing in the act which requires a common carrier engaged in interstate commerce to have every car on its railroad equipped with the same kind of coupling, or which requires it to have every car equipped with a coupler which will couple automatically with every other coupler with which it may be brought into contact in the usual course of business upon a great transcontinental system of railroad."

Why, one of the principal objects of this association is to secure the interchangeability of couplers, and this court's decision sets at naught one of the fundamental ideas of the Master Car Builders' Association, which, more than [illegible] ago, urged and took steps to bring about the use of an interchangeable automatic coupler.

The Car Coupler bill in that particular was principally directed toward uniformity; it sought to avoid the very thing that took place when Johnson lost his arm. The Congress of the United States, when it enacted this measure, had the advantage of having before it the results of the experience of you gentlemen who, in the thirty-seven years of the existence of your association, have wrought upon this problem. Congress did not say you must use this type, or that you must use that type, or that you must use the Master Car Builders' type; but simply that you must use a coupler which will couple automatically by impact; bring about the conditions which the act sought, and prevent the men from going between the cars to couple and uncouple.

In the Johnson case the court seems to have lost sight of the fact that the question of uniformity and the interchangeability of couplers was one of the most prominent points brought out in the debates in the Congress. Senator White (now Justice White of the Supreme Court of the United States), who fully and intelligently grasped the situation, said in the debates attending the passage of the act:

"How does that meet the difficulty that the railroads using their best endeavor at the present time, this best endeavor being used upon different roads, reach different conclusions upon different roads? Road A, using its best endeavor, reaches one conclusion and puts in one form of appliance; road B, using its best endeavor, puts in another form of appliance. If those two appliances brought together, because of their want of uniformity beget fatality to human life. does the argument of best endeavor remove that difficulty?"

As Colonel Haines, the president of the American Railway Association, telegraphed the Senate:

"Any legislation will be of no effect which does not specifically provide for the adoption of the type of coupler approved by our association, and of which there are many different patents, all interchangeable with each other."

So Congress allowed the railroad to continue working out the solution of the problem of an interchangeable type of coupler, and this, as I have shown, they had succeeded in doing through your work before the passage of the act. It was, therefore, the method and conditions only that became the subject of Congressional regulation.

It is, therefore, with great satisfaction that I have to tell you that, although under the procedure of our courts such cases are understood to be final in the Circuit Court of Appeals, the Supreme Court of the United States has consented to use a power which, as it has itself said, should be "exercised only in cases of gravity and importance," and granted the writ of certiorari which had been petitioned for. The attorney general of the United States deemed this matter of sufficient importance to intervene, and the Supreme Court is to hear an appeal in this case.

If the honorable circuit court which decided this Johnson case had read the broad and comprehensive language uttered by Senator (now Justice) White when the law was considered in the Senate, it is inconceivable, in my opinion, that the present determination could have been reached.

When the decision, which, from the government's point of view, practically nullified that portion of the law in respect to couplers, was brought to the attention of Congress, that body hastened to amend the law; so that it now reads that when couplers are brought together they shall couple automatically by impact in all cases, whether or not the couplers brought together are of the same kind, make or type. Whatever, therefore, the decision of the Supreme Court of the United States may be, the law will be effective after September 1, 1903. On that date the amendment of March, 1903, takes effect, and when couplers are brought together they must couple automatically by impact, and when a man is compelled to go between the cars to couple or uncouple them he does so at the pecuniary risk of his employer.

The law formerly applied only to trains or cars engaged or used in interstate commerce; no train could be lawfully run in interstate traffic that had not a sufficient number of cars in it so equipped with power or train brakes that the engineer on the locomotive drawing such train could control its speed without requiring brakemen to use the common hand brake for that purpose. The amended law is vastly broader, and will apply to all trains of any carrier engaged in interstate commerce, to locomotives, tenders, cars and similar vehicles used on any railroad engaged in interstate commerce, and also requires "that whenever, as provided in said act, any train is operated with power or train brakes, not less than 50 percentum of the cars in such train shall have their brakes used and operated by the engineer of the locomotive drawing such trains, and all power braked cars in such train which are associated together with said 50 percentum shall have their brakes so used and operated," but does not change the provision of the original law that there shall always be a sufficient number of cars in a train equipped with power or train brakes so that the engineer can control its speed. Therefore, no question can arise in the future as to whether or not locomotives, caboose cars, tenders, snow plows, etc., should be provided with automatic couplers that are interchangeable with those on all cars.

The year the law went into effect—August 1, 1900—Congress appropriated $15,000 to enable the Interstate Commerce Commission to keep informed regarding compliance, and to render effective the requirements of the act. The next year the appropriation was increased to $25,000 to do this, and to enforce the requirements of the act, and the next year to $35,000, and the commission was also authorized to employ inspectors to execute and enforce the requirements of the act. The value of this inspection has been demonstrated, and for the coming year Congress has appropriated $50,000.

A great many persons are seeking this employment, and the commission has endeavored to use the greatest care in the selection of its safety appliance inspectors, and they have been taken from the field of active railway work. In connection with this employment the Interstate Commerce Commission and the United States Civil Service Commission have agreed upon regulations which shall govern their selection. As an evidence of the value which is attached to the work and standards of this association, the Master Mechanics' Association, and the American Railway Association, I quote from the civil service rule d; the examination of an applicant must show:

"That he is thoroughly familiar with the rules, standards and recommended practice of the Master Car Builders' Association, particularly in regard to safety appliances, and also with the proceedings of the American Railway Master Mechanics' Association and of the American Railway Association regarding equipment and operation of trains."

It must be very interesting to you to know that the report for the year 1902 shows that the annual number of casualties due to coupling and uncoupling cars has, since the law was enacted in 1893, been diminished more than nine thousand; the number of employes killed shows a diminution of 68 per cent, and the number injured of 82 per cent, and this notwithstanding the fact that there were from fifteen to twenty thousand more men engaged in coupling cars on the later date.

It would be extremely gratifying to me to be able to tell you that this reduction in casualties applies to all the hazardous employments in which railroad employes are engaged, but I regret to say that the number of men killed and injured in falling from trains has increased. Even today the last report of the statistician to the commission shows that one man in every ten was injured and one man in every one hundred and thirty-five killed, of the conductors, enginemen, firemen and trainmen employed.

When we realize that if the railroad employes were more careful, less lax in their compliance with the regulations, or if the railroad companies maintained their appliances and equipment in better condition and used more safety appliances, many of these accidents could be avoided, it seems a cruel waste of human life.

Comment has been made upon the increase of accidents. This is partially due to the increased care in the making of reports. It was only after the 1st of July, 1901, that a monthly report of all accidents, under oath, was required of all carriers engaged in interstate commerce. There seems, however, to have been a misapprehension on the part of some railway managers, as they have endeavored to separate the accidents which have occurred in purely interstate traffic from those which applied to state traffic only. Repeated instances of this have occurred. On their attention being called to the law and its stringent provisions, corrections have been made and these corrections have disclosed a material increase in the number of accidents which should have been reported in the first instance. It is therefore fair to presume that before the enactment of the accident law the accidents occurring in purely state traffic were to a great extent not reported, and the numbers shown in the published statistics were to that extent diminished. Independently of these reports from railway managers, reports from every source, as far as obtainable, of all accidents are received and examined in the office of the commission.

There are many cases where collisions, both rear and butting, occur owing to the fact that trains are by some mistake given the right to the same track at the same time. The law, however, contemplates that one of the requirements of railway operation that compels the men to run on top of a train from one end to the other while it is in motion, to apply hand brakes, should be abandoned, and under the stringent provisions of the amended act we believe such practice will be done away with.

There is an increasing determination on the part of those who are interested in the law that it must in the future be strictly enforced. It was only the morning of my leaving Washington that I received a copy of a resolution, which was also directed to the president, demanding, on the part of a large and representative body of railway employes recently assembled in biennial convention, that the law must be strictly enforced and that every violation which came to the attention of its members should be reported to the Interstate Commerce Commission and prosecution demanded.

As I said in the beginning of my remarks, the court decision in the Johnson case, dealing with the Miller coupler on the dining car is not final, as the Supreme Court of the United States is yet to consider the question; and, moreover, the first of September will see a far-reaching change in the law. All such controversies as that in the Johnson case will then be done away with. The law will then apply to all trains, all kinds of vehicles, used in either state or interstate traffic.

STEEL CARS.

An Individual Paper by Mr. A. L. Humphrey.

One of the most important questions of the day is that of steel cars. You often hear the question asked, "Has the steel car come to stay, or is it a temporary fad, like many others, that will fade away in the near future?" Some have been extreme enough to predict that ten years from now the steel car will be a thing of the past. I think I can safely say that there is nothing connected with our railroads that is being more carefully watched or that is receiving more world-wide attention than the steel car. Some claim that it is too early to draw conclusions, claiming an insufficient time in service. As for myself, however, I feel convinced that the car has come to stay, and predict that in a very few years there will be nothing else built than steel cars, or cars with steel underframing for 60,000, 80,000 and 100,000 pound capacity. For the past eighteen months I have been watching the steel car very closely, especially so, as prior to that time I must confess I was somewhat skeptical regarding the future success of them. After a most careful study and thorough investigation I am pleased to say that I have been favorably surprised to find in them what appears to me a most successful car. The repairs are phenomenally low; in fact, barring wrecks and occasional repairs necessary to the coupling attachments and trucks, there are no repairs necessary to the steel car. When the railroads become equipped to handle repairs to steel cars, the repairs caused by wrecks will be as simple as to wooden cars. I realize this subject has been discussed from its different phases. No one has questioned the advisability of the steel car from a purely traffic standpoint. There are so many advantages in favor of the steel car in the way of reducing the dead weight, which permits the increased percentage of revenue load to dead weight, than from an operation standpoint there can be absolutely no question as to their success. In case of wrecks they have proven to be all that could be expected in the way of resisting shocks which in a wooden car, or a wooden underframe car, would have been quite the reverse.

Is a composite car of wood and steel better adapted to coal traffic than cars built wholly of steel?

In December of 1900 the Chicago & Alton Railway Company obtained five hundred 100,000-pound capacity composite cars with steel underframing. These cars have proven, so far as service is concerned, equal to the all-steel car, 800 of which the same road purchased in May of the same year. The dead weight of the all-steel car is 35,000 pounds, or 35 per cent of the carrying capacity; dead weight of the composite car is 41,000 pounds, or 41 per cent of the carrying capacity, showing 6 per cent in favor of the all-steel car. The cars are equipped with the same style of truck and are identically the same in every particular, except the decking and sides, and have been operated in the same service. So far as maintenance is concerned there has been very little difference between the two designs, as neither design has to date cost us anything so far as running repairs are concerned, except as referred to above. It is a noticeable fact, however, that in case of wrecks the composite cars do not stand the resistance that the steel cars do, except the underframing, so that wreck repairs on the all-steel car have proven less than on the composite cars. The question then arises, "What will be the comparison in ten to twelve years hence?" The one danger with the future success of the steel car is the one of deterioration from corrosion and rust. It has been claimed by some writers that the composite car would prove more successful on this account than the all-steel car. Our experience, however, has been quite the reverse, for the wooden floor and sides become seeped with water and moisture from the coal, which keeps the iron work of the car moist with water containing sulphur and other injurious elements, all of which contribute seriously toward corroding the iron that the drippings come in contact with. The drippings follow the interior and exterior of the siding run from the ends of the decking down over the side sill, badly corroding at the corner of the top flange of the sill and corroding badly the entire distance of the side, so much so that in order to prevent side sills from deterioration we have found it necessary to scrape thoroughly and paint these sills as high as three and four times a year. The moisture follows down between the boards and the posts, badly eating away the rivets and under side of the post, which is also very injurious, and if not constantly looked after will prove extremely serious in a very few years. The underframing of the composite cars is protected with tar paper, but with the constant dripping taking place, especially in wet weather, in coal cars, the tar paper does not seem to protect the side sills. As yet we have had no trouble with any of the other sills comprising the underframing.

From experience obtained with high side hopper bottom gondola cars I see no reason why an all-steel frame box car cannot be equally as successful as all-steel gondola cars. The same rule regarding dead weight to the carrying capacity will apply to box cars as to the coal carrying cars, and if the price of lumber continues to advance and the quality to depreciate, it will soon not be a question of advisability, but one of absolute necessity.

As already explained, we have found no repairs necessary to steel underframing. While we have a limited number of steel underframe box and furniture cars, we would not think of purchasing any other design. With proper steel underframing and truck, with suitable design of draft rigging, running repairs to freight equipment will be lessened to a minimum, and the danger to equipment and lading in case of wrecks has been greatly reduced. Attention should be paid to the design, especially at the side sills, to avoid the corroding on account of water dripping from the sides of the car on to the side sill, which has proven so serious in the case of composite cars.

I can see no reason for applying part steel and part wood. Steel affords a lighter framing, and if preferable in case of draft timbers, why not for the intermediate and side sills?

It has been very properly stated that rust is the enemy of the steel car, and after an experiment of eighteen months, I have come to the conclusion that I know very little regarding a proper preventive of rust. Remove the possibility of corrosion and the steel car will be everlasting. Some method of preventing rust must be obtained. The car is here to stay. There is surely some preventive. I have not as yet found any for the interior of the car. The exterior of the car is easily taken care of. With the interior it is quite different. The coal dropping into the car from the chutes scales the paint, and the sulphur and other chemicals in the coal do the rest, so much so that any paint I have been able to obtain will not last to exceed from three to six months. In my opinion there is no subject more important before this convention, and I would urge that a committee be appointed to give this question special attention and report at the next meeting on a suitable preventive of rust on steel cars.

A REVIEW OF THE DECISIONS OF THE ARBITRATION COMMITTEE.

By George L. Fowler.

In reviewing the long series of decisions of the several arbitration committees that have served the association it will be found that there is a remarkable consistency running through the whole. That this should be so speaks well for the honesty and sincerity with which this branch of its affairs have been administered. When it is taken into consideration that these rules have been in operation for twenty-five years, that their interpretation has been in the hands of a committee for twenty-four, and that there has been a complete revolution in many of the details of railroad mechanics and operation in that time, it would not be strange if there were variations in the decisions of those in charge. That this is not the case speaks volumes for the character both of the men and the rules they were called upon to apply.

One of the earliest rules formulated by the first committee for its own guidance, and which has been ever since observed, was to the effect that no hypothetical cases would be considered. This was found to be necessary because of the tendency of the members of the association to review the rules mentally, and, after formulating a suppositious case, ask the committee for a decision. A few such cases were presented, but the prompt refusal to consider them of course put a stop to the practice.

Turning now to the decisions themselves we find that the defect card in the various aspects of its use and abuse was the basis of much of the work that the committee has been called to perform.

The committee has been called upon repeatedly to decide that responsibility was disclaimed. In every case it was ruled that "a defect card is an authorization to make repairs." Sometimes inspectors would mark the cards, "Not authority to make repairs," with the excuse to substantiate the disputing of the bill that the card was merely issued to facilitate the movement of cars. In every case the committee supported the bill rendered on such a card, with the statement that "inspectors have no authority to issue cards and withhold authority to make repairs," because the moment the defect card ceased to carry with it the responsibility for the defects named on it, its value would be destroyed.

In a direct line with this principle was another that "defect cards must not be altered, but must bear evidence of having been written at one time and by one hand." This was called forth by the repeated occurrence of addition to defect cards in explanation of conditions that were said to have existed at the time of the furnishing of the card and which were expected to annul the responsibility of the issuing road or to extend that responsibility beyond the items originally named.

This decision also had a bearing upon another in which it was held that the defect card partook of the nature of a contract by which the issuing road made itself responsible for certain definite defects named upon the card, and it was repeatedly held that this responsibility extended no further under any circumstances, with one exception. That exception was where certain parts were named as missing and the very fact that they were gone involved the absence of certain others. Thus a card calling for missing brake beams naturally included the brake heads and shoes, though the latter were not mentioned.

This last principle was also so extended as to include responsibility for necessary items of expense involved in repairing the defective parts; that is to say, if the work of repairing the items named on the defect card involved the removal or replacement of some other part, then that expense could be charged to the road issuing the card. At the same time a very strict circle of limitation was drawn around the defect card itself, and the original principle has been maintained throughout years of controversy.

This also involves the principle of consequential damages, and it has been repeatedly ruled that damages consequential upon carded defects can not be billed against the issuing road.

Neither can a road recover for uncarded defects discovered after the inspection upon which the issuing of the card was based. A road must protect itself against responsibility for existing defects by demanding a card at the time of the receipt of the car and failing in this becomes itself responsible for the condition of the car.

It was the desire to avoid this responsibility and to pass it on to a connecting road that led to the excessive delays to cars at interchange points, where inspectors were more than eager to protect their employers and at the same time save their own necks. The conditions brought on by this state of affairs are the cause for the revision of the rules in 1896 and the transference of responsibility for ordinary wear and tear defects from the delivering road to the owners, and inspection for safety only.

Attention has been called to the decision that a bill can not be rendered on a defect card if the car was moved and broken before repairs were made. This principle was elaborated in several instances, and may be formulated by the general statement, that bills can not be rendered for repairs under a defect card if they were not made until after the car was wrecked or damaged. The reason for such a position is that the defect card does not give an authorization to make repairs on a foreign car unless its safety demands it. The fact that the car was operated without making repairs shows that, in the opinion of the operating road, the carded defects did not impair the safety of the car.

Under the system of inspection for defects rather than for safety many cards were issued for minor defects that in no way impaired the safety of the car. Under these circumstances it is quite natural that when the car was returned to its owner, the latter should not consider it worth while to make the repairs authorized by the card. This practically meant that it was useless to issue such a card. At the same time, with the card in its possession, the owning road frequently rendered a bill for these repairs on the authority of the card. Such charges were often disputed and many cases were referred to the arbitration committee for settlement. This committee invariably ruled that repairs authorized by a defect card can not be charged for unless actually made. This form of charge cropped up in many ways, but the ruling was always the same. It is, therefore, a firmly fixed principle that a defect card is rendered null and void if the car bearing it is wrecked, and that the repairs must be made before a bill is rendered. These are the principal exceptions to the authorization of the defect card for the making of repairs.

It was held in a number of cases that where a card had been issued because of ignorance of the rules on the part of the inspector, and it was clearly out of harmony with the same, that such a card was invalid and no bill for repairs could be issued on its authority. At the same time a rigid distinction was drawn between a card issued through ignorance and through a mistake. The former was held to be invalid, as already stated, while the latter was held to be good, and whether the card belonged to one class or the other depended upon the circumstances of the case, and the decision rendered was dependent upon the evidence submitted to the committee.

It so happened, also that some roads, for reasons best known to themselves, issued certain forms of defect cards that were not in accordance with that prescribed in the rules. The receiving road accepted a car bearing such a card at its own risk, as it was held that an irregular defect card carried no authority for making repairs. It will be noticed that this is quite in accordance with the position assumed that decisions must be made in accordance with the rules and no documents or arguments outside the same will be considered.

Finally the use of the defect card was limited to its legitimate object: an authorization for repairs and the fixing of the responsibility for the same. It so happened that, on a number of occasions, attempts were made to add other functions. Among these was an attempt to have it serve as a bill of lading. For instance, it may have become necessary to remove a brake staff or some other parts of a car to accommodate the lading. These parts were placed in the car and a defect card issued with a notation to that effect. Under the conditions of the service these parts were lost or stolen and the road issuing the card disputed the bill for the same on the ground that they had been properly cared for and the responsibility rested with the receiving road. This position was invariably declared to be untenable in that the defect card was not intended to serve as a bill of lading, and that inspectors have no authority to extend the scope of the card beyond that laid down in the code.

The decisions on the defect card may be narrowed down to a statement that it is merely an authorization for repairs; that its functions do not extend beyond this, and that any irregularity in its form or method of making out renders it invalid.

Closely allied to the defect card and paralleling it in the number and importance of the cases referred to arbitration are those relating to repairs.

The underlying principle of all repairs to cars on interchange traffic is that the railroads do not do that sort of work as a means of revenue, but merely as an interchange of courtesy. Under these circumstances it has been the aim of the compilers of the rules, from the very start, to so schedule the prices allowed for the various classes of work that they shall be fixed at as near the average cost as possible, so that, while there may be no loss, the profit shall be reduced to such a minimum that there will be little or no inducement for any road to make unnecessary repairs to a foreign car. For this reason it was held that in the interchange of repair parts, there should be no freight charges added to the bill.

Some latitude was allowed in the methods to be pursued in making repairs. For example, it was decided that repairs could be made in accordance with the current practice of doing the work. Thus, in a dispute over some broken truss rods, the owner held it to be bad practice to repair such rods by welding, claiming that new ones should have been applied. It was held, however, that welding being the current practice of the road doing the work, the method was proper, and the claim for wrong repairs was not sustained, for it was not to be presumed that any road would use equipment that it did not consider safe to run.

After repairs have been made, the road making them is responsible for the same until they have been accepted by the owner, whether they are carded as wrong repairs or not. This touches upon the responsibility of an intermediate road for wrong repairs. It is, of course, the duty of every road to protect itself by demanding a defect card for any wrong repairs that may exist upon a car at the time of its receipt, and, failing to do so, becomes itself responsible to the owner for altering the car to its original construction. At the same time, if the road making these wrong repairs is known the responsibility reverts back to it, as a matter of common equity.

The rules provide, however, that there may be a variation from the original construction in the making of repairs, provided M. C. B. standards are used, that do not mar or impair the safety of the car. As it has always been the policy of the arbitration committee to foster and encourage the use of these standards, claims for wrong repairs, when they have been used within the intent and meaning of the rules, have not been sustained, it being held that the application of M. C. B. standards can be made without the responsibility for wrong repairs.

While it has been conceded that the road making repairs is at liberty to do so in accordance with its own practice, it does not follow that it is warranted in making extensive repairs until it has been authorized to do so by the owner. The rules do not contemplate the granting of any such privilege. Nor is a road free, when making repairs to a foreign car, to treat the material removed as it pleases, regardless of the property rights of the owner. The rules do not convey the privilege of scrapping good material simply because it is more convenient for it to do so, nor is it allowable to scrap material standard to the car. If proper material for repairs is not on hand it should be ordered and the work delayed until its arrival.

At the same time, it is fully conceded that the party doing the work must be the judge as to whether the material removed is suitable for repairs.

The road making repairs is hedged about by the rules in such a way that it is made decidedly to its interest to make proper instead of improper repairs. In short, it is to the interest of the delivering road to put a car in good repair for the owners and render a bill for the same, rather than make itself responsible for the repairs under a defect card.

In the case of cars destroyed, the rules have always been explicit in regard to the calculation of the depreciation; nevertheless the arbitration committee has been called upon to rule regarding what constitutes the age of a car body and trucks. The decisions so rendered have been to the effect that the depreciation of bodies and trucks can be calculated separately according to the age of each, and the date from which the depreciation of the body is to be calculated is that of its original construction, or when it was "entirely rebuilt," and that this latter specification does not mean merely the date at which it received general repairs.

Closely following and intimately connected with those governing repairs are the decisions relating to charges and credits for work done and material used on foreign cars. Very many cases of this sort were referred to arbitration, but they were, for the most part, disputes as to the actual meaning to be put upon some single item in the schedule of prices upon which a decision could be rendered without formulating any principle or affecting any other item or any succeeding code. The only feature that need be touched upon in this connection is the relationship existing between railroad companies and private car lines.

In the earlier codes a clause was introduced allowing an additional charge of ten per cent to be made against private car lines for repairs to their cars above what would be charged a railroad company. This was done because it was claimed that the repairing of cars at cost among the railroads was a matter of courtesy which the private lines were not in a position to reciprocate, and because of the tendency of these lines to delegate the maintenance of their cars to the railroad companies provided they could get it done at cost. The arbitration committee ruled, however, that when a private car line did repair a car belonging to a railroad it was justified in adding ten per cent to its bill, and that all charges and credits to and fro between private lines and railroads should be the same. And, further, that in all cases the ten per cent is to be added to the bill after the credits have been deducted.

Turning to the subject of inspection it will be found that the receiving road is compelled to protect itself in every instance by a careful inspection at interchange points, and, failing to do so, is held responsible for any defects that may have existed on the car at the time of its receipt. At the same time it is to be the sole judge as to what is safe to run either from the standpoint of the car, the trainmen or the lading, and it was repeatedly ruled that the judgment of the operating road is to be final in this particular. But a car with defects that do not render it unsafe to run must be accepted. Should the inspection at the interchange point be improper and damage to car or lading result from the oversight, the operating road is to be considered as responsible therefor. In other words, by combining this with other decisions previously alluded to we find that the operating road is responsible for a car failing under defects whether they have been carded or not.

In connection with the subject of inspection a few cases were referred to the committee in which a charge had been made for the inspection of new cars en route from the builders to the owner. It was simply ruled that such bills were improper and that the charge should be canceled.

There was one other point in connection with car inspection that is of some importance. It relates to the matter of joint evidence. In one or two instances the simple statement of the joint inspector was submitted as constituting such evidence on the grounds that he represented two independent parties. It was ruled, however, that the statement of a joint car inspector is not a joint evidence statement and that the latter requires the signature of two persons.

There have been many disputes over the responsibility for damage to cars owned by trust companies, and the freight charges for the return of parts of destroyed cars, especially in the case of the trucks, which were sent to the owner by the road damaging the body.

First in regard to the ownership of a car. The rules do not recognize the existence of a trust company as a car owner and it was repeatedly decided that the company whose name or initials appear upon the body is considered to be the owner of the car, and this holds good even when it is shown that the actual owner of the whole car is a trust company or where the body and trucks are really owned by separate companies. It is left for the apparent owner, under the rules, to make such settlement as it may under its contracts with the real owners. But as far as the inter-relations between railroad companies are concerned the company whose initials or name appear upon the body owns the car.

The rules require that, in the case of a destroyed car in which the trucks are to be returned, they shall be delivered at the nearest point on the road of the owner of the car. Many disputes have arisen as to what constitutes such a delivery. Of course where the trucks were sent with freight prepaid to a point on the owner's road, there could be no dispute. The trouble arose where the trucks or other parts were sent to a point on a different branch of the same system from that whose initials appear on the body. It frequently happens that divisions or roads operated under the same management keep their accounts separately and charge each other for freight. It is under these conditions that the disputes have arisen.

The rulings on these points have been to the effect that a leased road is a part of the leasing road, and that two roads having the same general officers constitute, in the eyes of the rules and the matter of freight delivery, one and the same road: whereas, two roads belonging to the same system but having different general officers and management are not to be regarded as the same road. This distinction has been very clearly drawn in a number of instances and there can be no confusion in the matter.

When it came to the delivery of parts of destroyed cars belonging to private lines it was simply ruled that they must be delivered at the shops of the owner.

It may be added, as an item of interest connected with the return of the trucks of destroyed cars to the owner, that it was repeatedly ruled that the brakes were to be considered as a part of the trucks whether they were hung from the body of the car or from the truck frame itself.

Attention has already been called to the fact that the receiving or operating road is to be the final judge as to what is safe to run. It was, therefore, outside the province of the arbitration committee to dictate as to what should be used in making repairs in a manner not directly sanctioned by the rules. Consequently it consistently limited itself to expressions of opinion that were in no way binding on any party to the code. Thus, in the case of a dispute over spliced air brake hose, in rendering its decision it said: "Spliced air brake hose is good, economical practice, but the receiving road is the judge as to whether it will pass inspection and be safe to operate."

Under the present (1902) code of rules the owner is responsible for many things that under the early codes were carried by the delivering road. There are some things, however, that always were referred to the owners. Among these is the responsibility for concealed parts. In some instances owners presented bills or defect cards were demanded for parts missing from the interior of the car, such as grain doors, ice box doors and the like, which were beyond the reach of ordinary inspection. It was first decided by the committee and afterward incorporated in the rules that, "inside parts of cars are at owner's risk except where damaged by wreck or unfair usage." In the same way the owner was first held and then made responsible for parts worn out or decayed.

From the very first a road has been held responsible under the rules for any damage received by a car due to derailment, wreck or unfair usage. But it is quite natural that many cases of dispute should have arisen as to what constitutes unfair usage.

The result is that a number of general statements have been put forth in the decisions as to what may or may not be held to constitute unfair usage. Thus it was claimed, in several instances, that the fact of brasses having been burned out under cars constituted a prima facie evidence of unfair usage. This was decided not to be necessarily so, but that "hot boxes are not invariably due to unfair usage." Nor is the breakage of certain parts evidence of the same, for it is quite possible for nearly every part of a car to break under fair usage.

It is, of course, needless to discuss the petty items, as their interest is local and of no general importance. But for the other broader and more important cases too much stress can not be laid upon them, as, by a careful study of what was done, a clearer and more comprehensive idea of the scope and intention of the rules can be gained than is possible to obtain in any other way. At the same time a better appreciation will come of the truth of the statement made at the opening of this article, that the whole history of the rulings of the arbitration committee has been an unbroken record of consistency, equity and justice.

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RAILWAY MASTER MECHANIC

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IN the design of new locomotive repair shops and in the extension of the old, the actual conditions determining the out put appear worthy of greater consideration than has been sufficiently in evidence in some recent examples. There seems to be an impression current that the output of the shop is determined by the pit capacity. Though the number of pits is important, this number is not a criterion of capacity if the machine tool equipment is insufficient to supply the demand of the erecting floor. It may therefore be more truly considered that the number of machine tools determines the output rather than the number of pits in a shop arranged transversely, or the number of engines which may be placed upon longitudinal pits.

The shorter time which a locomotive is held in the back shop for general repairs the greater the service rendered by the locomotive. It therefore appears enconomical to so arrange the relation between number of pits and number of machine tools, that work on all locomotives on the erecting floor may be continued without cessation.

Where the relation is such that the machine side of the shop is incapable of supplying the parts required for continuous work, there are necessarily a number of locomotives standing idle which could be earning interest on the capital which they represent, had they been left in service until the shop was capable of handling them.

During a recent conversation with a prominent mechanical official, the opinion was expressed that for successful operation there should be at least ten machine tools per erecting pit and the operation of fifteen machines per pit might be considered economical practice.

THE attention of the engineering world at large, and the railroad world in particular, will be attracted by the extended scientific investigation of locomotive performance to be conducted in the locomotive laboratory which will be installed as part of the exhibit of the Pennsylvania Railroad in the Transportation Department of the St. Louis Universal Exposition of 1904. The performance of the tests will be under the jurisdiction of Mr. Willard A. Smith, Chief of Transportation of the Exposition and Mr. F. D. Casavane, late General Superintendent of Motive Power of the Baltimore & Ohio Railway, representing the Pennsylvania Railroad. These tests will prove an unusual and appropriate opportunity for obtaining accurate data of the performance of existing types of locomotives, upon which to base future designs, and a comparison of locomotives, both domestic and foreign, appearing at a peculiar time when locomotives are assembled as representatives of the skill and engineering ability of nations.

From the standpoint of original investigation and research the results will not be thoroughly conclusive, but may be considered as introductory and further investigation will doubtless follow as a result of the possibilities demonstrated by this step on the part of the Pennsylvania. It is understood that at the close of the Exposition the plant and appurtenances necessary thereto, will be removed to the Altoona shops of the Pennsylvania Railroad Company.

In order that the testing plant may be scientific and practical in every respect, upon the request of the Exposition and Pennsylvania officials, the American Society of Mechanical Engineers and the American Railway Master Mechanics' Association each appointed three representatives to act as an advisory committee in preparing the plans and conducting the series of tests, and the Exposition Commissioners of Germany, France and Great Britain will each be invited to appoint one corresponding member of this advisory committee.

The tests are to be operated throughout the seven months of the Exposition and it is proposed to test thoroughly as many locomotives as practical within this time. That the apparatus is to be far in advance of present requirements is evidenced by the capacity of the dynamometer which will be capable of measuring tractive effort up to 80,000 pounds.

THE convention of the Traveling Engineers' Association in Chicago next month should be most interesting, to judge from the list of subjects (printed elsewhere in this issue) upon which committees are to report and papers are to be presented. The economy of the brick arch in the various types of boxes using soft coal, is well worth having attention drawn to it in these times of wide, shallow boxes. There is hardly any question as to the direct economy of the arch. Fairly accurate tests with a deep box and rather good quality of coal have evidenced an increase of one-half pound of water evaporated per pound of coal. It is reasonable to believe that this percentage of benefit will increase in proportion as the box is shallowed, or more specifically, as the firebox volume in relation to the grate area and tube heating surface is reduced. In addition to this, where the grates are carried as near the tubes as is the general practice now, the arch is a great protection to the tube ends and tube sheet in interposing a wall of slowly changeable temperature between the fire and the tube ends, between the tube sheets and the currents of cold air, between the tubes and the fire, which otherwise is dragged into the lower tubes to an extent which rapidly clogs them and in general is a means of preventing rapid changes of temperature at the tube sheet. On the other hand, the arch delays matters considerably in the round-house. In case of flue leakage and flue stoppage it is in the way of workmen, though this is offset by its service in tending to prevent necessity of such work. The general objection, however, to the brick arch is that on divisions where the character of water is such as to occasion frequent boiler washing, is the length of time the arch takes in cooling off sufficiently to permit the operation to be undertaken without harm to the firebox, sheets and tubes. This keeps the engine out of service so undesirably longer a period as to minimize the benefits of the arch to an extent which has caused its abandonment on bad water divisions. Where the water conditions admit, however, the advantages afforded by the brick arch are, especially in a shallow box, so manifest that the traveling engineers do well to favor its use.

MR. T. W. GEER.
GENERAL MANAGER OF THE TIFTON THOMASVILLE & GULF RAILWAY.

Mr. Geer entered railway service in 1877 with the track department of the Chesapeake & Ohio, afterward entering the dispatching department of the same road and later accepted a position in the corresponding department of the Pennsylvania. He has since held a number of responsible positions with the Louisville & Nashville, Missouri Pacific, Louisville, Evansville & St Louis, Litchfield, Carrollton & Western, Hutchinson & Southern, Gulf & Ship Island, Atchison, Topeka & Santa Fe, and at the time of his appointment to his present position in April, 1903, was superintendent of the Mobile, Jackson & Kansas City.

WHAT method should road foremen pursue in riding on engines and instructing to obtain the best results?" Best results in what way? To the company? Then the superintendent of motive power in most cases could accomplish considerable initially by more clearly designating the duties of the road foreman. At present his duties as a go-between for the transportation and motive power departments, as an assistant to the master mechanic, superintendent of motive power, division superintendent, diplomat between the engineers and roundhouse foremen, as a killed stock and pulled draw-head tracer, etc., etc., usurp so much of his time in the capacity of general all-around athlete, that it is impossible for him to spend the time riding engines that is necessary in order for him to accomplish what he is supposed to have been appointed for. If the superintendent of motive power would select and designate the road foreman simply as an expert engineer and insist on his duties being conducted exclusively to this line of work, an immediate benefit would be derived. He can then stay on the road, where he belongs, and find out for the master mechanic "What's the trouble with engine 500?" and for the superintendent "What's the matter with crew on engine 200?" If the road foreman is what he is supposed to be, viz., an expert engineer, the best and only successful "method to pursue in riding on engines" is to take the throttle himself and "show" that the tonnage can be pulled with this engine, or that the time can be made with that engine, or that the fireman can keep her hot if pumped properly, or to take the scoop and "show" the fireman that the engine will steam if fired properly, or else find out what really is the matter with the engine, to the end of enabling intelligent repairs to be made. Such work demands an ablebodied man, who unquestionably knows his business, his division and his engines, yet only such road foremen can accomplish proper results, for particularly with the older men, demonstration proves and is the only method of avoiding argument or injustice to either the roadman or the shopman. Still, with all this, the road foreman cannot accomplish "best results" unless efficiently backed-up by the heads of the two departments he works under. When he "turns in" an engineer or fireman for inefficiency, or an engine for indicated repairs, there should be no appeal. No brotherhood can make a case upon an inefficient man in face of a properly made road demonstration. No division superintendent can consistently complain against holding an engine for repairs which his department has reported as delaying its train. If he insists upon having such power regardless of chance of delay or failure, let the dispatcher's order carry an attached memorandum to that effect, for forwarding to motive power headquarters as bearing upon the 87th report of that day.

Topeka Shops of the Atchison, Topeka and Santa Fe Railway

Machine Tool Equipment

(Continued from Page 248.)

THE erecting tracks in the locomotive shop, it will be remembered, are arranged longitudinally, the central, or main, track having a pit extending 450 feet from the south end of the shop and each side track having a pit at its south end extending but 160 feet of its length. Locomotives entering the shop for general repairs are placed over the pit of the central track where they are stripped. They are then lifted from their running gear by the two 60 ton cranes and carried toward the north end of the erecting floor where they are placed on blocks over one of the side erecting tracks. In order that they may be located near together and yet facilitate the removal of boiler tubes, they are placed slightly diagonally with the center line of the track, an arrangement which is proving quite successful. When the parts have been repaired and reassembled, the locomotives are returned to the south end of the shop and replaced upon the wheels, where the motion work, valve setting, etc., is done over the pit of the side track upon which the repair work had been done.

Upon being stripped, the locomotive parts are removed to the several departments in which they are to be repaired or to the machine tools upon which they are to be machined. The large tools for heavy work are placed in the west bay and as a general rule are individually driven, though a few tools in this bay are grouped. The lighter tools are located in the east bay and are arranged in groups driven by a single electric motor. The brass room, tin shop, air brake department and manufacturing tool room are in a balcony over the east bay. The machines in the balcony are all arranged in groups each department operating its individual group.

The selection of motors for driving each group, was made after a close investigation of the horse power required to drive each one of the several machine tools constituting a group. These figures were summed up and 40 per cent of the total decided upon as the horse power required for the group motor. The locations of the motors with respect to

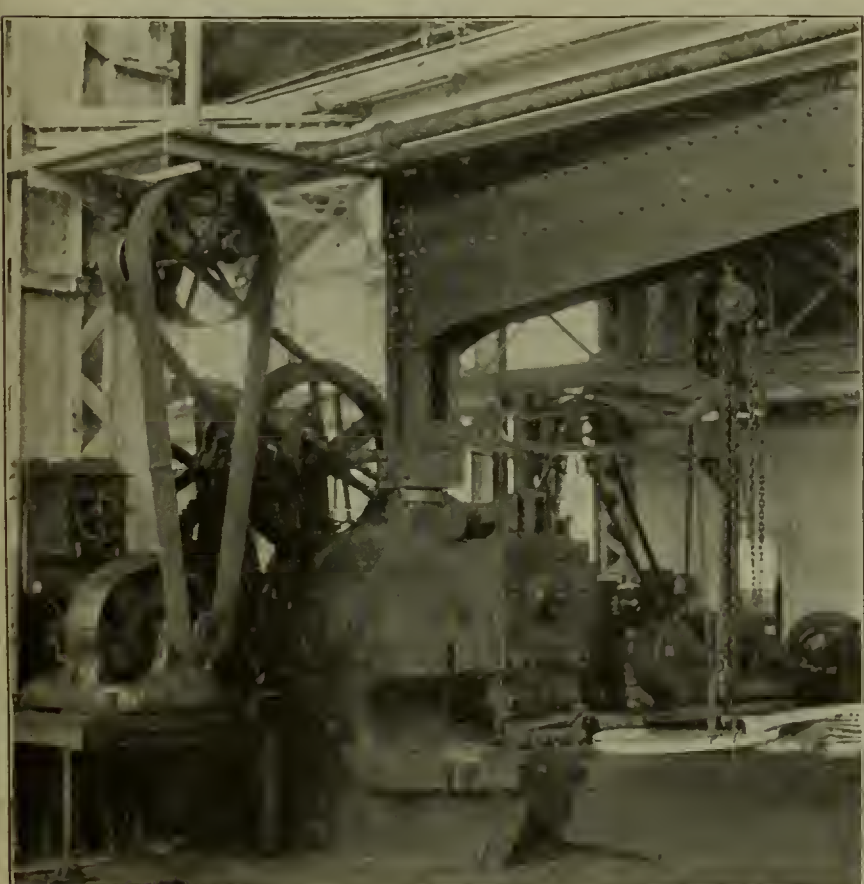


FIG. 1—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—SHOWING BELT CONNETION OF PUNCH AND SHEAR OPERATED BY INDIVIDUAL MOTOR, AND ACCOMPANYING CRANE FOR HANDLING PLATE.

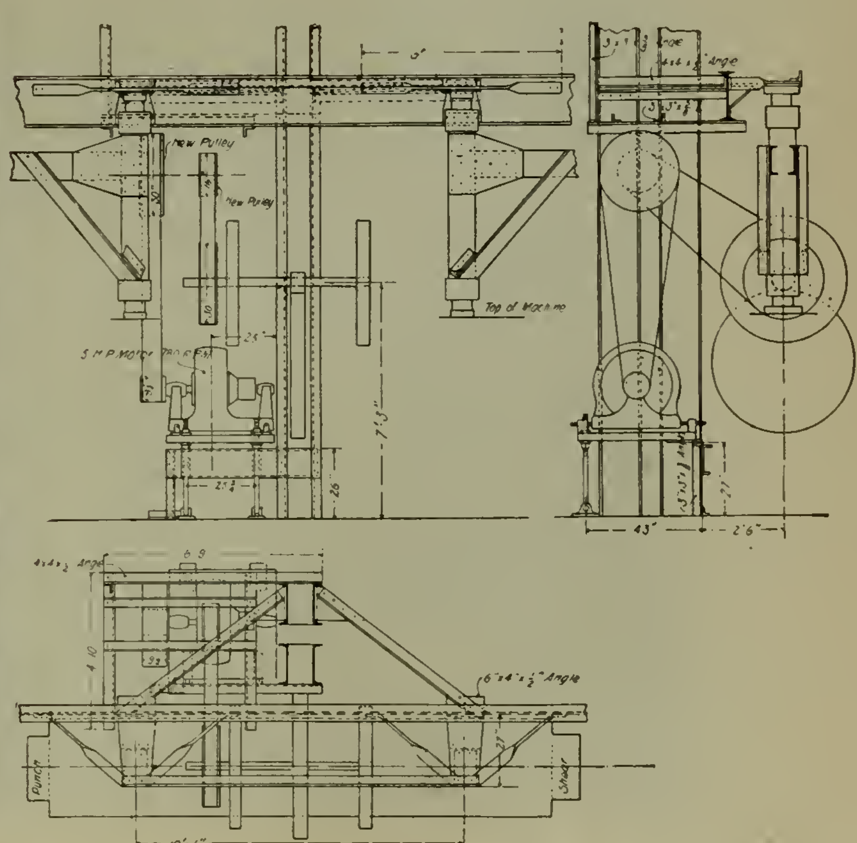


FIG. 2—ERECTING PLAN OF MACHINE AND EQUIPMENT APPEARING IN ADJACENT COLUMN.

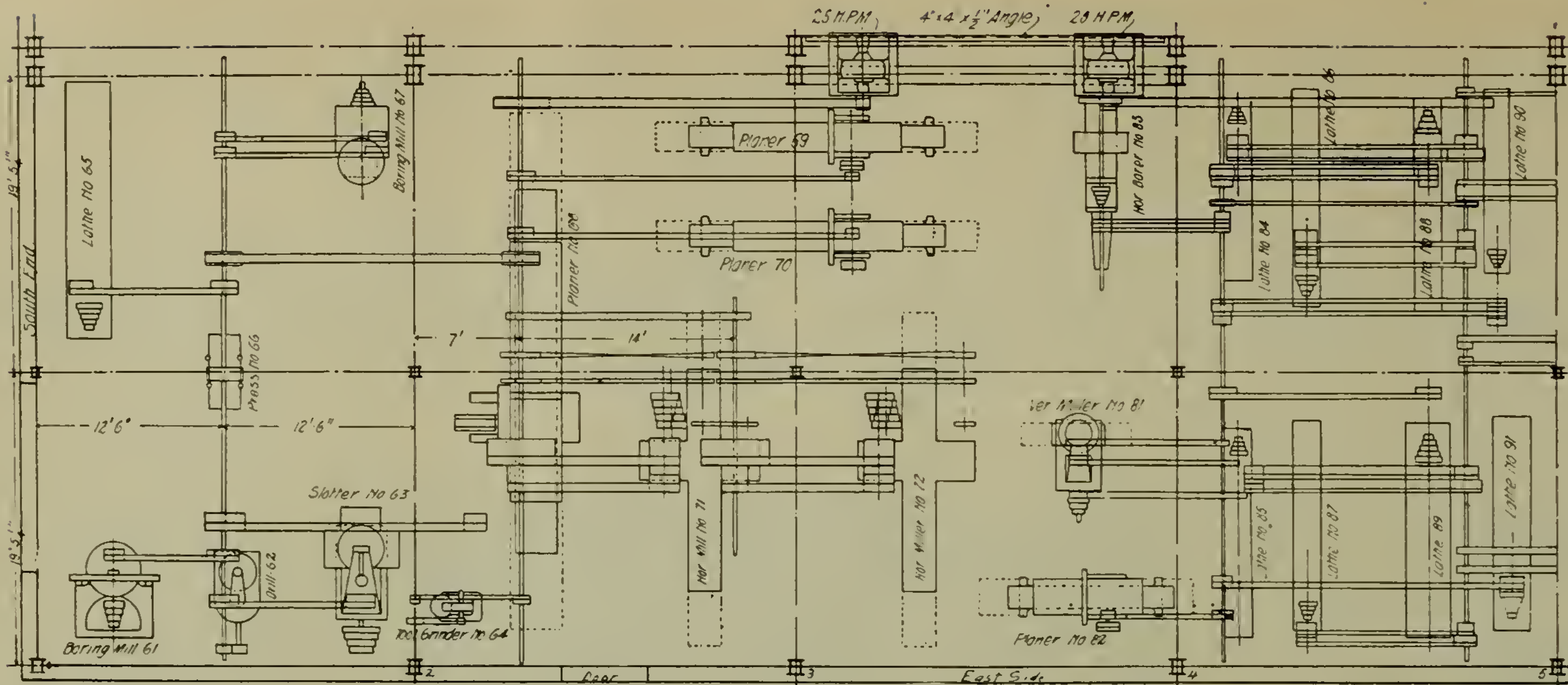


Fig. 3—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Group on Main Floor, East Side, Operated by 25 h. p. Motor, the Machines Installed Being More Especially for Driving Box, Shoe and Wedge Work, Etc. There are 102 ft. 3-in. Main Line Shafting, 16 Main Line Hangers and 10 Countershafts. Drawing also Shows Motor Connection to a Second Group, Only a Part of Which Appears.

the positions of the machine tools in several of the groups are shown in a number of the accompanying illustrations and the length of line shaft, number of hangers and countershafts for each group may be seen by referring to the accompanying list of tools.

The west bay in which the heavy machine tools are installed, is served by two electric traveling cranes built by the Whiting Foundry Equipment Company. Each crane has a capacity of 5 tons and spans a distance of 35 feet 9 1-2 inches, between center lines of crane runways. The main hoist and bridge are operated by 5 horse power motors and the trolley travel is operated by a 2 horse power motor.

All tools in the several shops are given individual numbers and the several groups are also indicated by numbers. By keeping a complete list of all tools installed, and by listing the tools in each group in connection with the group in which they appear, their performance can be readily observed. For a basis on which to begin a systematic arrangement of the numbers in the locomotive, or machine and boiler, shop, the numbering is begun at the south end and continued toward the north end so that the

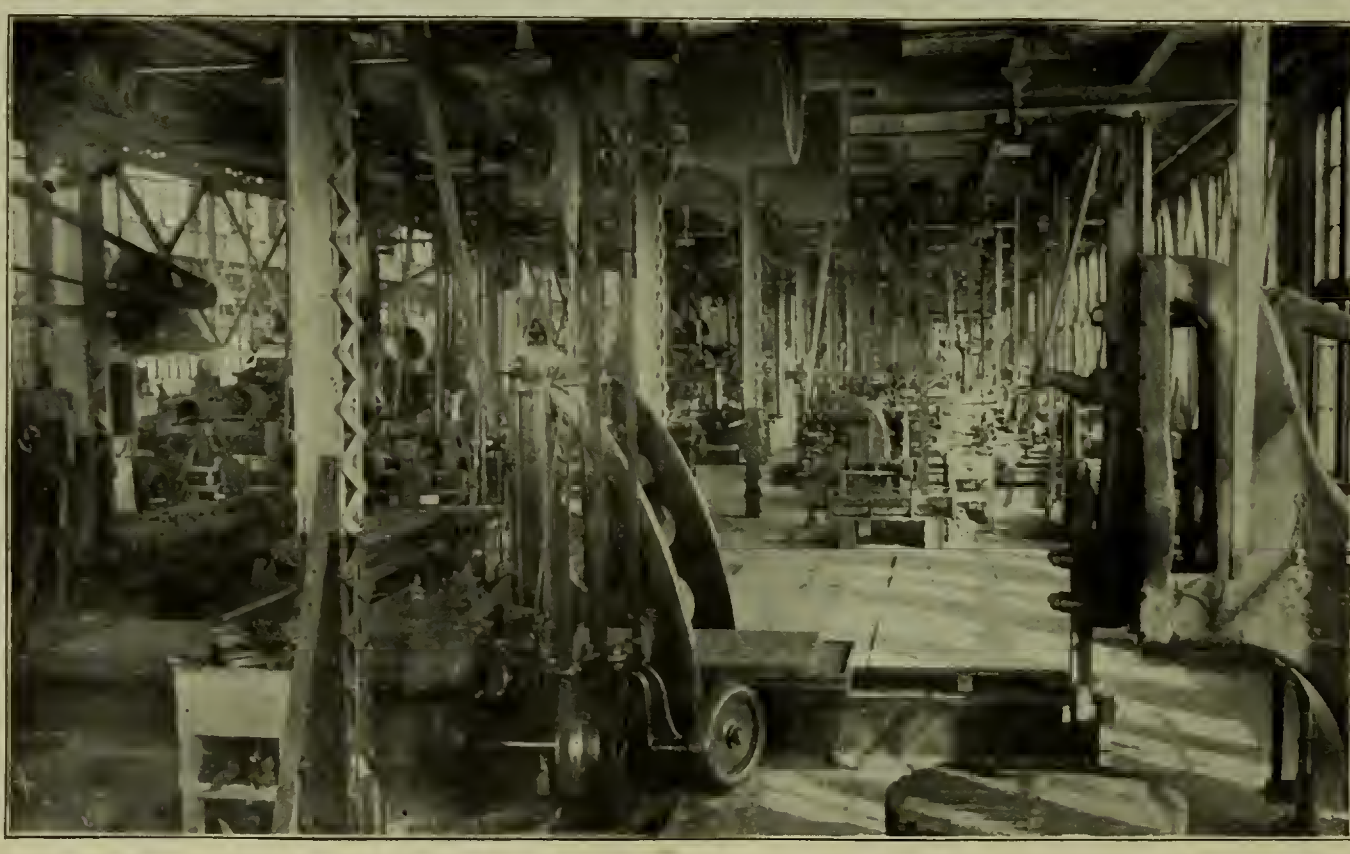


Fig. 4—Topeka Shops of the Atchinson, Topeka & Santa Fe Railway—Portion of Group on Main Floor, East Side, Operated by 25 h. p. Motor. Motor is Shown Supported by Structural Work at Extreme Left of Illustration. For Details of this Group See Fig. 3.

Fig. 5—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Air Brake Repair Room Located in Balcony.

smaller numbers appear at the south end of the building and the larger at the further extremity.

The several rows of columns in the locomotive shop are indicated by numbers, the first transverse row at the south end being designated as number 1. In making sketches of the arrangement of the groups, the columns appearing, are indicated by the number of the row in which each is located, so that the position of a machine, or group of machines, may readily be seen by referring to the number on the nearest column.

A large number of machines have been transferred from the old shop to the new, and in order to conform to the present system of numbering the old machines have been renumbered and all machines, both old and new, appear in the accompanying table under the heading "new shop number." Tem-

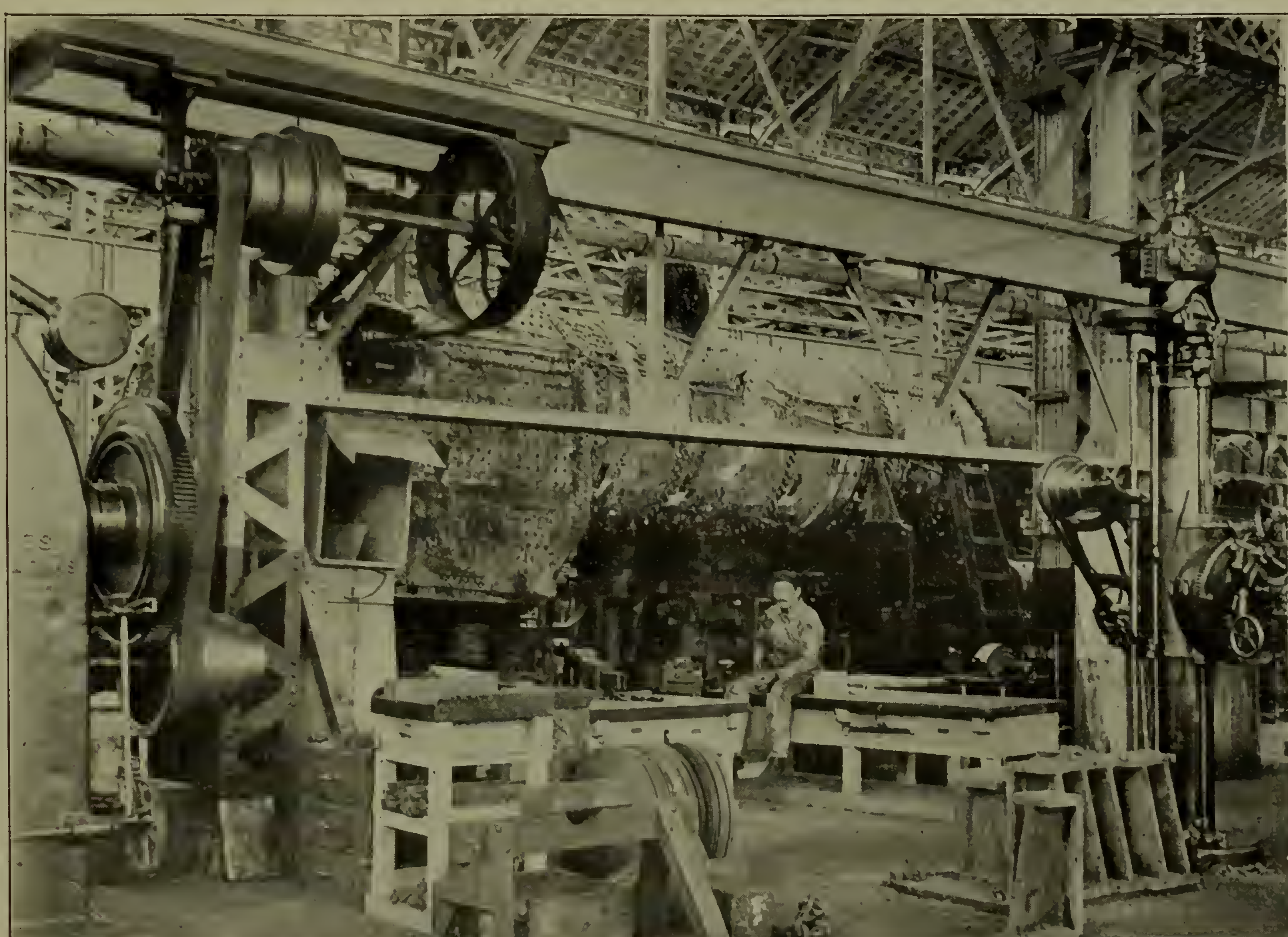


Fig. 6—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Examples of Belt and Direct Gear Driven Machine Tools.

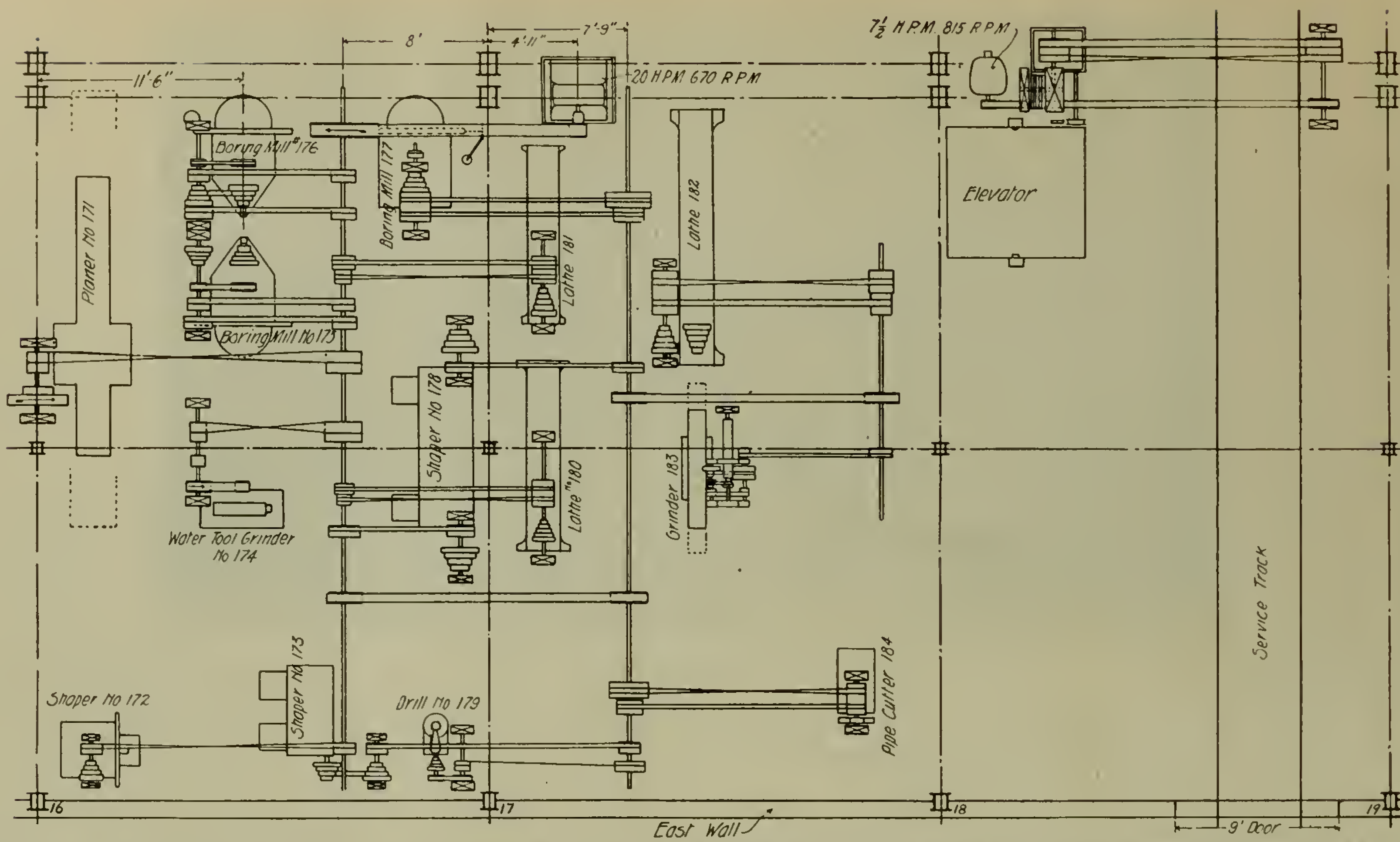


FIG. 7—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—ARRANGEMENT AND MOTOR CONNECTION OF GROUP FOR GENERAL WORK, OPERATED BY 20 H. P. MOTOR AND CONTAINING 96 FT. 3 INS. MAIN LINE SHAFTING, 13 MAIN LINE HANGERS AND 15 COUNTERSHAFTS. AT RIGHT IS SHOWN CONNECTION FOR ELEVATOR OPERATING BETWEEN MAIN FLOOR AND BALCONY.

porary numbers given to machines recently purchased appear in the column headed "old shop number" and are designated in this column by a prefix.

In considering the electrical installation of the new shops, the operation of existing transfer tables in the car department, the turntable serving the round house and the lighting of the shops and yards, all available data was thoroughly sifted, and such ap-

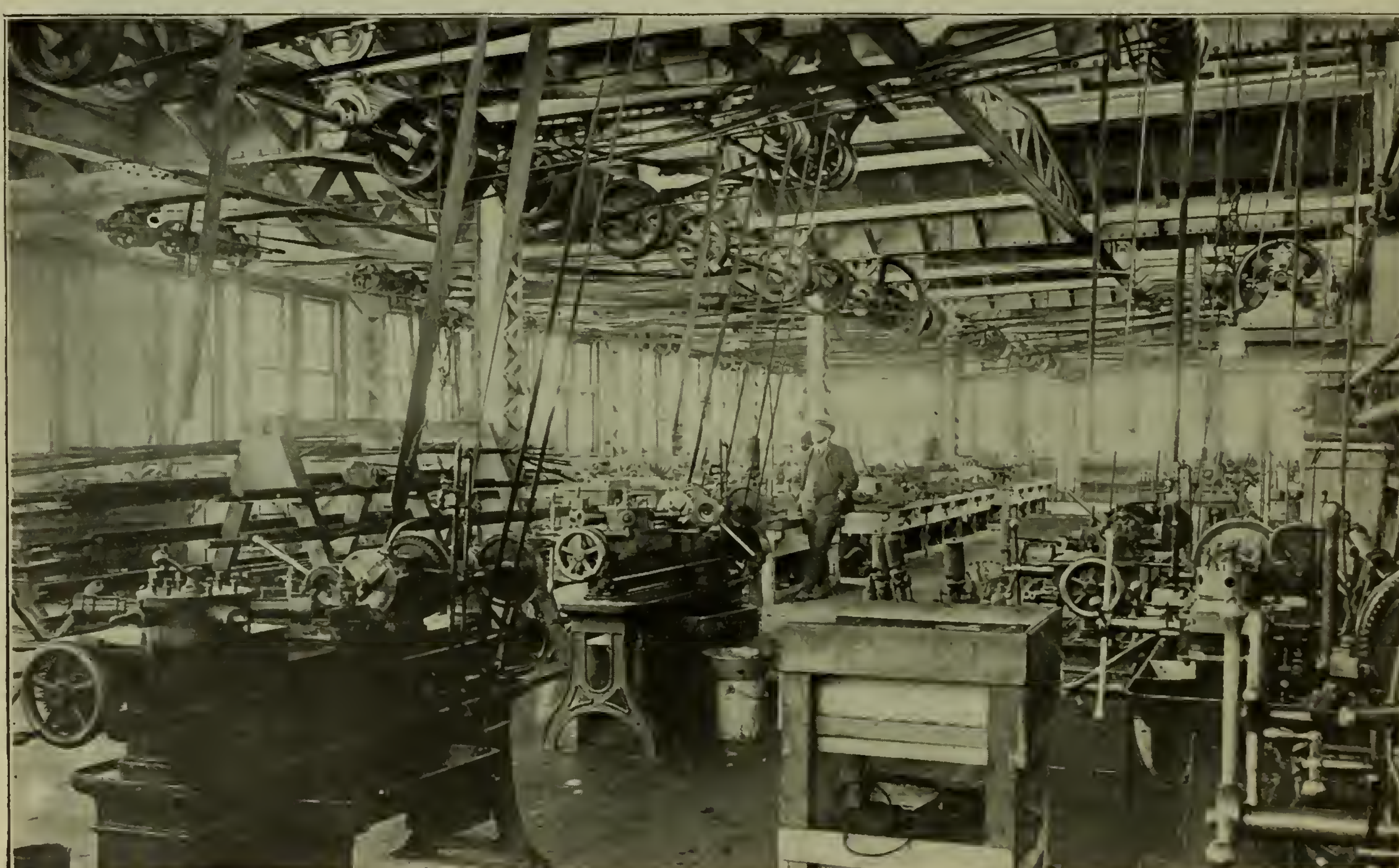


FIG. 8—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—BRASS SHOP LOCATED IN BALCONY; SHOWING RELATIVE POSITIONS OF MOTOR, SHAFTING AND MACHINES. IN THIS GROUP ARE 27 MACHINES OPERATED BY A 25 H. P. MOTOR. THERE ARE 120 FT. OF 2½ INS. MAIN LINE SHAFTING, 15 MAIN LINE HANGERS AND 24 COUNTERSHAFTS.

Fig. 9—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Showing Belt Connection to 74-in. Sellers Lathe Operated by a 7½ h. p. General Electric Motor.

paratus selected as could be best suited to existing conditions and the material previously used in the old shop whose service it was desired to continue to an economical end. The several points of consumption being but practically a short distance from the generators, the two wire direct current system offered an advantageous method of electrical distribution, operating under 250 volts at generators and 230 volts terminal pressure. The shops are well located with relation to each other and to the power house for such distribution; the Topeka station of the Atchison, Topeka and Santa Fe, which is lighted by power from the shop power house, is but a short distance away.

An interesting feature of the machine tool installation is the application of electrical drive to old machine tools. In this connection individual motors were applied very simply by the use of belts, all belts being so arranged as to offer no obstruction to the effectual operation of overhead traveling cranes. The motors are placed on the structural work of the building about 8 feet above the floor in line with the row of columns, near the machines which they operate, in positions offering no obstruction; bolted to the columns; or placed on platforms suspended by angle irons from the steel structural work. The disposition of motors, arrangement of belts and location of machine tools is best appreciated by reference to the several illustrations presented herewith in which each governing condition is shown by its environment.

It is interesting to observe that the experience in this shop with geared direct connected machines and belt driven machines running side by side, has been largely in favor of the belts. Even in cases where a complicated system of belting has been instituted, the belt driven machines have continued in successful operation without being delayed for repairs or without requiring night or Sunday labor to be expended upon them in order to maintain them in condition for the following day's work. The operators in immediate control of the machines speak highly of the service given by them and offer no complaint consequent upon ineffectual operation of the belts and pulleys. The principal difficulties offered by the direct gear connected machines are the noisy chatter of the gear-

Fig. 10—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Tin Shop Located in Balcony of Locomotive Shop.

ing, the failure of the shafting to maintain its alignment, the bending of the shafts, breaking and rapid wear of pinions and gears.

An interesting example of the single belt connection between machine and motor is presented in Fig. 11 in which a beveling shear manufactured by the Lennox Machine Company, is driven by a 7 1-2 horse power, General Electic, constant speed motor, running at 815 revolutions per minute. The adjustment of the motor is clearly shown, its bed being bolted to two plates riveted at one end to a flange of the main column and riveted at the other end to an angle iron suspended from the crane girder. By means of the set screws extending above and below the bed plate, the motor may be raised and lowered to tighten or loosen the belt as desired. To facilitate handling large boiler plates in connection with the shear, a jib crane is placed conveniently accessible, on the arm of which runs a small carriage supporting a chain block of 4,000 pounds capacity manufactured by Edwin Harrington Sons & Co.

A different construction of crane is seen in connection with the Long and Allstatter punch and shear appearing in the back ground of the illustration.

Another method of motor support and belt connection is shown in Fig. 1. The motor is a 15 horse power General Electric, M. P. type, operating at 780 revolutions per minute, driving a Long and Allstatter punch and shear having a capacity of punching a 2 inch hole in 1 1-8 inch plate. This illustration further displays very clearly the swinging crane and chain block of 6000 pounds capacity, for handling plate being operated upon by the machine.

A typical arrangement of motor support and belt connection, employing a countershaft, for driving a wheel lathe, is seen by reference to Fig. 9, Illustrating a 74 inch Sellers wheel lathe driven by a back geared 7½ H. P. motor.

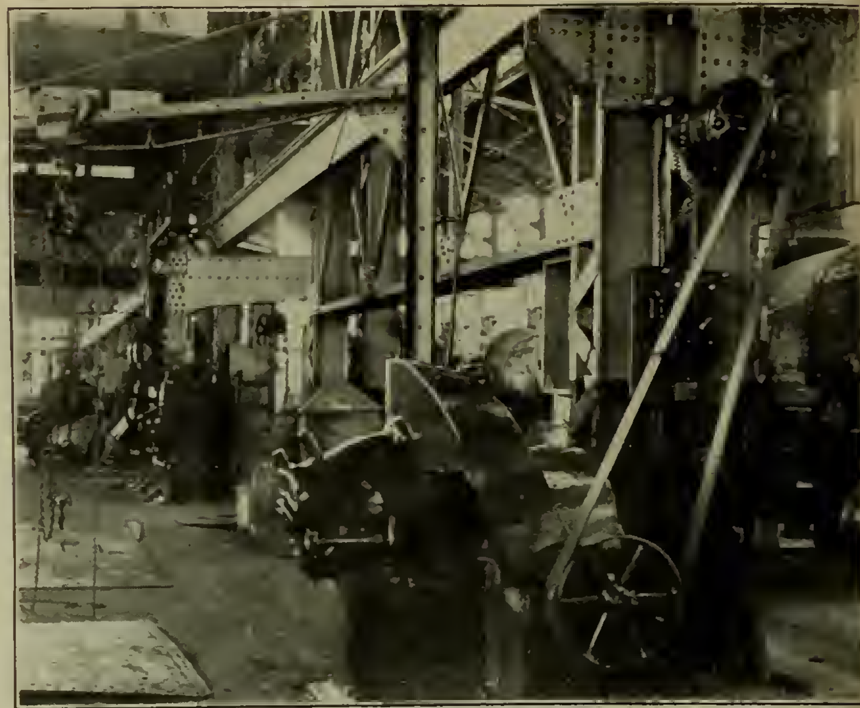


Fig. 11—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Showing a Simple Belt Connection, Location of Motor and Controller and Position of Attendant Crane—Lennox Beveling Shear Driven by a 7½ H. P. General Electric Motor, Operating at 815 R. P. M.

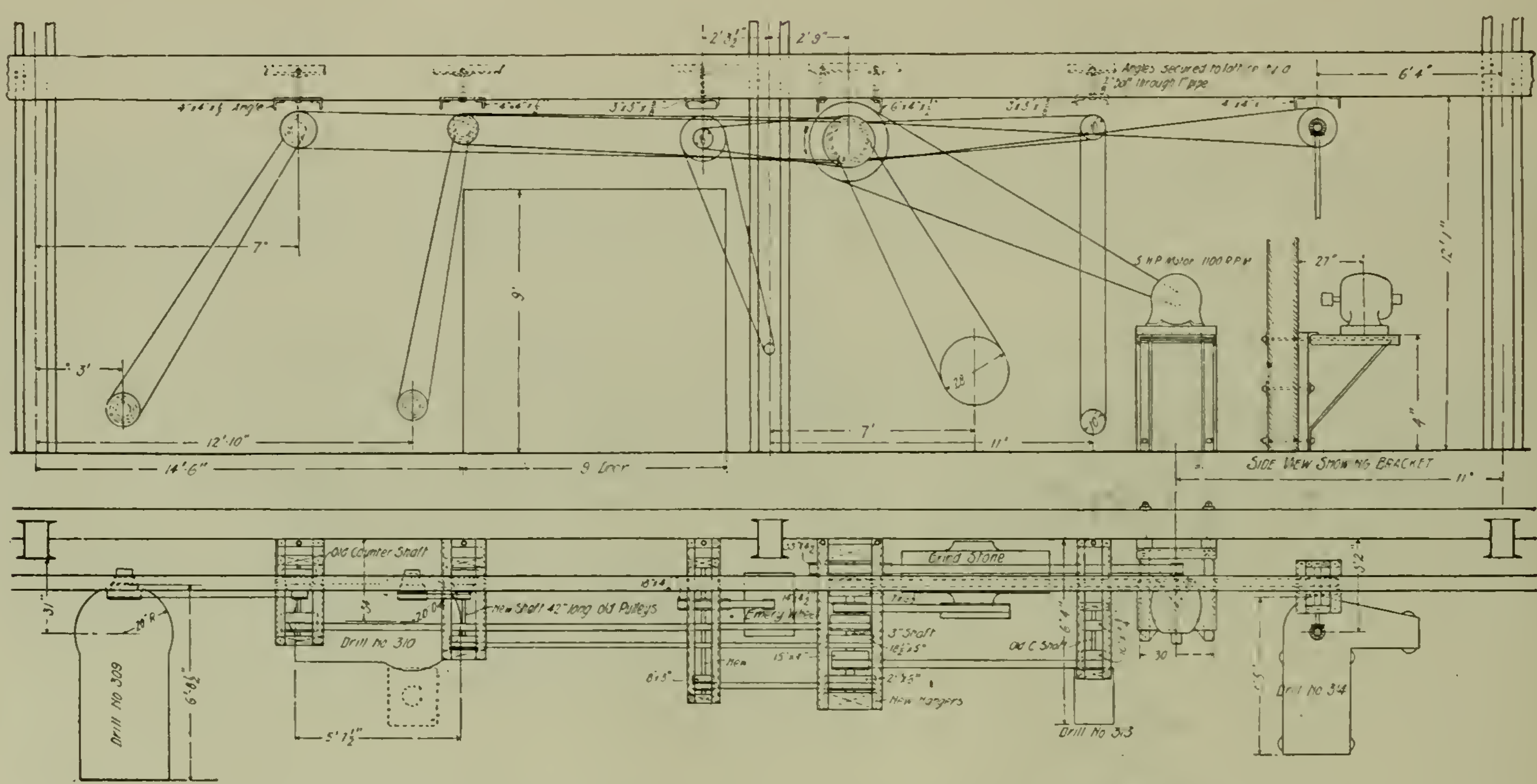


Fig. 12—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Erecting Plan of a Group of Drills Located in Boiler Shop, Operated by a 5 H. P. Motor.

Fig. 6 presents an illustration of individually driven tools employing belt drive and direct-connected gear drive, placed side by side. The machine at the extreme left is an 18 inch Niles Slotter driven by a 5 horse power motor, and the Niles 72 inches radial drill at the right of the illustration is driven by a Northern, vertical type "E," 3 horse power motor, at normal speed of 600 revolutions per minute.

Tools and Machinery at Topeka Shops

IN MACHINE SHOP.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
1	96	Quartering Machine	79½ ins.	Bement		"	5	West Side
2	A121	Wheel Press	(300 tons) 96 ins.	Niles		"	10	"
4	39	Car wheel borer	42 ins.	Bement		"	7½	"
5	107	Engine Lathe	36 ins. x 16 ft.	Niles		"	5	"
7	A14	Axle lathe (double)	10 ins.	Niles		"	10	"
8	91	Wheel lathe	84 ins.	Niles		"	7½	"
9	A105	Water Tool grinder	2½x20 ins.	Diamond		"	2½	"
11	A142	Key seater	No. 4—¼ x 2 ins.	Mitts & Merrill		"	3	"
12	93	Wheel lathe	74 ins.	Sellers		"	7½	"
14	12	Wheel lathe	74 ins.	Sellers		"	7½	"
17	111	Ver. boring mill	72 ins.	Bement		"	7½	"
18	A71	Ver. boring mill	96 ins.	Niles		"	10	"
20	114	Cylinder borer	Single	Bement		"	5	"
21	B105	Water tool grinder	2½x20 ins.	Diamond		"	2½	"
23	42	Radial drill	96 ins.	Bement		"	3	"
24	A41	Cylinder planer	84 ins. x 16 ft.	Niles		"	25	"
26	A73	Ver. boring mill	51 ins.	Niles		"	5	"
31	77	Frame Planer	60 ins. x 27 ft.	Hewes & Phillips		"	15	"
34	A1	Radial drill	72 ins.	Niles		"	3	"
35	C105	Water Tool grinder	2½x20 ins.	Diamond		"	2½	West Side
37	A61	Loco. frame slotter	24x48 ins. 42 ft. bed	Bement		"	10	"
38	34	Slotter	18 ins.	Niles		"	5	"
40	A81	Horizontal miller	10 ft.	Bement		"	15	"
42	35	Vertical miller	40 ins.	Hilles-Jones		"	7½	"
43	A11	Car wheel lathe	42 ins.	Bement		"	15	"
46	D105	Water tool grinder	2½x20 ins.	Diamond		"	2½	"
47	A141	Cold saw (26 ins.)	No. 2	Newton		"	5	"
61	112	Ver. boring mill	48 ins.	Bement	501	"	25	East Side
62	44	Upright drill	34 ins.	Putnam	"			"
63	66	Slotter	16 ins.	Bement	"			"
64	A106	Water tool grinder	2½x20 ins.	Diamond	"			"
65	17	Engine lathe	36 ins. x 16 ft.	Putnam	"			"
66	184	Belt driven hydraulic driving box press	60 ton	Home Mfg.	"			"
67	A75	Ver. boring mill	37 ins.	Niles	"			"
68	72	Planer	54 ins. x 16 ft.	Sellers	"			"
69	75	Planer	25 ins. x 10 ft.	Pond	"			"
70	71	Planer	25 ins. x 10 ft.	Pond	"			"
71	A82	Horizontal miller	20 ins. x 10 ft.	Becker-Brainard	"			"
72	B82	Horizontal miller	20 ins. x 10 ft.	Becker-Brainard	"			"

Note—This group more especially for driving box, shoe and wedge work, etc.
Group 501 contains 102 ft. 3 in. main line shafting, 16 main line hangers, 10 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
81	A85	Vertical miller	60 ins. No. 6	Becker-Brainard	502		20	East Side
82	74	Planer	25 ins. x 6 ft.	Pond	"			"
83	99	Horizontal borer	Table 24x72 ft.	Bement	"			"
84	81	Engine lathe	26 ins. x 12 ft.	Bement	"			"
85	87	Engine lathe	26 ins. x 14 ft.	Fitchburg	"			"
86	100	Engine lathe	26 ins. x 14 ft.	Fitchburg	"			"
87	83	Engine lathe	26 ins. x 14 ft.	Fitchburg	"			"
88	101	Engine lathe	26 ins. x 14 ft.	Fitchburg	"			"
89	15	Engine lathe	36 ins. x 14 ft.	Putnam	"			"
90	14	Engine lathe	24 ins. x 12 ft.	McFarland	"			"
91	106	Engine lathe	26 ins. x 14 ft.	Pond	"			"
92	85	Engine lathe	26 ins. x 14 ft.	Pond	"			"
93	A21	Engine lathe	32 ins. x 16 ft.	Pond	"			"
94	80	Engine lathe	26 ins. x 14 ft.	Pond	"			"
95	20	Engine lathe	26 ins. x 10 ft.	Putnam	"			"
96	B106	Water tool grinder	2½x20 ins.	Diamond	"			"

This group for general work and contains 80 ft. 3 in. main line shafting, 12 main line hangers and 16 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
101	A112	Pillar shaper	24 ins.	Handy	503		20	East Side
102	A103	Surface grinder (wheel 6-in. face)	Table 8 ft. 0 ins.	"Tanite"	"			"
103	113	Piston key seater	1 in.	Bement	"			"
104	57	Centering machine	4 ins.	Whiton	"			"
105	18	Engine lathe	18 ins. x 8 ft.	Putnam	"			"
106	22	Engine lathe	20 ins. x 8 ft.	Putnam	"			"
107	105	Engine lathe	18 ins. x 8 ft.	Putnam	"			"
108	9	Engine lathe	18 ins. x 8 ft.	Putnam	"			"
109	45	Nut facer	1½ ins.	Bement	"			"
110	134	Nut facer	1½ ins.	Bement	"			"
111	A133	Bolt cutter, double	2½ ins.	Acme	"			"
112	47	Radial drill	48 ins.	Bement	"			"
113	49	Upright drill	34 ins.	Putnam	"			"
114	41	Upright drill	34 ins.	Putnam	"			"
115	43	Upright drill	34 ins.	Putnam	"			"
116	48	Radial drill	48 ins.	Bement	"			"
117	46	Radial drill	48 ins.	Bement	"			"
118	50	Radial drill	48 ins.	Bement	"			"
119	52	Radial drill	60 ins.	Niles	"			"
120	117	Sensitive drill	18 ins.	Home Mfg.	"			"
121	115	Upright drill	24 ins.	Niles	"			"
122	A151	Oil separator	No. 2	Springfield	"			"
123	53	Twist drill grinder	2¼ ins.	Sellers	"			"

Note—Machines No. 101 to 121 for general work.
Group 503 contains 52 ft. 3 in. main line shafting, 8 main line hangers, 20 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Part.	Drive. H. P.	Location.
151	08	Emery wheel, double	2½x12 ins.	Home Mfg.	504	20	East Side
152	C106	Water tool grinder	2½x20 ins.	Diamond	"		"
153	33	Open side planer	144 ins.	Pedrick & Ayer	"		"
154	29	Shaper	12 ins.	Bement	"		"
155	A26	Engine lathe	16 ins. x 6 ft.	Le Blond	"		"
156	B26	Engine lathe	16 ins. x 6 ft.	Le Blond	"		"
157	51	Radial drill	48 ins.	Bement	"		"
158	13	Engine lathe	48 ins. x 17 ft.	McFarland	"		"
159	73	Planer, double	34 ins. x 11 ft.	Bement	"		"
160	A83	Horizontal miller	16x60 ins.	Becker-Brainard	"		"
161	A84	Horizontal miller	8¼x36 ins.	Becker-Brainard	"		"
162	A62	Slotter	12 ins.	Niles	"		"
163	A25	Engine lathe	20 ins. x 10 ft.	Le Blond	"		"
164	103	Shaper	16 ins.	Bement	"		"
165	86	Engine lathe	26 ins. x 8 ft.	Fitchburg	"		"

This group more especially for link motion, rods, etc.
Group 504 contains 80 ft. 3 in. main line shafting, 11 main line hangers and fifteen countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Part.	Drive. H. P.	Location.
171	78	Planer	34 ins. x 10 ft.	Hewes & Phillips	505	20	East Side
172	104	Shaper	12 ins.	Hewes & Phillips	"		"
173	102	Shaper	14 ins.	Bement	"		"
174	137	Water tool grinder	5x36 ins.	Springfield	"		"
175	C75	Ver. boring mill	37 ins.	Niles	"		"
176	B75	Ver. boring mill	37 ins.	Niles	"		"
177	135	Ver. boring mill	37 ins.	Bullard	"		"
178	31	Shaper, double	16 ins.	Bement	"		"
179	116	Sensitive drill	18 ins.	Home Mfg.	"		"
180	21	Engine lathe	24 ins. x 10 ft. 8 ins.	McFarland	"		"
181	A23	Engine lathe	24 ins. x 10 ft.	Niles	"		"
182	84	Engine lathe	26 ins. x 14 ft.	Pond	"		"
183	98	Crank pin grinder	12 ins.	Brown & Sharpe	"		"
184	185	Pipe cutter	2 ins.	Home Mfg.	"		"

This group for general work.
Group 505 contains 96 ft. 3 in. main line shafting, 13 main line hangers and 15 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Part.	Drive. H. P.	Location.
201	A35	Brass forming lathe	18 ins. x 6 ft. 6 ins.	Warner & Swasey	511	25	Balcony.
202	B35	Brass forming lathe	18 ins. x 6 ft. 6 ins.	Warner & Swasey	"		"
203	28	Brass turret lathe	18 ins.	American Tool Co.	"		"
204	27	Brass turret lathe	17 ins.	American Tool Co.	"		"
205	26	Brass turret lathe	16 ins.	American Tool Co.	"		"
206	55	Brass turret lathe	21 ins. x 6 ft. 6 ins.	American Tool Co.	"		"
207	56	Brass turret lathe	21 ins. x 6 ft. 6 ins.	American Tool Co.	"		"
208	A34	Brass turret lathe	18 ins. x 6 ft.	Warner & Swasey	"		"
209	A33	Brass turret lathe	No. O, 24 ins. x 8 ft.	American	"		"

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
210	A24	Engine lathe	22 ins. x 8 ft.	Lodge & Shipley	"			"
211	7	Engine lathe	16 ins. x 7 ft.	Pratt & Whitney	"			"
212	5	Engine lathe	16 ins. x 6 ft.	Putnam	"			"
213	58	Hexagonal miller	8 ins.	Warner & Swasey	"			"
214	A86	Large hand miller		Becker & Brainard	"			"
215	04	Emery wheel, double	1½x10 ins.	Home Mfg.	"			"
216	F106	Water tool grinder	2½x20 ins.	Diamond	"			"
217	01	Bench drilling lathe	½ in.	Home Mfg.	"			"
218	06	Bench brass saw (special).		Home Mfg.	"			"
219	05	Bench cock grinder (cab work)	1 spindle	Home Mfg.	"			"
220	02	Drain cock grinder	9 spindle	Home Mfg.	"			

Note—Machines No. 201 to 220, inclusive, for Brass Dept. work.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
231	36	Screw machine	No. 2, 1¾ ins.	Bardons & Oliver	"			"
232	A32	Screw machine	No. 3, 1¼ ins.	Bardons & Oliver	"			"
233	25	Screw machine	2x10 ins.	Niles	"			"
	24	Screw machine	2x10 ins.	Niles	"			"
235	23	Screw machine	1¾x10 ins.	Niles	"			"
236	A31	Flat turret lathe	2x24 ins.	Jones & Lamson	"			"
237	B31	Flat turret lathe	2x24 ins.	Jones & Lamson	"			"

Note—Machines No. 231 to 237, inclusive, for stud, screw and stock work.

Group No. 511 contains 120 ft. 2½ in. main line shafting, 15 main line hangers, 24 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
251	82	Engine lathe	26 ins. x 14 ft.	Fitchburg	512		10	Balcony
252	88	Engine lathe	26 ins. x 14 ft.	Pond	"			"
253	B27	Turret engine lathe	16 ins. x 6 ft.	Le Blond	"			"
254	D106	Water tool grinder	2½x20 ins.	Diamond	"			"
255	A27	Turret engine lathe	16 ins. x 6 ft.	Le Blond	"			"
256	B6	Friction driven Sensitive drill	14 ins.	Barnes	"			"
257	—	Emery wheel, double	1½x10 ins.	Home Mfg.	"			"
258	32	Pillar shaper	12 ins.	Niles	"			"
259	011	Air brake repair table 8 ft. x 8ft.	3 spindles, 1 drill	Home Mfg.	"			"
260	03	Stop cock grinder	9 spindles	Home Mfg.	"			"

Note—Machines Nos. 251 to 260, inclusive, for air brake department work.

Group No. 512 contains 40 ft. 2½ in. main line shafting, 6 main line hangers, 9 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
271	A29	Tool lathe	16 ins. x 8 ft.	Pratt & Whitney	513		15	Balcony
272	A30	Tool lathe	16 ins. x 8 ft.	Pratt & Whitney	"			"
273	A28	Tool lathe	18 ins. x 10 ft.	Le Blond	"			"
274	4	Tool lathe	18 ins. x 10 ft.	Niles	"			"
275	07	Small cold saw	5x5 ins.	Miller Falls Co.	"			"
276	A6	Friction driven sensitive drill	14 ins.	Barnes	"			"
277	A111	Friction driven pillar shaper	20 ins.	Hendy	"			"
278	A88	Universal miller	No. 3	Cincinnati	"			"
279	A87	Universal miller	No. 3	Cincinnati	"			"
280	A95	Universal gear cutter	6x24 ins.	Brainard	"			"
281	3	Universal miller	No. 3	Brown & Sharpe	"			"
282	2	Universal miller	No. 1	Brown & Sharpe	"			"
283	A102	Grinder, cutter and reamer	No. 1	Anderson	"			"
284	1	Universal grinder	No. 3	Landis	"			"
285	E106	Water tool grinder	2½ ins. x 20 ins.	Diamond	"			"
286	6	Cold saw grinder	32 ins.	Newton	"			"

Note—Machines Nos. 271 to 286, inclusive, for manufacturing department of tool room.

Group No. 513 contains 80 ft. of 2½-in. shafting, 10 shaft hangers and 16 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
296	A170	Tin shop shear	41 ins.	Niagara	514		7½	Balcony
297	A122	Double crank press	No. 2½	Bliss	"			"

Note—Machines Nos. 296 and 297 for tin shop work.

Group No. 514 contains 18 ft. 2½-in. main line shafting, 3 main line hangers, 0 countershafts.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
South		1 Ton elevator	8x8 ft.	Home Mfg.		"	7½	East Side.
North		1 Ton elevator	8x8 ft.	Home Mfg.		"	7½	"

IN BOILER SHOP.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
301	171	Mud ring drill	6 spindle	Bement		"	5	West.
305	165	Plate rolls	146 ins.	Wickes Bros. steam driven				"
308	A2	Countersinking radial drill	15 ft. x 6 ins.	Cleveland P. & S. Wks. Co.			2	"
309	172	Radial drill	60 ins.	Bement	551		5	"
310	176	Radial drill	48 ins.	Bement	"			"
313	178	Sensitive drill	18 ins.	Home Mfg.	"			"
314	175	Radial drill	48 ins.	Niles	"			"
316	188	Bevel shear	⅝ in.	Lennox		"	7½	"
317	164	Plate planer	16 ft. 0 ins.	Bement		"	5	"
320	A164	Flange punch	1⅛-in. plate	Long & Allstatter.		"	7½	"
321	163	Punch and shear, double, 43-in. gap.	1 in plate	Long & Allstatter.		"	15	"
323	A207	Flanging press. 450 ton. 8 ft. 4in. x 12 ft.		Bement hydraulic, 1500 lb. pressure				"
325	A162	Splitting shear	1-in. plate	Long & Allstatter.		"	7½	"
326	—	Flanging clamps	11 ft. 0 ins.	Home Mfg. pneumatic				"
329	—	Pressure blower	No. 9	Sturtevant		"	21	"
330	A165	Multiple punch and hand spacer	6 holes, 7-16 in. in ¼ in.	Long & Allstatter.		"	3	"
331	162	Punch and shear, double	26-in. gap, ⅞-in. plate	Bement		"	10	"
333	161	Plate rolls	126 ins.	Bement		"	15	"
336	A160	Angle iron rolls	3x3x½ ins.	Cleveland P. & S. Co.		"	10	"
337	A161	Angle iron shear	5x5x½ ins.	Long & Allstatter.		"	7½	West Side.
339	—	Grindstone	48 ins.	Home Mfg.	554		3	"
340	130	Rotary punch...7-in. gap, ½ in. in ⅜ in.		Hilles-Jones	"			"
351	—	Crown bar bolt head dresser		Home Mfg.	553		7½	East Side.
352	—	Oil separator	No. 2	Springfield	"			"
353	167	Triple stay bolt cutter	1½ ins.	Acme	"			"
354	166	Double stay bolt cutter	1½ ins.	Acme	"			"
361	A201	25-ton crane and riverter (150 ton)	17-ft. gap	Bement hydraulic, 1500 lbs. pressure				"
362	A205	10-ton crane and riveter (100 ton)	12-ft. gap	Bement hydraulic, 1500 lbs. pressure				"
371	—	Emery flue grinder	1½x10 ins.	Home Mfg.	552		5	"
372	—	Flue cutter	2 ins.	Home Mfg.	"			"
373	—	Flue welder	2 ins.	Hartz	"			"
374	—	Flue welder	2 ins.	Hartz	"			"
375	—	Flue cutter	2 ins.	Home Mfg.		"		"
400	—	Flue rattler	20 ft. 0 ins.	Home Mfg.		"	15	"

Note—Group No. 551 will include a 48-in. grindstone and an emery wheel 2½ in. x 12 in. (not yet installed) in addition to machines 309, 310, 313 and 314. The grindstone will be New Shop No. 311 and emery wheel 312.

Group No. 554 will include an emery wheel 2½ in. x 12 in. (not yet installed) in addition to machines 339 and 340. Emery wheel will be New Shop No. 341.

Group 551 contains 6 ft. main line shaft, 2 hangers, 5 countershafts.

Group 552 contains 36 ft. main line shaft, 6 hangers, 2 countershafts.

Group 553 contains 36 ft. main line shaft, 6 hangers, 4 countershafts.

Group 554 contains 5 ft. main line shaft, 2 hangers, 1 countershaft.

IN ROUND HOUSE.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
401	89	Engine lathe	38 ins. x 14 ft.	Fitchburg	R H		5	Rd. Hou.
402	19	Engine lathe	20 ins. x 11 ft.	Sellers	"			"
403	30	Shaper	16 ins.	Bement	"			"
404	157	Upright drill	40 ins.	Bement	"			"
405	—	Emery wheel, double	1½x10 ins.	Home Mfg.	"			"
406	—	Grind stone	48 ins.	Home Mfg.	"			

This group contains 40 ft. 3 in. main line shafting, 6 main line hangers, 5 countershafts. Seldom that more than two of these machines are working at a time.

IN MACHINE, BOILER AND TENDER SHOP.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
South		Electric crane	60 ton, 70 ft. 6 ins.	Whiting	Main hoist		50	Main Shop
					Aux. hoist		25	"
					Bridge Trav.		50	"
					Trolley Trav.		7½	"
North		Electric crane	60 ton 70 ft. 6 ins.	Whiting	Same as above		132½	"
South		Electric crane	5 ton, 35 ft. 9½ ins.	Whiting	Main hoist		5	West Bay
					Bridge Trav.		5	"
					Trolley Trav.		2	"
North		Electric crane	5 ton, 35 ft. 9½ ins.	Whiting	Same as above		12	"

IN WATER SERVICE DEPARTMENT.

Shop No. New.	Old.	Tool. Kind.	Size.	Maker.	Group.	Drive. Ind.	H. P.	Location.
411	183	Two-spindle lathe	26 and 44 ins. x 20 ft. 6 ins.	Dietz, Schumacher & Boye	W S		20	East wing of old shop.
412	119	Taper attach. engine lathe	18 ins. x 10 ft.	Niles	"			"
413	120	Taper attach. engine lathe	18 ins. x 10 ft.	Niles	"			"
414	—	Horizontal small bench drill	5-in. swing, ⅜-in. hole	Home Mfg.	"			"
415	118	Engine lathe	26 ins. x 14 ft.	Pond	"			"
416	16	Engine lathe	25½ ins. x 12 ft. 8 ins.	Sellers	"			"
417	136	Engine lathe	24 ins. x 10 ft.	Blaisdell	"			"
418	62	Sensitive drill	18 ins.	Home Mfg.	"			"
419	40	Radial drill	48 ins.	Bement	"			"
420	63	Planer	25 ins. x 11 ft.	Pond	"			"
421	—	Grindstone	48 ins.	Home Mfg.	"			"
422	—	Shaper	12 ins.	Hewes & Phillips	"			"
423	—	Emery wheel, double	1½x10 ins.	Home Mfg.	"			
424	A131	Pipe machine	2½ to 8 ins.	Eaton, Cole & Burnham	"			"
425	54	Pipe machine	¾ to 4 ins.	Jareki	"			"

This group contains 89 ft. main line shafting, 13 hangers and 15 countershafts.

Air Brake Instruction Car, Chicago & North-Western Railway

THE Chicago & Northwestern Railway has recently placed in service a thoroughly equipped air brake instruction car. The car, which was taken from passenger service, is 55 ft. 6 in. long by 9 ft., 10 in. wide, and is divided into three compartments. The air brake instruction room is 30 ft. long. The boiler room at one end and the office and living apartments for the instructor at the other, are each 12 ft. long. The arrangement is such that all of the apparatus is in front of the class, and at the same time as much floor space as possible for the latter has been provided. As shown by the accompanying plan, there is room for thirty chairs, and space for an aisle. The arrangement and relation of the apparatus is apparent from this plan, and also from the engraving showing the interior of the car.

There is equipment for a forty car freight train, a driver brake, and two passenger cars. This latter has the high speed attachments. There is also a complete outfit of sectional apparatus, arranged in tandem with the working apparatus wherever practicable. The sectional pump is placed at the front end of the center bank of freight equipment, just behind the instructor's table, and the sectional freight reservoir, brake cylinder and quick action triple valve are swung from the roof above the table. There is also an equipment of sectional apparatus for the use of the instructor, which may be mounted on his table and taken apart in front of the class.

The main reservoir is hung under the car. Instead of the usual train pipe for freight car equipment, each reservoir and cylinder has under it a 10 in. by 12 in. brake valve equalizing reservoir, the capacity being such as to give, with the attaching pipes, the required train volume. They are connected in such a manner as to give a close equivalent to the friction of a standard train line, this having been determined by time tests for both service and emergency applications and for releasing. The advantage of the arrangement is its compactness, the reduction in weight, and also in the leakage incident to a considerable amount of piping in a confined space. A duplex sectional governor is attached to the sectional pump. When the maximum pressure is accumulated the sectional governor and the governor on the pump in boiler room are both closed at the same time. This is accomplished by connecting the upper ends of the governor cylinders by a copper pipe.

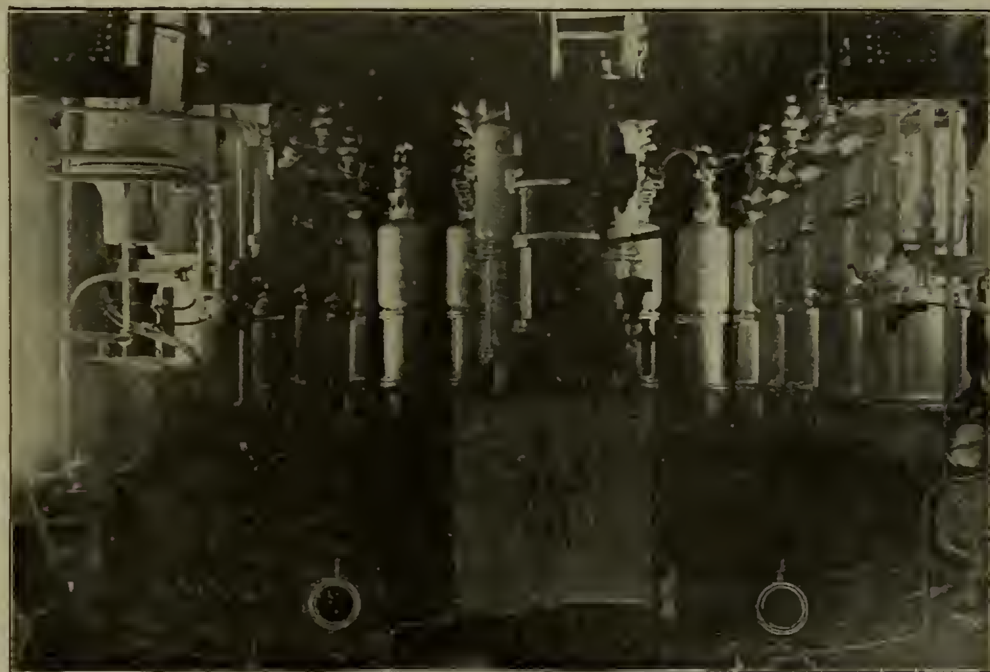


FIG. 1—AIR BRAKE INSTRUCTION CAR, CHICAGO & NORTH WESTERN RAILWAY—INTERIOR.

The car contains signal apparatus for a six-car train, and a Pintsch gas equipment arranged for instruction purposes. There is also a cylinder arranged with a strap and blocks to show the effect of different piston travels. It is shown swung overhead on the left in the interior view.

Swung from the deck immediately over the instructor's

FIG. 2—AIR BRAKE INSTRUCTION CAR, CHICAGO & NORTH WESTERN RAILWAY—EXTERIOR.

table is a wooden box 24 ins. by 30 ins., the lid of which swings downward and back. The inside of this lid serves as a blackboard for the instructor. Within the box, mounted on rollers, are eighteen standard colored charts of Westinghouse apparatus, one of which is shown drawn down in the engraving. The blackboard is back of this.

All of the apparatus is painted a light color, which gives the interior a light, cheerful and attractive appearance. Steam is supplied by a 48 in. upright tubular boiler, with a 9½ in. pump mounted on the side. Two

and to listen to one complete instruction once a year, but may come as often as they wish. The oral examination for enginemen has been discontinued. After passing an examination satisfactorily they are not required to take another unless there is evidence that they are neglecting to keep informed, or give poor service on the road, or make poor round-house reports. It is found the men take fully as much interest as they would if they expected to be examined after each annual instruction. Firemen have a first, second and third year examination preparatory to their promotion to enginemen. The

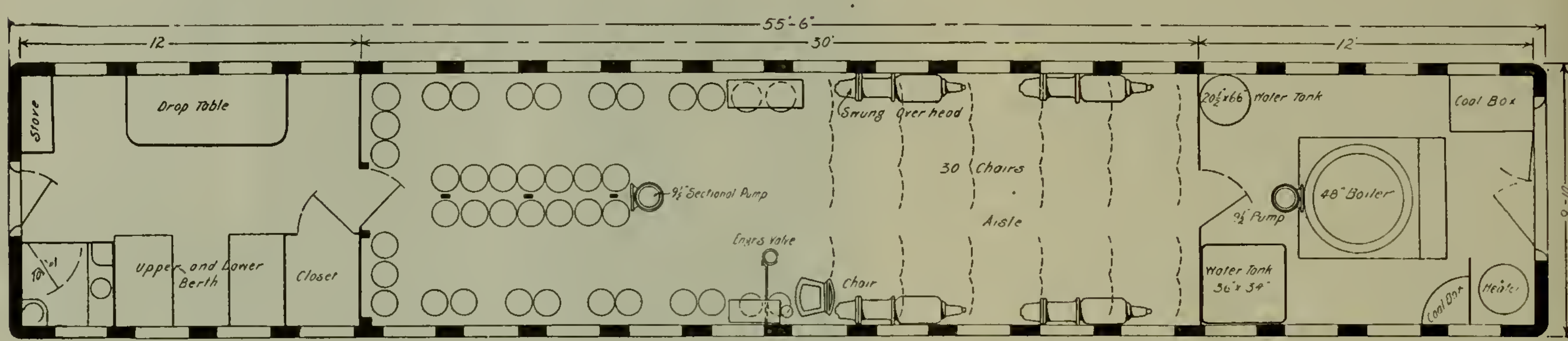


Fig. 3—Air Brake Instruction Car, Chicago & North Western Railway—Plan.

water tanks, boxes for coal storage, and a Baker heater for the car, are placed in the boiler room, the floor of which is covered with galvanized iron. The accommodations provided for the instructor at the opposite end of the car are shown in the plan. During the hot weather an awning is stretched the length of the instruction room, thereby shading it from the sun and making it more pleasant for the classes.

About nine months are required for the car to make the rounds of the Northwestern system, giving two classes per day. The employes are required to come to the car

first and second year's examination refer principally to firing, with a few questions on the details of the air brake mechanism. The third year's examination is a regular engineman's examination, composed of questions on machinery, break-downs, air brake operation, defects and train handling.

In presenting the illustrations and description of this car we acknowledge the courtesy of Mr. H. T. Bentley, assistant superintendent of motive power and machinery, and Mr. L. M. Carlton, general air brake inspector, of the Chicago & Northwestern Railway.

Subjects for the 1903 Convention of the Traveling Engineers' Association

AT the 1903 convention of the Traveling Engineers' Association, to be held at Chicago in September, beginning on the 8th, the following subjects are to be presented and discussed:

Traveling Engineers' Front End Arrangement, Adaptable to Modern Power.

Most Satisfactory Method of Lubricating Piston Rods and Valve Stem Packing, also Cylinders of Engines Equipped with Piston Valves.

Taken from an Economical Standpoint, How do You consider the Use of Brick Arches in Engines Burning Bituminous Coal; Deep, Shallow and Wide Fireboxes? Is the Water Glass a Valuable Adjunct to the Successful Operation of the Locomotive?

What Practice Should Traveling Engineers Pursue in Riding on Engines and Instructing, to Obtain Best Results?

Is there an Advantage in Placing Main Check Valves Above the Water Line of Boilers Where Feed Water Contains Lime; and When Scale Forms on Injectors, Injector Tubes, etc., What is the Best Method of Removing Same?

Is it Desirable that Freight and Switch Engines be Equipped with the Combined Straight and Automatic Brake on Engine and Tender? What are the Advantages of Having an Engine so Equipped?

The Proper Method of Handling Compound Engines.

Switching Locomotive, Chicago, Milwaukee & St. Paul Railway

IN pursuance of its policy to build as large a per cent as practical of its own locomotives, the Chicago, Milwaukee and St. Paul Railway has recently placed in service six switching engines built at its West Milwaukee shops, to be used in general switch and yard service. The experience with these locomotives has proven them so satisfactory that sixteen more are to be built according to the same design. In preparing this design provision was made for a wider water leg than had heretofore been the practice in the construction of the road's switch engines. The water space at the mud ring was increased from 3 ins. to 3 1-2 ins. This increase in the water leg complies with several remarks offered at the recent convention of the Master Mechanics' Association in which it was advocated that greater space be supplied in the water leg to aid circulation and to provide a greater body of water to protect the sheets.

The total amount of cast steel appearing in the construction of each engine amounts to 2125 pounds. An interesting feature among the cast steel parts is the rocker box shown in detail in Fig. 1, appearing in position in the side elevation and in one of the sectional views. The brake hanger pin casting and rocker box are cast in one piece as two separate pieces could not readily be placed in such close proximity. In addition, this casting forms a face, immediately below the hanger pin, for the bearing surface of the driver springs. The other driver springs bear upon similar faces in the lower portion of the individual brake hanger pin castings.

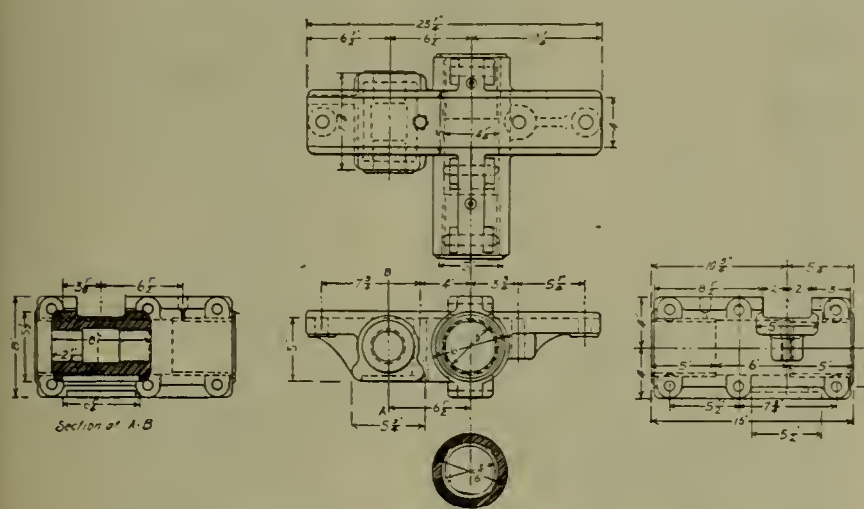


FIG. 1—SWITCHING LOCOMOTIVE, CHICAGO, MILWAUKEE & ST. PAUL RAILWAY—DETAILS OF ROCKER BOX.

The boiler is of the radial stayed, straight stop type, having two rows of sling stays at the forward end of the firebox, and the back head and front flue sheets are braced with gusset plates 1-2 inch thick, instead of the usual tie rods. The firebox is narrow, the mud ring being supported above the frame, between the driving wheels. There are 238 flues, 2 inches outside diameter, 12 feet 5 1-8 inches over flue sheets, spaced on 2 11-16 inch centers, giving a flue heating surface of 1538 square feet. The firebox is supplied with a firebrick arch supported on 3 inch water tubes and there are three combustion flues 2 inches outside diameter through each side water leg arranged in the fourth row of staybolts, 19 1-2 inches from the bottom of the mud ring.

By the company's individual system of classification this design constitutes class I_5. The locomotives are designed to burn bituminous coal and operate under 180 pounds steam pressure. Reference to the accompanying half tone engraving will show a handsome engine, constructed upon graceful lines. Determining the tractive effort by the usual formula, in which the mean effective pressure is taken as 85 per cent of the boiler pressure, the engine is capable of exerting a starting power of 28,720 pounds. The weight on drivers being 127.000 pounds, the ratio of adhesive weight to tractive effort is 4.42; the ratio of tractive effort to total heating surface is 16.8. and the ratio of total heating surface to grate area is 66.2.

The following table presents the general dimensions and further details of construction:—

Class	I_5
Gage	4 ft. 8½ ins.
Fuel	Bituminous coal
Weight on drivers	127,000 lbs.
Weight, total	127,000 lbs.
Weight, tender, loaded	79,000 lbs.
Wheel base, total, of engine	11 ft.
Wheel base, driving	11 ft.
Wheel base, total (engine and tender)	40 ft. 3¼ ins.
Length over all, engine	32 ft. 4¼ ins.
Length over all, total, engine and tender	54 ft. 10¼ ins.
Height, center of boiler above rails	8 ft. 4 ins.
Height of stack above rails	14 ft. 8¼ ins.
Heating surface, firebox	170 sq. ft.
Heating surface, tubes	1,538 sq. ft.
Heating surface, total	1,708 sq. ft.
Grate area	25.8 sq. ft.
Drivers, diameter	50 ins.
Journals, driving axle, size	8½ ins. by 12 ins.
Main crank pin journal	5½ by 6 ins. and 6½ by 5 ins.
Front crank pin journal	3½ x 4½ ins.
Rear crank pin journal	3½ x 4½ ins.
Cylinders, diameter	19 ins.
Piston stroke	26 ins.
Piston rod, diameter	3¾ ins.
Main rod, length center to center	75 ins.
Steam ports, length	17½ ins.
Steam ports, width	1¼ ins.
Exhaust ports, length	17½ ins.
Exhaust ports, width	3 ins.
Bridge, width	1¼ ins.
Valves, kind of	Slide
Valves, greatest travel	5½ ins.
Valves, outside lap	¾ ins.
Valves, inside lap or clearance	1-32 in.
Boiler, type of	Radial Stay
Boiler, working steam pressure	180 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	5-8 in.
Boiler, diameter of barrel	5 ft. 2 ins.
Thickness of tube sheets	½ ins.
Crown sheet stayed with	Radial stays
Dome, diameter	30 ins.
Firebox, length	7 ft. 7⅛ ins.

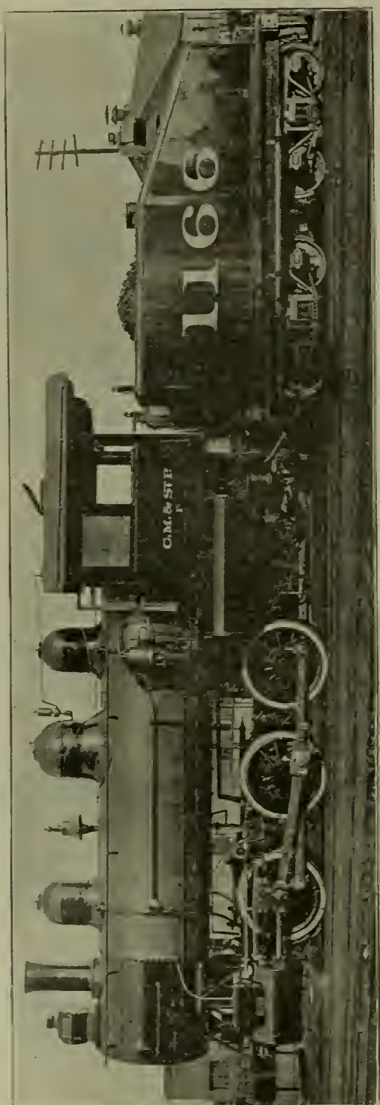


Fig. 2—Switching Locomotive, Chicago, Milwaukee & St. Paul Railway.

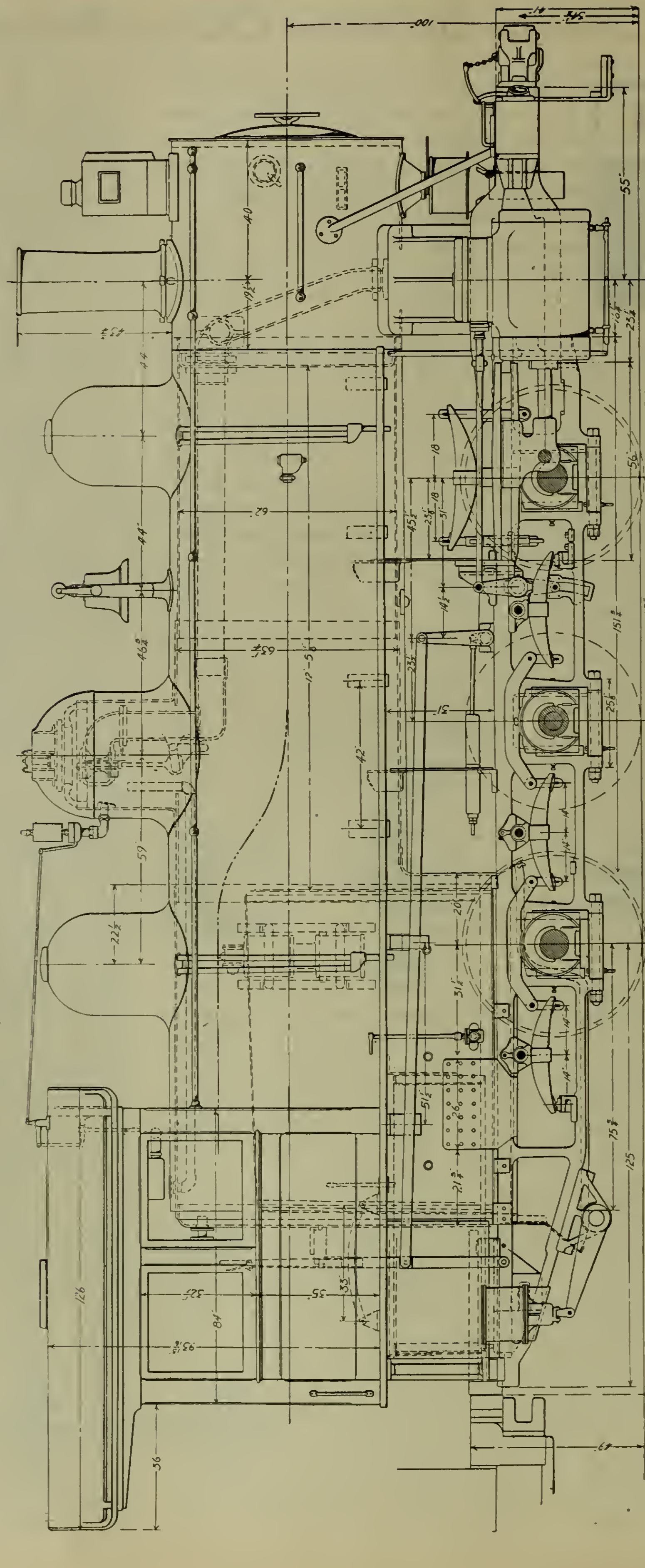


Fig. 3—Switching Locomotive, Chicago, Milwaukee & St. Paul Railway—Elevation.

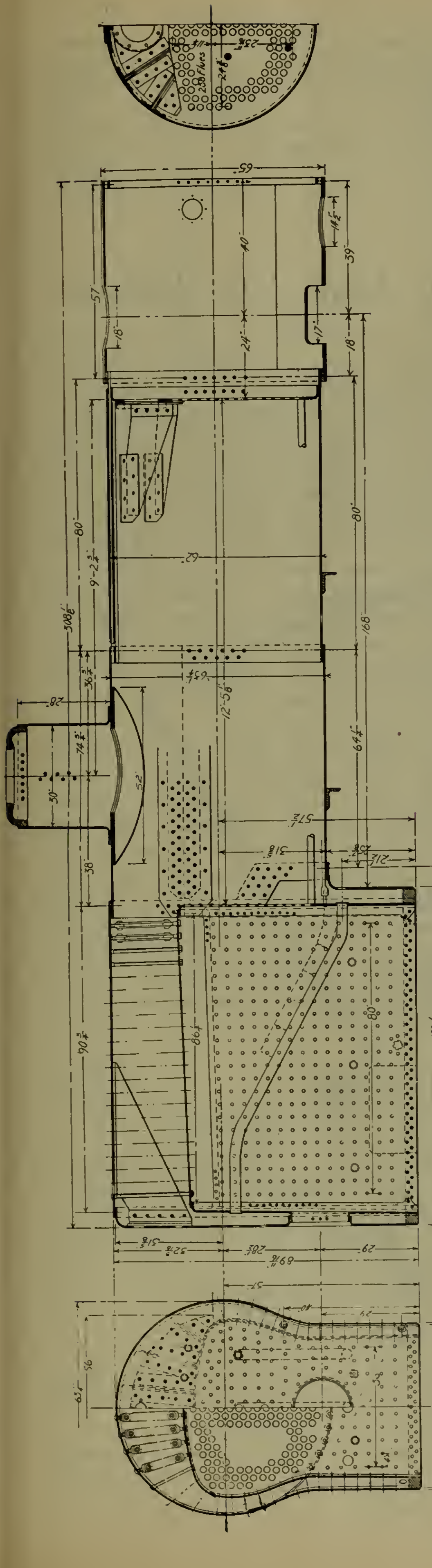


Fig. 4—Switching Locomotive, Chicago, Milwaukee & St. Paul Railway—Boiler.

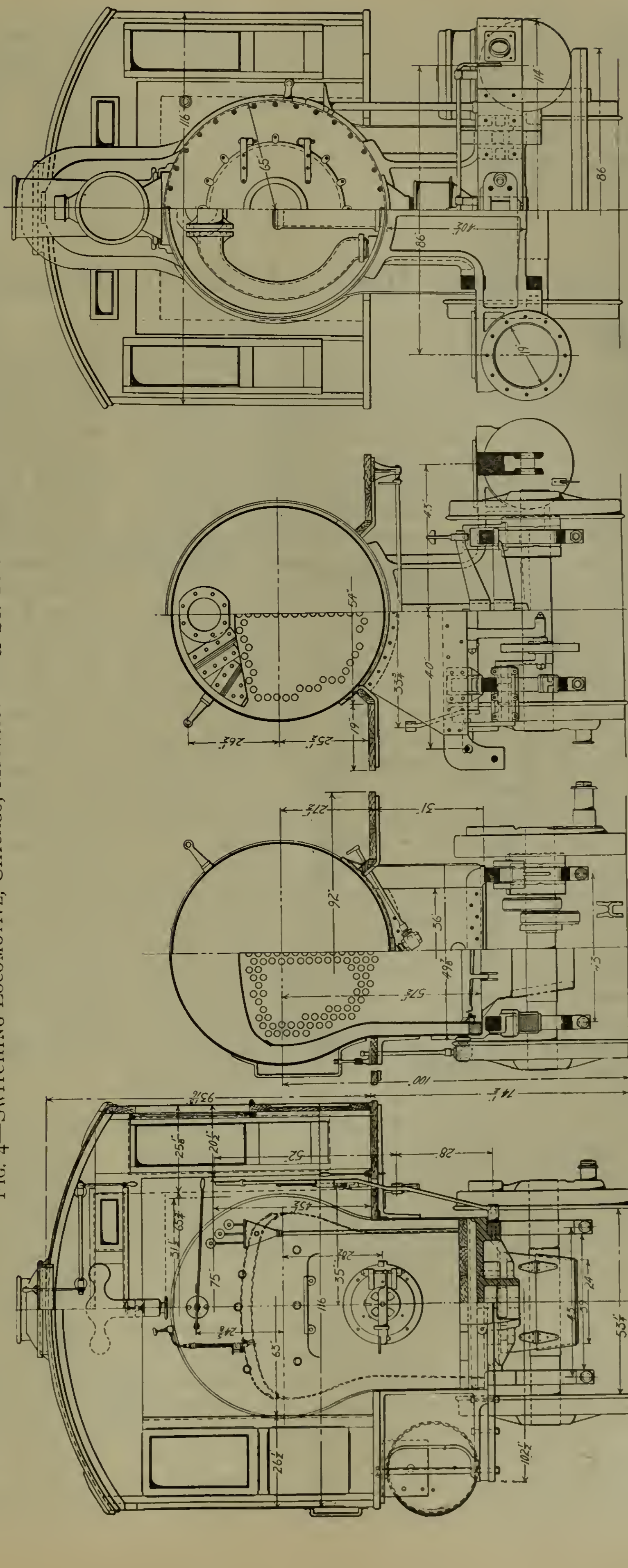


Fig. 5—Switching Locomotive, Chicago, Milwaukee & St. Paul Railway—End Elevations and Sectional Views.

Firebox, width	3 ft. 6 ins.
Firebox, depth	5 ft. 9½ ins.
Firebox, material	Steel
Firebox, thickness sheets	5-16, ⅜, ½ in.
Firebox, brick arch	Yes
Firebox, water space, width	4 ins. front, 3½ ins. sides, 3½ ins. back
Tubes, number	238
Tubes, outside diameter	2 ins.
Tubes, length over sheets	12 ft. 5⅛ ins.
Smokebox, diameter	65 ins.
Smokebox, length	64 ins.
Stack, height above smokebox	43¾ ins.

Tender.

Tank capacity for water	4,500 gals.
Coal capacity	4½ tons
Kind of material in tank	3-16 and ¼-in. tank steel
Type of under-frame	Wood
Diameter of truck wheels	33 ins.
Diameter and length of axle journals	4¼ by 8 ins.
Length of tender frame over bumpers	22 ft. 6 ins.
Length of tank	17 ft. 10 ins.
Height of tank	5 ft. 11 ins.
Total weight of loaded tender	79,000 lbs.

New Round House of the Rio Grande & Eagle Pass Railway

WHILE of small proportions, the four-stall roundhouse recently built by the Rio Grande & Eagle Pass Railway is of as much importance to this short road as one of more extensive proportions would be to a larger road. As the building and equipment are up to date in every respect and some ingenuity has been exercised in the operation of machines and the maintenance of repairs, this small plant appears of interest, especially so to those contemplating the arrangement of facilities for caring for a small number of locomotives.

The building is constructed of 12 in. walls of Laredo pressed brick 18 ft. high, upon concrete foundations 3 ft. below grade. The roof is of No. 22 corrugated galvanized iron, with 2½-in. corrugations. The joists are 3 ins. by 14 ins. yellow pine, set on 12 ins. I beams, supported by 10 by 10 ins. yellow pine posts bolted to brick bases upon concrete foundations. The flooring is of gravel tamped solid. The building is well lighted by windows in rear wall between pilasters and by sashes in the front swinging doors. It is intended to install an acetylene gas plant for lighting at night.

There are four pits in the roundhouse, one of which is a drop pit, provided for removal of drivers, equipped with Vreeland patent transfer pit jack. The bottoms of pits are concrete 12 ins. thick, covered with Portland cement; the side and end walls are of brick 22 ins. thick. The side walls are capped with 6 ins. by 16 ins. yellow pine timbers, to which the rails are fastened.

Separated from the roundhouse by a partition of corrugated iron are the machine shop and engine room, 25 ft. by 66 ft. The machine shop is equipped with the following new machine tools: A Perkins 26 ins. by 10 ft. bed lathe, a Prentice Bros'. 14 ins. by 6 ft. lathe, an Ohio Machine Co. 24 ins. by 25 ins. shaper, a Schaffer 200-ton 42-in. wheel press, an American Tool Works Co. 42-in. drill press, a Hertz flue-welding machine. A 9½-in. Westinghouse air pump is installed for testing cars and operating air tools.

Car wheels are bored on the 42-in. drill press and the most interesting feature of the machine tool operation is the arrangement for turning driving wheel tires with a 26-in. lathe. The arrangement for performing this work is shown in the accompanying line drawing, Fig. 1. The driving wheels are supported on a wooden carriage, which is bolted to the bed to prevent the lathe from tilting, and causing the tool to gouge into the work. To add to the rigidity of the device two small jacks are placed between the lathe bed and the nearest longitudinal timber. Instead of carrying the wheels on two centers, the axle journals run in two inverted driving boxes, the weight of the wheels being supported by the crown brasses and held in position by friction brasses E, made of old crown brasses. Across the cellar end of the box is placed a steel plate 18 ins. by 61 ins. by 1½ ins., through which pass 1-in. rods F F, holding the box rigidly in position. A set screw C passes through plate D, holding friction brass in position, thus steadying the axle. A sprocket wheel G is bolted to driving wheel A with U bolts, and a small sprocket wheel G is bolted to the face plate of the lathe. Power is delivered from the smaller sprocket wheel by a steel roller chain with straight side bars 1½ ins. by ⅜ in. The diameter of the wheels are in the ratio of 7 to 1.

It was found that when the wheels were set parallel to the lathe bed it was impossible to give the proper taper when using the compound tool rest, as the tool would dig into the work with the sprocket and chain attachment in operation. In order to obviate this difficulty it was necessary to move the carriage away from the head to give the proper taper to the tire. In this manner the tires have been turned very successfully. The tool rest is reversed so as to bring it as near the tire as possible, thus reducing the length of tool extending beyond the rest and minimizing the tendency to

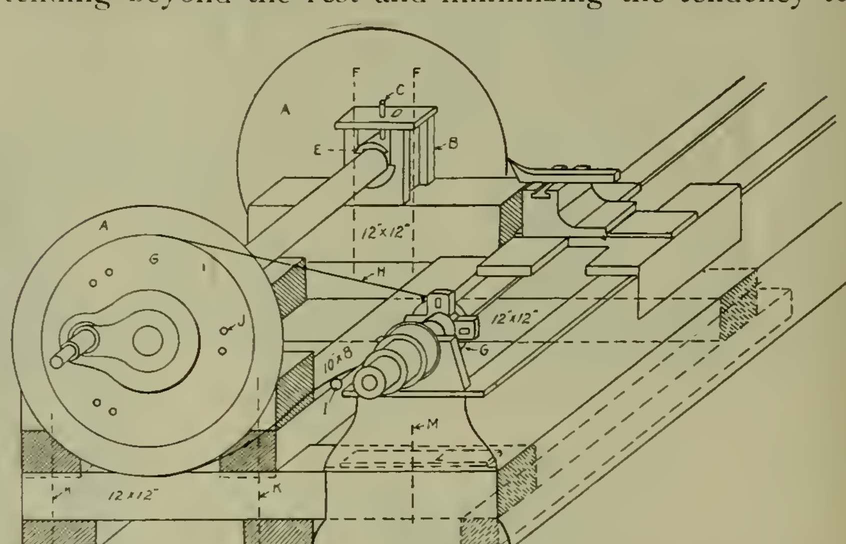


Fig. 1—Method of Turning Driving Wheel Tires with a 26-in. Lathe, at the New Rond House of the Rio Grande & Eagle Railway.

spring. It is necessary to weight the drivers to counteract the weight of the counterbalance and thus cause the wheels to run steadily.

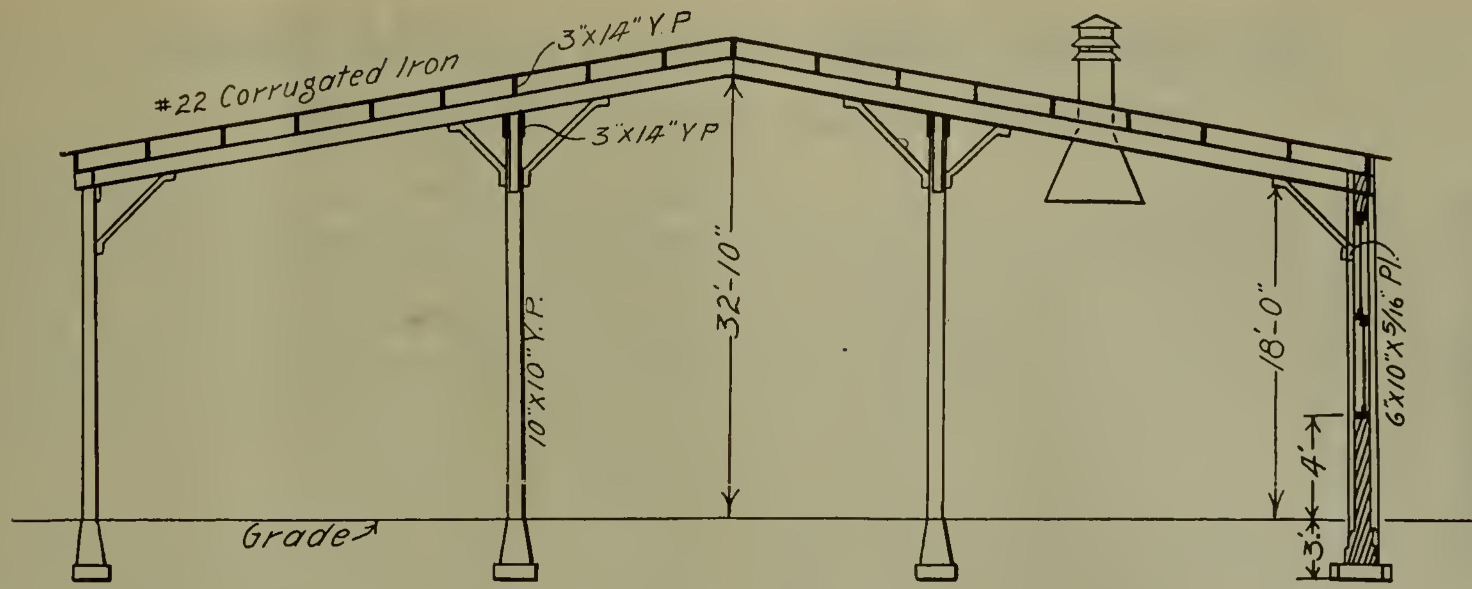


FIG. 2—NEW ROUND HOUSE OF THE RIO GRAND & EAGLE PASS RAILWAY—CROSS SECTION.

The wheels are leveled by laying a straight edge of sufficient length to extend beyond wheel centers, across the bed plate of the lathe, and adjusting same with a 24-in. level. By striking a circle on the face of the axle the radius of which is equal to the distance from the edge of the straight edge to the center of the axle, and by repeating the operation on the opposite end of the axle, working lines are obtained by which the wheels are readily adjusted.

In presenting the accompanying line drawings we acknowledge the courtesy of Mr. W. F. Galbraith, master mechanic at Laredo, Texas.

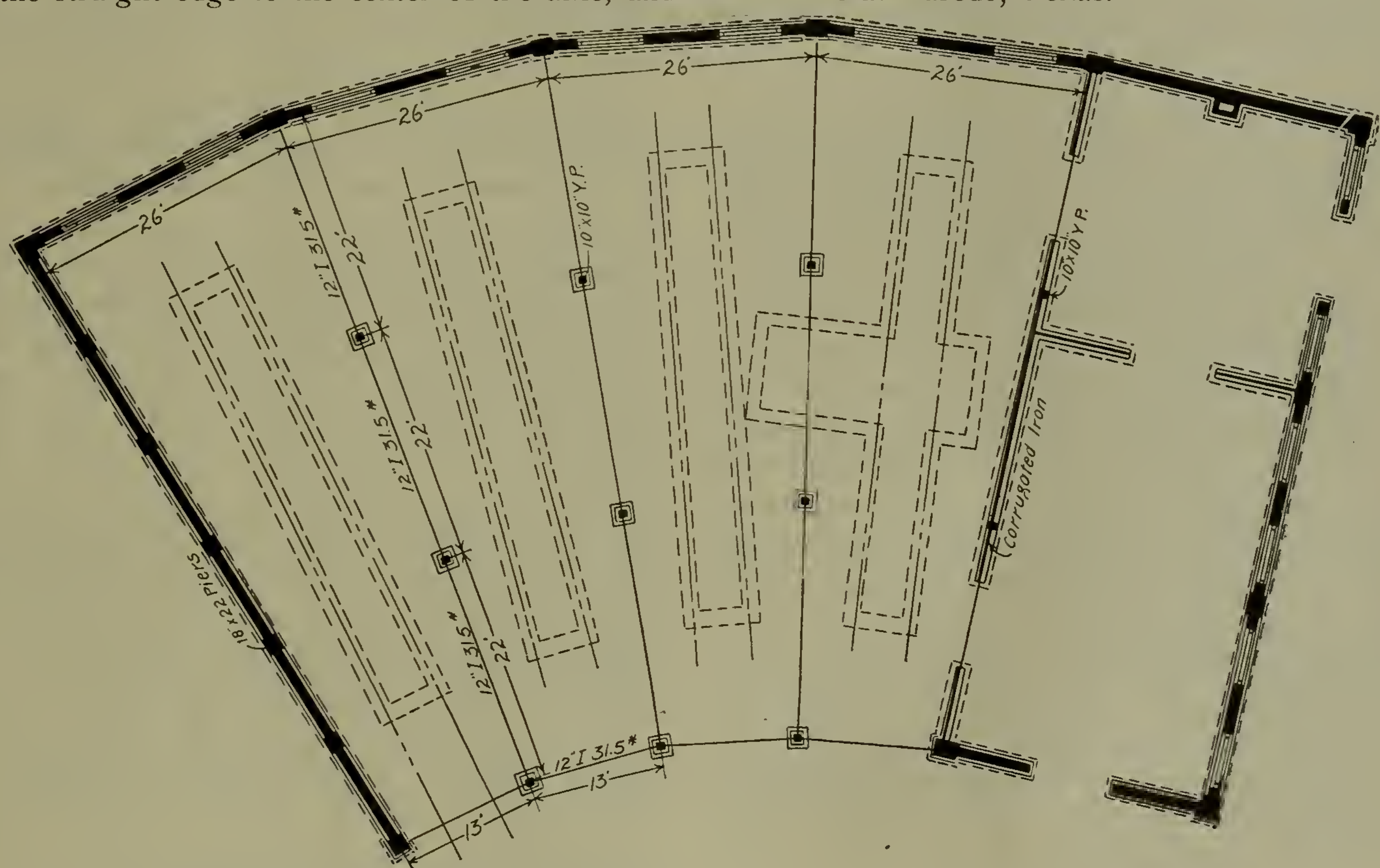


FIG. 3—NEW ROUND HOUSE OF THE RIO GRANDE & EAGLE PASS RAILWAY—PLAN.

Petroleum Residue as Fuel for Locomotives

According to a report of the general management of Roumainian railroads, 342 locomotives out of a total of 482 are designed to be fired either with residue of petroleum or with brown coal; 17 locomotives use residue of petroleum exclusively. The Monitor of Roumanian Petroleum Interests states that the Society of Petroleum Explorers and Producers has now requested the management of the Roumanian railways to change all the locomotives into burners of petroleum residue and to introduce this fuel into the railroad shops.

Economical Repairs to 9 1-2 inch Air Pumps

By Otto Best, Air Brake Inspector, N. C. & St. L. Ry.

IN order to give what we considered the best practice for repairs to the 9½ inch air pump an accurate account of both labor and material was kept to ascertain definitely the most economical way of doing the work and we have found that the following is the best:

The practice of partially overhauling pumps on engines should only be indulged in to a very limited extent. It will be found much more economical and reliable to remove the pump and give same a thorough overhauling in the air-brake repair room.

We have adopted the plan of overhauling air pumps at our general shop. This eliminates improper repairs being made at the smaller places and the carrying of extra stock for making repairs, which is one of the greatest expenses attached to a railroad company.

It can readily be seen that the repairs to air pumps will be much more satisfactory and economical when done at a general point, and under the direct supervision of a competent and thorough air-brake man.

There are two very important factors we must bear in mind; first, "Workmanship"; second, "Standards." Only such men who are competent and who have been thoroughly instructed by the general air-brake inspector, should be employed on repairs to air pumps.

Air pumps should be put into a vat or tank containing a strong solution of lye and allowed to soak until all grease and dirt have been removed. Steam should not be admitted direct into the vat as with this method the solution is rapidly diluted; a coil with a drain should be used. Remove pump from vat and thoroughly blow out with steam all ports and passages until they are perfectly clear. This work should be done by a helper. Pump should then be turned over to the air-pump repairman, and should be thoroughly dismantled.

TOP HEAD.

The practice of scrapping main valve bush No. 75 and applying a new one instead is an extravagance, to say the least of it. Main valve bush should be pressed out of the head, put in a lathe, and bored to 3 5-16 of an inch, after which a bushing should be turned to fit the main valve bush that has been bored, and should be forced in, bored to standard size and properly faced, ports to be drilled through new bushing. Bush is now ready to be pressed back into the head. This work can be done for 85 cents, and against $4.75 for new bush, a saving of $3.90 can be made.

The left main valve cylinder head should be placed in a lathe and bored to 2⅜ of an inch, after which a bushing should be turned and pressed into the head, bored and faced to standard size, and ports properly drilled. This work can be done for 40 cents, and against 75 cents for new head, is a saving of 35 cents.

The large and small main valve piston packing rings, No. 78 and 80, should be removed and new one applied and properly fitted. Our experience has been that home-made rings do not give the proper wear and life the rings furnished by the Westinghouse Air Brake Company do.

The main slide valve and its seat should be properly faced. When main slide valve has 3-64 of an inch play between shoulders of main valve stem, same should be scrapped and a new valve applied.

Next remove reversing valve chamber bush, No. 73, and apply new one. Also new reversing valve No. 72. We have found that when bush is renewed an old reversing valve should never be applied.

Three sixty-fourths of an inch play between valve No. 72 and reversing valve rod, when valve is new, calls for a new rod, however, templets should be used to ascertain which part is worn and needs renewing.

It should also be noted that the reversing valve chamber cap is properly fitted on bush No. 73 and on the head proper.

Great care should be taken that the distance between the knob on end of reversing valve rod and shoulder is of the proper length; reversing valve plate should be removed to ascertain the exact condition of the under side. If worn on either side apply new plate.

Steam piston and rod No. 65 should be examined and it is quite essential that the rod be perfectly true. New piston packing rings should be applied. Great care should be taken in the workmanship in applying rings, otherwise pump will blow and back pressure will be materially increased.

When a packing ring is cut, that portion of it nearest the ends, has a tendency to remain straight. When ring is reduced to size of cylinder the result is a poor fit for almost one-third of the circumference. To obviate this trouble and thereby secure better fitting rings it is necessary to either file off outside of rings near the ends, or turn them up in a lathe after rings have been cut; either will do, just so the rings are made to fit the cylinder properly. Same is applicable to the air cylinder piston packing rings.

In applying piston No. 66 it is desirable that lock nuts should be used on the end of the piston rod as furnished by the Coffin-McGeath Supply Company, Franklin, Pa.

It is the most advisable and most economical way, when necessary to bore steam and air cylinders, to bore them to a standard of 9⅝ of an inch and apply new pistons and rods.

CENTER PIECE.

The center piece needs more than passing notice.

If piston rod has been turned down in order to true it up new glands should be applied and as close a fit made on the piston rod as advisable without binding.

Stuffing box nuts should fit neatly and box should be carefully examined to see that same is properly secured and tightened in center piece. Air valve seat No. 87 and valve cage No. 88, when worn, should be removed and new ones applied. Also new air valve No. 86. Great care should be taken that the lift of the air valves does not exceed 3-32 of an inch.

It is not advisable nor practicable to use new air valve with old valve cage or valve seats unless seats are properly trued. All copper joints should be annealed.

Pumps should be put on a test rack and run a sufficient length of time to determine their efficiency before being placed in active service.

The failure of air pumps on line of road has been reduced to a minimum. Year ending June 1, '03, there were three (3) pump failures; "Reversing rod broke," "Main piston rod broke," "Reversing plate bolt worked out."

Scholarships Offered by the American Railway Master Mechanics' Association

IT is announced by Secretary Taylor that there is one vacancy in the scholarships of the American Railway Master Mechanics' Association, at Stevens' Institute of Technology, Hoboken, New Jersey. The constitution of the association provides that acceptable candidates shall be the sons of members or deceased members, and if there is not a sufficient number of such applicants for the June examination, application will be received from other railroad employees or the sons of other railroad employees for the fall examination, preference being given to the mechanical departments, and the successful candidate shall be required to take the course of mechanical engineering. The date set for the entrance examination is September 14 to 17, 1903, inclusive.

Joseph T. Ryerson & Son have generously endowed several scholarships, for worthy young men desirous of obtaining a technical education, and have requested the American Railway Master Mechanics' Association to select one of the recipients, and at the recent convention the trust was accepted by the association. As the time between the present and the beginning of the fall term of the various colleges is so short, it has been thought best that the executive committee should select the college and it was decided upon Purdue University, La Fayette, Indiana. The fall term at Purdue begins on Wednesday, September 9, 1903. The date set for the preliminary examinations is Monday, September 7, 1903.

For further information and for certificates entitling candidate to attend the preliminary examinations, application should be made to Mr. Joseph W. Taylor, Secretary, 667 The Rookery Building, Chicago.

Communications

Editor Railway Master Mechanic:

The writer of the article which appeared in your June issue, page 233, criticizing the decisions of the Arbitration Committee, has no doubt found his answer in the paper presented by Mr. G. L. Fowler at the recent convention of the M. C. B's. Association. As that admirable paper gives the fundamental principles which have governed the Arbitration Committee in the settlement of disputes, I wish a copy of it could be in the hands of every man who has anything to do with the interchange of cars on American railways.

It is doubtful if many of us have realized the amount of patient study which has been given by the committee to the solution of the six hundred or more questions which have been presented to them for settlement. Fewer still perhaps have stopped to think that the committee is composed of busy men, who at a personal sacrifice to each, have given of their time and energies to the impartial settlement of questions which have arisen in the interchange of cars incident to the immense traffic of a continent, and that they do this without recompense.

The wonder is that men of ability are willing to accept such onerous duties and subject themselves to criticism and the possible loss of friendships, for they know that they cannot render a single decision without bringing disappointment to some.

When we stop to reflect on these things we ought to be able in a measure to realize how thankless is the task to which they have been called.

The applause with which the paper of Mr. Fowler was received by the convention is evidence that the members of the association were glad to be reminded of the important and lasting work performed by their Arbitration Committee. Very truly,

A. R. McAlpine.

To the Editor:—

Relative to the article on page 208 of the Railway Master Mechanic of May issue, I fail to recognize any particular advantage of a circular furnace chamber over a square rounded corner chamber. I have been here in Los Angeles now for about ten months and have installed quite a few oil furnaces. I am now forging all our axles, from 4 ins. to 6½ ins., with oil fuel and also employ oil fuel on all my forging machine furnaces, both machine furnaces and on the spring furnaces. The latter I construct with a double retort thereby avoiding the usual production of scale or carbon from collecting on the spring leaves or plates while undergoing the process of heating, it all being consumed in the fire chamber before it reaches the operating chamber, which enables the operator to work much faster, as his steel plates are perfectly free from all carbon and scale. I am now forging 6½ in. axles, employing oil fuel and use No. 2 scrap with No. 1 scrap, equal parts, and I am thoroughly convinced by my experience in the past that I can make a much better percentage on axles with oil fuel than can be produced with coal, if the oil is applied properly and the furnace constructed to consume every atom of fuel applied. I employ a high pressure burner on my axle and scrap furnaces and employ boilers over the furnaces with steam jet blowers in stock. By this method I find I do much better work with a drawn draft than with a forced draft, as my furnace never congests at the velvetry, in the throat of the flue, which is the vital point of a welding furnace.

I am chairman of the fuel and furnace committee of our association and I am now trying to get out prints for some of our most successful furnaces, as they are of my original design. As I have perfected the furnaces and burners for different classes of work required I will soon have blue prints made from them, which I will present to the National Railway Master Blacksmiths' Association at Buffalo, N. Y., in August, for the consideration of that organization. Yours truly,

T. A. McNeal,

Gen'l Foreman Blacksmith Department, Pacific Electric Railway, Los Angeles, Cal.

Railroad Shop Tools

By Charles H. Fitch

IV.

AS a drop the steam hammer is simply worked with a treadle, rod, lever and spring connection to the cam or wiper. The blow is that of the falling weight assisted by steam pressure, the hammer immediately rising for the next stroke by the lagging action of the wiper. Where a considerable number of parts are required which must be very tough, and of a form more irregular or special than can conveniently be made from merchant bar, the drop hammer is a tool which effects great saving. Some of the forms made are shown in Fig. 1. Articles weighing as much as 6 pounds are forged in the dies of a 3,000 pound drop hammer. The formation of these dies with respect to draft, and the making of smooth forgings requires careful and experienced attention.

Early devices for drops were needlessly complex. In some of them a weight was made to climb between columns by an ingenious system of catches and detents, the repeated lifts being derived from a crank shaft, and the weight going up like a man on a rope hand over hand, after which idea the device was modeled. These were large machines, 20 of them in a single shop, but it was found that a simple board gripped by compressed paper pulleys one of which is in eccentric bearings served the purpose more simply and better.

Some of the latest and best approved details of "plank" drops are shown in the following illustrations, the friction pulley engagement, Fig. 2, and the means of releasing the plank and letting the weight drop by automatic trip with holes for insertion of knock offs, Fig. 3, and by lifting latch which works with a compression spring, Fig. 4. The automatic trip simply breaks connection between the treadle and the engaging roll or pulley without permitting the weight to be lifted to the latch, so that by this means a succession of quick short blows are struck. Cuts are also shown of the complete hammer, Fig. 5, of the forges used which have fire caps and doors lifted by treadle, Fig. 6, and of a drop hammer with its usual companion machine, the trimming press, Fig. 7. These are eccentric presses and have a side attachment for cutting off bars. The cutters are adjustable to allow for grinding, and the plunger of main press is adjustable by means of right and left screw covered by nut. The trimming press is for the removal of fins which are difficult to avoid if sufficient metal is supplied to the dies. These illustrations represent the practice of the Billings & Spencer Co.

Drop hammers for railroad shops to be effective should be heavy as the work is much heavier than usual in shops such as agricultural implement works where these hammers are commonly used. The function of the drop hammer is to produce forgings at a stroke quickly with large area of displacement, and of a quality requiring a penetrating blow. This is heavier and quicker than small hammer work, and requires a heavy machine. It has been found that by doubling the weight of anvil from about 7½ times the falling weight to about 15 times the falling weight, the work done with the same falling weight is nearly doubled. This would seem to imply that a still greater increase in weight of anvil would be advantageous, but to recommend more would increase the price so that 15 to 1 is adopted as the present commercial ratio. It is said that the next industrial age will be the cement age, and if anvil iron is dear, the effectiveness of hammers, and the solidity of all machines under heavy stresses is increased by substantial wide and deep concrete foundations. For a 3,000 pound hammer a concrete foundation 12 feet deep and 7 × 10 feet in plan is recommended. Entering upon an era of heavier work we should provide heavier foundations. Concrete gives us bearing support cheaply. This might well be considered in providing foundations also for heavy cutting tools. I have seen quite heavy bed plates broken by use of new cutting steel, and in such cases good foundations help.

It is noted that the makers of steam hammers in most

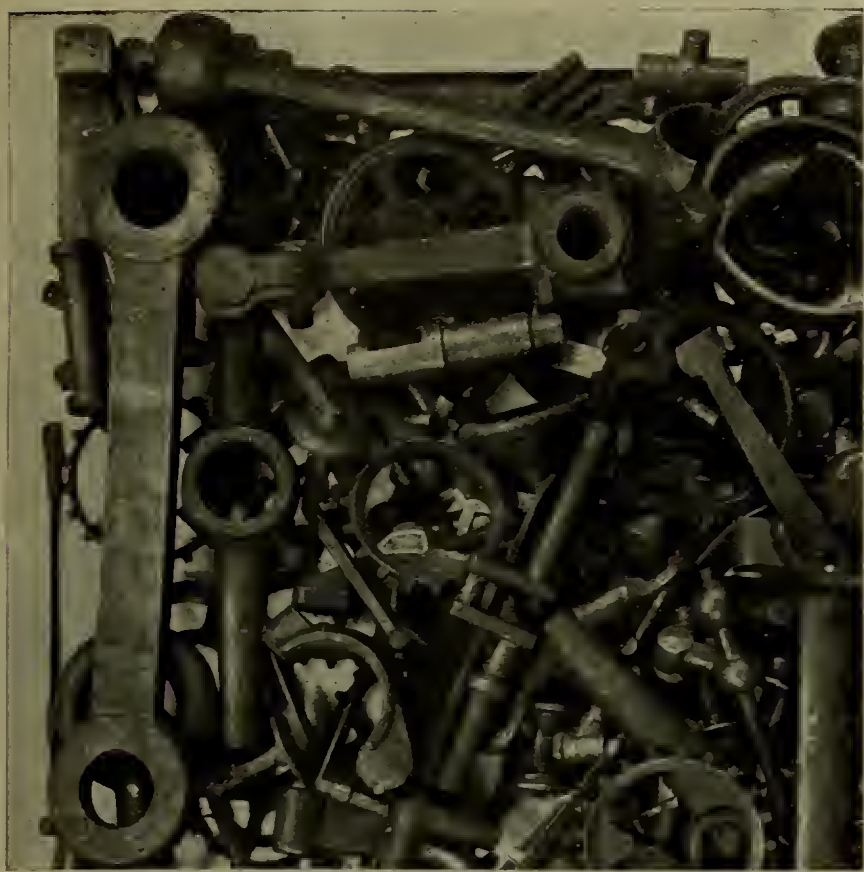


Fig. 1—Drop Forgings of Iron and Steel—Billings and Spencer Co.

approved use advise anvils of a weight 8 times that of the falling weight. The advantage gained by doubling weight of anvils of drop hammers would indicate that the penetration of blows would be increased by heavier anvils under steam hammers.

A hammer which may serve a purpose in some shops is the crank drop. This is a cheaper type than the board drop, but has not the same adaptability and ready variation of stroke. It operates by flexible connection, belting or ropes between a crank and a falling weight. Little stress comes on the shafting as it is entirely separate from the anvil and guides. Rotary motion is communicated from the power shaft to a crank shaft by a ratchet or cam (Sandage type), and the weight is released by treadle or rope. These machines are built by Williams, White & Co.

Mention should be made of a machine as yet little used in railroad shops, but one which promises advantages over other hammers on some classes of railroad work. This is the Yeakley vacuum power hammer. It is very quick in action and gives a heavy penetrating blow, making it suitable for heavy die and axle work. It can be used on rough die work where the finishing is done with a lighter hammer.

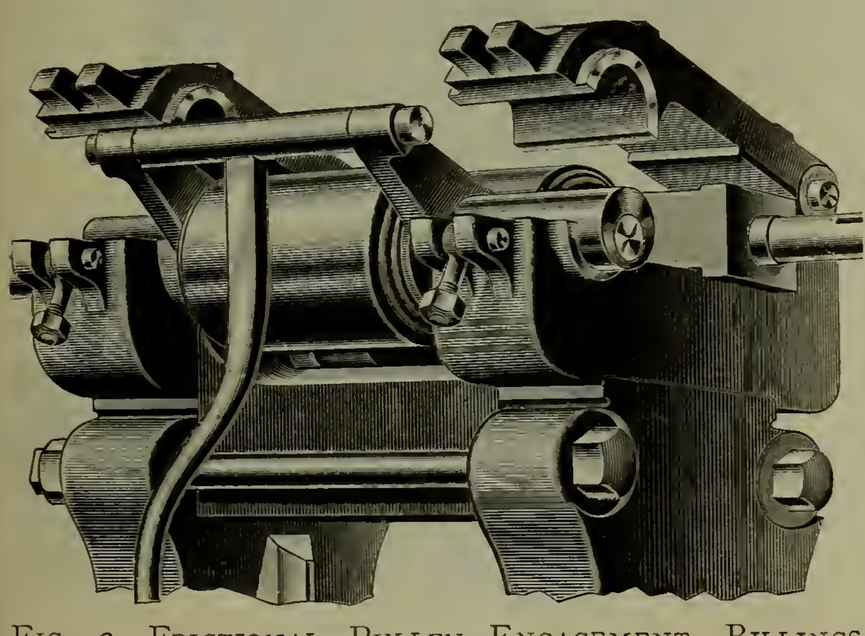


Fig. 2—Frictional Pulley Engagement—Billings and Spencer Co.

The Yeakley on heavy die work is claimed to nearly double the capacity over power spring hammers. This hammer is shown in Figs. 8 and 9. The construction is simple. It is a power hammer in which the ram is driven by air connection, and lifted by vacuum. The power cylinder and ram cylinder are connected by a passage controlled by a rotary valve governed by a treadle.

When the shaft is running, and the hammer is not striking, the air from the power cylinder is merely driven through a bypass into a chamber in the frame, but on lowering the treadle the pressure of the power piston is transmitted through the valve to the ram. It gives a heavy, steady blow at short stroke upon a very large die with massive guidance for the ram which always comes to rest clear up leaving the hammer wide open for work.

Obtaining to a less degree some of the same advantages by means of leaf springs between the crank and the head are hammers of the Justice type, sometimes called dead stroke hammers because the power connection is not positive. This spring may assist or restrain the falling weight, and the character of blow may be varied accordingly, being called elastic. It is a quick-working hammer, the 100 pound size making up to 250 blows per minute. In the hammer shown in Fig. 10 the head is hung from the middle of a leather link, and the blow is controlled by treadle operating friction cones. In other designs the treadle operates a belt tightener.

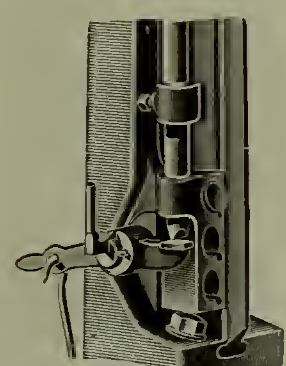


Fig. 3—Automatic Trip—Billings and Spencer Co.

In Fig. 11 is shown a hammer made by the Bradley Co., Syracuse, N. Y., which is operated by a belt tightener, and uses a pair of rubber springs instead of steel leaf springs. This hammer is remarkably compact, and is called an upright hammer. Both this and the Justice hammer are much used on light miscellaneous work in railroad shops.

We find a considerable variety of small hammers in use, some of them such as small trip hammers serving a purpose without any points of special commendation. Manufacturers usually make several different

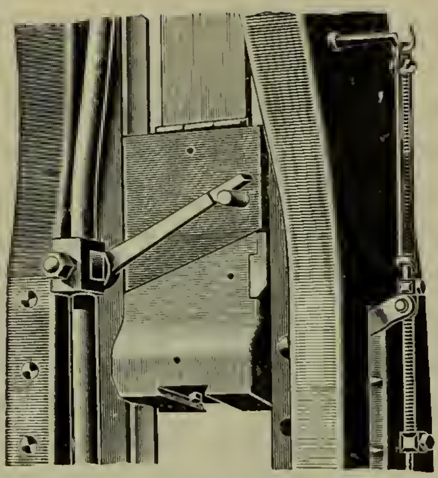


Fig. 4—Latch and Compression Spring—Billings and Spencer Co.

types with variations in springs. helves, and drives, not because one is distinctively better than another, or suited better to a particular line of work than another, but to cater to the tastes of customers who have used one or the other kind with satisfaction. A machine which gives a good account of itself continues in demand whether or no it be better than any other, and this perpetuates a needless number of types. Concentration upon a few types is desirable as it leads to lower prices, and closer attention to

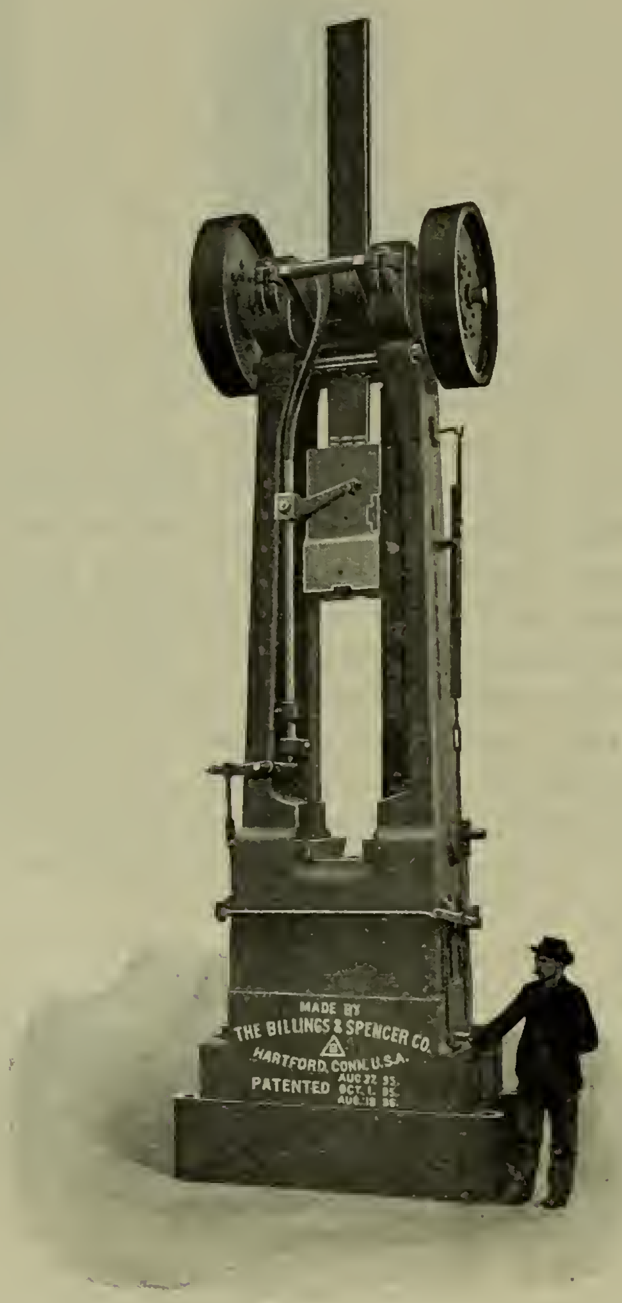


Fig. 5—The Billings and Spencer 3000-lb Drop Hammer,

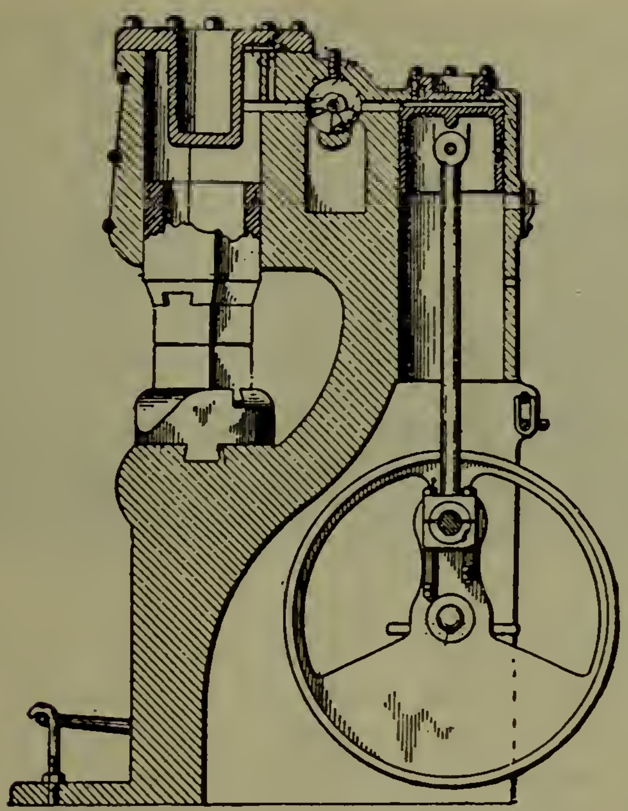
details, clearing the air of distinctions which have no good reason.

More than the type is the care and thoroughness with which a machine is designed and put upon the market. Machines excellent in theory and embodying good features of design are sometimes offered for sale before they are thoroughly worked out in detail,

Fig. 6—Forge Used in Connection with Drop Hammer.

and adapted to practical requirements. Most purchasers have had experiences with such machinery, and are inclined to be conservative and hold fast to approved models. Among such approved types the Bradley cushioned helve hammer holds a conspicuous place. It is shown in Fig. 12, and is, as will be seen,

Fig. 7—Trimming Press—Billings and Spencer Co.



The Yeakley Vacuum Power Hammer.
Sectional Elevation.
Fig. 8.

a helve hammer suspended between four rubber buffers. It is so provided with conveniences of ad-

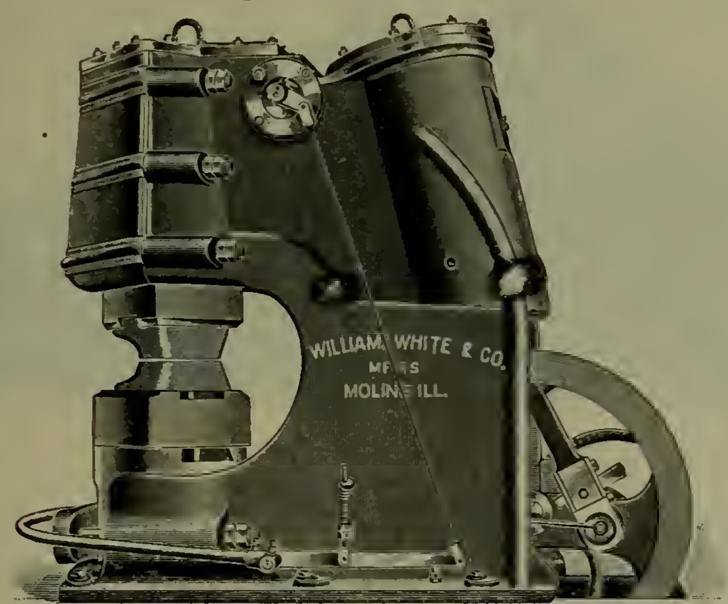


Fig. 9—The Yeahley Vacuum Hammer—Williams, White and Co.

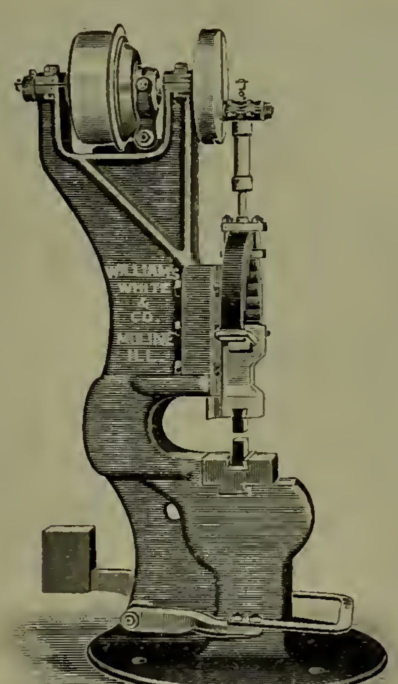


Fig. 10—Dead Stroke Hammer—Williams, White and Co.

justment, and adapted to practical uses that it enjoys special favor with railroad men. It has a quality of blow especially suited for drawing down small pieces and finishing work in dies.

Among the details of this machine may be mentioned the separate adjustable anvil block which prevents the wearing out of the hammer frames by internal shock, the so-called crystallization of iron. Wood packing is used to adjust the block with the

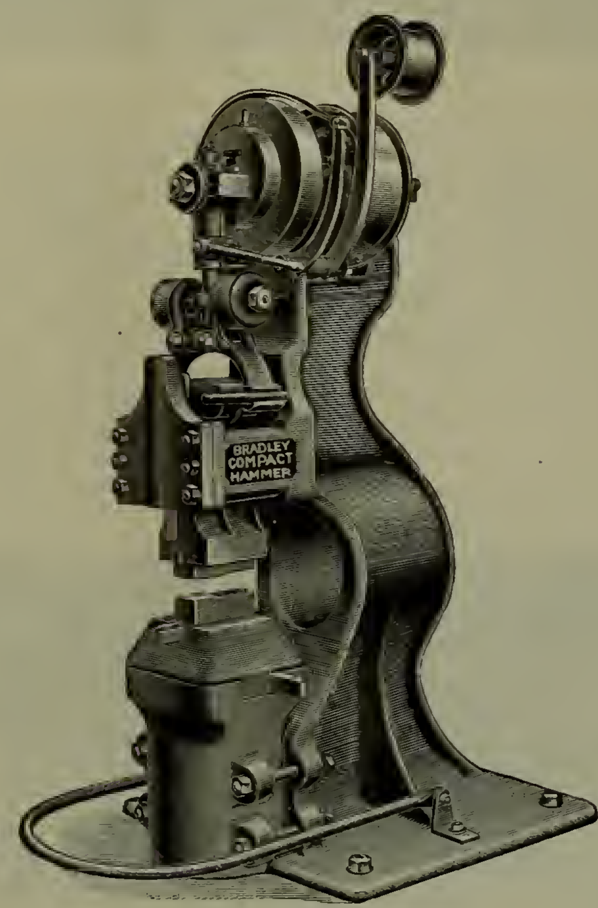


Fig. 11—Upright Bradley Hammer.

hammer to bring the dies into alignment; the adjustable eccentric determining length of stroke from 1 in. to 5½ ins. according as the work is best handled by short and quick or by longer and slower strokes. The adjustment is made with accuracy by aid of marks on the eccentric and shell.

Just as costly labor is wasted on the slow speeds and fine feeds used in old-fashioned machine tool practice, so expensive labor is not applied to the best purpose if the power and rapidity of the blow be not suited to the work in forging. We are trying to reduce machine shop practice to a science, but it can

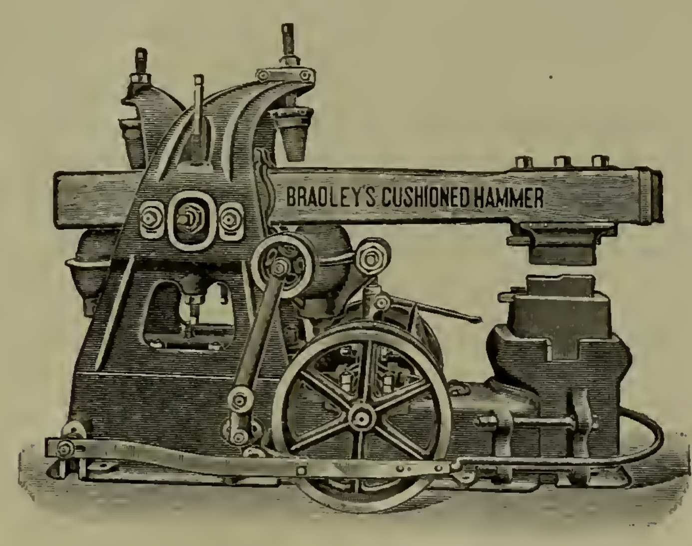


Fig. 12—Bradley Cushioned Helve Hammer.

hardly be said that this has been attempted in blacksmith shop practice.

There is certainly room for some comprehensive work of record in determining the facts of work on different locomotive and car parts, using different forging machines. Such records might prove eye-openers in their exhibit of relative efficiency of work, and might lead to more improvement than has been shown in the hammer department during recent years. The present tendency is for hammer work to be encroached upon by press work and the work of special forging machinery. This machinery is more exact and requires less expensive skilled labor, except in the die making which may be compared with tool room work in the machine shop, and obtains similar economy in production.

Improvements at the Brooks Works of the American Locomotive Company

ECONOMIC production in the manufacture of locomotives must be aided by refinement in the facilities employed in construction and the continual substitution of improved methods for conditions which fail to keep pace with the demands. This is evidenced by the improvements constantly being made at the several locomotive building establishments, among which may be mentioned additons and changes in progress at the Brooks Works of the American Locomotive Company at Dunkirk, N. Y. The erecting shop is 255 ft. by 69 ft., having a capacity of seventeen erecting pits which are served by two double trolley traveling cranes, one of 120 tons capacity manufactured by the Morgan Engineering Co., and the other of 10 tons capacity manufactured by the same company. The former is for lifting entire locomotives and the more massive parts, and the crane runways are situated at such height as to permit a locomotive to be lifted over others standing on the pit tracks. At the south end of the machine and old erecting shop a two-story extension 120 ft. long has been built. This portion of the building is supported by steel structural work and the remainder of the shop will be rebuilt of similar construction at such time that conditions permit. This extension is served by a Shaw 10-ton electric crane. Light machine tools are placed on the second floor.

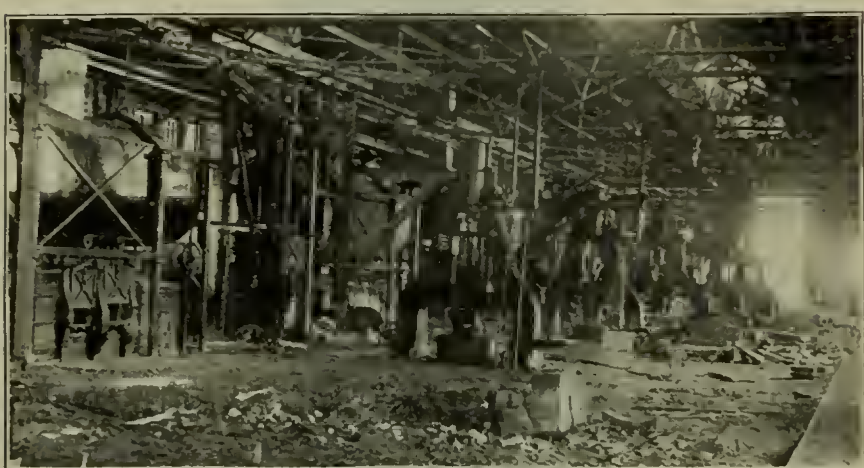


Fig. 1—Interior of New Hammer Shop, Brooks Works of the American Locomotive Co.

Fig. 2—Exterior of New Hammer Shop, Brooks Works of the American Locomotive Co.

A new hammer shop has been built and is now in partial operation. The walls of the building are of brick, a large portion of the areas of which are given up to glass windows to provide effective lighting by day. The roof is supported by steel structure. The location of this building in the plant is shown in the accompanying plan of the works, Fig. 6. The exterior of the building is shown in Fig. 2, and the arrangement of hammers and furnaces is shown in Fig. 1. Nine 6,000-lb. Bement hammers are to be installed, six of hich are now in place and being operated. Each hammer is served by an individual furnace burning bituminous coal, and above each furnace is a boiler receiving its heat from the furnace for operating the hammer. As greater floor area is required in the blacksmith shop, the old hammer shop is being

Fig. 3—Interior of New Tank Shop, Brooks Works of the American Locomotive Co.

Fig. 4—Interior of New Cylinder Shop, Brooks Works of the American Locomotive Co.

Fig. 5—Exterior of New Cylinder Shop, Brooks Works of the American Locomotive Co.

converted to supply this deficiency, as it is located adjacent to the blacksmith shop.

A new cylinder shop, 100x275 ft., served by a Niles 10-ton electric crane, has been built and recently placed in service. The general form and construction of this building may be seen by reference to the accompanying half-tone engavings, Figs. 4 and 5. The location of this building is shown in the accompanying plan. The old cylinder shop is being converted into a store-room for all shop supplies, and, being located centrally with reference to the remainder of the plant, is peculiarly well adapted for such a purpose.

A new building, 400x55 ft., has been erected as a tank shop and is now in operation, being equipped with all the latest improved machinery. Adjoining this building is a tank storage room, 200x55 ft. Both rooms are served by Niles double trolley 10-ton electric traveling cranes. The interior of this building is shown in Fig. 3.

The foundations are being built for a new wheel shop, which is to be 212x90 ft. This building will be used for driving wheel work only and all machines installed therein are to be motor driven. The shop is to be served by two Shaw 10-ton electric cranes, and the stock yard adjacent to this shop will be spanned by the same type of 10-ton crane.

All buildings of the plant are connected by stand-

Fig. 6—Plan of Brooks Works, American Loco motiv Co.

ard gauge and by 24-in. gauge lorry tracks for convenience in the transportation of material.

A recent installation of boilers, amounting to more than 1,800 horse power, has been made, fired by endless chain grates manufactured by Aultman & Taylor Machinery Co., Mansfield, Ohio. Among other installations may be mentioned a General Electric 500 k. w. generator directly connected to a Brown-Corliss engine, for operation of cranes and for supplying both arc and incandescent lights; a 1,700 cu. ft. air compressor, and a 12-ft. riveter in the boiler shop.

Personals

Mr. J. J. Doran, master mechanic of the Houston & Texas Central, with headquarters at Ennis, Tex., has resigned.

Mr. John Nelligan has been appointed superintendent of the shops of the Baltimore & Ohio at New Castle, Pa.

Mr. David Cornelius has been appointed foreman of the freight car department of the Santa Fe shops at Topeka, Kan.

Mr. Robert Bagley has been appointed master mechanic of the Tacoma Eastern to succeed Mr. James Chalmers, resigned.

Mr. H. Whitham has been appointed master mechanic of the San Francisco & Northwestern Railway, with headquarters at South Bay, Cal.

Mr. J. W. McFarland has been appointed assistant master mechanic of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa.

Mr. Joseph E. Gould has been appointed master mechanic of the Northern division of the Cincinnati Hamilton & Dayton, with headquarters at Lima, O.

J. P. McMurray, traveling engineer of the Rio Grande division of the Santa Fe, has been transferred to the Panhandle division.

Mr. R. F. Kilpatrick, heretofore master mechanic of the Delaware, Lackawanna & Western at Kingsland, N. J., has been transferred to Scranton, Pa., to succeed Mr. A. G. Elvin, resigned. Mr. W. L. Boler has been appointed master mechanic at Kingsland, N. J., to succeed Mr. Kilpatrick, transferred.

Mr. A. L. Humphrey has resigned as superintendent of motive power of the Chicago & Alton to become the western representative of the Westinghouse Air Brake Company at Chicago.

Mr. Willard Kells has resigned as assistant master car builder of the Union Tank Line and, as previously stated, Mr. John W. Dalman has been appointed to the position, with office at 26 Broadway, New York.

Mr. S. D. Kinney, formerly connected with the Baldwin Locomotive Works, has been appointed superintendent of the Gulf, Colorado & Santa Fe shops at Cleburne, Tex.

Mr. A. L. Moler, heretofore master mechanic of the Vicksburg, Shreveport & Pacific, has been appointed superintendent of motive power of the Chicago, Cincinnati & Louisvile, with headquarters at Richmond, Ind., to succeed Mr. H. K. Mudd, master mechanic, resigned.

Mr. D. P. Child has been appointed acting shop superintendent of the Como (St. Paul) shops of the Northern Pacific to succeed Mr. A. Child, resigned.

Mr. A. G. Elvin, master mechanic of the Delaware, Lackawanna & Western Railway, has resigned, effective Aug. 1, and has been appointed manager of tre mechanical department of the Coffin-Megrath Supply Company, at Franklin, Pa.

Mr. W. A. George, who recently resigned as master mechanic of the Colorado & Southern, has been appointed master mechanic of the Southern division of the Kansas City Southern with headquarters at Shereveport, La.

Mr. Thomas Sutherland has been appointed superintendent of motive power and Mr. F. J. Welch general foreman of the Dawson City, Dalhart & Oklahoma City railroad, with headquarters at Dalhart, Tex.

Mr. H. P. Latta, general foreman of the Toledo & Ohio Central shops at Toledo, O., has been appointed master mechanic of the Toledo Railway & Terminal Co., with headquarters at Toledo, O. Mr. Latta is succeeded in the former position by Mr. J. H. O'Gara.

Mr. J. B. Wells has been appointed road foreman of engines of the Pennsylvania at Harrisburg, Pa. Mr. L. C. Clemson has been appointed assistant road foreman of engines at Harrisburg, and Mr. C. T. Derrick to a similar position at Altoona, Pa.

Mr. E. F. Needham has been appointed master mechanic of the Wabash Railroad, with headquarters at Fort Wayne, Ind., with jurisdiction over the Buffalo, Detroit and Eastern divisions. Mr. Needham has heretofore been assistant master mechanic at Fort Wayne.

Mr. John H. Wynne has been appointed general foreman of the Richmond division of the Pennsylvania lines west of Pittsburg, with headquarters at Richmond, Ind., effective Aug. 1. Mr. Wynne's appointment is another pleasing instance of the recognition of ability resulting from technical training and practical experience in the railroad shop. He is a graduate of Cornell University at Ithaca, N. Y., and has served successively with the Illinois Central as special apprentice, draftsman, machinist, and gang foreman.

Mr. G. A. Gallagher has resigned as master mechanic of the Eastern Railway of Minnesota division of the Great Northern, and has been succeeded by Mr. George A. Bruce, who has been transferred from a similar position on the Willmar & Sioux Falls division. The headquarters of Mr. Bruce will be at West Superior, Wis.

Mr. D. M. Perrine, master mechanic of the Pennsylvania at Pittsburg, Pa., has been transferred to West Philadelphia to succeed Mr. R. K. Reading, who was recently made superintendent of motive power at Williamsport, Pa. Mr. I. B. Thomas, heretofore assistant engineer of motive power at Altoona, succeeds Mr. Perrine as master mechanic at Pittsburg.

Mr. E. D. Nelson, heretofore superintendent of motive power of the Northern Central at Williamsport, Pa., has been appointed engineer of mechanical and electrical tests of the Pennsylvania Railroad, with headquarters at Altoona, Pa. Mr. R. K. Reading, master mechanic of the Pennsylvania at West Philadelphia, Pa., succeeds Mr. Nelson as superintendent of motive power of the Northern Central at Williamsport, Pa.

The shops of the Houston & Texas Central, the Houston, East & West Texas and the Houston & Shreveport railroads at Houston, Tex., have been consolidated and the jurisdiction of Mr. S. R. Tuggle, superintendent of motive power and machinery of the Houston & Texas Central, has been extended over the three roads. The office of master mechanics of the Houston, East & West Texas and Houston & Shreveport has been abolished, and Mr. S. Millican, heretofore master mechanic, has been appointed general foreman of the combined shops, at Houston.

Mr. Pulaski Leeds, superintendent of machinery of the Louisville & Nashville Railroad, was on July 6, shot by a former employee of the company, and on July 8 died from the effects of the wound. Mr. Leeds has for a number of years been one of the most prominent railway mechanical officials in the United States, and his loss will be felt by a host of friends. Mr. Leeds has always taken an active part in the work of the Master Car Builders' and American Railway Master Mechanics' Associations, and was president of the latter association in 1897-1898. Mr. Leeds was born June 1, 1845, at Darien, Conn., and entered railway service on March 4, 1861, from which time he was consecutively up to Sept. 1, 1877, machinist apprentice, journeyman and locomotive engineer on the New York & New Haven Railroad. From the latter date up to September, 1879, to Feb. 12, 1882, was superintendent of motive power of the Indianapolis, Decatur & Springfield Railroad. On Feb. 12, 1882, Mr. Leeds was appointed master mechanic of the Louisville & Nashville, which position he held up to July 1, 1889, when he was elevated to the position of superintendent of machinery of the same road, holding this position up to the time of his death.

Announcement has been made by General Manager G. L. Peck, of the Pennsylvania lines west of Pittsburg, that Mr. D. F. Crawford, superintendent motive power of the Northwest system, will, on Aug. 1, become general superintendent motive power of the whole system west. Other appointments are also announced, the promotion of Mr. Crawford necessitating several other changes. Mr. Crawford will fill the position that has been vacant since November, 1899, when G. L. Potter, now third vice-president of the Baltimore & Ohio, was advanced to the general managership of the Pennsylvania lines west. Mr. Crawford's headquarters will be in Pittsburg. Mr. T. W. Demarest, superintendent motive power of the Southwest system, at Columbus, O., has been appointed to succeed Mr. Crawford as superintendent of motive power of the Northwest system, at Fort Wayne, Ind. Mr. Demarest has been succeeded by M. Dunn, master mechanic at Columbus. Mr. Dunn is in turn succeeded by S. W. Miller, master mechanic at Logansport, Ind. G. C. Bishop, master mechanic at Wellsville, on the Northwest system, goes to Logansport, on the Southwest system, in the same capacity, and W. C. A. Henry, assistant engineer motive department, at Fort Wayne, succeeds to Mr. Bishop's place. Mr. Crawford is a former Pennsylvania Railroad man, having started with this company at Altoona. He was appointed to a minor position in the motive power department of the Pennsylvania lines west, and in 1899 succeeded Mr. Potter as superintendent of motive power of the Northwest system.

Notes of the Month

Mountains, Lake, Rivers, Seashore, Picturesque and Charles River to the Hudson are the titles of six beautiful portfolios published by the Boston & Maine Railroad Passenger Department, Boston.

Each portfolio contains thirty or more half-tone reproductions of views along the Boston & Maine Railroad, representing, as the titles indicate, river, mountain, lake and seashore pictures, while "Picturesque" portrays numerous old historical and miscellaneous scenes throughout New England.

"The Charles River to the Hudson" takes in the scenes all along the Fitchburg Division including Deerfield Valley and the famous Hoosac Country.

This set of books will be mailed to any address upon receipt of six cents for each book or thirty-six cents for the whole set.

The old and well-known firm of Thomas H. Dallett & Co., of Philadelphia, has lately been reorganized and incorporated as the Thomas H. Dallett Company, with officers as follows: President, Thomas H. Dallett; vice-president and general manager, Ernest C. Bliss; secretary and treasurer, E. C. Clay; with W. H. Van Sickel, late New York representative of the Under-Feed Stoker Coompany of America, and formerly identified with the pneumatic tool industry, as superintendent. The company will greatly extend and enlarge the capacity of their plant, located at York street and Sedgley avenue, and while continuing the manufacturing of their well-known belt and electrically driven portable drills, deck planes, etc., will devote special attention to the production of "Dallett" pneumatic tools. Their works are equipped with the latest and most improved machinery and the extensions projected are necessary to enable them to supply the demand for the "Dallett" tools, which have by their intrinsic merit gained an enviable reputation.

F. M. Hicks has orders for the following equipment: Two 10-wheelers for the Midland Valley Railroad; one freight locomotive for the Louisville & Atlantic Railroad Co.; one logging engine for the Arkansas Lumber Co.; twenty-five flat cars and twelve box cars for the Midland Valley R. R.; forty flat cars for the Orange & Northwestern R. R.; five flat cars for the Toledo, Port Clinton & Lakeside Railway; seven tank cars for the Santa Fe Central Railway; fifteen box cars for the Denver, Enid & Gulf Railroad; eight flat cars for the Inter-Urban Railway of Des Moines. Miscellaneous orders for freight cars for Cleveland, Painesville & Ashtabula Railway Co.; Oscar Daniels Co., contractors; Western Wheeled Scraper Co., Crossett Lumber Co., Ohio River & Columbia Railway Co., L. H. Vaughan & Co., contractors; Thomas Phee, contractor; Laquin Lumber Co., railroad contractors.

"Modern Machine Shop Tools," by William H. Van Dervoort, is a comprehensive work embracing complete information relative to the construction, operation and manipulation of both hand and machine tools appearing in usual machine shop practice. The book is the outgrowth of a series of articles prepared for the students in machine shop practice at the University of Illinois and contains much practical instruction prepared with a full appreciation of the influence of modern manufacturing shop methods upon the training of young mechanics. The work is logically arranged, the various hand and machine tools being grouped into classes, and a description of each is given in proportion to its relative importance. It includes chapters on filing, fitting and scraping surfaces; drills, reamers, taps and dies; the lathe and its tools; planers, shapers and their tools; milling machines and cutters; gear cutters and gear cutting; drilling machines and drill work; grinding machines and their work; hardening and tempering; gearing, belting and transmission machinery; useful data and tables. The mechanic will find many valuable suggestions which will assist him in his daily work and the foreman and shop superintendent will read this book to good advantage. It is well bound and contains 544 pages, well illustrated by 673 engravings. Published by Norman W. Henley & Co., 132 Nassau street, New York City. Price $4.

We have been advised that one of the competitors of the John F. Allen Co., after two years steady efforts, has finally admitted that his riveting machine was not a success and has withdrawn it from the market. To take its place his company is now introducing another style of riveter which embodies almost identical attachments of the Allen old style riveter, prior to patented improvements which were made during the past year, which embody a double lever toggle arrangement, and cut-off valve connection effecting a great saving of air. All users of riveting machines are advised not to confuse these machines with the genuine Allen riveter, or be persuaded that they are equally as good.

Howard W. White & Co., manufacturers, agents and dealers in iron and steel and special tools and machinery equipments, have recently opened offices in the Old Colony Building, Chicago, and contemplate extensive plans which will enable them to handle quick orders very effectually. Mr. White, the present active factor in the firm, is well known to large buyers of machinery in both the Chicago and eastern territories, having been connected with one of the largest Chicago iron and steel houses for the past several years.

The sales of the new company during the first month of its history exceeded 5,000 tons of metal, which, however, is but a beginning, for among the company's plans for extending its business is the construction of a large warehouse at Chicago which will offer facilities for handling and maintaining a large stock which can readily be drawn upon. That the firm will conduct business on modern and improved lines seems to be foreshadowed by some innovations which they are adopting.

In addition to the regular lines of iron and steel plates, bars, bands, structural material, etc., carried, will be machine tools of well known manufacturers. Among the special lines handled are hydraulic tools and machinery, air hoists and compressors, electric cranes, pneumatic tools and various kinds of special machinery and tools for railroads, manufacturers, boilermakers, mines, etc., Another specialty will be locomotive jackets, iron and steel; high grade, smoothly finished steel and iron and tinplate stock for all classes of plating, stamping spinning, enameling, etc.; electrical sheets, iron and steel aluminum coated sheets; special smooth finished, rolled or hammered charcoal iron sheets; hot and cold rolled "strip" steel for high grade metal specialties; special bright dead soft strips for bicycle, sewing machine, typewriter parts, etc.; iron and steel skelp for pipe and boiler tubes; high or low carbon Bessemer or open hearth skelp for shovel manufacturers and agricultural implement makers; also pig iron and coke, billets and sheet bars, lap welded charcoal iron and steel and seamless cold drawn locomotive boiler tubes, double refined iron and open hearth or Bessemer steel rivets, Bessemer or open hearth steel, and nickel tool steel.

The company have in course of compilation a large catalogue, which will possess novel features, and be bound in genuine black seal. In addition to the long line of goods described there will be many tables of value and blank pages for the convenience of the user.

New Service on the Erie

The Erie Railroad announces a new service to Cambridge Springs, Chautauqua Lake and Buffalo. The trains are solid wide vestibuled between Chicago and Buffalo, drawing-room sleeping cars from and to Chicago and Cincinnati and dining car service. The announcement is made in an exceedingly unique and catchy circular.

The Thousand Islands

There may be somewhere on the earth a more delightful region than that of the Thousand Isles, but if there is, it has not been discovered. It is the Venice of America, but also has good hotels that can be kept warm if there shall happen to be a cold rainy evening. It is as fine as the Bay of Naples, with 2,000 picturesque Islands scattered along the twenty-five miles of one of the most beautiful rivers in the world. You can find out a great deal regarding it in No. 10 of the "Four-Track Series," "The Thousand Islands." Copy will be mailed free on receipt of a 2-cent stamp by George H. Daniels, General Passenger Agent, Grand Central Station, New York.

Model Time Table Folders

Model time table folders, which are superior to any time table folders ever printed, have been issued by the New York Central's passenger department. They are Numbers "29" and "30" of the famous "Four-Track Series," and both are literary gems and compendiums of railway travel. General Passenger Agent George H. Daniels has incorporated various suggestions made by bright people, and he has tried to include in these folders all that could reasonably be put into such books.

They are worth a prominent position in every library, and on every business man's desk.—From the Buffalo Commercial.

The New Graphite Lubricant

In all the essentials of a first-class lubricator, "Number 205 Lubricating Graphite," manufactured by the United States Graphite Co., Saginaw, Mich., commends itself to all who have to do with engines or machinery. It is absolutely pure and is prepared perfectly. Besides a lubricant it is conveniently usable mixed with oil as a roof or stack paint or pipe-joint compound. A sample quarter-pound can is offered for free trial to any one interested, as is also an instructive booklet on graphite lubrication. Reference is suggested to the manufacturer's advertisement appearing on another page of this issue.

Cheap Tickets to Colorado

The Chicago, Burlington & Quincy Railway is going to make it easy for people of moderate means to spend their vacations in Colorado this summer. In the average outing the two largest items are those of transportation and board. This is the way the transportation item is to be taken care of:

From June 1 to September 30 the company will sell round-trip tickets to Denver, Colorado Springs and Pueblo at half fare, plus 50 cents. This means $30 for the round trip from Chicago; $25 from St. Louis. Good returning until October 31, 1903.

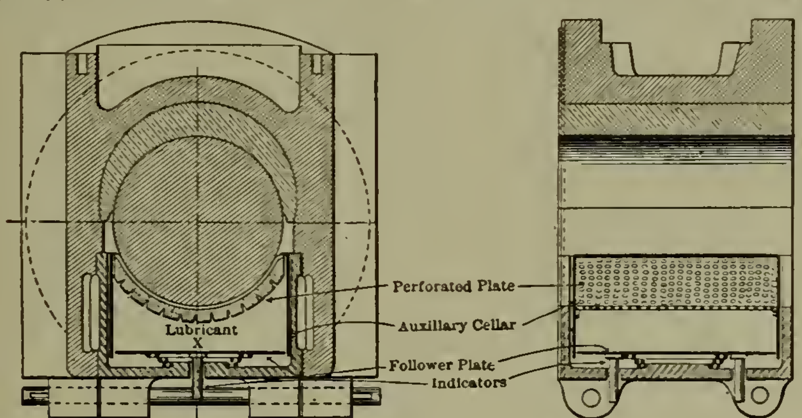
It is figured that the board item will take care of itself, because Colorado has so many moderate-priced hotels and boarding houses. Excellent fare and good quarters can be had for as little as $8 to $10 per week.

Send for a copy of the "Colorado Handbook"—it's free. This handy little work tells just what you want to know about the hotels and boarding houses.

Automatic Driving Box Lubricator

One of the difficult problems confronting the motive power departments of railroads to-day, particularly with the present tendencies towards heavier locomotives, is that of hot driver boxes. It was recognized that the one commonest cause of such difficulties is the drawing of small particles of waste in between the journal and brass, though there are other causes which are less easily determined.

With this fact in view, and in order to alleviate the difficulty, the Elvin Automatic Driving Box Lubricator has been designed, and was patented November 10, 1902. It is adapted for the use of a solid lubricant instead of oil, doing away entirely with the use of waste in consequence. It consists of an auxiliary cellar fitted into the regular cellar, as shown in the accompanying line drawing, which shows a section of the driving box with the device applied. Fitted into the auxiliary cellar and engaging the journal is a perforated plate containing 2,200 very minute holes. These perforations are made very fine in order that the journal cannot tear away the lubricant, and this feature affords the tremendous economy which the device accomplishes. Working within the auxiliary cellar with the solid lubricant resting upon it is a follower plate as shown in the drawing. This feeds the lubricant against the perforated plate and to the journal under the pressure of the spring. Attached to the bottom of the follower plate and protruding through the bottom of the regular cellar are two indicators which are in easy view of the engineman and serve the purpose of determining the quantity of lubricant in the cellars. These indicators are so arranged that they entirely disappear when there is still enough lubricant in the cellars to run the engine 10,000 miles, thus offering an unusual factor of safety against running the driving boxes dry. This device has had more than 12 months' service upon one of the largest railway systems of the United States and has been introduced upon forty additional roads within the past few months. The average mileage of an engine bearing the device is from 60,000 to 70,000 miles without refilling the cellars. One engine has attained a record of over 100,000 miles without renewing the lubricant. An engine of the consolidation type weighing 193,000 pounds has a record of 55,000 miles with 36 pounds of lubricant. In connection with a recent test a run of 36 miles was made



Automatic Driver Box Lubricator.

in 29 minutes, 9.2 miles of this being made in 6 minutes, without raising the temperature of the driving journals above the point which would have been attained had the speed been but 25 miles per hour. On this particular division, where all the engines are equipped with the lubricator, from 75 to 80 miles per hour is attained daily.

The most remarkable feature of this device is that there is not now a record of a single detention chargeable to driver boxes equipped with the lubricator. A truly wonderful record, and this notwithstanding the fact that many of the engines, when the device was first applied, have had bad records on their division on account of hot driver boxes.

The lubricator is applied to the average cellar without that part having to be altered and to all cellars with slight modifications thereto. In addition to the economy occasioned by the small quantity of lubricant required (and it will be understood that no oil whatever will be used), there is a tremendous saving in the packing of the boxes. The record of 100 consolidation engines, 70 per cent being equipped with the lubricator and 30 per cent with oil, shows that the engines using the oil had 2,305 boxes packed, while but 65 boxes bearing the device had to be repacked.

This device is marketed by the Coffin-Megeath Supply Co., Franklin, Pa.

Franklin Asbestos Dust Guard

Though usually considered among the minor parts of car equipment the dust guard bears a very significant part in the successful operation of a car journal. As the effect resulting from the entrance of dust and cinders into a journal box is well known it is useless to dwell upon the necessity of an effectual guard, further than to emphasize the necessity of a guard which is durable and will not be affected by heat in case of hot boxes.

An indestructible guard which will not swell in the box, burn or crack, has been made of long fibre asbestos and is found to be of simple construction, strong and adjustable. Two forms of this guard are shown herewith, the solid asbestos and the adjustable asbestos guards. The oil and waste

Solid Asbestos Dust Guard.

Adjustable Asbestos Dust Guard.

with which a box is packed may burn out, but being noncombustible the asbestos guard will not be affected in the least. Furthermore, this material is found to have very lasting qualities, with the result that asbestos guards will outlast the life of a set of wheels and they are no more expensive than wooden guards.

This guard known as the Franklin asbestos dust guard is manufactured by the Franklin Manufacturing Co., Franklin, Pa.

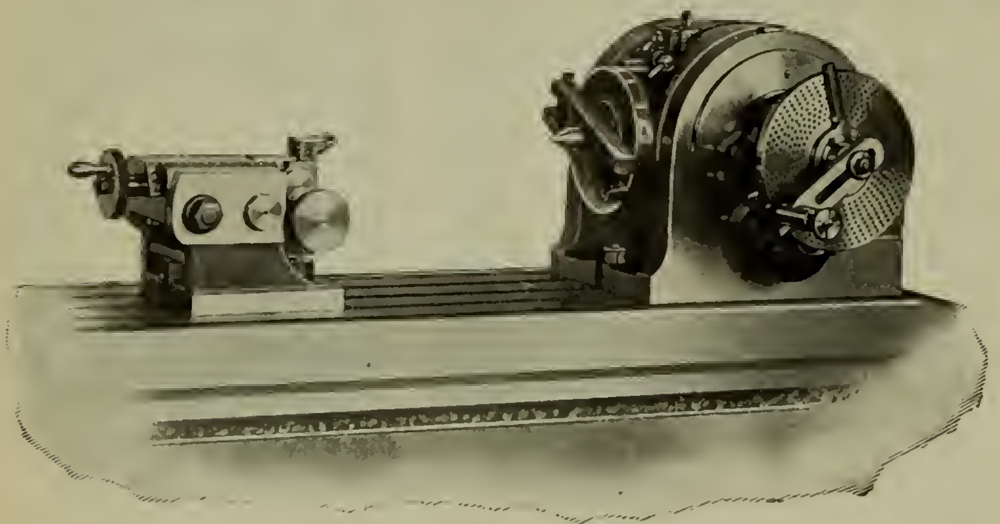
Index Head For Universal Milling Machines

The illustration herewith shows a new universal indexing and dividing head for Universal milling machines, giving an idea of the general appearance of the head and tail stock as well. It is arranged for making all divisions up to and including 360. Some of the details are entirely new, particularly the method of taking up wear between worm and worm wheel, and the arrangement for clamping swivel block at an angle. Angular settings of the work spindle can be made from 5 degrees below the horizontal to 50 degrees beyond the perpendicular when geared to Universal machines. When fitted to plain machines it may be swiveled through a complete circle if the front index plate is removed.

The worm and worm wheel may be thrown out of mesh for any position of the work spindle by turning the T-bolt through half a turn, and this is accomplished without removing any parts, slacking up any locknuts, or disturbing any adjustments whatever. The motion of the T-bolt is positive, and it comes to a dead stop. The end of this T-bolt engages a slide attached to the worm casing, which slide is free to move endwise. The worm casing itself being confined between the walls of the swivel block can only move in a vertical direction. The slide takes the horizontal motion of the eccentric end of the T-bolt. From this it will be seen that the worm moves away from, or toward the worm wheel in a plane perpendicular to the axis of the worm wheel.

Compensation for wear between these members is obtained by adjusting the screws which attach the slide holder to the worm casing. It will be noticed that this compensation for wear is made along the same straight line in which the worm moves away from the worm wheel when disengaging, so that these parts may be adjusted repeatedly without danger of disturbing their alignment.

The method of clamping the swivel block is rather novel, and deserves attention because of its extreme simplicity. The swivel block has large trunnions, and it is firmly secured in any position by means of the clamping straps, which are made to grip the trunnions by tightening two cap screws. These trunnion bearings have an arc of contact of 360 degrees; are always fully protected, no part of them being exposed at any time, no matter at what angle the spindle is set. The entire mechanism is symmetrical in design and is very rigid in its construction. There are no openings to the inside and all gears on outside are completely covered and protected from dirt, at the same time insuring safety to the operator. The worm wheel is larger in diameter than is usual on mechanisms of this sort.



Index Head for Universal Milling Machine.

Instead of the usual single notch on the index plate for locking, there is a series of small notches milled on the edge of the plate which permit of moving the plate a very small amount, which is very often convenient when adjusting work to the cutter.

The work spindle is provided for adjustment to compensate for wear, and it is provided with a clamping device, by means of which it can be firmly locked during cutting operations without disturbing the accuracy of the spacing.

The tail stock has the usual elevating center. It may be set at any angle up to 10 degrees above or below horizontal to bring the centers in line with the center of the work when milling taper reamers or similar work.

This dividing head is made in three sizes, 10, 12 and 14 inches swing. It is made by the Cincinnati Milling Machine Co., Cincinnati, Ohio.

The Nelson Loose Pulley

This loose pulley, herewith illustrated, is somewhat of a departure from the average attempt at producing a satisfactory loose pulley for the high speeds to which they are subjected in wood-working shops. Unlike others, it is not honey-combed with oil grooves, channels and chambers, nor is it bushed with wood, babbitt or other materials for the purpose of reducing friction.

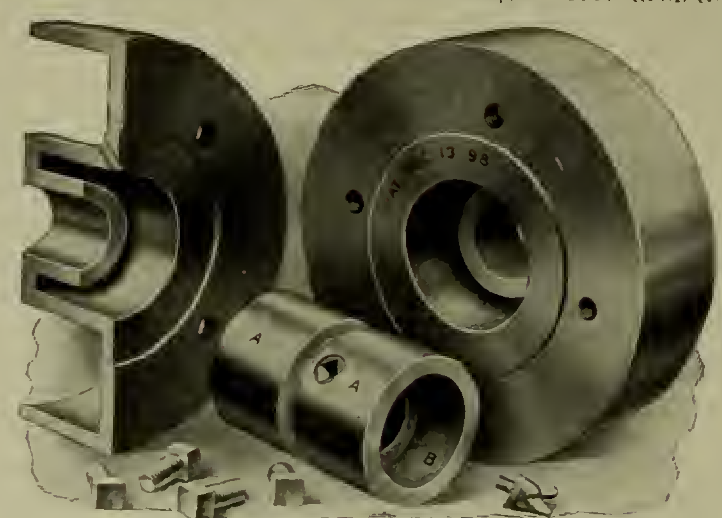
What has been accomplished, however, is the provision for an exceedingly large amount of bearing surface and this appears to have been done in a very simple, and at the same time efficient manner.

The sleeve, fastened to the shaft, provides for the bearing surface not only by its increased diameter but also by having in each end a bearing for the pulley, as shown at B, in the illustration.

The ordinary loose pulley hub is too short and the diameter of the shaft too small to provide sufficient bearing surface to prevent the belt tension forcing the oil from between the surfaces and nearly all failures of loose pulleys can be justly attributed to this cause. No matter what materials are used in bearings they cannot successfully run together without oil and this oil should be present in so thick a film that contact of the surfaces is impossible.

As, however, the oil is retained in any bearing by the capillary attraction, and forced out by the pressure on the bearing, it is obvious that there must be provided some means of producing sufficient capillary attraction to prevent the oil being pressed out from between the surfaces or, the capillary attraction remaining the same there should be provided sufficient bearing surface so that the pressure per square inch will be reduced to an amount where it is incapable of forcing out the oil. Then will the bearing be successful, not only as regards proper lubrication but also in eliminating wear.

It should here be noticed that the oil chamber is between bearing surface and the shaft so that centrifugal force assists lubrication and as the higher the speed the greater this force, lubrication is greatest when most needed.



Nelson Loose Pulley.

The makers prefer the use of the word "eliminating" to the word "reducing" here and as they claim, apparently justly, that in these pulleys the film of oil interposed between the bearing surfaces is so thick that at no time is there a metal to metal contact and the pulley thus virtually floats on the oil and no wear is perceptible even after years of use.

Now, if this pulley were of such construction that dirt or dust could easily enter it and destroy the lubricating properties of the oil, its large amount of bearing surface would be of little avail, but it is happily so constructed that it is impossible for either the oil to get out or dust to enter. The oil, therefore, remains clean and a perfect lubricant so that but very little of this is required. Aside from the above, the makers state that in every other feature this pulley is equally desirable. Its oil tightness prevents its throwing oil on the belts. Its design is such that it does not wear the shaft and needs but little oil. It is noiseless, runs very easily and requires but little power so that looking at it from every point of view the pulley appears to be very desirable, as indeed has been proven by nearly five years of continued use; several of them in places where no other form of loose pulley has ever been found to stand up to the severe test.

While this pulley as above indicated is not entirely new, it is nevertheless comparatively unknown as it has been made for five years without being advertised, in a small way, in Chicago, but the present makers, the Wilmarth & Morman Co., of Grand Rapids, Michigan, were attracted by its remarkable record and having purchased the patents have now taken up its manufacture. These people, already well known by their New Yankee drill grinders, will see to it that the pulleys are correct in every detail.

Convention Echoes

We publish herewith a couple of interesting pictures which should have been included in our "Snap Shots" last month but were overlooked. One photograph is of Mr. L. H. Turner,

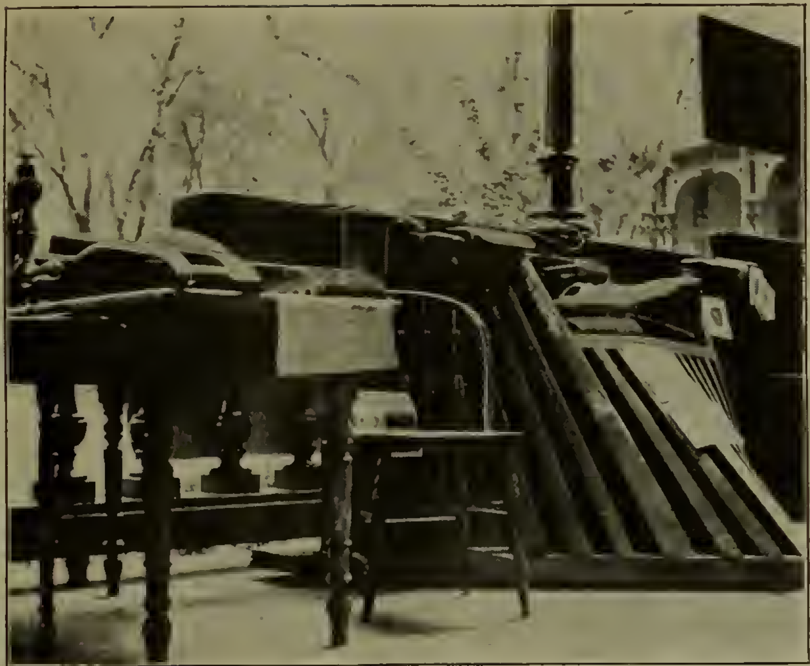


EXHIBIT HANDY CAR EQUIPMENT COMPANY.

L. H. TURNER, S. M. P. OF THE P. & L. E. AND J. H. MITCHELL, PRESSED STEEL CAR COMPANY.

superintendent of motive power of the Pittsburg and Lake Erie, taken with Mr. J. H. Mitchell, sales agent of the Pressed Steel Car Company at Chicago. The other photograph shows the exhibit of the Handy Car Equipment Company of Chicago.

The Car Foremen's Association of Chicago

July Meeting

NOTICE.

The Committee is at work arranging for the annual picnic. The plan is to give a railroad excursion to some ideal, nearby picnic grounds where the Association members can indulge in all kinds of out-door sports. This will be free to all members (in good standing) and their families.

To those who have not attended any of these excursions we suggest that you ask those who have. We promise to give you a better time and more fun for your money (it is all free) than you have ever had in one day in your life. After it is over, if you are not satisfied and will report to any officer of the Association, you can have your choice, viz. your money back or a picture of the president.

Announcement as to date, time, etc., will be made later, but in the meantime just plan for this great event.

Committee.

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209, Masonic Temple, Chicago, Wednesday, July 8th, at eight o'clock p. m. In the absence of President Parish, Vice-President La Rue presided.

Among those present were the following:

Bates, G. M.	Plum, C. J.	Depue, Jas.
Deane, J.	Harris, S. H.	Jones, R. R.
Joseph, H. A.	Kaminski, W.	Kline, Aaron
La Rue, H.	Morris, T. R.	Nordquist, Chas.
O'Neill, Jas.	Pettis, C. D.	Powell, C. R.
Shearman, C. S.	Treptow, A.	Terry O. N.
Wensley, W. H.		

The minutes of June meeting, not yet having been printed, the matter of approving them was laid over.

Secretary Kline: The following have made application for membership:

F. J. Campbell, Car Foreman, C. R. I. & P., Bucklin, Kans.
E. L. Cress, Car Foreman, C. R. I. & M., Dalhart, Tex.
W. Carney, Chief Clerk, C. R. I. & P., Peoria, Ill.
H. Fletcher, Car Foreman, C. R. I. & P., Herington, Kans.
J. H. Hank, Gen. Foreman, C. R. I. & P., Peoria, Ill.
O. S. Hamilton, Foreman, C. B. & Q., Aurora, Ill.
C. M. Jones, Train Master, C. R. I. & P., Bucklin, Kans.
W. W. Leeman, Master Mechanic, C. R. I. & M., Dalhart, Tex.
B. H. Lynn, Foreman, L. S. & M. S., Toledo, O.
D. J. McOsker, Foreman, A. T. & S. F. Ry., Chicago.
A. A. McGregor, Gen. Foreman, C. & A., Chicago.
D. D. Robertson, Master Mechanic, C. R. I. & P., Herington, Kans.
Louis J. Schorr, Clerk, C. B. & Q., Aurora, Ill.
Geo. N. Terry, F. C. I., L. S. & M. S., Kalamazoo, Mich.
F. J. Welch, R. H. Foreman, C. R. I. & M., Dalhart, Tex.
J. M. Yoder, Road Foreman Engines, C. R. I. & P., Herington, Kans.

Mr. Morris: Under the head of "unfinished business" I would like to bring up the matter of the election of a Second Vice-President. The Constitution now provides for a Second Vice-President, but I do not think one has been elected and I would move that a nominating committee be appointed to present a nominee for this position. Motion seconded and carried.

Mr. La Rue: I will appoint on that committee, Mr. Morris, Mr. Bates and Mr. Powell.

Mr. La Rue: This brings us to the program of the evening, the first subject of which is, "What is the relative value of filled vs. lined brasses, taking into consideration the liability for heating and length of service."

Mr. Morris (C. M. & St. P.): The company I am with has had quite a little experience with filled bearings, but for a little more than a year past we have been using lined brasses in our passenger cars instead of filled. Of course there is quite a difference in the various kinds of filled bearings and I believe we had,—well I will say not the best. The trouble with the filled bearing, in my mind, lies in the fact that the shell, in a good many cases, is too light. They are perhaps all right for the low capacity car we had years ago, but at the present time the very heavy cars being run the shell is not firm or strong enough to hold the weight put upon it. The consequence was that a great many of them broke through the back and got out of line generally. Another thing is,—when the filled bearing heats the filling melts out and there is actually nothing left to run on. We had a great many cases such as that.

In the case of a good lined bearing, if the lining should melt out you would still have a good solid back or brass to work on and we have all seen lined brasses that have been hot, come in, that have started to come to a very smooth surface and are running all right. I do not believe we can get as good service, so far as running cool is concerned, with a filled bearing as we can with a lined. Of course it makes all the difference in the world whether the filling or lining is good or bad. A good lined bearing should be bored out and the lining soldered on, so that when the lining melts out the wear would gradually come on to the brass without any sudden change from a smooth surface to a rough one.

As to the life of a filled and a lined brass, our experience has been that there would probably be 10 to 15 per cent longer service with a lined brass. Of course so far as the cost of the two brasses is concerned, I suppose there is no two ways of looking at it,—the filled brass is much cheaper, but I venture to say that it is dearer in the long run, considering the use and service they give.

Mr. Pettis (I. C.): I would like to ask Mr. Morris if in his figures of 15 per cent more service from a solid brass, compared with a filled-one, all features are taken into consideration? That is length of service, breakage, cost, etc.? For instance in putting 1,000 filled brasses and 1,000 solid brasses in service under the same conditions, would not the percentage of efficiency be higher than 15 per cent for the solid bearing? Considering such features as the lining, melting out of the filled brass, account of running hot and the shell breaking, thus rendering it unfit for further use; this result not existing to such extent with the solid bearing. In fact I have seen cases, as Mr. Morris mentions, of solid brasses running hot and lining melting out, nevertheless the journal had gotten a seat on the brass proper and afforded further service. Another important feature entering into this subject is the question of mixtures of the lining. If too soft, under excessive weight there seems to be a tendency of the lining to slip to one side. On the other hand, if the lining is too high in proportions of antimony and tin with heavy loading, it will crack, impairing its usefulness

Mr. Morris: I think it would. My remarks referred to a filled brass as compared with the lined brass, both brasses running out their full life. That is, when taking into consideration the fact that many of the filled brasses break and a great many of them, when getting hot, would have the shell spoiled for further re-filling, I think the percentage would be still higher in favor of the solid brass. I believe that the only feature, as I said, wherein the filled brass is ahead of the other, is the possibility to re-fill that shell, which makes a cheaper brass,—that is, apparently cheaper. I question whether in the long run it would be cheaper if we could follow the brasses right out from one year's end to the other.

Mr. Treptow (L. S. & M. S.): I believe that the filled brass is out of date for the heavy capacity cars. The company I am with does not use any filled brasses, it only uses lined brasses, but we have had a good many broken brasses in refrigerator cars loaded with export beef from packing town; we used to find from three to six broken brasses in a train. Of course this delayed the train, and the party who owned the cars wanted to know how it could be that there were so many broken brasses in the cars. They had men where the cars were loaded who examined the brasses carefully, but when the cars came over the crossings from Packingtown we would find a number of broken brasses. These were not worn out brasses, some of them were as thick as if newly applied. The filled brasses crack right in the center; we very seldom find any solid brasses broken. I think in the long run the solid brass, or lined brass, is much cheaper than the filled brass. They were all right for the light capacity cars, but with the heavy capacity cars the railroads are using nowadays, the shells are not strong enough, and I believe so far as running hot is concerned, the lined brass will run just as well as the filled brass will. Hot boxes are the result of packing more than anything else.

Mr. La Rue. (C. R. I. & P.): My experience with the filled brasses has not been extended any great length of time.—possibly three years, and then only with light capacity cars, 40,000 and 50,000 and possibly a few 60,000-lb. cars. Our present practice is a solid brass with a lead lining. The brass is bored to the true circle as required for the different sizes of journals. Then, if from any cause the brass is removed, like change of wheels or anything of that kind, even if the brass is half worn out, it is re-filled. We do not re-cast a brass until it is worn out. We re-fill brasses the second time, or third time, and possibly some of them four or five times, where change of brass is occasioned by change of wheels or change of brasses under respective journals and I am of the same opinion as the gentlemen who have spoken, that for the heavy capacity cars I really do not know anybody that is using a filled brass on the heavy capacity car. From my experience with a filled brass, before I went with the road that used a filled brass, I was strongly in favor of the solid brass. My experience in the contract shop in using filled brasses on new cars leaving the shop was a great ways from being satisfactory,—a great ways, but in going with the road that used a filled bearing and was very careful with their mixture, really more than ordinarily careful with it, very good results were obtained and at that time I thought that the filled brass really answered every purpose that the solid brass did, but as for myself to say, even if I was going to buy them for myself, I would be in favor of the solid brass for heavy capacity cars. Our passenger brasses, when new, are filled with a soft lining. When they are refilled they are filled with a harder mixture and a mixture that is more costly than the brass itself and we find that we get the very best results from it. The experiments were conducted before I went with the road, in regard to the more expensive metal, and it is being continued to this day.

Mr. Bates (C. B. & Q.): We are now using filled brasses on our heavy capacity cars, but we have not been using them long enough to learn very much about their performance in service. At the present time we are using nothing but filled brasses in our cars, both passenger and freight. We have been getting the heavy 80-000-lb. capacity cars about two years, and I believe the first of these had solid brasses and only the later ones have the filled brasses. We have not had very much trouble with them up to this time, but I do not know how they are going to turn out.

Mr. La Rue: Mr. Bates, don't you think in the use of the filled bearings on new cars that that was really the first cause of your putting the card on the car that the loading for the first trip should only be so much.

Mr. Bates: No, I do not think so, because on our road we always put the card on new cars, and also on cars that receive new journals all around. That has always been the practice since I have been on the road.

Mr. Pettis: What has been your experience in the matter of the harder lining so far as cracking is concerned? I ask that question, as your information relative to difference in cost and service results occasioned some experiments of which I am aware, as to the service ability obtained with the harder metal, compared with the softer in the original lining. It was my opinion that the lining being used was too hard and too expensive. Several passenger cars had the journals in truck at one end equipped with the softer lined brasses and the brasses in the other truck equipped with the harder mixture. The softer lining was composed of 95 per cent lead, 4 per cent antimony and 1 per cent tin. The harder lining, if I recall correctly, was composed of 74 per cent lead, 18 per cent antimony and 8 per cent tin. . The cars were put in service and at the expiration of two years the same brasses were in the cars with the exception of two. It was necessary to remove these two brasses on account of the lining in both of the harder mixtures being cracked and broken. None of the bearings with the softer lining required removal for any cause; in fact there was no evidence that ony of the brasses had been heating. My experience favored the softer mixture, as the results accomplished were more satisfactory, for that reason, I ask the question as to what had been your observation with lining of harder mixture cracking and causing trouble.

Mr. La Rue. In answer to Mr. Pettis, to my personal knowledge, we have had no trouble with the lining cracking. What the proportions in the mixture are I am unable to say. These experiments were conducted before I went with the road and the conclusions arrived at, and there has been no change made. In passenger service we aim to use on new journals a softer metal, then after the journal comes back from the shop the second time we put in the harder metal.

As to the cracking, I had some experience last summer and winter with some special brasses, four of them. They were removed in due course of time for wheels to be re-turned. Those brasses were all in first class shape except one. In that one the metal lining was considerably cracked. The question was asked was I going to put that back again. I said "yes, most assuredly." Under what conditions? I said, "after it has been scraped or rebored to the required diameter." We did so. The brass is still in the car so that I do not think that the fine cracks that will sometimes develop in the harder metal cuts much figure if it has come down to a good bearing.

Mr. Pettis: The brasses I referred to as being removed were lined with the harder metal and the lining was not only cracked, but there were small pieces missing, possibly a half square inch or three-quarters square inch in size, leaving parts of the brass where the axle did not touch; and to allow to remain in service would seem a little hazardous. The journal did not have a full bearing and it was a question of putting in a new brass or relining the old one. There were four cars in the test and none of the brasses at the expiration of the two years were defective; and one only, had worn until the journal was bearing on the brass itself, the lining having taken all the wear. This led me to believe it would be economy to devote sufficient care to the mixture to obtain the best results, for when the journals began wearing through the lining it would obtain a good seat before the lining was entirely gone.

Mr. La Rue: There is one thing I noticed on the road that used the filled bearing, which was this,—every employe connected with the running of the train knew that those were filled bearings and as soon as it was shown that there was any development of heating in that box it was immediately attended to. I will say this, there were fewer, in my opinion (I have no figures to substantiate it) there were fewer rough and damaged journals caused by the journals running hot or the brasses being hot, than there is where the solid brasses are used.

Mr. Pettis: Don't you think that means a liberal application of oil?

Mr. La Rue: No, not so much that. I may be mistaken in my idea but I think with the solid brasses the trainmen will take the car into the terminals if it is possible to do it, regardless of the consequences, where with the filled bearing they would either change it or if it is possible, they do not think changing of the brass will take it in, they will run a solid brass to the terminals if it is possible to do it.

Mr. Morris: Since we have abandoned the use of filled brasses in passenger cars we have used, I cannot say what percentage less, but the number we have saved in application has been a great many, and another thing, we have noticed in our filled brasses a very large number of them crack through the center before they are nearly worn out, the filling will crack. It is not only cracked, but the cracks run in various ways and pieces of the filling drop out and under such conditions the liability for heating certainly increases. There is another thing. —we have not started the use of the lined brasses on our freight cars yet and I do not know just what the results will be, but we all know that when a filled bearing begins to heat, if it is taken out and a lined bearing put in it will sometimes run cool for that time, but you cannot depend on a filled bearing running on a warm journal. It is going to melt out the same as this one and I think that counteracts in a way the condition you speak of in regard to running a lined brass longer than a filled one.

Mr. La Rue: I think the filled bearing, if there was the same care taken in designing the back as there should be, and the same care used in the mixture of the filling I do not see why it should not run as good as the solid brass. As I said before, my experience in the contract shops, extending over several years, with the filled bearings was not in it at all on new cars. It was almost an impossibility, if the cars were loaded out, to get them over the road the first trip, but as a general thing, when they come to a filled bearing they make it a filled bearing. There is nothing else to it,—possibly a small rib at the end, maybe one, or possibly two in the length of a 7-in. brass and a very small rib lengthways through the center. The shell would probably weigh 3½, not over 4 lbs. For that reason I think the filled bearing has been brought into disrepute by bad design.

Mr. Pettis: It seems to me the point in that connection is this. Assuming a filled brass with the diagonal ribs. They afford a certain area of contact for the journal and the lead part of the filling also affords a certain amount of area. The softer metal of the two would come quicker and more easily to a bearing than the harder metal. Consequently the ribs would bear the hardest on the journal and have the hardest part of the lead to carry; consequently the liability to heat would be greater. This increases the possibility of raising the temperature to the melting point for the lining. Another feature I believe is that the intersection of the diagonals and the corners afford greater opportunity for a crack to start, and when a crack is started the brass is at once defective and must be removed, as it cannot be told just how much longer it is going to last. For that reason it seems to me that the solid brass presents advantages for length of service and general desirability that the filled brass does not possess. Furthermore the extent to which the solid brass is used is of itself evidence that it is considered the superior one of the two.

Mr. La Rue: Mr. Pettis I do not consider a brass a filled brass, that, as you say, has diagonal braces in it where the brass comes in contact with the journal before it has to be removed. A filled brass, in my mind, is one that the brass back is never supposed to come in contact with the journal. It is merely a shell to carry the softer metal. I think I have in mind a style of brass that is referred to and I do not approve of that under any consideration, although it has been stated much cheaper to use and everything of that kind, but as Mr. Pettis has stated, that was my experience with a brass of that make and that shape and build. The way I understand, it is a shell merely to hold the filling and when it comes down to the brass part must be removed.

Mr. Pettis: I have seen many filled brasses where the journal had worn to the brass and was still serviceable, but just as soon as it reaches that point there is liability to failure. I entirely agree with you that just as long as the lining only of the filled brass comes in contact with the journal it is just as good for service as the solid brass.

Mr. La Rue: That was my reason for making the statement that a company using a filled bearing the employes would give it attention immediately. For instance a brass had been left in, as Mr. Pettis states, until it had become worn down to the ribs, if there was signs of heating it would immediately be attended to and another brass put in, and in the majority of cases there will be no further trouble.

Mr. Wensley (C. & E.): My experience has all been with the lined bearings as we do not use anything but lined bearings on our road. Our hot box report for the month of June did not show a hot box on the Chicago Division. We had eight or ten hot boxes on cars coming from foreign lines and in every case, except one, they were filled brasses. We never repack a box that has a filled bearing. We always remove the filled bearing and apply a lined bearing. If we find a hot box with a lined bearing we remove the brass and scrap it.

Mr. Terry (C. B. & Q.): I saw some experiments with malleable shells filled with lead, but they seemed to wear the collar of the journal too much and it also wore the malleable shell, I believe. The bearings were closely watched, as they were on locomotive tenders, but it seemed to crumble away where it cut into the malleable shell.

Mr. La Rue: Do you think that would come under the head of a filled bearing?

Mr. Terry: I think it would. It would have the same filling the brass would.

Mr. La Rue: As a general thing you will find, where you have a malleable back you will have three different metals in the brass,—the malleable back, then a harder metal and then a soft lining.

Mr. Terry: There were made with two metals in the malleable shell.

Mr. La Rue: I had experience at one time with a brass of that kind, a soft metal filling in a malleable back, and I do not care to repeat it. My experience was the same as the gentleman just quoted, it would almost take off the collar of the journal.

We will now take up Subject No. 2.—"A's car has one-half roof blown off on B's line. Car is sent home but A refuses to accept responsibility, claiming there is no authority for same in the rules, and furthermore, that the car does not show any signs of the roof being faultily constructed or in a defective condition."

Mr. Treptow: It is the general practice, I think, where the roof is blown off, to send the car home and it is considered an owner's defect. But as it states the roof was not defective it might be a case similar to the one decided by the Arbitration Committee a short time ago, where a whole train was blown from the track and carried away a couple of blocks. Of course in a case like that I cannot say. There are a great many cars running around which have loose roofs. I have seen cases where all the nails in the roof were sticking up about a half an inch, the roof is all loose and the running boards loose. I never heard of a company refusing to take its car home on account of roof blown off. Certainly it is not fit for loading and it is not safe for the trainmen. The company on whose line the roof is blown off is no more responsible than if it had blown off on the owner's line.

Mr. La Rue: It seems to me this is the same as a door lost off a car offered in interchange.

Mr. Bates: I would like to know if there were any indications showing that this car had been mis-used in any manner. If not and the roof was blown off it seems to me to be a clear case of owner's defects, and I do not believe I have have ever heard of a case where the owner refused his car with either all or part of the roof blown off. I think Rule 35 fully covers the case. It says,—"Locks, grain doors and all inside or concealed parts of cars missing or damaged under fair usage, and failure or loss under fair usage of any part of the body of the car." Now if a roof is blown off, as stated here, on a private line car it seems to me all that is necessary is to bill the car home to the owner and if it is a railroad company's car then of course it is necessary to take the matter up with the owner according to Rule 122, and if the owner saw fit to have the car sent home he would have to furnish home route cards. I do not see where the owner has any claim coming at all.

Mr. Morris: From the papers presented to the committee on subjects there was nothing to show that there was any defects on the car to indicate that it had received rough usage,—that is, nothing to show that it had been cornered or scraped in any way. I think the owner did not make any such claim. They stated that the car had passed through their hands not a great while ago and the roof was inspected by them as usual and found to be all right and that if it had been defective at that time it would have been made good. The railroad company that had the car in its possession when the damage occurred states positively that the roof was blown off. The owner of the car says it could not have blown off because it was in no way defective.

Mr. Pettis: This seems to be a case wherein the quantity of the roof that was missing is the important feature. In the case of a car with whole roof gone, it is accepted in general practice to allow the car to go home, the owner being responsible. There are a great many cases of cars sent home with the entire roof gone and the question of responsibility is never raised. Therefore, why should the question be raised if there is no evidence of misuse to the car, with just one-half of the roof gone. We might go farther and say that ⅞ of the roof was gone or ¾ of it. I am sure it will be generally admitted that one-half of the roof can be blown off as well as the entire roof, because the wind is very capricious. In my opinion the owner is just as much responsible for one-half a roof blown off as if the entire roof was blown off. There is another feature that enters into consideration, that is, what constitutes one-half of the roof. I presume it is intended to mean the top course of boards, or if it is a metal roof, the metal sheets also. There are a great many cars sent home with the purlins and carlins in place but the roof boards and roof sheets gone. If we are to be very technical in this case, do not the carlins and purlins form just as much a part of the roof as the roof sheets or boards? Taking these points into consideration, it seems to me the owner of the car is just as much responsible for one-half or three-fourths as he would be if the entire roof was blown off.

Mr. Morris: I think the owner of the car was honest in his belief that the roof of the car was in good condition when it left his hands. But we all know that the nails for securing the roof are very apt to become rusted, and we have all seen cars with the roofs apparently in good condition, where the nails are rusted and will admit of the roof being raised almost bodily. This damage, I believe, occurred in the west where they have wind storms of more or less severity, and I think it only fair to assume that the roof was blown off just as stated. The railroad company would not have any object in misstating a case of that kind, because the M. C. B. Rules give the possessor of the car privileges enough for making repairs and charging the owner for same without stooping to say anything that was not so. It does not seem to me that the owner has any ground at all for refusing to accept responsibility. His mere statement that the roof was in good condition when he inspected the car last should not go very far with anyone that understands the construction of cars and the liability of roofs to be blown off.

Mr. La Rue: Is there anything to show what kind of a roof it was—whether a metal or double board roof?

Mr. Morris: There is not. I believe, though, it was a refrigerator car.

Mr. Wensley: I would make a motion that it is the sense of this meeting that this is a case of owner's defects. If only one-half of the roof was gone there must have been something wrong or the other half would have gone with it. Carried.

Meeting adjourned.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

F. E. Fornwalt.

After rambling around in other fields for a while we return to the Pennsylvania fold again, and take pleasure this month in presenting to our readers another of that numerous brood of foremen painters on that great system, this time the successor of Mr. B. F. Wynn at the Harrisburg shops, Mr. F. E. Fornwalt, who was Mr. Wynn's assistant before he was transferred to the Pitcairn shop.

In 1882 Mr. Fornwalt began as an apprentice, and after serving the allotted time concluded to see some of our beautiful country, as well as to gain a wider knowledge of his trade, and launched out as a journeyman, and for several years followed this course, working in a number of the largest cities in the country.

Mr. F. E. Fornwalt.

In 1889 he cast his lot with the Pennsylvania railroad company at the Blairsville shops, remaining there as a workman until 1893, when these shops were abandoned. He then removed to Harrisburg shops as a workman. In 1899 he was made assistant foreman, and in 1900 was appointed foreman of painters at these shops, at which point he is at present located.

Mr. Fornwalt is among the more recent additions to the membership of our association, but, like most of his associates on the Pennsylvania, we trust that he will develop into a useful members, as well as an ornamental one. He attended the Setroit convention in 1900, also that in Boston last year.

He writes that there has recently been installed in his shops a battery of tank for storage purposes, with improved air system for drawing material; that blue prints are being prepared, and as as completed will be glad to send us a sketch, with explanations, for insertion in these columns, which we trust he will do at once.

The Foreman Painter's Efficiency

The foreman painter's efficiency, or inefficiency, as we view it, may depend largely upon his environment. Some men, it is true, are born leaders of men; they will, under the difficulties that would utterly discourage others with less strategy, push and energy, so organize their forces and press the battle as to be victorious under seeming defeat and bring order out of chaos.

Wilderness to "fight it out on this line if it takes all summer." The majority of men wilt and flinch under discouraging circumstances and are never at their best unless fortune smiles on their every movement and stomebody is ever and anon praising their work.

That some foreman painters of good ability would do well, if given a better chance, and are thrown down for the lack of fair show, we have not the slightest doubt. The relations of many such with their immediate superiors is often such as to stir the latter's envy, jealousy, or dislike, frequently on personal grounds only; and he ever after, instead of helping the foreman painter, proceeds to make it uncomfortable for him, until the latter is either virtually killed in ambition or roasted out altogether. And so it happens that a change of shoes is made for a corn that is on the other foot. A tombstone is set up at the grave of some one who has passed away that would better fit the graves of some now living. If all the Hamans could be hung on the gallows that they erect for the Mordecias this would be a happier world to live in.

The foreman painter is declared to be inefficient because he is not allowed to be otherwise, as strange a paradox as this may seem. He is too often dictated to by a prehistoric general foreman, instead of being assisted by one of the up-to-date kind. He is not allowed to select his own men, and if he has trouble with a man furnished him, the cause is attributed to the said foreman and not to the man—at heart, if not in reality—and in this way his hold on shop discipline is broken and he loses his grasp. This is all dead wrong. Any foreman painter worthy the name and place should hire or discharge his own men, as the case may be; the responsibility should be put upon him by his superior and then the results expected The superior should not be afraid of curtailing his own power in thus doing—he is not; he is simply increasing it by transfer to good shoulders, that is all. When some candidate for a position in the paint shop calls at the office asking for work, the superior should say, "You will have to see my foreman painter; I put that matter in his hands."

Then there are the other matters of materials, tools and appliances; these should be the selection of the foreman painter also, either directly or indirectly, in order to place the responsibility where it belongs and to expect the results desired. But alas! it is too often the case that the foreman painter has no voice in these important matters, and then he is blamed for the results as an inefficient factor in this unequal warfare. Often what he condemns is forced upon him by the purchasing power, and he is not given due consideration in tools and appliances by the shop foreman. Thus another nail is driven in his coffin.

Then as to methods of doing his work, while many will accord him much ability in this regard, there are some who will not allow him to classify the paint or varnish repairs that a car shall take when it arrives at his shop, but dictate just what shall be done to it, as whether to be burnt off, or repainted over old paint, "cut in," or varnished, and how many coats, etc. Indeed, we know one master car builder of a small road who would take the varnish brush out of his foreman's hand and show him how to varnish! In fact, some men's knowledge of paints and painting, which is of limited observation only, in their eyes is of more consequence than that of their foreman painter, who not only served his time to learn his trade, but has spent a lifetime at it as well.

Now while the young, full of ginger and ambition, will not stand such treatment, but will pack up and get out at once to more congenial fields, the old men will continue to be imposed upon, until somebody in authority knows better (if they ever do), because they have passed that point when they can go out on their merits and obtain work as journeymen at fair pay. So they endure it in silence and make the best of it—"grin and bear it"—with all ambition, spirit and self-respect ground out of them. They let things go their accustomed way until somebody—likely the very one responsible for it—wonders why that fellow, the said foreman painter, does not have "some get up and get" about him and do better work and more of it! The fact is, all life and ambition was crushed out of him long ago to lead off in anything, and so he tags the procession along as best he can and—draws his pay, which is necessary to have, or he would not stay. How can a man become successful as an all-round athlete in confinement with his hands tied? How can a flea show his jumping powers with your thumb on him? The writer once knew a foreman painter in a piecework shop who was taken sick with nervous prostration, and for some time while confined to his home, and even to his bed, the work-cards were sent up to him for correction; and still that foreman painter lost his own time! Also he went to the shop on holidays to set a man or two to work on some special hurried jobs, and yet lost the day himself! This, in addition to all the other things hereinbefore specified, were his to enjoy (?) Is it any wonder that some men become inefficient in the eyes of their would be superiors when all their life and spirit is drowned out by these repeated duckings?

But, heaven be thanked, these cases are exceptions rather than the rule, and that in most cases we are optimistic enough to believe the foreman painter is on a par with the rest of the foremen of the shop, if not actually in the lead in efficiency and enterprise, because he is treated as well, if not better, than others, and is exploiting his trade instead of being driven in it like cattle.

Official Notice of Annual Convention

The thirty-fourth annual convention of the Master Car and Locomotive Painters' Association will be held at Chicago, Ill., September 8-11, inclusive, convening at 10 a. m. Tuesday, the 8th. The headquarters of the Association will be at the Victoria Hotel.

The committee of arrangements have secured rates as low as $3 per day on the American plan. For extra accommodations, viz., rooms with bath, etc., an additional charge will be made. Rooms can be secured at any time in advance by writing to the hotel, and members and friends should attend to this at once.

Those having papers on the different subjects will please send their typewritten copies to the secretary ten days previous to the convention, to insure their presentation at the meeting.

A cordial invitation is extended to all the foremen car and locomotive painters throughout the States and Canada to meet with us in convention and profit by an interchange of ideas and enjoy the social intercourse.

Following is a list of the subjects to be presented at the meeting, with the committees assigned:

1. Best method and material for the interior finish of modern passenger cars, including hardwood, acid-burning treatment, fillers, stains, etc.

J. T. McCracken, Jackson & Sharpe Co., Wilmington, Del.

D. L. Paulus, Barney & Smith Car Co., Dayton, Ohio.

A. L. Allen, New York Central & Hudson River R. R., West Albany, N. Y.

2. Heating and ventilating car and locomotive paint shops.

J. F. Lanfersiek, Pittsburg, Cincinnati, Chicago & St. Louis Ry., Columbus, Ohio.

Wm. Mullendorf, Illinois Central R. R., Chicago, Ill.

W. H. Dutton, Lehigh Valley R. R., Sayre, Pa.

3. Which is the best method to pursue, touching up or cutting in?

John Gearhart, Pennsylvania R. R., Altoona, Pa.

Thos. Byrne, Chesapeake & Ohio R. R., Richmond, Va.

H. C. Herron, Ohio Central R. R. Kenton, O.

4. Essay—"Harmony in Color in Finishing and Furnishing the Modern Railway Passenger Car."

Chris. Clark, New York, Chicago & St. Louis Ry., Chicago, Ill.

5: The proper method of painting and maintaining a locomotive engine.

J. H. Kahler, Erie R. R., Meadville, Pa.

A. P. Dane, Boston & Maine R. R., Boston, Mass.

J. A. Jackson, Wisconsin Central R. R., North Fond du Lac, Wis.

7. The best method and material for painting and maintaining steel cars.

H. C. Lafferty, Pressed Steel Car Co., Allegheny, Pa.

W. O. Quest, Pittsburg & Lake Erie R. R., McKees Rocks, Pa.

J. D. Wright, Baltimore & Ohio R. R., Baltimore, Md.

7. Essay—"Is the Authority and Responsibility of the Master Painter Co-Equal?"

J. H. Pithard, Mobile & Ohio R. R., Whistler, Ala.

8. Essay—"The Copper-Sheathed Car."

J. A. Gohen, Cleveland, Cincinnati, Chicago & St. Louis Ry., Indianapolis, Ind.

9. What is the best material for the shop cleaning of passenger cars preparatory to painting or varnishing?

Robert Shore, Lake Shore & Michigan Southern Ry., Cleveland, Ohio.

Warner Bailey, Boston & Maine R. R., Concord, N. H.

A. J. Bishop, Northern Pacific R. R., St. Paul, Minn.

10. Report of Committee on Tests.

C. E. Copp, Boston & Maine R. R., Lawrence, Mass.

H. M. Butts, N. Y. C. & H. R. R. R., West Albany, N. Y.

C. E. Coons, St. Louis, Mo.

T. J. Hutchinson, Grand Trunk R. R., London, Ont.

C. D. Beyer, Louisville & Nashville Ry., Pensacola, Fla.

QUERIES.

1. Does any member advocate the use of steel wool in the paint shop?

2. Do we pay enough attention to the front ends of our locomotive engines?

3. Can you successfully paint galvanized iron without degalvanizing it?

4. What glass, if any, should be bedded?

5. Does any member still use a paint sprayer? If so, why?

6. Is there anything better than white lead for stenciling freight cars?

A daily exhibition of paint shop appliances by manufacturers or users.

With the July number we completed ten years of service editing a department devoted to the interests of the Master Car and Locomotive Painters' Association, beginning with the August, 1903, number of the Railroad Car Journal, which, in September, 1894, at Buffalo, was made the official organ of the association. We continued in that paper until it was merged into the Railroad Digest in January, 1901, and if the Digest until we began in the Master Mechanic in November, 1901. "The Railroad Paint Shop," so-called, a name given to this department by Mr. E. A. Phillips of the Car Journal when it was made the official organ, will be nine years old in September. We have scratched a good deal during this time to try to make this a live department—even the hair all off the top of our head!—and still we feel that we have failed—not in getting the hair off, but in making our columns what we wanted them to be.

For the year etnded June 30, 1903, the Boston & Maine R. R. put through its shops 1,468 cars of its passenger equipment for cleaning, painting and varnishing. Of this number 86 were burned off, 59 painted over old paint, and 71 were new or resheathed, or 217 in all painted; 1,089 cars were cut in, as against 724 the previous year, on account of a change to a lighter shade of body color. As the total output was 1,460 cars the previous year, and was excelled by eight cars this year, this shows that cutting in is as expeditious in turning out equipment as the old way of touching up, for the same number of men were employed, and the result is a much better looking car. We make mention of this because this subject is to be discussed at our next convention; 284 cars were varnished inside, and of the freight equipment 3,602 cars were painted complete, of the following classes: 2,357 box cars, 22 refrigerator, 365 coal and coke, 488 platform, 7 stock, 169 caboose, 126 dumps and log, 32 maintenance of way, 32 wrecking, 3 milk to run on freight trains (some 50 milk cars are varnished and run on passenger trains), and one chemical car. The company's principal locomotive shops, exclusive of car work, are at Boston, Mass., and Keene, N. H., but at Concord, N. H., Lyndonville, Vt., and Springfield, Mass., the locomotive painting is done by car department men, 195 engines and 198 tanks being done for the year ending June 30, at the three last-mentioned shops, as follows: 119 engines and 119 tanks at Concord, 60 engines and 62 tanks at Lyndonville, and 16 engines and 17 tanks at Springfield.

Notes and Comments

Secretary McKeon writes, in a note accompanying his official notice of the annual convention in another column, as follows: I heard from President Fitch last week. He is still in Sacramento as manager of the Sacramento Magic Specialty Co. He will be on hand to preside at the Chicago meeting."

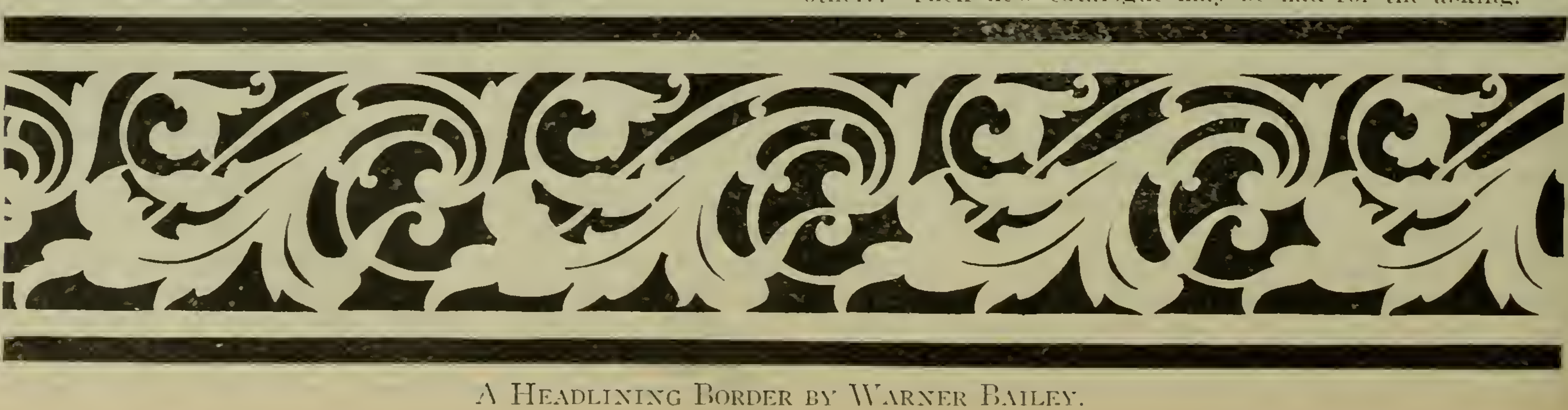
Mr. Carleton Ellis of Boston, inventor of "Phenoid" varnish remover and other specialties, graduate of Massachusetts Institute of Technology, specializing in chemistry, is a rising young chemist of much promise. He has for some time been investigating paint and varnish and kindred products and the makers of these articles will do well to consult with him or "fight shy of him," unless they are putting good goods on the market. He can take a varnish to pieces and tell what it is composed of, which has hitherto been considered a difficult if not practically impossible thing to do. Railroads looking for a chemist will do well to consult with him. He understands the nature of steel, iron, etc., as well as other materials.

We understand that Mr. Charles W. Mason, foreman painter, P. R. R., Altoona locomotive shops, is in a Philadelphia hospital for treatment. He has many friends among our associates, and readers will regret his illness and hope for his speedy recovery.

The Boston & Maine has been severely afflicted among its officials of late. Following close upon the decease of the aged superintendent of the Northern division, John W. Sanborn, came the sudden death of James E. Pickering, general foreman of car department at Boston, who was at his office as usual Friday, July 10, and died that night of acute indigestion. A brother of his, a trainman, died the same night. To cap all came the sudden demise of the first vice-president and general manager, Mr. T. A. McKinnon, who was taken at his desk, the same day as Mr. Pickering, with neuralgia of the heart, and died Sunday, July 12, at 2 a. m. He was respected and loved by all with whom he came in contact. Doubtless the excessively hot weather of that week had much to do with these deaths.

Calling on associate Samuel Brown of the Roxbury shops of the New York, New Haven & Hartford R. R., July 16, we went out to Readville, a few miles from there, to see the new car shops that have been erected and are now being fitted up. We expect to visit this plant later, when nearer completion, and, through the courtesy of Mr. W. P. Appleyard, M. C. B., give some definite and detailed description of it. Suffice it to say for the present that from an hour's glance about the premises we regard it as the best and most extensive plant for car work exclusively there is in this section of the country, if not in the United States, and when in running order, as it ought to be the coming winter, if the electric power plant can be completed and the power supplied, it will pay one to go a long way to see it. About 75 acres of land are used for shops and yard, and are fenced in, and there are about 12½ acres roofed in. One at first glance, as the paint shop is the first to be seen in approaching from the railroad station, is reminded of the Pennsylvania paint-shop at Altoona, as the external architecture is similar, and if permanent staging can be installed, the interior appointments will not be a whit behind that famous shop, and Bro. Ball can no longer claim the best paint-shop in the U. S. It has ten tracks that hold three cars each. But more anon.

A new catalogue that will be of particular interest to the paint department of railroads has just been issued by Chas. Kaestner & Co., Chicago, manufacturers of paint grinding mills, etc. The book is a handsome example of the printing art with the covers in blue and heavily embossed. It contains illustrations of the firm's latest constructions in mills designed for rapid and fine work and especially those mills designed for railroad work. The Chas. Kaestner Company are the oldest and largest manufacturers of paint grinding mills and mixers in the country. During the past ten years they have equipped some of the largest railroads and steel plants with complete paint manufacturing plants. Among them are the Chicago & Northwestern Ry., the C., M. & St. P. Ry., B. & O. Ry., Baldwin Locomotive Works, Illinois Steel Co. and others. Their new catalogue may be had for the asking.



A Headlining Border by Warner Bailey.

Established 1878.

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Maham H. Haig, Associate Editor.

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THE eleventh annual convention of the Traveling Engineers' Association will be held at the Stratford Hotel, Chicago, beginning the eighth of this month, September, 1903. The list of subjects to be considered was presented on page 358 of the August issue of the Railway Master Mechanic. Judging by the points to be brought up for consideration and the manner in which this association has acquitted itself in the past, it is believed that the coming convention will be very instructive. The results of the meeting will be anticipated with especial interest in view of the report to be presented upon the design of locomotive front ends, as it was promised by Mr. W. G. Wallace at the Master Mechanics' convention that the association will this year recommend a front end which will be practical and worthy of consideration. The paper on handling compound locomotives will, no doubt, provoke a very lively discussion. The author of this paper has made very careful observations of the operation of the compound, making intelligent comparisons of the methods of handling under the different conditions affecting its performance.

THE attention at present being devoted to obtaining the maximum amount of work from railway shop machine tools is resulting in increasing the output in many instances to a surprising extent. One way of measuring this increase in the amount of work done is to compare the output of machine chips, turnings and borings. This offers a relative idea of the work the machines are doing, but should not be taken as any measure of the shop economy. For with this latter question there are several matters involved, to which as much attention should be devoted as to the machines themselves. Variations in the grade of castings necessary to be machined, the amount of material necessary to be removed from forgings, and the matter of whether it is really necessary to machine certain surfaces or parts; these are matters which, while bearing intimately upon the machine tool output, yet cannot be judged from the amount of chippage, and are points which should be called freshly to the attention at regular intervals.

THE effect of impure water upon the life of firebox sheets, flue troubles, and boiler operation, and the consequent relation of the same to locomotive performance, impels us to direct attention to the paper on water purification appearing on page 387 of this issue. Let the boiler question be introduced for discussion in any of its forms, whether on long flues or what not, and the argument will soon center itself upon the elimination of boiler scale. That the final solution of the feed water question will undoubtedly show the term "bad water" to have covered a "multitude of sins," was demonstrated at the recent convention of the Master Mechanics' Association when greater spacing between flues and other changes in design were advocated. Be that as it may, the ill effects of scale-forming material exist and will continue to exist and cover other failures until the original cause is removed.

While continued attempts have been made to alleviate this difficulty, the removal of foreign matter before feeding water into the boiler is a comparatively recent investigation. Several railroads have installed plants for purifying feed water before delivery to locomotive tanks, thus instituting a system which is giving very gratifying results. While this method entails some little expense for chemicals and maintenance, taking the results accomplished into consideration, the price is really very low.

A REPORT of the eleventh annual convention of the National Railroad Master Blacksmiths' Association appears on page 396 of this issue. The report of the secretary is gratifying in that it demonstrates the growth of the association, a fact which may be taken as an evidence of the appreciation of its work among the superior officials of railways, as well as among master smiths. For it is usually with the approval, and often at the instigation, of higher officials that a man enters an association whose aim is to promote the interest of the class of work in which the individual is especially interested.

Among the most important subjects considered this year may be mentioned the repairs to steel and iron frames, a topic which received a very lively discussion. Welding frames was considered not only in the matter of manufacturing new frames, but also as regards the best methods of accomplishing satisfactory welds under the hammer, as well as without removing the frame from the locomotive.

The discussion elicited by an individual paper, entitled "The Advantages of Piece Work over Day Labor," showed the association to be in favor of the piece-work system.

The reports presented and the remarks of the members in attendance, seemed to favor the results obtained with oil as fuel in furnaces with regard to economy, class of work done and ease of manipulation.

AN instance of the value of technical papers was suggested in a remark recently made by a young man who was asked to advise a text book which treated comprehensiely of a given subject. His reply was to the effect that while text books present opportunities for acquiring fundamental knowledge and principles, they fail to keep up with the times; they soon become back numbers. This deficiency in text books is supplied by the technical journals whose province it is to describe and illustrate the most recent designs and improvements as well as to invite and elicit discussion by eminent authorities concerning the relative merits of the latest achievements of mechanical progress.

Journals devoted to specific departments of engineering or science thus form useful records of new and improved designs and original investigations which are made in the field covered by them. Such records are appreciated not only by those whose interest is purely technical or casual, but particularly by those who are contemplating improvements similar to those that are thus described and who, by taking advantage of the information so distributed, are enabled to avoid the discrepancies and mistakes of others and to give the proper values to methods which have been newly demonstrated to be practical and efficient by the tests of actual service.

MR. CHARLES M. HAYS.

GENERAL MANAGER OF THE GRAND TRUNK RY.

Mr. Hays was born at Rock Island, Ill., in 1856, and began his railway career when seventeen years old as a clerk in the passenger department of the Atlantic & Pacific Railway in St. Louis. From there he was moved to the auditor's office and to that of the general superintendent. In 1877 he left this road and became secretary to the general manager of the Missouri Pacific. In 1884 he accepted a similar position with the Wabash, St. Louis & Pacific Railway, being appointed assistant general manager two years later, exchanging this position a year after for that of general manager of the Wabash Western, later taking a similar position over the whole Wabash system, finally becoming vice-president as well, in 1894. January 1, 1896, he assumed the duties of general manager of the Grand Trunk. Five years later he accepted the presidency of the Southern Pacific, returning, however, in less than a year to the Grand Trunk as second vice-president and general manager.

WHERE the road foreman is backed to the extent necessary in order for him to accomplish results, he will experience little trouble in securing the performance of the amount of round-house work really necessary. Then a personal note from him to the round-house foreman, with carbon copies to the master mechanic and superintendent, is an absolute order to perform that certain work. This should be kept entirely distinct from the engineer's report and should never contain request for any work not absolutely essential to enable the engine to get over the division successfully. Inclusion of non-vital repairs cheapens the order and places the requested repairs among those of the engineer's—upon the necessity of which the round-house foreman is at liberty to decide. Where one is ordering an engine held for bushing a nozzle tip, or a new driving box brass, for instance, there is a great temptation to mention several other things needing attention, but which are not "vital." Yet the round-house foreman will attend to as many as possible of these from the engineer's report and by refraining from reports of any but absolutely necessary work the order of the road foreman will always be recognized as in a class by itself—that which must not be neglected, regardles of other work. On the other hand, the round-house foreman is so intimately connected with the condition and present performance of the engines under his charge that by giving him assistance by riding engines to which he calls attention and thus providing him with an intelligent idea of what is really the sole essential trouble with particular engines, and the effect of the changes he makes, that he will thereby be greatly inclined to assist in securing results—particularly if he notes the road foreman spending most of his time on the road instead of standing around the round-house and annoying him with complaints which he knows perfectly well come from mere consultation with engineers instead of being the result of personal observation on the road.

SOME announcements appearing in a recent article discussing the superiority of British locomotives as compared with those built in other countries, impel us to question the advisability of extreme delicacy in the assemblage of locomotive parts. The writer states that English manufacturers "build their locomotives to last more than the average length of human life, while they finish them with the delicacy of an astronomical instrument." Granting that such delicacy may produce a more perfect machine, judging from certain standpoints, and that the life of the machine is greatly increased, where does the true economy lie? Such construction is very expensive and where the first cost is so great, larger returns are necessary to pay interest on the first cost, with the result that the engine has become a "back number" before it has paid for itself and more modern and up-to-date machines have been designed which are capable of operating more economically than the former locomotive. In view of the recent very rapid changes in locomotive design and the increasing facilities for cheaper construction, it appears more economical to build a cheap engine capable of doing its work, even though its life is consequently short, and replace it in due time by an improved design.

The Capacity of Railroad Shops

ON page 347 of our August issue were some editoral remarks concerning the relations which should exist between the number of machine tools and locomotive pit capacity. This subject appears to be a live issue, to judge from the number of communications relative to the matter which we have received—some of which we present herewith. Several of the signatures have been withheld at the request of the writers.

Editor, Railway Master Mechanic:—

Referring to the editorial in your paper of August issue, I am of the opinion that there can be no question but that the stand taken is correct. There are a large number of shops which I am fully satisfied could easily double their output by adding to the machine side; in fact, the average shop, whether built recently or some time ago, could be greatly increased as regards output by simply adding the necessary machinery. As a proposed method of ascertaining just what the capacity of a pit in an erecting shop is, a series of tests might be made by parties interested in shop enlargement or new shops so as to get some definite idea on this subject. As a suggestion for such test, it would be first advisable to find out how many men, and the class of men, that could be worked to the greatest advantage on one pit, always provided that the machine side of the shop would not hold them back. After the pit gang had been satisfactorily settled it would then be advisable to take three or four types of representative engines, such as would be handled in the shops, and concentrate the work from the machine side for these engines when they are in shop to ascertain the minimum amount of time in which they could be overhauled. It would probably be well with each class of engines to make a representative class of repairs, that is, starting with simple tire turning and light repairs, new tires, general repairs, new fire-box and heavy repairs; this having been done with three or four types of representative engines it would seem that the connection between the time taken on any engine and, say, either the horse-power or the total weight, as a reference factor, a curve could be completed in which the one ordinate would be the necessary pit time and the other ordinate would be either the horse-power, weight, or some other reference factor. It would then be easy to determine, knowing how often an engine has to be shopped on an average—the number of days in the shop, and finally to estimate the total number of days required to handle all the necessary power. If such a trial were carried out, I think the average shop would discover that if anything they have a surplus of pits and a considerable shortage of machinery; and where it is desirable to increase the output, machinery could be added until the two sides of the shop balance.

This question is of sufficient value and importance, in my estimation, to justfy such experiments; and furthermore, I deem it of sufficient moment to be made the subject of investigation and report by the Master Mechanics' Association. The data, if such tests could be made, would be found valuable to nearly every one, as would also the number of machines per pit that would be required in a shop working on such a basis. It is more than likely that 10 would be the minimum, but it is probable that 15 would be nearer the number than 10, at least, it is questionable if it would drop below 10.

Yours truly,

F. F. Gaines,

M. M., Wyoming Div., Lehigh Valley Railroad.

Editor, Railway Master Mechanic:—

I have noted your editorial in the August issue of the Railway Master Mechanic on the subject of locomotive repair shop design with special reference to the ouput. I think you are entirely correct in the idea that the machines are the controlling factor rather than the pits. I know of shops in which this is certainly the case and in which the machine capacity might be doubled or perhaps trebled without exceeding the capacity of the erecting floor. Engines as a rule stand too long in the erecting shop, and as you state, there are usually quite a number of locomotives standing idle waiting for work from the machine shop, so that the actual time in the shop is two or three times as long as it should be. I believe that for a shop where repair work only is done, the floor space of the machine shop should be about three times that of the erecting shop. Some good authorities recommend as high a ratio as one to six, but I do not believe this would be profitable, except perhaps in very large shops.

Yours truly,

F. H. Clark,

Supt. M. P., Chicago, Burlington & Quincy Railroad.

Editor, Railway Master Mechanic:—

In the design of new shops, for locomotive repairs, or extension of old, after the necessary output has been carefully considered, the next important feature is how to obtain the output by shopping as few engines at one time as possible. Local conditions must now be carefully considered; namely, the kind and class of repairs necessary owing to conditions peculiar to the road owning the locomotive. Which might be classed as follows: Amount of boiler repairs necessary. Special defects in design, such as weak frames, cylinders and other special parts.

The above conditions all have a bearing as to the number of machine tools necessary per pit. The question of standard and special machinery is an important factor. If parts of locomotives are well standardized more special machinery can be utilized, which will increase the output.

The next question is the amount of manufactured material than can be carried in stock. Many roads force the item of material, in stock, down to too low a point, especially manufactured material. There is no question but that many errors have been made by not carefully considering the output of machine capacity in relation to the pit capacity.

By allowing engines to stand on pits too long, cost of repairs will increase and decrease in proportion as this time is reduced. By decreasing the time engine is held the earning capacity of same is increased, which results in less number of engines being required.

I do not think any rule can be laid down as to the number of machines per pit, as the local conditions named above must be considered in each case. Not failing, however, to provide the necessary number and kind of machine tools to keep ahead of pit capacity.

Output of foundry, blacksmith and boiler shops are equally as important and must be considered.

Yours truly,

J. S. Chambers,

Supt. Motive Power, Atlantic Coast Line.

Editor, Railway Master Mechanic:—

I note your editorial in regard to the design of new locomotive repair shops and the extension of old. This is where the greatest advances can be made in the motive power department at the present time. I have studied the question a good deal and feel satisfied that it is the weakest point at present in the motive power department. I suggested several years ago to the Master Mechanics' Convention that a committee be appointed on motive power accounts and shop system and the editorial brings up this question of shop system. The whole matter of motive power repairs, in order to get the best results, must be placed on exactly the same basis as a manufacturing establishment.

A number of years ago it was considered impossible to handle engine repairs by piece work and many will say that it is impossible to handle motive power repairs in the same way but, as the first statement was proven false, I am satisfied that this last one will be found to be equally erroneous. There is no earthly reason why portions of the machinery of the shops should not be selected with the view of doing a certain class of the repairs and certain pits and machinery be set aside for number one repairs and other pits, etc., for number two repairs. The machinery, which it has been found, after careful study, to be best fitted for this kind and necessary for number one repairs, should be grouped along or near the number one pit, the same for number two and other classes of repairs. There should be certain workmen kept for the number one repairs and certain ones for the number two. In other words, treat the repair shops exactly as one would treat a shop for the erection of bicycles, sewing machines or other products.

In the construction of new work, modern locomotive shops have reached a high degree of development along this line but the same cannot be said of repair shops. Of course, in taking this up, the fundamental proposition is to do the work with the least expenditure of money. For money is expended in paying interest on idle engines just as surely as in paying the workmen for working on them and the cost for all parts of the work and all details of the work with interest charge, taxes, etc., and losses due to the lost earning power of an engine, must all be taken into account. This problem is very like, yet infinitely more complicated than one which the writer met some years ago, where he recommended a duplicate boiler and engine plant. The loss for an engine shut down for an hour was about $500, five days shut down in a year meant a loss of earning capacity of $60,000, enough to erect a duplicate plant. In the same way it will be found that a very much more extensive expenditure on motive power repairing machinery will be justified than is commonly thought. It has been a hard and up hill row to thoroughly convince the railway men of the country, and particularly the motive power men, that a railway is a machine for manufacturing transportation and must be handled like any other first class manufacturing establishment.

Yours truly,

L. S. Randolph,

Professor of Mechanical Engineering,

Virginia Polytechnic Institute.

Editor, Railway Master Mechanic:—

Referring to an editorial appearing on page 347 of the August issue of the Railway Master Mechanic, I have found from experience that the capacity of a locomotive repair shop is determined by the output of the machine tools, while the pit capacity is of minor importance. There are too many shops where a number of the pits can only be used for storage purposes on account of insufficient machine-tool equipment. It is clearly evident that the number of machine tools determines the output of any shop rather than the number of pits.

Yours truly,

S. Higgins,

Mechanical Superintendent, Southern Railway.

From a Superintendent of Motive Power.

Editor, Railway Master Mechanic:—

In adding to the capacity of our shops we recognize the fact that so far as machinists' work on the locomotive is concerned, the tool supply of the shop determines the output. So far as the pit side is concerned the question of output is one of men and whenever the machine side is equal to the demands upon it, by increasing the number of men on the pit side, the output can be increased to meet the requirements.

In selecting tools with which to increase the output of these shops we undertook to arrive at a definite understanding as to just how many hours' work of each particular type was required on the engines coming in for repairs as they average, and in placing our order for tools based it on these calculations, and unless the modern engines vary from what we have figured on in the matter of each type of work required, our new equipment of tools should meet the conditions as referred to in the article, that is, we should have tools enough to handle engines rapidly over the pits. Of course it is always desirable that an engine be in the shop as short a time as possible.

To illustrate what I have in mind in building new locomotives, of which we are constantly building several each year, we find that after the boiler is placed on the pit, if the machine work is in proper shape, it only takes from five to six days to have the locomotive ready for service, showing that the work that can be accomplished on the pit side is one depending only on the way it is gone at.

From a General Foreman.

Editor, Railway Master Mechanic:—

There are comparatively few shops in the country that have given proper thought to the ratio between erecting and machine shop floor space. You are entirely correct when you say the number of pits alone is not the criterion of shop capacity.

Careful observation has led me to the conclusion that in shops which have no great amount of work outside of strictly locomotive repairs, the relation between the machine side space and erecting floor space should be about 2 to 1 respectively, with the machine tools grouped and distributed judiciously of course. In machine shops the proportion is 1 to 1 with a large amount of outside work thrown in.

On account of the increased size of the modern locomotive, larger, heavier and in some cases special tools have to be installed to handle the work efficiently and economically. It is to be regretted that most railroads do not realize that rebuilding a locomotive is just as much of a business proposition as buying one—to the stockholders.

In order to keep the men in the erecting shop busy and in order to keep them interested, we must be ahead of them with the finished material; this cannot be done unless the machine shop is adequately supplied with tools.

From a Mechanical Superintendent.

Editor, Railway Master Mechanic:—

At the present time we have but 38 machine shop tools for an 8 pit shop. I do not consider this enough, and we will make some additions next year. Our output could be largely increased by a substantial increase in machinery and floor hands, but I do not believe we would want 10 machines per pit. At this time I feel that 15 machines per pit would be unwarranted extravagance.

A Plea for Better Boiler Water

By John H. Wynne

The day has arrived when the details of every possible economy in the cost of operating railroad systems must be more closely examined by their officials. The present fierce competition demands every possible saving, no matter how small, nor in what department. Should competition cease, or, in other words, should all the roads in the Americas be merged into one system, the manager would still continue to demand of his subordinates "Get all you can" on the one hand and "Save all you can!" on the other. Nowadays railroads are not having trouble to get the business, but we all know what a time some are having to take care of the enormous shipments thrust upon them.

In order to handle traffic efficiently and economically there must not only be sufficient motive power and rolling stock, but this machinery must be kept in service where it can earn or, in other words, be kept in good physical condition. Without going into the technical details to any great extent, we shall endeavor to show that the use of bad water has its influence upon the pocketbook of the stockholder.

WATER.

Water consists of two elements (gases), hydrogen and oxygen, combined chemically in the proportion of two parts of the former to one of the latter. It exists in the several well-known forms. The change in the physical state of water forms a complete cycle, evaporation, condensation and precipitation, being continually and repeatedly in operation. It is evaporated from the surface of ponds, streams and oceans, and rises to form invisible vapors and clouds. When these vapors come in contact with cool currents of air condensation ensues, and the water is precipitated by the action of gravity upon the earth in the form of rain, snow or hail, depending upon the temperature of the air through which it passes. The atmosphere contains carbonic acid gas, which is readily soluble in water, so that by the time the rain has reached the surface of the earth it contains a large percentage of carbonic acid in solution absorbed from the air. Upon reaching the earth rain water is disposed of by running off in streams to form the rivers and finally the oceans; by being collected in ponds, lakes or swamps and by soaking into the earth—the means of the disposition depending upon the nature of the surface upon which it falls.

THE PRESENCE OF SCALE-FORMING MATERIALS IN WATER.

The substances that give the greatest trouble from the formation of scale in boilers are carbonate and sulphate of lime and carbonate and sulphate of magnesia.

Carbonate of lime is chalk, common limestone, marble, etc. It is insoluble in chemically pure water, but is readily dissolved in water containing carbonic acid gas in solution. By itself it forms a comparatively soft, friable white scale.

Sulphate of lime, the common name of which is "plaster of paris" or gypsum, forms a hard, porcelain-like scale. It is readily soluble in cold water without requiring the presence of carbonic acid or any other foreign agent. Mr. Wm. Kent, in his "Steam Boiler Economy," states: "The amount of sulphate of lime which can be dissolved in one United States gallon of water at different temperatures may be appreciated by the following table:

At	32 degrees Fahr.,	120 grains per gallon
At	95 degrees Fahr.,	148 grains per gallon
At	212 degrees Fahr.,	127 grains per gallon
At	250 degrees Fahr.,	9 grains per gallon

"At from 260 degrees to 302 degrees Fahr., it is practically insoluble. This latter temperature (302 degrees) corresponds to 55-lb. gauge pressure, and, therefore, when water is thoroughly boiled at this temperature, practically all of the sulphates will be precipitated. The crystals of sulphate of lime will be found to be long and needle-like, and also very heavy and possessing cement-like qualities; so they fall rapidly and, mixing with the precipitated carbonates, they bind them together into a hard, resisting mass, difficult to remove with even hammer and chisel, if they form a considerable portion of the scale."

Carbonate of magnesia is the commonest form of magnesia. It is soluble in water only when carbonic acid is in the solution.

Sulphate of magnesia or "epsom salts" is readily soluble in water without requiring the presence of carbonic acid. When present in a boiler along with carbonate of lime a chemical reaction takes place, resulting in the formation of sulphate of lime and hydrate of magnesia. This hydrate acts as a cement and binds together whatever precipitate with which it comes in contact. The scale formed by these two substances is as hard as porcelain.

When the rain water falls upon soil containing any of these salts, it dissolves them and forms what is known as "hard" water—the degree of hardness depending upon the amount dissolved or, in other words, the amount available in the solution. We may now conclude that the degree of hardness of water is directly dependent upon the geological deposits of the soil upon which the water flows or through which it percolates.

In his valuable paper read before the Western Railway Club at the February, 1903, meeting, Mr. G. M. Davidson, of the Chicago & Northwestern Railway, gave the following analyses of samples of water from different localities, which will serve to illustrate the variation in degree of hardness. (See Table 1.)

It will be seen that Wisconsin water has but little scale-forming material in solution, while Iowa, Minnesota and Dakota waters contain large quantities. In his "Steam Boiler Economy" Mr. William Kent says: "A condensed summary of the various causes of incrustation, corrosion, etc., and their remedies, is given as follows in a paper by Messrs. W. E. Hunt and G. H. Clapp, in the Transactions of the American Society of Mechanical Engineers, vol. XVII, p. 338, and credited to Prof. L. M. Norton, as follows (See Table 2)

"Causes of Incrustation.—1. Deposition of suspended matter. 2. Deposition of salts from concentration. 3. Deposition of carbonates of lime and magnesia by boiling off carbonic acid which holds them in solution. 4. Deposition of sulphates of lime, because sulphate of lime is soluble in cold water, less soluble in hot water, insoluble above 270 degrees Fahr. 5. Deposition of magnesia because certain magnesium salts decompose at high temperatures. 6. Deposition of lime-soap, iron-soap, etc., formed by saponification of grease.

"Methods of Preventing Incrustation.—1. Filtration. 2. Blowing off. 3. Use of internal collecting apparatus, or devices for directing the circulation. 4. Heating the feed water. 5. Chemical or other treatment of water in boiler. 6. Introduction of zinc in boiler. 7. Chemical treatment of water outside of boiler."

As before stated, water running over, standing upon or percolating through earth containing sulphates of magnesia or lime readily takes them into solution. So that the geological deposits of the locality in which the rain falls, the time that it is on or in the earth and the depth to which it penetrates all bear directly upon the degree of hardness of the water, or in other words, upon the amount of scale-forming matter in solution. All water available for use in boilers contains solid matter, either in solution or in suspension, to a greater or less degree. Solid matter in suspension, such as mud, slime, sticks, moss, etc., may be readily removed by filtration, but the chemical salts in solution must be removed by chemical reagents.

THE EFFECT OF SCALE UPON BOILERS.

One of the best-known authorities upon subjects pertaining to boilers says that the damage done to boilers by unsuitable water is enormous. Those of us who are using hard water in our locomotives do not need expert testimony to convince us that such is the case.

Let us now follow the process of deposition of scale on the sheets and flues of a locomotive in a "bad" water country. We will assume that the water contains carbonates and sulphates of lime and magnesia and that the locomotive uses steam at 100 lb. gauge pressure. The water is fed into the boiler and very rapidly assumes the temperature existing therein. By the process of boiling, the carbonic acid in solution is driven off, causing the carbonate of lime and carbonate of magnesia to precipitate; by the process of heating the sulphate of lime is precipitated, for a gauge pressure of 200 lb. means a temperature of about 388 degrees Fahr., and as before stated, sulphate of lime is insoluble in water at 270 degrees Fahr.; by reason of the presence of carbonate of lime the sulphate of magnesia is broken up into hydrate of magnesia and sulphate of lime and assists in forming the scale. These precipitates fall upon the flues, crown sheet, shell and side sheets, attach themselves and bake into a hard, resisting coating which we call the scale. This scale not only shortens the life of the sheets and flues but reduces the efficiency of the boiler as a transformer of energy.

The thicker the deposit upon the parts, the hotter they will become when exposed to the heat of the fire; conversely, the cooler they will become when cold air rushes into the fire box with each scoopful of

Name of Station	Grand Rapids Wis.	Cedar Wis.	Chicago	Cary Ill.	Council Bluffs Iowa.	Boon Iowa	Tyler Minn.	Salem S. Dak.
Source of Supply	Well Near Bank of Wis. River	Spring	Lake Michigan	Fox River	Wells 70 ft Deep	Well 104 ft Deep	Well 575' D.	Well 16' D.
Total Solid matter dissolved								
in one Gallon	5.24	1.87	7.78	14.23	53.67	23.04	140.36	152.88
This solid matter consists								
of the following.								
Carbonate of Magnesia	1.14	Trace	2.20	5.64	1.18	7.06	8.20	4.93
Sulphate of Lime	0.78	——	0.30	0.07	6.22	——	15.04	84.45
Sulphate of Magnesia	——	——	——	——	13.33	——	24.75	37.70
Iron & Alumina Oxides	0.03	0.08	0.02	0.12	0.39	Trace	0.30	0.03
Silica	0.93	0.60	0.30	0.48	1.42	1.74	2.00	1.57
Carbonate of Lime	1.15	0.39	4.46	6.02	24.39	13.46	35.08	13.78
Incrusting Solids	4.03	1.07	7.28	12.33	46.88	22.26	85.37	142.46
Alkali Chloride	0.04	0.25	0.22	0.57	1.21	0.09	1.46	9.77
Alkali Sulphate	0.56	——	0.28	1.33	5.58	Trace	53.53	0.65
Organic Matter	0.61	0.57	——	——	——	——	——	——
Alkali Carbonates	——	——	——	——	——	0.69	——	——
	1.21	0.82	0.50	1.90	6.79	0.78	54.99	10.42
Pounds of Scale forming								
matter in 1000 Gallons	0.57	0.15	1.04		6.69	3.18	12.19	20.35

Note — The figures express the number of grains (Troy weight) in one U.S. Standard gallon (231 cubic inches)

TABLE I.—WATER ANALYSES, SHOWING VARIETY IN DEGREE OF HARDNESS.

Troublesome Substance	Trouble	Remedy or Palliation
Sediment, mud, clay, etc.	Incrustation	Filtration: Blowing off
Readily soluble salts	Incrustation	Blowing off
Bicarbonates of Lime, Magnesia, iron	Incrustation	Heating feed: addition of caustic soda, lime, etc.
Sulphate of Lime	Incrustation	Addition of Carbonate Soda barium hydrate, etc.
Chloride of Magnesium	Corrosion	Addition of Carbonate Soda, etc.
Carbonate of Soda in large Amounts	Priming	Addition of barium chloride, etc.
Acid (in Mine Waters)	Corrosion	Addition of Alkali
Dissolved Carbonic acid & Oxygen	Corrosion	Feed Milk of lime to the Boiler to form thin internal coating.
Grease (from condensed steam)	Cor. or Incrus.	Different cases require different
Organic matter (Sewage)	Pri., Cor., or Incr.	remedies. Consult a Specialist on subject.

Table 2.—Impurities in Boiler Feed Water.

coal. This is due to the fact that the film of scale separates the water from the sheet and the capacity of this scale of heat ("specific heat") is less than that of water. A wider range of expansion and contraction, therefore, confronts us, which means that the staybolts are compelled to swing through a greater arc than with cleaner sheets, and will break sooner as a consequence. The effect upon the flue sheet is the same; the increased expansion and contraction breaks the joint between flue and sheet, with leaks as a result. Broken staybolts are not only dangerous but expensive to replace, and leaky flues mean engine failures and delayed traffic.

In addition to the above, gradual deterioration takes place in the sheets themselves, frequently approaching a point dangerous to life and property. The increased range of expansion and contraction magnifies the effect of internal stresses due to the molecular action, and crystallization of the metal follows sooner than it would if the scale were not there. Perhaps a more important consideration than that of crystallization is the danger of burning; as the scale increases in thickness, burning becomes more imminent. On some roads the allowed limit of thickness is one-sixteenth of an inch. Of the engines we see coming into the shop for repairs, on how many flues and sheets is the deposit as thin as that?

Sulphate and carbonate of lime and the corresponding salts of magnesia are poor conductors of heat. Taking the resistance to the passage of heat offered by wrought iron as 1, that of copper is 0.4; of carbonate of lime is 17 and of sulphate of lime is 48. Carbonate of magnesia is largely used as boiler lagging and is an excellent non-conductor of heat. So we can readily see that sheets and flues coated with these substances offer resistance to the transfer of the heat from the fire to the water and thus reduce the economy and efficiency of the boiler.

We can now readily see how leaky joints will occur where scale exists. We shall assume that the engine has been out of the shop several months and the sheets have become coated with scale. When the fire door is shut with the engine working steam, the fire is at its hottest and consequently the sheets and flues. When the door is opened for the purpose of adding coal, the draught from the exhaust (a forced draught in every sense of the word) sucks a large quantity of air into the furnace, which not only cools the fire but also the sheets and flues. As before stated, the metal has become hotter with this film of scale on it than it would have had the water been permitted to remain adjacent to it, on account of the difference in the specific heats of the water and the scale. This condition will remain until some external influence is brought to bear. Now when the air is admitted, the cooling action is more rapid and the temperature falls to a lower point than it would were the water directly surrounding the metal. So we have a greater range of temperature change and therefore a greater amount of expansion and contraction. The repeated movements of the firebox relative to the outer boiler shell break the staybolts, and alternate expansive and contractive movements of the flue sheet loosen the flues, causing the leaks.

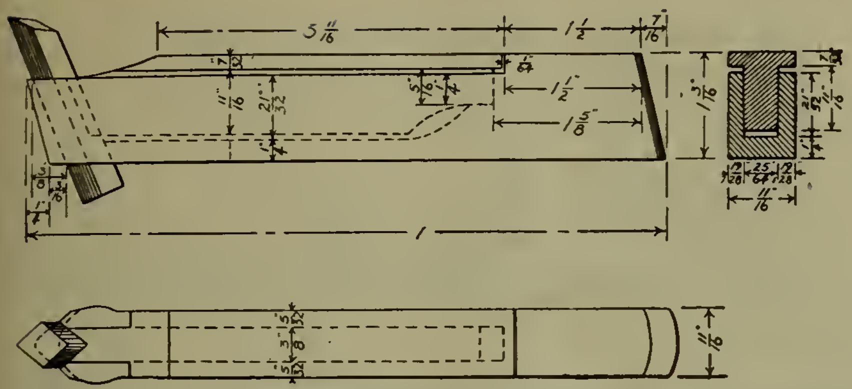
So in addition to loss in fuel economy by reason of the poor conductivity of the scale, there is an additional loss due to leakage.

One of the subjects exciting the interest of motive power men at this time is that of better circulation in locomotive boilers. Scale clogs the spaces between staybolts and retards circulation around the firebox and between the flues. This is especially true in boilers of the crown-bar and Belpaire types.

[This interesting subject will be concluded in the October issue.—Ed.]

The Roebbel Tool Holder

In consideration of the price of high-speed tool steel it is desirable to use as small a piece of steel as possible in forming a tool. To facilitate the employment of small pieces of tool steel in such capacity Mr. F. W. Roebbel, machine foreman at the St. Louis



THE ROEBBEL TOOL HOLDER.

shop of the Missouri Pacific Railway, has designed a tool holder which is readily adjustable and which has proven efficient in service. This holder is shown in the accompanying line drawing, which clearly illustrates the construction of the device. The body of the holder is made of soft steel, while the clamp, which fits into the body and secures the tool in position, is made of tool steel. The holder is made in four sizes, 5-16 in., ⅜ in., ½ in. and ¾ in., the larger two for service with wheel lathes and the smaller for use in light work. By reference to the line drawing the principle on which the tool is clamped in the holder is readily seen.

By screwing down the set screw in the tool post the clamp is forced against the tool, holding it rigidly in position. As the position of the tool may be readily adjusted within the holder, the holder may always be allowed to remain in a perfectly horizontal position. In turning 1⅜-in. bolts a speed of 90 ft. per minute is readily maintained. In tuning up driving wheel tires a speed of about 13 ft. per minute is maintained successfully and a speed of 14 ft. per minute in turning car wheel tires.

This tool is patented, the rights being held by Mr. Roebbel, to whom we are indebted for the accompanying line drawing.

Topeka Shops of the Atchison, Topeka & Santa Fe Railway

Machine Tool Equipment

(Continued from page 356.)

THE introduction of high speed tool steel and the consequent increase in size and power of machine tools to render them capable of utilizing the new steels to full advantage, has directed attention to the amount of work which individual tools are capable of producing. In view of this fact the results of several observations made of the power input of a number of tools appear worthy of interest. The data here presented was gathered when the machines were performing their regular duty, without previous arrangement or special preparation of the machine and no effort was made to obtain maximum or extraordinary results. The number of each tool appearing, is given and by referring to the tool list on pages 355 and 356 of the August issue, the size and maker of each tool may be seen.

POWER IMPUT OF MACHINE TOOLS.

Machine in actual operation, cylinder borer.
Individual drive, machine No. 20.
Material, locomotive cylinders, cast iron.
Width of feed, ¼ in.

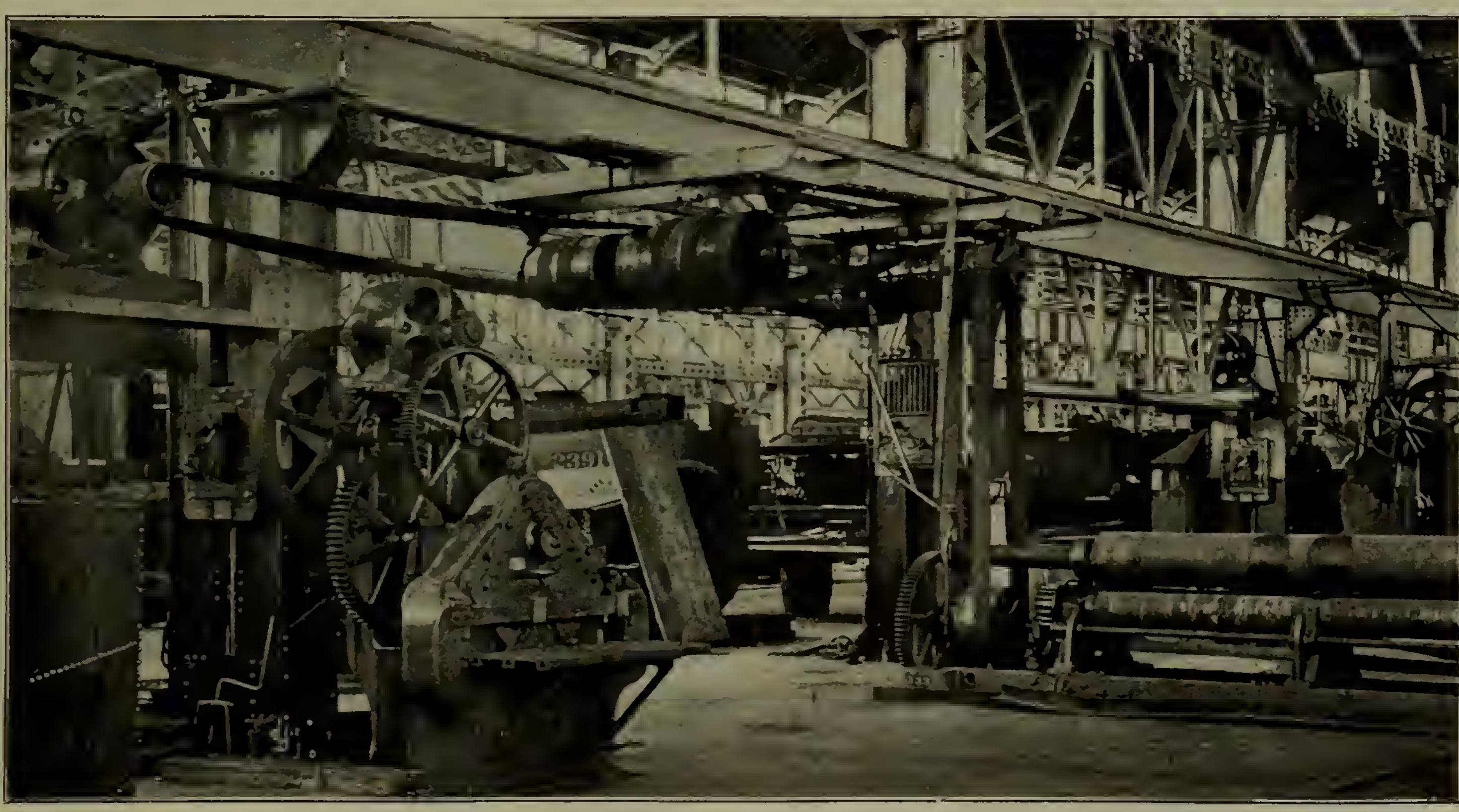


FIG. 1—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—TYPICAL EXAMPLES OF INDIVIDUALLY MOTOR-DRIVEN MACHINES.

Depth of cut, ¼ in.
Cutting speed, 18 ft. 85-100 in.
Diameter of piece, 18 ins.
Rated H. P. of motor, 5.
Current required for above work, 3 tools cutting, Amps., 12 to 20; Volts, 229; average H. P., 4.91.
Current required for running machine idle: Amps., 2; Volts, 229; H. P., .61.
Current required for facing ends and boring out, cut

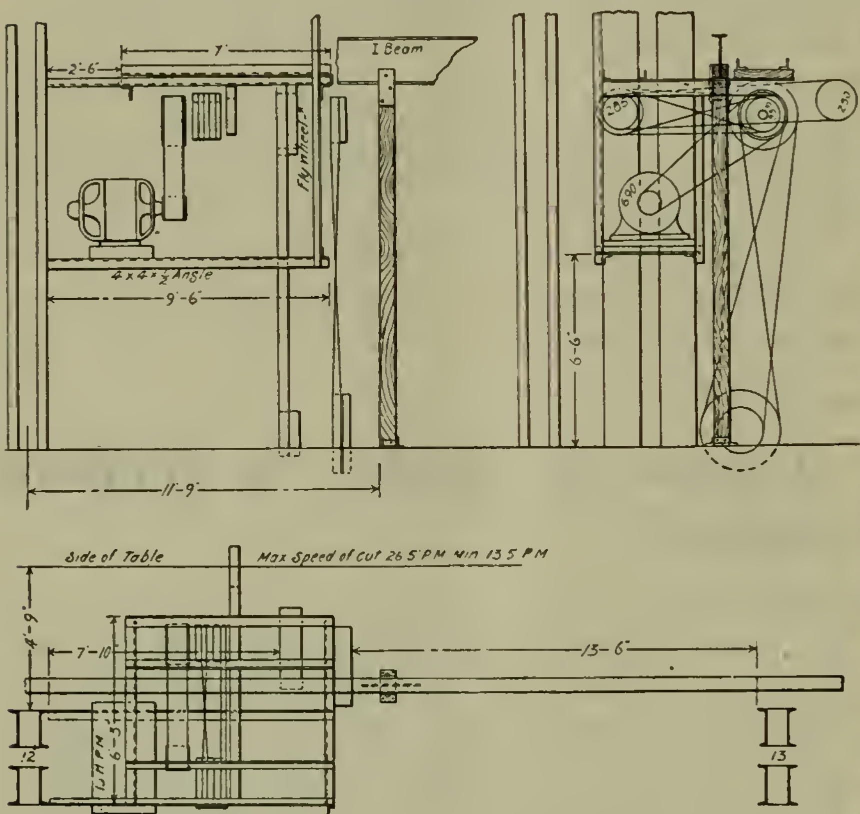


FIG. 2—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY, ERECTING PLAN OF MACHINE SHOWN IN ACCOMPANYING COLUMN.

on ends, ¼ in. deep—1-16 in. feed—total number of 5 tools cutting, Amps., 15 to 26; Volts, 229; average H. P., 6.29.
Cu. ins. removed per min. by 1 tool, 14.13.
Cu. ins. removed per min. by 3 tools, 42.39.
Cu. ins. removed per min. by 1 tool, facing ends, 3.52.
Cu. ins. removed per min. by 2 tools, facing ends, 7.04.
Cu. ins. removed per min. by 5 tools, total, 49.43.
Cu. ins. removed per H. P., per min., boring cylinder, 8.21.
Cu. ins. removed per H. P., per min., boring cylinder and facing ends, 7.85.

Individual drive, machine No. 31, frame planer.
Material, locomotive frame, wrought iron.
Width of feed, ¼ in.
Depth of cut, 3-16 to 7-16 (.312 ins. ave.)
Cutting speed, 21 ft. per min.
Rated H. P. of motor, 15.
Current required for above work: Amps., 26 to 64; Volts, 228; average H. P., 13.75.
Current required for running machine idle: Amps., 24; Volts, 228; H. P. 7.33.
Current required for reversing: Amps., 84; Volts, 228; H. P., 25.7.
Cu. ins. removed per min, 19.65.
Cu. ins. removed per H. P., per min., 1.44.

Individual drive machine No. 40, Rod Miller.
Material, cast iron driving box shoe.
Width of cut, 7 ins.
Depth of cut, 3-16 in.
Cutting speed, 1 36-100 in. per min.
Rated H. P. of motor, 15.
Current required for above work: Amps., 12 to 20; volts, 228; average H. P., 4.9.

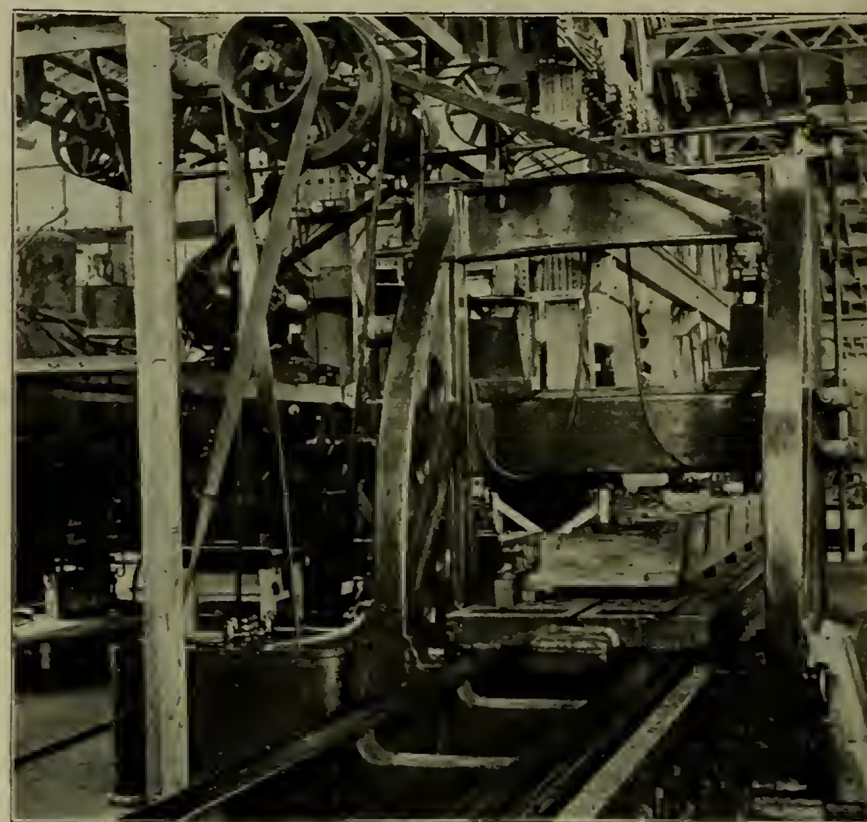


FIG. 3—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY, SHOWING APPLICATION OF FLY WHEEL TO DRIVING SHAFT OF INDIVIDUALLY MOTOR DRIVEN PLANER FOR OVERCOMING INERTIA OF PLATEN AT END OF STROKE.

Current required for running machine idle: Amps., 7; volts, 228; H. P., 2.1.
Cu. ins. removed per min., 1.78.
Cu. ins. removed per H. P. per min., .36

Individual drive, machine, punch and shear.
Width of feed, punching 13-16 in. hole in ⅜ plate.
Rated H. P. of motor, 15.
Current required for above work: Amps., 4 to 12; Volts, 229; H. P., 2.45.
Current required for running machine idle: Amps., 4; Volts, 229; H. P., 1.24.
Cu. ins. removed, .201.

Machine in actual operation, 74 ins. wheel lathe.
Individual drive, machine No. 12.
Material, driving wheel tires (2).
Width of feed, 1-32 in.
Depth of cut, ½ in.
Cutting speed, 11 ft. per min.
Diameter of piece, 45 ins.
Rated H. P. of motor, 7½.
Current required for above work: Amps., 12 to 24; Volts, 228; average H. P., 5.5.

Cu. ins. removed per min., 2.04 by 1 tool.
Cu ins. removed per min., 4.08 by both tools.
Cu ins. removed per H. P., per min., .74.

Machine in actual operation, 36 ins., engine lathe.
Individual drive, machine No. 5.
Material, locomotive crank pin.
Width of feed, 3-32 in.
Depth of cut, ⅜ in.
Cutting speed, 44 ft. 6 ins.
Diameter of piece, 6½ ins.
Rated H. P. of motor, 5.
Current required for above work: Amps., 24 to 28; Volts, 228; H. P., 8.
Current required for running machines idle: Amps., 2; Volts, 228; H. P., .61.
Cu. ins. removed per min., 18.69.
Cu ins. removed per H. P., per min., 2.33.

Machine in actual operation, locomotive frame slotter.
Individual drive, machine No. 37.
Material, locomotive driving frame, wrought iron.
Width of feed, 3-32 in.
Depth of cut, ½ in.
Cutting speed, 31 ft. per min.
Thickness of piece, 2-4 in. frames (1 tool).
Rated H. P. of motor, 10.
Current required for above work: Amps., 36; Volts, 230; average H. P., 11.05.
Current required to run machine idle: Amps., 10; Volts, 229; average H. P., 3.07.
Cu. ins. removed per min., 18.
Cu. ins. removed per H. P., per min., 1.62

Group No. 511:
Shop numbers of machines in actual operation, 203, 204, 205, 206, 207, 208, 209, 210, 211, 214, 215, 231, 232, 236 and 237.
Rated H. P. of motor, 25.
Current required for above work: Amps., 20 to 38; Volts, 228; H. P., 8.86.

Group No. 513:
Shop numbers of machines in actual operation 271, 272, 273, 275, 278, 279, 281, 282 and 285.
Rated H. P. of motor, 15.
Current required for above work: Amps., 8 to 12; Volts, 229; H. P., 3.07.

Group No. 501:
Rated H. P. of motor, 25.
Current required for running shafting: Amps., 18; Volts, 229; H. P., 5.52.

Group 502:
Rated H. P. of motor, 20.
Current required for running shafting: Amps., 17; Volts, 229; H. P., 5.21.

Group 503:
Rated H. P. of motor, 20.
Current required for running shafting: Amps., 14; Volts, 229; H. P., 4.3.

Group 504:
Rated H. P. of motor, 20.

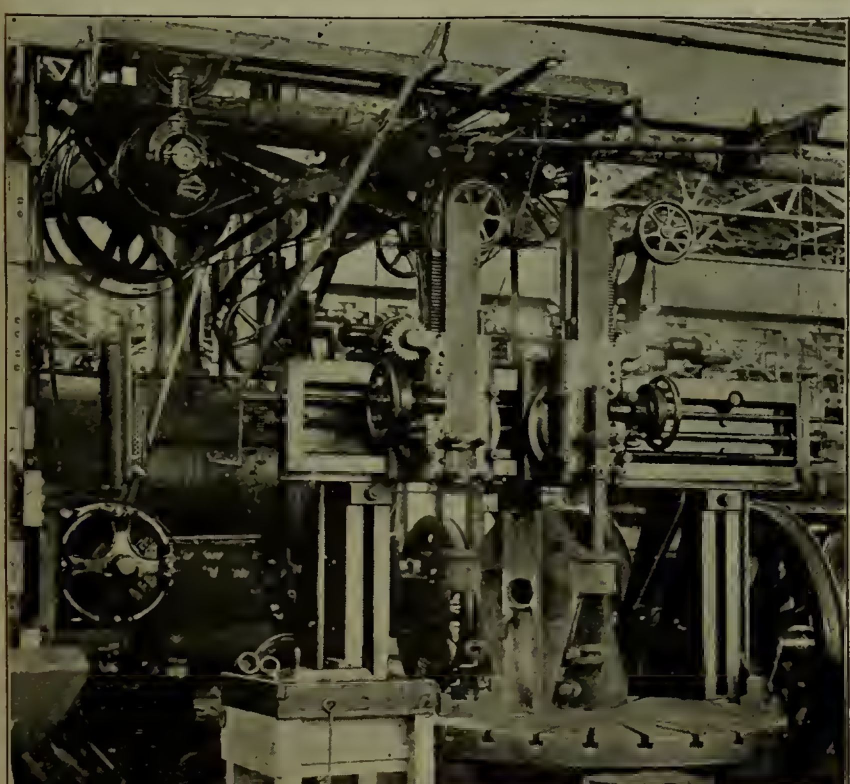


Fig. 4—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—72-inch Vertical Boring Mill Belt Connected to 7½ h. p. Individual Motor.

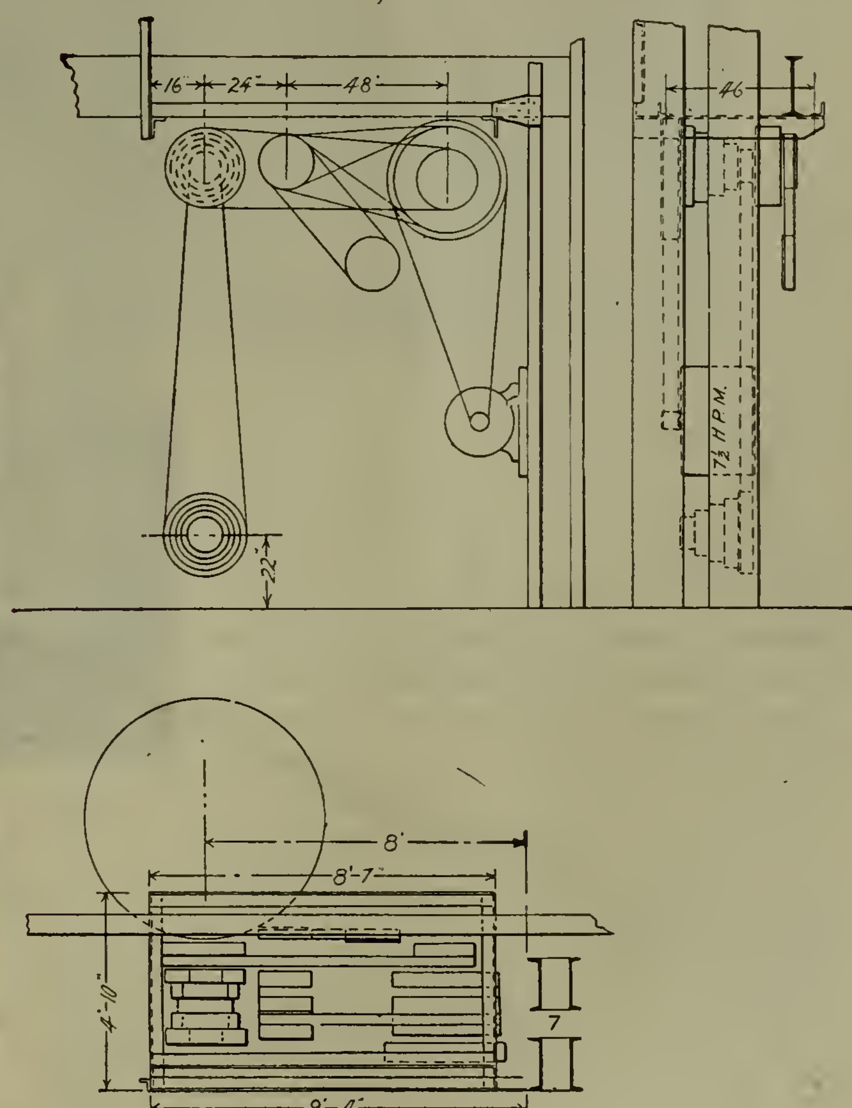


Fig. 5—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Erecting Plan of Machine Shown in Adjacent Column.

Current required for shafting: Amps., 20; Volts, 229; H. P., 6.14.

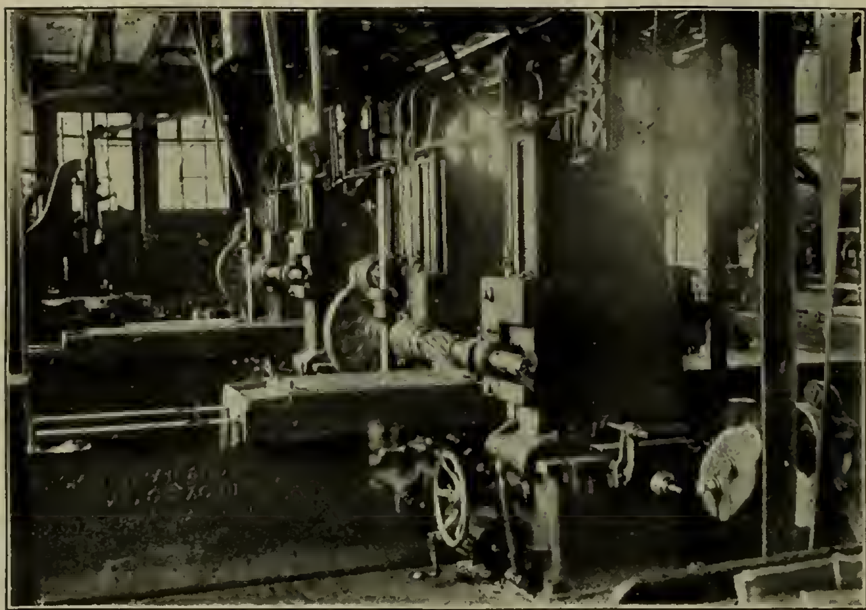


Fig. 6—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Milling Machines in Motor Driven Group.

Group 505:

Rated H. P. of motor, 20.

Current required for shafting: Amps., 17; Volts, 229; H. P., 5.21.

Group—Motor located in north end of blacksmith shop:

Machines in operation—3 punches, 5 bolt headers, 2 bulldozers.

Rated H. P. of motor, 25.

Current equired for above work: 30 to 60 Amps., 230 volts, average H. P., 13.87.

South transfer table carrying standard baggage car:

Rated H. P. of motor, 25.

Current required for above work: Amps., 34; volts, 230; H. P., 10.48.

Current required for starting: Amps., 75; Volts, 230; H. P., 23.07.

South transfer table carrying day coach number 2613:

Rated H. P. of motor, 25.

Current required for above work: Amps., 40 to 42; Volts, 230; average H. P., 12.64.

Current required for starting: Amps., 75; Volts, 230; H. P. 23.07.

Current required for running north transfer table, empty, 32 to 100 Amps., 228 Volts, average H. P., 20.17.

An illustration of the application of a heavy fly wheel to the driving shaft of a motor driven planer, to overcome the inertia of the reciprocating platen at the end of its stroke, is presented in Fig. 3. While not thoroughly investigated under the old method of machine drive, upon the introduction of individual motor driven machines, it was observed that the power required to drive a planer varied considerably throughout the stroke and that the power required at the moment of reversal of the platen, is several times greater than the power required during the stroke. This fact is demonstrated to a certain extent in the ordinary method of drive by the slipping of belts.

This sudden increase in the demand for power imposes an instant overload upon the motor, the results of which are very detrimental as the excessive sparking consequent thereto burns the commutators and has a tendency to burn out the armature coils. It is found that by placing a pulley, or wheel, with a heavy rim upon the driving shaft the energy stored therein relieves the motor to a great extent, of the sudden demand at the end of the stroke, tending to equalize the varying input of power and permitting the use of a smaller motor.

The planer in question has been in service in the old machine shop and upon the completion of the new building was transferred, with a number of other machine tools. Upon the application of individual motor drive to this machine the former large driving pulley was replaced by a pulley with a heavy rim in order to obtain the results here mentioned. This pulley, the arrangement of shafting and belting, position of controller upon main column, location of motor upon platform suspended from crane girder by angle irons, are clearly shown in the illustration, and an erecting plan of the same is presented in Fig. 2. The planer is a Hewes and Phillips,

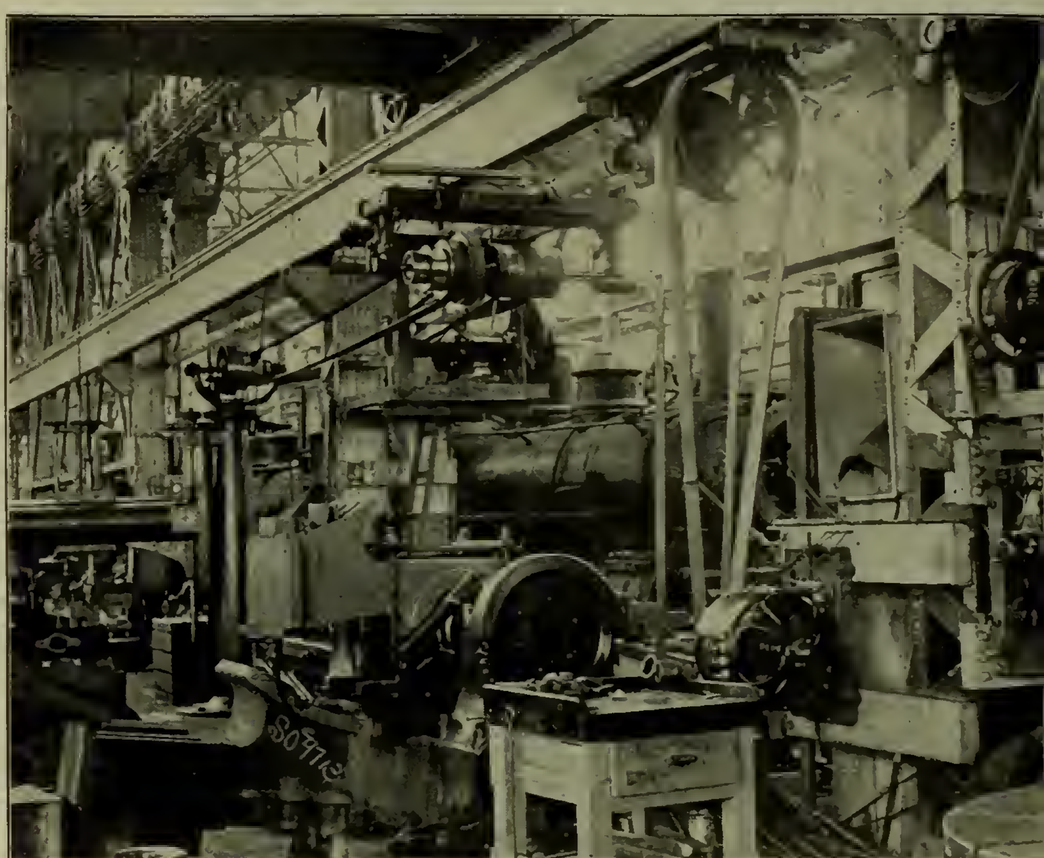


Fig. 7—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Examples of Individually Motor Driven Machines.

60 ins. by 60 ins., with a 27-ft. stroke, having a bed 42 ft. long. It is driven by a General Electric, type C. E. 15 horse power, variable speed motor, making from 405 to 800 revolutions per minute, and is used principally for planing locomotive frames. This is the only planer to which a fly wheel was applied by the shop force, the other old planers being placed in groups with other machines and the new planers installed being equipped with

fly wheel attachment and individual drive by the manufacturers. In the case of group drive, it was considered that the momentum of shafting, etc., would be sufficient to overcome inertia of reciprocating parts at end of stroke.

Fig. 1 is of interest as showing several arrangements of individually driven machines, the location of the several motors and controllers. At the left of the illustration there appears a Long and Alstatter double angle iron shear, for cutting 5 ins. by 5 ins. by ½ in in. angle iron, either squarely or at any desired angle. The machine is directly geared to a 7½ horse power motor. The machine at the extreme right is a double punch and shear, with a 26-in. gap, having a capacity of shearing ⅞ in plate and punching ⅞-in. hole in ⅞-in. plate; belt connected to a 10 horse power motor. The most prominent feature of the illustration is the plate roll, of 126 ins. capacity, and its belt connection to a 15 horse power motor.

Among the belt-driven machines, the 72-in. vertical boring mill, Fig. 4, is of interest because of the apparent complication of belts and the fact that the belt connection has given excellent service, the particular attention of the shop management having been drawn to this machine by its effectual work and the successful operation of the many belts included in the drive. The 7½ horse power motor driving this machine is securely bolted to one of the main columns, the controller being located immediately above the motor, as shown at the left of the illustration. The arrangement of the several belts is more clearly shown by Fig. 5, presenting the erecting plan of the machine and its connections.

Locomotive frames are slotted upon a large double head frame slotter, having a bed 42 ft. long. The machine, illustrated in Fig. 8, has a capacity for slotting four of the largest frames at one time. It is manufactured by Bement, Miles & Company. The heads are entirely independent, each one being operated by its own motor.

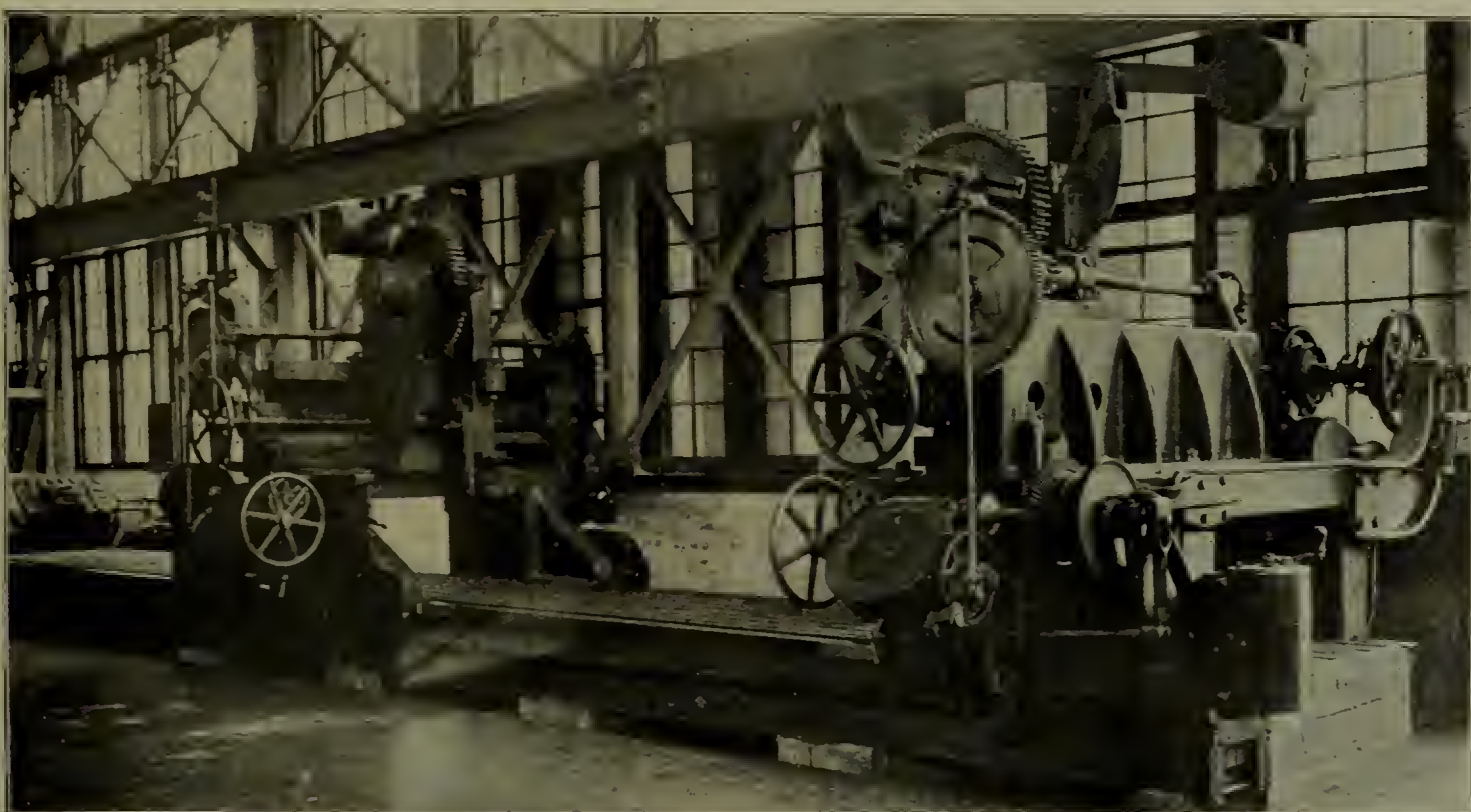


Fig. 8—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Large Double Head Frame Slotting Machine, of Which Each Head is Operated Individually by an Individual Motor, Manufactured by Bement, Miles and Co.

The Becker Brainard Milling Machines appearing in Fig. 6, present graceful outlines, embodying at the same time a heavy construction ensuring rigidity against the strains imposed by high speed tool steel, the machines having been designed to operate upon heavy work. The spindle of each machine is elevated by a screw with adjustable dials graduated to thousandths of an inch and has a counterbalance for ease of operation. There are twenty changes of speed for the cutter spindle obtained by gearing in the main driving cone, operated by clutch and lever, so that all changes can be made easily. The table is very heavy; travels on flat ways securely gibbed and has a quick return operated by power from a separate countershaft. It can also be moved by the usual hand wheel. The feed of the table is directly operated through gearing from the spindle at the ratios of 13½ and 27 to 1 by 5-in belts on a 5 step cone, the diameter of which is 23 ins. on the largest step and 13 ins. on the smallest, giving a range of feed through eight changes from 3-64 to ⅜ in. These changes of speed can be made instantly by means of a lever, without stopping the machine. The head may be adjusted from either side of the machine, so that it is not necessary to take the cutters off the arbor in order to change their position in relation to the work.

The radial drill shown at the left of Fig. 7 is driven by a 3-horse power, 552 to 1100 revolutions per minute, variable speed motor, back gared 5 to 1. The back gear shaft carries a very wide force pulley, from which the countershaft is belted with one open and one cross belt. On the countershaft are two loose pulleys, one tight pulley and the cone pulley, which is belted to cone pulley on drill press. A belt shifter is located between the motor and the countershaft to reverse the motion of the drill or tap for backing out the same.

National Railroad Master Blacksmiths' Association

Eleventh Annual Convention

THE eleventh annual convention of the National Railroad Master Blacksmiths' Association was called to order Tuesday morning, Aug. 18, 1903, at 10:30 o'clock at the Genesee hotel, Buffalo, New York, by Vice President George Lindsay, acting in the absence of President John McNally, whose attendance was prevented by ill-health. In the usual course of opening events the meeting was led in prayer by the Rev. F. S. Rowland and the convention addressed by Councilman John J. Smith, representing the Mayor of Buffalo, and Mr. F. Howard Mason, of the Chamber of Commerce. In his opening address Mr.

Mr. John McNally, President of the National Railroad Master Blacksmiths' Association.

Lindsay presented a touching tribute to the memory of Mr. W. P. Savage, past president of the association, who guided the Chicago convention so admirably last year and whose recent death cast a shadow over the whole association. He further called attention to the results obtained through advanced methods, promoted by the gathering of master blacksmiths in their annual conventions, considering the association's growth as an indication of its appreciation among railroad master blacksmiths as well as higher railway officials.

The report of the secretary showed the membership at the close of last lear to be 261. The present membership consists of 262 active, 35 associate, 3 honorary, making a total of 300 members on Aug. 15, 1903. The report of the business disbursements and receipts shows a balance on hand, Aug. 15, of $394.92.

REPORT OF COMMITTEES.

Repairs of Steel and Iron Frames.

In the absence of Mr. John Coleman, chairman of the committee, the report was read by Mr. G. H. Judy, acting for the secretary, following the report by letters from other members of the committee. The sense of the association as expressed in the report of the several committeemen and ensuing discussion, indicates that the most practical method of welding frames, both steel and iron, is by the use of the V weld. Care should be taken that the fibers of the wedge be arranged to correspond with the fibers in the material of the frame, iron welds being used with steel frames as well as iron frames. Several members advocated the use of a V whose angle is over 90 degrees, for the reason that with an acute angle the material forming the V is apt to slip or drive past its first contact with the walls of the aperture. In considering this subject Mr. McCaslin advocated an angle of 110 degrees. Mr. Timmons of the Richmond Locomotive Works presented line drawings showing what he believed to be the most effectual method of welding the parts of

Mr. A. L. Woodworth, Secretary of the National Railroad Master Blacksmiths' Association.

new frames. This method is to weld the parts in the jaw near the upper bar, the jaw and lower bar being formed in one piece by bending the frame at the junction of the jaw and lower bar by means of a form under a steam hammer. This arrangement continues the fiber of the material in the lower bar and jaw without having separate fibers or necessitating a cross grain. Mr. Treacy presented a number of remarks in favor of arranging male and female parts for welding, where practical to so arrange the material, believing such a weld to be much stronger and worthy of greater confidence than the V weld. He admitted, however, that the V weld is the only one possible where frames are welded without being removed from the locomotive.

The Preparation of Scrap.

The best method of preparing scrap and working same to make good iron for new and repaired locomotive frames, rods, straps, etc., was presented to the convention in a communication from Mr. S. Uren, chairman of the committee on this subject, in which he expressed his own views and those of the other members of the committee.

The ensuing discussion evidenced that in piling scrap all steel should be omitted so far as possible, for the reason that steel will not stand such a high heat as is required to weld the iron into a solid mass, resulting in a detrimental effect to the final bar. In view of the introduction of steel in locomotive parts, upon motion, it was decided that the association should place itself on record as recommending steel as the best material for crank pins, rod straps, side rods and piston rods.

ADDRESS.

Mr. W. O. Thompson, division superintendent of motive power of the New York Central & Hudson River Railroad, being present at the meeting, was called upon by Chairman Lindsay to address the convention. During his remarks Mr. Thompson called attention to the advantages gained in associations of this nature and mentioned the advisability of offering recommendations with regard to the several subjects considered, for the reason that those not in immediate touch with the classes of work on hand look to reports of such associations for information.

REPORT OF COMMITTEES.

Fuel Oil.

Oil; is it successful as fuel for the manufacture of iron axles and to heat iron scrap for axle slabs, was a title of a report presented by Mr. T. A. McNeal in the form of a communication read before the association. This report was accompanied by a number of blue prints showing the type of furnaces and burners used by Mr. McNeal. As much interest was evidenced in the blue prints, upon motion, it was decided to defer the discussion of this subject until the blue prints had been examined by the members present. When again taken up for consideration, oil was shown to be the most popular fuel used for furnace work and the remarks of the members largely centered upon the experience of those who use such fuel. Mr. Folk, whose shop is located in the Allegheny Mountains, where coal may be had from $1.50 to $1.75 and is therefore very cheap, is much in favor of the use of oil as fuel, for he finds that in doing work successfully and in getting a good, soft, pliable and clean heat, oil is far superior to coal. Mr. Folk uses a common fanblast, an eight or nine ounce fan being used, which supplies a draft to 70 fires as well.

Piece Work.

A report was presented by Mr. T. C. Lace upon the feasibility of piece work in a railroad shop. Upon motion, this report was referred back to the committee and was finally withdrawn. At the same time an individual paper was presented by Mr. T. F. Keane upon the advantages of piece work over day labor. At the time of its presentation this paper was lain upon the table. However, upon the final withdrawal of the above mentioned report, was presented and the subject of piece work opened for discussion. A lively discussion followed the opening of this subject, evincing the fact that a great deal of thought had been expended upon the advantages of piece work and the substitution of the same for day labor. The remarks of a number of the members would indicate that among manufacturing establishments piece work is popular and is giving thorough satisfaction. The railroad men, however, appeared to consider that the variety of work encountered in railroad shops renders the piece work system more difficult, as new work is constantly occurring, making a fair decision of prices a hard proposition. It was generally believed that where piece work could be arranged satisfactorily and the prices decided upon consistently to both parties interested, that the piece work is practical and advantageous. Upon motion, the association placed itself on record as favoring piece work.

Machine Forging.

The report of Mr. H. A. Folk, chairman of the committee to consider the advantages of machine forging in car and locomotive construction, was read by Mr. G. H. Judy. This report and the ensuing discussion of the members indicated the unquestionable advantage of forging by machines instead of by the old hand method, the machines being capable of putting out work more quickly, readily and economically. As an instance of the work of machine tools in blacksmithing and the economy of the same in both time and labor, Mr. Folk presented, for the examination of the members, two truss rod anchors for a six wheel passenger car. While one of these anchors could not readily be made by hand in less than seven hours, Mr. Folk turns out from 50 to 65 in ten hours, machine made, employing three men to heat the material in an oil furnace and doing the work in a large forging machine.

Tool Steel.

As the chairman of this committee was absent and no report had been prepared for the convention the subject will be carried over until next year. Mr. E. T. Clarage of the Crucible Steel Company of America, was requested to address the convention on tool steel and called attention to a number of interesting points in the manipulation of this material, especially the high speed steel which has been recently introduced.

Best Form of Oil Furnace for General Locomotive Shop.

Mr. W. P. Savage had been appointed chairman of this committee and the subject had not been given to another until it was too late to prepare a satisfactory report for presentation. It was therefore, decided, upon motion, to continue this subject until next year.

Best Method of Forging Locomotive Rocker Shafts and Valve Yokes.

As no report had been prepared on this subject it was passed over and continued for another year.

Track Tools.

The subject of most interest under this head, appearing in both the committee report and in the discussion, was the making of track tools out of old locomotive tires. Where suitable facilities were available it is considered practical to manufacture track tools for such material. Where, however, such facilities are not available it has been found cheaper to purchase new tools. In repairing spike mauls when they get too short on face end, it has been found practical to upset the smaller end, making the same into a face end and drawing it to such a length that it will clear the rail without breaking the handle.

Tuyere Irons for Light and Heavy Work.

This report was accepted as read by the secretary and met with no discussion. The report presented, directed attention to the tuyere iron as an important factor in successful blacksmithing. In heating iron a good clean heat is necessary to obtain good results, time and material being often wasted on account of poor heat. In the judgment of the committee, the sideblast tuyere iron should be substituted for by bottom blast for either light or heavy work, as it produces a uniform heat regardless of the length or width of the same and an even heat is assured at all times. The bottom blast is believed to give a quicker, better and shorter heat, in addition to a saving of both time and fuel in cleaning the fire.

Case Hardening.

A comprehensive and interesting report was read by Mr. A. W. McCaslin, chairman of the committee, appointed to consider the best methods and best material to do good work in case hardening. Of the several different materials used for this work, Mr. McCaslin believes granulated raw bone to be the best for case hardening as it is cheaper and always ready for use, easily handled and does excellent work.

Frogs and Crossings.

Two communications were read by the secretary considering this subject and a discussion of the same was opened by Mr. Godsell, who questioned the advantages of riveting frogs to steel plates. The most important subject under this head is evidently the use of old material for making repairs. Where rails are about half worn out it costs more to make frogs or crossings with old rails than to use new, especially as old rails are more or less crooked and in many instances are found to be defective. From the standpoint of economy it appears best to scrap old frogs at market prices and make new ones.

Hammer Dies.

There being no report on this subject several members were called upon to give their experiences with relation to the use of dies, the discussion centering upon the material best adapted for the same. Upon motion of Mr. Timmons, the association placed itself on record as recommending the use of steel for dies.

Flue Welding.

A comprehensive report on this subject was presented by Mr. George Lindsay, the matter at hand being so well covered by the report that there was little room for discussion and the subject was soon closed. Mr. Lindsay welds about 260 flues in seven hours, testing each one carefully by water pressure. He directed attention to the requirement of superior work rather than making an apparently high time record and advocated superior workmanship rather than a large quantity. To illustrate his method of procedure and machines used, a number of blue prints and photographs were passed around among the members. Mr. John Cross of the Canadian Pacific Railway being unable to attend the convention in person, sent a number of samples of welded sections to be examined by the members. While flue welding may be considered under the jurisdiction of the boiler making department, that much interest is taken in this work by master blacksmiths is evidenced by the keen appreciation of the samples and blue prints presented.

Spring Making.

In the absence of Mr. J. W. Smith, chairman of the committee, his report was read before the association by Mr. G. H. Judy. Accompanying the report were a number of blue prints, illustrating furnaces used and the springs made under Mr. Smith's jurisdiction. He advocates the selection of a mild tough steel, rather than a steel high in carbon, and considers it bad practice to use old steel unless reasonably assured that the steel is of the same make as the rest of the spring. His experience has been, that a long wide spring has greater elasticity and consequently longer life, giving better service than a short narrow spring. While Mr. Smith has tried a number of oils, raw linseed oil has proved the most satisfactory for hardening.

ELECTION OF OFFICERS.

The result of the ballot for the election of officers for the ensuing year, is as follows: President, George Lindsay, E. & T. H. Railroad; vice-president, T. F. Keane, Ramapo Iron Works; second vice-president, J. W. Riley, Pullman Company; secretary and treasurer, A. L. Woodworth, C. H. & D. Railway; chemist, G. H. Williams, B. M. Jones & Co., Boston, Mass.

ENTERTAINMENT.

During the convention the members visited the repair shops of the New York Central and Hudson River Railroad at Depew, and the shops of the Pullman Car Works at East Buffalo, where they were extended every courtesy possible by the respective companies. After the close of the business meeting, the members of the association and their visiting friends spent a day at Niagara Falls where they enjoyed a pleasant outing as well as an instructive visit to the several power plants deriving power from the falls. While the members were occupied with the business meetings, the visiting ladies were entertained with a trip on Lake Erie, tally-ho rides about the city and an evening at the theater.

AMONG THE SUPPLY MEN.

The Ajax Manufacturing Company, of Cleveland, O., manufacturers of the Ajax or Blakeslee improved heading, upsetting and forging machines, bulldozers, etc., exhibited a large number of forgings made upon their different sized tools, and distributed a number of their attractive catalogues, showing many improved tools and an illustration of work done thereon. This company was represented by John R. Blakeslee, Sr., John R. Blakeslee, Jr., I. H. Pratt, A. L. Guilford and Henry Gaul.

A. C. Trout, representing the Garlock Packing Company, exhibited a number of specimens of special steam hammer packing. Mr. Trout is the Buffalo representative of this company who are manufacturers of steam water and ammonia packings, located at Palmyra, New York.

The Crucible Steel Company of America, represented by E. T. Clarage, presented all members of the association with a case containing a small section of the natural steel bar, together with specimens of refined, over heated and burned steel. By comparing steel in actual service with the specimens, it is possible at a glance to determine the nature of the material at hand.

B. M. Jones & Co., manufacturers of Taylor's best Yorkshire iron and Mushet's special steel, were represented by G. H. Williams, W. L. Pierce, and J. E. Williams.

Firth-Sterling Steel Company, manufacturers of blue chip steel, were represented by W. A. Nungester and W. C. Royce.

Crerar, Adams & Co., dealers in railway supplies and contractors materials, were represented by F. W. Clifford.

Cincinnati Railway Supply Company were represented by Charles Kopenhoefer, who advocated the use of Jessop steel.

R. E. Stafford, G. A. Thompson, S. F. Sullivan and J. A. Sherwood attended the convention in the interest of the Ewald Iron Company of St. Louis.

Brown & Co., Inc., of Pennsylvania, were represented by J. W. Williams.

The American Blacksmith, a monthly journal, devoted to the blacksmithing craft, published at Buffalo, N. Y., presented each day to the members a bulletin giving a complete report of each day's proceedings and copies of the bulletins were sent to all members immediately after the convention.

COMMUNICATIONS

M. C. B. Rule No. 73

To the Editor:

Does the Master Car Builders' Association realize that Rule 73 of the Code, concerning repair cards, is becoming a dead letter in its operation; that the issuance of repair cards by a large number of railroad companies is considered a very unimportant matter and that only a very small percentage of foreign cars that are repaired have the cards attached as per the rule? Some idea of the magnitude of the non-observance of the rule may be had when I state that one of the prominent roads entering Chicago has records to show that only about 30 per cent of the wrong repairs on its cars are covered by repair cards.

Another feature is the filling out of one side of the card only and in many cases the writing is so dim that it cannot be deciphered.

Why is it that repair cards are not applied when repairs are made to foreign cars? My opinion is that there are two reasons. First—It is too much trouble for the repair men to fill out and apply them. Second—When wrong repairs are made the failure to apply them is deliberate, as their absence will in most cases prevent the owners locating the guilty parties and recovering for same.

I realize that this is a serious charge and may be considered too harsh, but I am at a loss to understand in what other way the matter can be looked at if met squarely. I have seen cars, which reached the owner after having undergone extensive repairs by foreign companies, without a single repair card on, when two and perhaps three would be required to cover all parts renewed, and having new sills, which were entirely guiltless of any signs of ever having been touched by a tack.

The practice of writing on one side of cards only should be strictly prohibited, and if ink is not used only the best quality of indelible pencils should be allowed.

Any rule or law that does not have a penalty provided for the non-observance of same is a howling farce, therefore, I say punish those guilty of failing to apply repair cards when they repair a foreign car; or else throw the rule out of the Code.

It would be a difficult matter to get a conviction in all cases but enough could be located and shown up to have the effect of making the careless ones much more careful.

Enforce the rule or do away with it altogether.

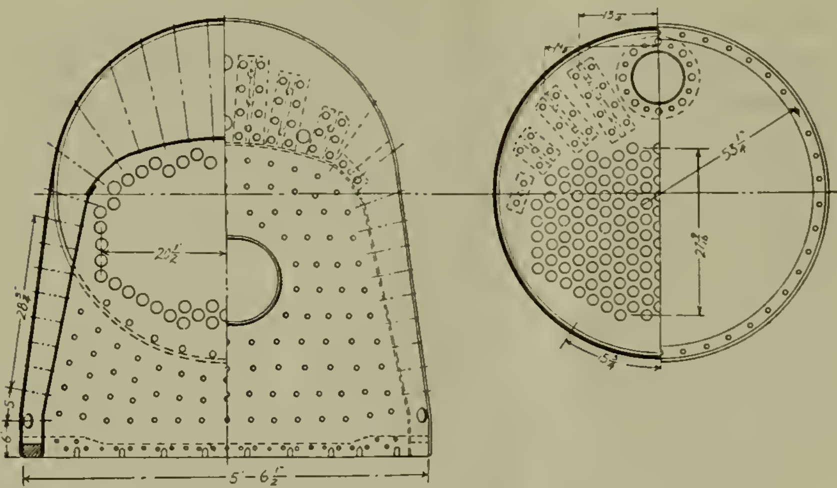
Very truly,

A. G. F.

Saddle Tank Switching Locomotive

New York Glucose Company

THE Rogers Locomotive Works has recently built a six-wheel switching locomotive for the New York Glucose Company, weighing 112 pounds in working order, having cylinders 18x24 inches and designed to operate under 180 pounds working steam pressure. The most peculiar feature of the construction of this locomotive is the application of a wide fire box to a saddle tank switcher. The fire box is designed to burn a mixture of equal parts of crushed anthracite and bituminous coal, being of about the same consistency as regular birdseye coal, which is the fuel used under the stationary boilers at the company's works.



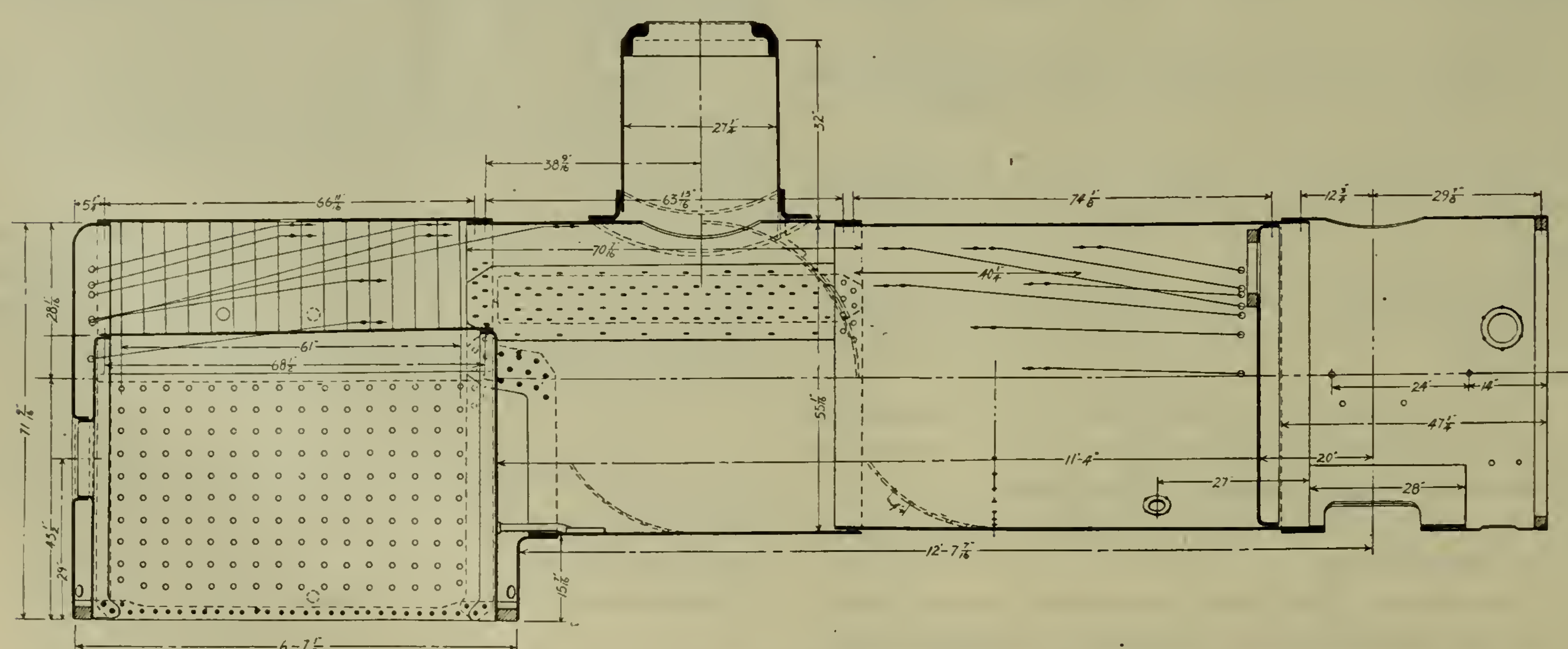
SADDLE TANK SWITCHING LOCOMOTIVE—TRANSVERSE SECTION OF BOILER.

The engine will be used for regular yard work, and also for hauling cars from transfer floats on the Hudson River. It will be operated by one man, the cab fittings as well as the engineer's and fireman's decks being arranged with this in view.

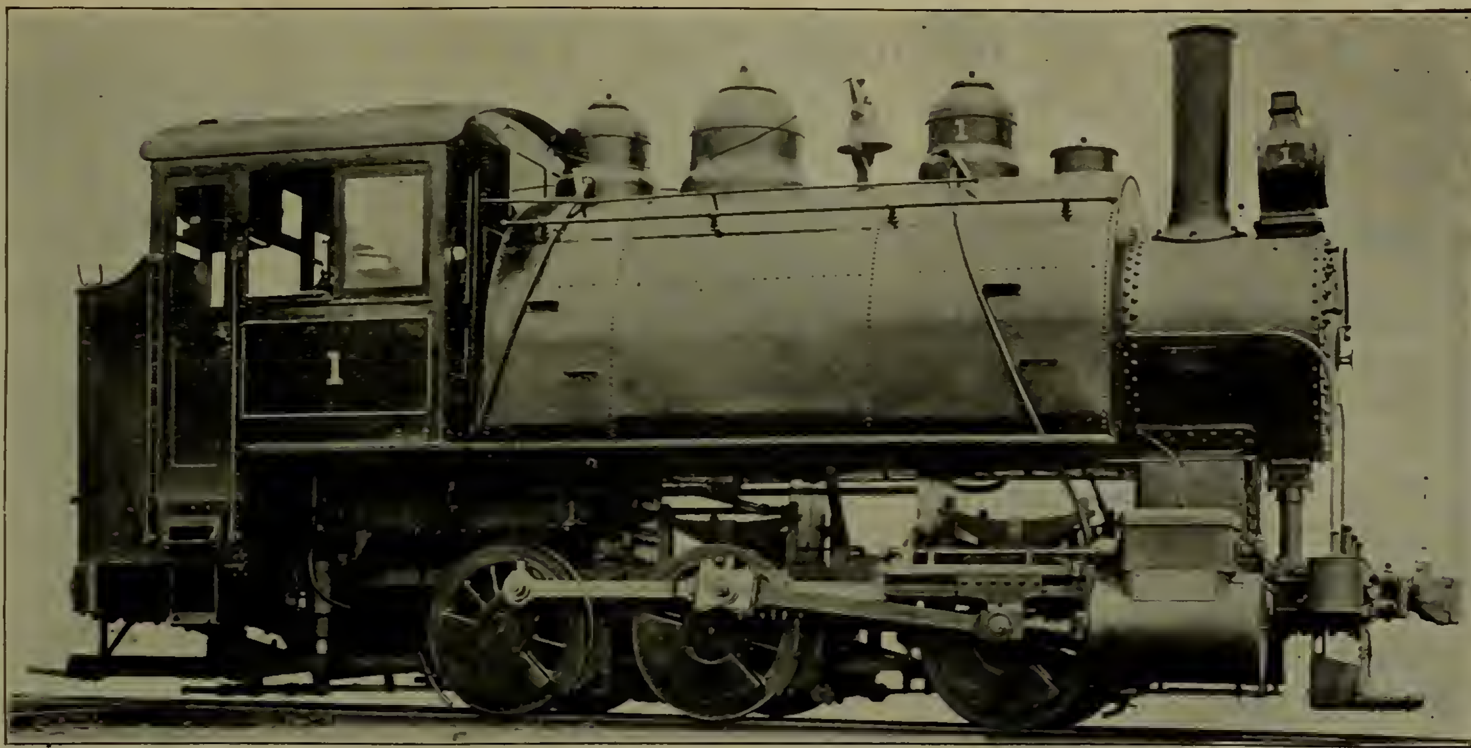
Assuming the mean effective pressure to be 85 per cent of the boiler pressure, and determining the tractive effort by the usual formula, the locomotive is capable of exerting a starting power of 27,000 pounds. The weight on drivers being 112,000 pounds, the ratio of adhesive weight to tractive effort is 4.14, the ratio of tractive effort to total heating surface is 23.7, and the ratio of total heating surface to grate area is 37.8.

The following table presents the general dimensions and further details of construction:

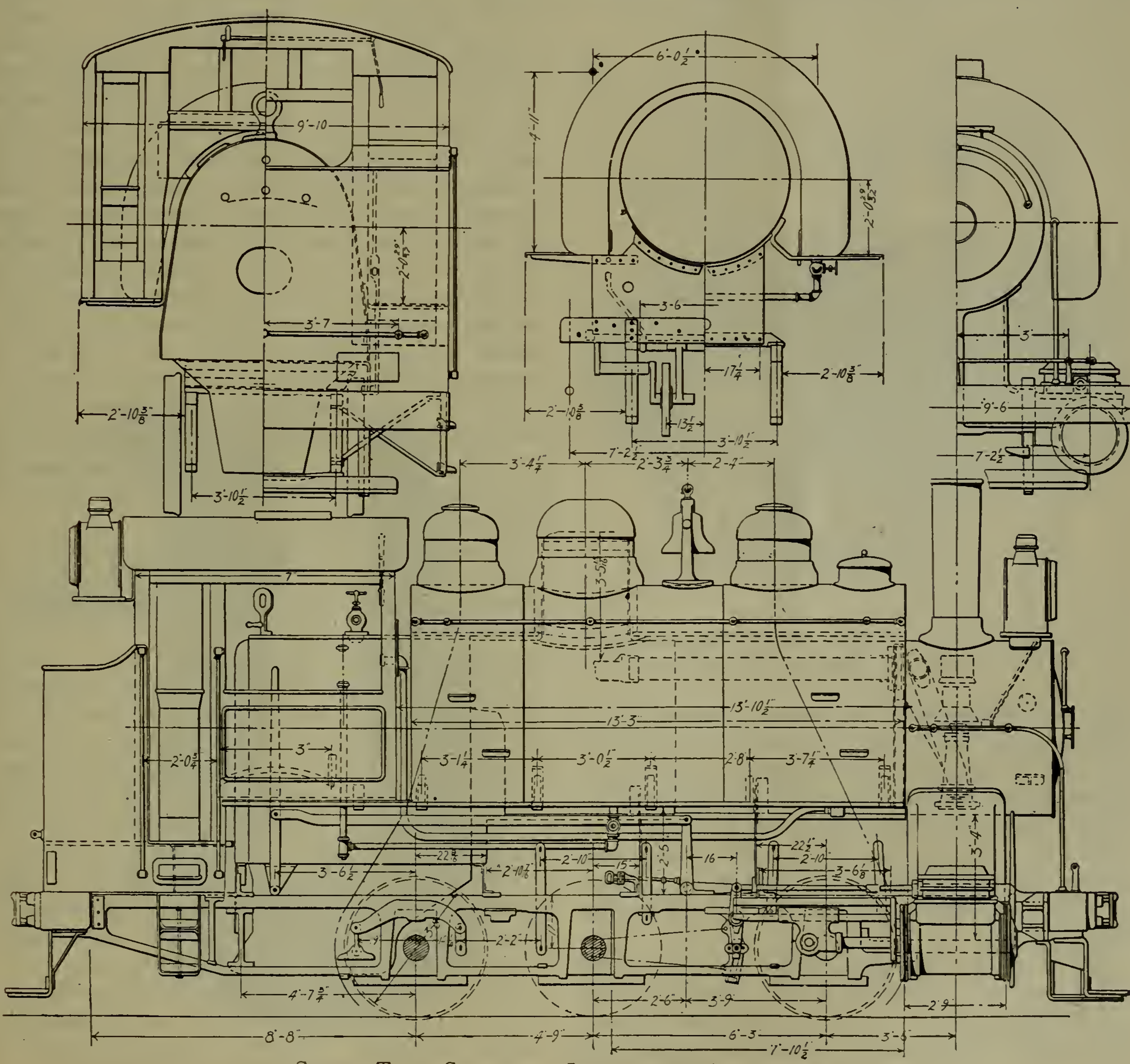
Name of road	New York Glucose Co.
Type	6-wheel saddle tank
Fuel	Small anthracite and bituminous mixed
Class	0-6-0
Cylinder	18 ins. by 24 ins.
Drivers, number	Six
Drivers, diameter	44 ins.
Driving wheel material	Cast iron
Driving axle material	Steel
Driving wheel base	11 ft.
Total wheel base of engine	11 ft.
Journals	8 ins. by 10 ins.
Weight on drivers	112,000 lbs.
Weight, total	112,000 lbs.
Heating surface, tubes	1038 sq. ft.
Heating surface, firebox	96 sq. ft.
Heating surface, total	1134 sq. ft.
Grate area	30 sq. ft.
Tubes, diameter	2ins. o. d.
Tubes, length	11 ft. 4 ins
Tubes, thickness	No. 12
Tubes, number	175
Tubes, material	C. C. iron
Grate, length	72 ins.
Grate, width	60 ins.
Boiler, type	Straight top, radial stayed
Boiler, diameter, inside front	54 ins.
Boiler, material	Steel
Boiler, working pressure	180 lbs.
Boiler, thickness of barrel	17-32 ins.
Boiler, thickness of dome course	17-32 ins.
Boiler, thickness of crown	3/8 in.
Boiler, thickness of tube	1/2 in.
Boiler, thickness of side	5-16 in.
Tank, capacity	1700 gals.
Safety valves	2-2 1/2 ins., plain
Lubricators	No. 8 double sight feed
Headlight	2-18 ins., round case
Brakes	Steam and hand brake
Boiler covering	Sectional magnesia
Packing	Metallic
Couplers	Short shank, radial
Tires	4-flange, 3 ins. by 5 1/2 ins., and 2 flat 3 ins. by 6 1/2 ins.
Sanding device	Hand lever only
Injectors	2 No. 8, lifting
Springs	Half elliptic



SADDLE TANK SWITCHING LOCOMOTIVE—LONGITUDINAL SECTION OF BOILER.



Saddle Tank Switching Locomotive for the New York Glucose Company.



Saddle Tank Switching Locomotive—Elevations.

Railroad Shop Tools

By Charles H. Fitch

V

THERE is no class of work in the shops which presents a more interesting study of varied machinery and means of doing the same work than appears in the formation of rivets. This was originally done by hand hammers, but is now also done by pneumatic tools held in the hand, by portable suspended machines with pneumatic or hydraulic power, and by hydraulic presses exerting up to 150 tons pressure, and served by hydraulic cranes operated in unison with the presses and occupying tower buildings set apart expressly for this purpose.

We need say nothing of mechanical power riveters, as their purpose is better served by fluid power machines; nor of steam riveters, because these are usually more expensive and less desirable than hydraulic machines. Electrical equipment can be used for pumping up pressure in hydraulic accumulators, and electrical or power cranes are somestimes used, but there seems nothing better for use with the hydraulic riveter than a hydraulic crane operated by a valve on the riveter. These cranes with wire-hoisting ropes, large wheels and roller bearings furnish a quick, smooth motion of the boiler from rivet hole to rivet hole.

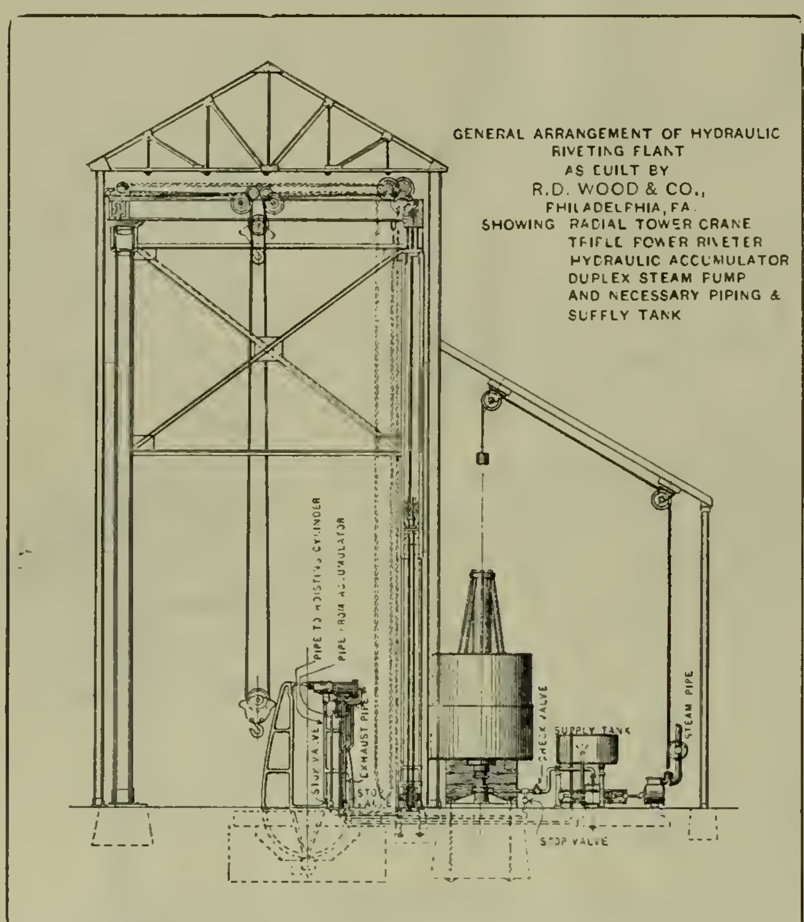


FIG. 1—ARRANGEMENT OF HYDRAULIC RIVETING PLANT.

Figure 1 shows a complete riveting tower equipment as furnished by J. T. Ryerson & Son, Chicago. Figure 2 shows interior of riveting tower at the Baldwin Locomotive Works, with gearing for crane, and rivet heater to the right. At the left is shown a locomotive boiler with grappling chains for suspending it vertically as usual. Above all is an overhead crane, not within the field of the picture.

The variation in weight and power of machinery for like purposes is emphasized by comparing Figure 3, showing a fixed hydraulic riveter having 10 ft. 6 in. gap (R. D. Wood & Co.), with Figure 4, a pneumatic riveter with 8 ft. gap (Q. & C. Co.). The latter has a light pipe yoke stiffened by a strap, the former a very massive yoke of cast steel. For the complete work of locomotive construction and repair shops 17 ft. gap riveters are used, with pressures of 1,500 lbs. per sq. in.

The other extreme from this heavy machinery is occupied by the wonderful hand-held pneumatic power hammers, used not only in riveting, but for caulking rivets, beading flues and chipping castings. In some of this work they are unrivaled, and furnish a clear labor-saving advance over ordinary hand tools. Figure 5 shows the construction of the hammer made by the Cleveland Pneumatic Tool Company, and Figure 6 the hammer made by the Q. & C. Co. The mechanism effects the admission of compressed air, and its release giving a rapid shower of blows from a reciprocating hammer or plug. In Figure 7 is shown a Q. & C. hammer used in beading flues in the smoke box end of a locomotive boiler. The usual weights of these hammers are four to eight pounds, and the work done is about double what can be accomplished without pneumatic power. The invention of pneumatic hammers comes in aptly with the larger use of steel castings. The latter are much harder than iron, and often rougher owing to the greater shrinkage, and the work of cleaning and smoothing such castings would be a serious obstacle to their use were it not for the efficient pneumatic hammers.

All the rivets (253—¾ inch) in a fire box were driven with a Boyer hammer in nine hours; labor required, one hammer man, one holder on and one heater. The cost of the job in labor was $4.32, or per rivet 1.7 cents. Ordinary hand riveting would have cost $16.95, or 4.3 cents per rivet for the same work, requiring the labor of two boiler men, one holder on and one rivet heater for fifteen hours. With the use of a snap in hand work, one boiler man being replaced by a helper, the cost of job was reduced to $7.56; time, twelve hours.

The question inevitably comes up: What are the relative merits of work done by the widely different machines for riveting? With proper care and under proper conditions all of them do good work. We present the theory of operation of the several tools, and a few examples of heavy work done by the lighter tools.

A light, rapid blow penes or spreads the surface of the material to which it applies, exactly what is required in caulking or beading. The effect of a more powerful but sudden blow is of greater depth, but still localized.

Fig. 2—Interior of Riveting Tower at the Baldwin Locomotive Works.

Slow, heavy pressure is diffused in all directions and causes something like a flow of the metal, a deep, spreading uniform effect.

The formation of one small forging, the rivet calls into play all these variations of hammer and press. Differences in principle of blow, which would be important on larger forgings, are believed not to affect the quality of riveting so long as the rivets are properly heated and driven true.

First referring to the small hand riveters, we quote the Q. & C. Co. They recommend an eight-pound hammer for 1¼-inch rivets driven hot, and state that this weight

Fig. 3—Hydraulic Fixed Riveter.

is sufficient not only to head the rivet properly, but to upset it throughout its length and thoroughly plug the hole. Rivets must be nearly evenly heated, the point having a yellow heat. Snaps should suit the head of the rivet and the length of stock so as not to strike the plate after making the head. In machines with plate-closing attachments, the sheets are first closed as they should be. Riveting is often done without plate closers, in which case the rivet is held against the sheet, and a few blows are given to upset it and give it a hold, but a fin may be formed bewteen the plates.

One general argument for the light riveters is that locomotive boilers are of such form that some riveting must be done by hand tools, and as the chain is no stronger than its weakest link it might be inferred that heavy pressure work is not essential. The pneumatic riveters, however, are good for long campaigns of very heavy work. A good example of this is afforded by the use of the Cleveland Pneumatic Tool Company's "Jumbo" at the Lake Erie Boiler Works. This tool, in the course of a year's continuous work, drove 20,000 and was perfectly tight under hydraulic test of 325 pounds per square inch.

Fig. 4—Pneumatic Riveter.

"The essential parts of a riveting machine," says Mr. F. R. Hutton, "are first a stationary stiff post or bolster, which shall serve as an abutment or anvil for upsetting the rivet." This is not quite true, for if the work can be properly grasped light apparatus may take the place of massive tools with heavy cranes for bringing work to the tool, and special high buildings to house the whole equipment. "By means of pipe," says the Q. & C. circular, "it is possible to make yokes of large gap at slight cost, and of exceedingly small weight compared to pressure riveters."

Historically, the heavy fixed steam and hydraulic riveters were an improvement on crank and toggle power machines (never very satisfactory) and upon hand riveting. Then came the portable hydraulic and pneumatic machines, and, last of all, the small pneumatic hand hammers. The portable pneumatic machines are hammer machines, but the portable hydraulic machines are

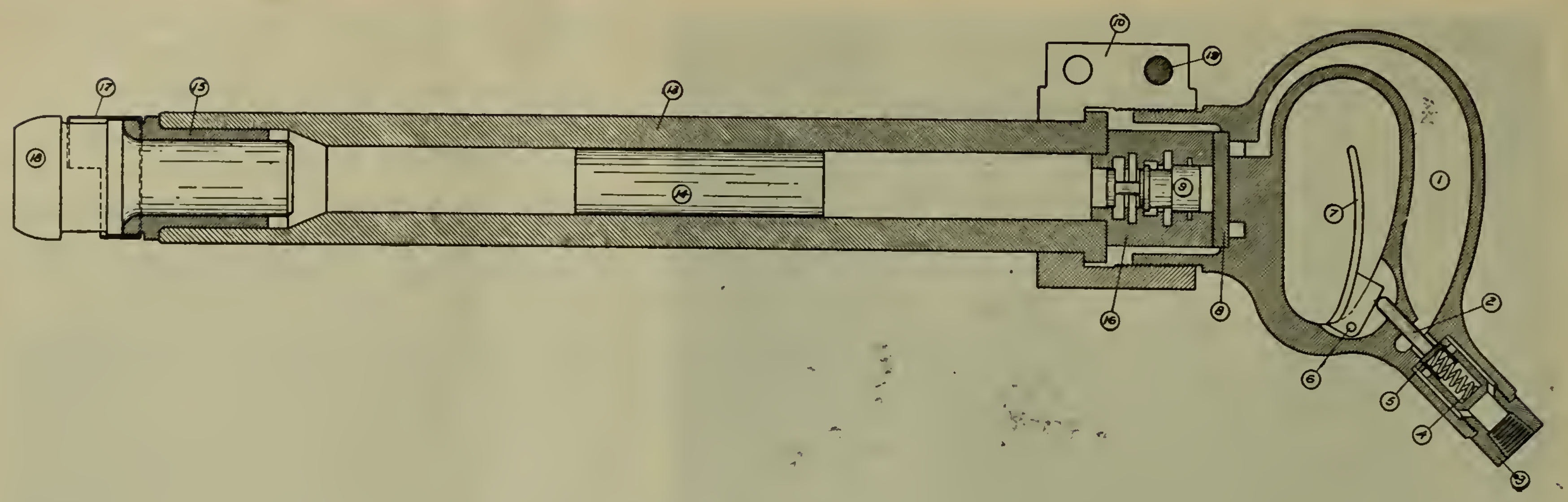


FIG. 5—PNEUMATIC HAMMER MADE BY CLEVELAND PNEUMATIC TOOL CO.

pressure machines, capable of exerting as high pressures as the fixed machines.

Wm. Sellers & Co., in their circular, state that "the superiority of the pressure-driven rivet is universally acknowledged," and base this superiority on the solid clamping of the plates and complete upsetting of the rivet shank so as to fill the hole.

In Figure 8 is shown the Allen pneumatic portable riveter. This machine costs half as much as steam or hydraulic riveters of the same reach, with less expense of installation also for the portable riveter. The manufacturers say: "They make tighter work and drive as many rivets as any hydraulic riveter." The plates are closed under pressure of 2,000 pounds, and rivets are formed at the rate of two or three a minute for boiler rivets. Air pressure used is thirty or forty pounds per square inch, and number of blows per minute is from 150 to 200. Some stationary boiler shops rely entirely on these machines, and have as many as seventeen of them side by side.

Portable hydraulic riveters and penumatic riveters of the jaw type have some approved use in locomotive tank and boiler work. The pneumatic riveters for bridge work, commonly called compression riveters, have a toggle movement in closing which renders them unsuitable for boiler work, as they do not drive the rivets perfectly true. Riveters using air at 60 to 75 pounds per square inch pressure with 10-inch cylinders and toggle joints can be made to exert as much as fifty tons pressure when the dies are nearly closed, but penumatic riveters suitable for boiler work exert much smaller pressures.

Modern fixed hydraulic riveters are made with provision for three pressures, usually 25, 50 and 75 tons, although by the same devices a series of 42, 84 and 125 tons may be obtained. Bement, R. D. Wood and Chambersburg machines are made in this way up to 204 inch gap. The method of obtaining triple pressures is ingenious, consisting of different devices for cutting out portions of the area of rams. The areas determine the proportional pressures. In the Chambersburg device a distributing valve admits pressure to one or all of a central, an annular and a third separate cylinder. As

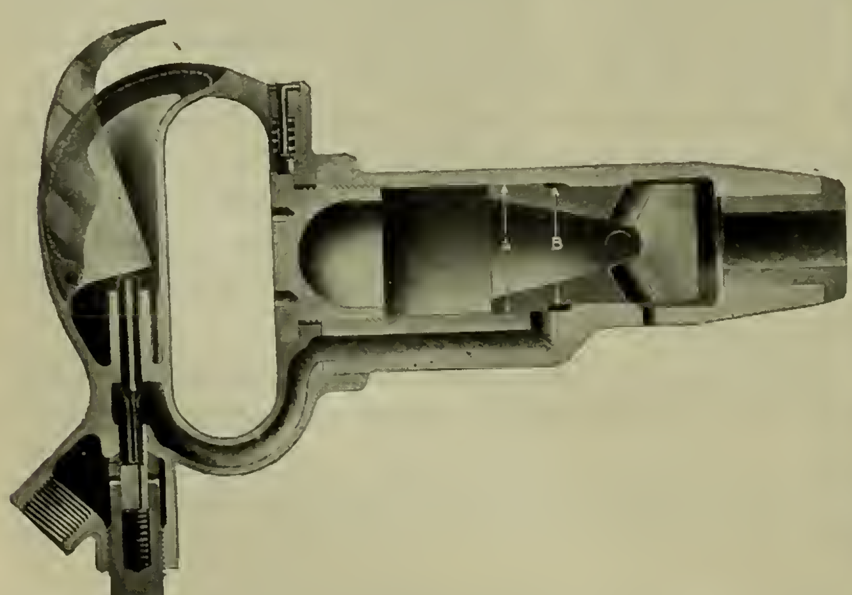


FIG. 6—PNEUMATIC HAMMER MANUFACTURED BY THE Q. & C. CO.

FIG. 7—Q. & C. PNEUMATIC HAMMER IN SERVICE BEADING FLUES.

one or more of these are brought into action the pressure is increased.

The Bement device is very compact. The triple pressures are controlled by one poppet valve with an additional mechanical device for attaching and detaching two concentric plungers within, and protruding from the main piston. The main piston gives the full pressure. Then by attaching to it a central plunger the central area is cut out, reducing area of pressure to two-thirds, and by also attaching an annular plunger area and pressure are reduced to one-third. The ingenious feature is the means of attachment by use of a screw and nut with threads partly cut away in slots, so that by turning the plungers slightly they may be slid along the slots and clinched in a different position by a slight turn.

These devices by different manufacturers are no doubt varied to effect independence of patent claims. They illustrate the readiness with which hydraulic power can be regulated and applied. It lends itself to designs and

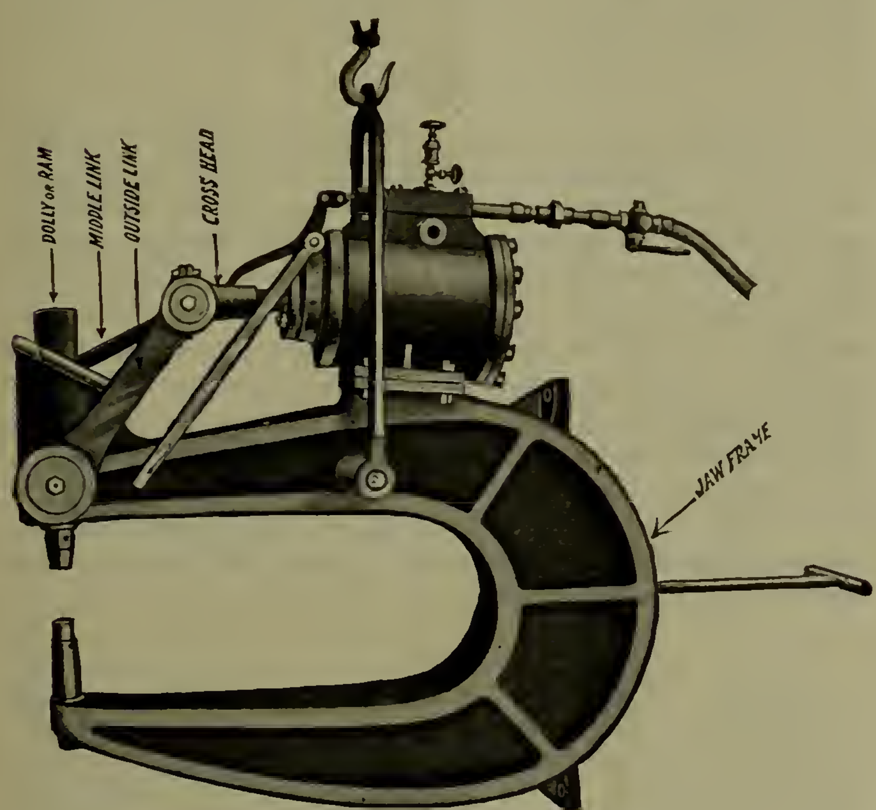


Fig. 6—Allen Portable Pneumatic Riveter.

purposes with wonderful flexibility and range of power.

It will be seen that perfect work is claimed for all the devices from 125-ton machines to hand-held riveters striking light blows, and that the latter are used by leading boilermakers on very heavy work on the largest boilers tested up to 325 pounds per square inch. The small pneumatic hammers would seem to have made a possibility of some radical changes in general practice, but the powerful fixed riveters have established an efficient and reliable usage in handling large straight work rapidly and thoroughly. The factor of personal reliability in the workman is less likely to affect the work than with small hand-held tools. This assurance of uniformly reliable work will well repay the installation of heavy machinery in permanent shops having such continuous work as is required in railroad shops. The best is wanted, not the cheapest; and for the straight work uniform and established methods will long maintain the use of powerful fixed riveters.

Personals

Mr. H. F. Whiting, foreman of the car department of the Texas Midland Shops at Terrell Tex., has resigned.

Mr. James Howe, general foreman of car inspectors of the New York Central & Hudson River at Buffalo, died at his home in that city on July 31.

Mr. Harrity has been appointed master mechanic of the Atchison, Topeka & Santa Fe at Raton, N. M., to succeed Mr. D. A. Sullier, resigned.

Mr. A. Dinan has been appointed master mechanic of the Atchison, Topeka & Santa Fe at Newton, Kas., to succeed Mr. W. S. Grandy, resigned.

Mr. J. C. Meehan has been appointed assistant master mechanic of the Mobile & Ohio at Mobile, Ala.

Mr. Harry Latta, general foreman of the Ohio Central shops in Toledo, has been appointed master mechanic of the Toledo Terminal.

Mr. C. D. Schaff has been appointed acting road foreman of engines of the New York Central & Hudson River at Watertown, N. Y.

Mr. J. E. Cameron has been appointed master mechanic of the Atlantic & Birmingham, with office at Waycross, Ga., to succeed Mr. G. E. Jones, resigned.

Mr. J. E. Irwin, master mechanic of the Marietta, Columbus & Cleveland, has also been appointed master mechanic of the Little Kanawha.

Mr. Carl H. Metzgar has been appointed foreman of shops of the East Broad Top Railroad, with headquarters at Rockhill Furnace, Pa.

Mr. Thomas Caffrey has been appointed assistant road foreman of engines of the Lake Erie & Western, with headquarters at Lima, O.

Mr. James Thornton, superintendent of the car department of the Mobile & Ohio at Cairo, O., has resigned and has been succeeded by Mr. L. T. Hutchinson.

Mr. James Rennie, heretofore mechanical engineer of the St. Louis & San Francisco, has been appointed shop superintendent of that road, with headquarters at Springfield, Mo.

Mr. G. M. B. Davis has been appointed general foreman of the car shops of the Pennsylvania Road at Lewiston, Pa., to succeed Mr. James B. Eckebarger, resigned.

Mr. H. P. Knight, master mechanic of the Baltimore & Ohio at New Castle Junction, Pa., has resigned and is succeeded by Mr. J. Kirkpatrick, who has been transferred from Chicago Junction, O.

Mr. George M. Whinney has been appointed master mechanic of the Great Northern (Wilmar and Sioux Falls division), with headquarters at Wilmar, Minn., to succeed Mr. George A. Bruce, recently transferred.

Professor Eugene W. Kerr has been appointed instructor in machine designing at Purdue University, Lafayette, Ind. He is a graduate of the Agricultural and Mechanical College of Texas, where he was assistant professor in mechanical engineering.

Mr. Henry Giegoldt, heretofore master mechanic of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been appointed master mechanic of the Colorado & Southern, with headquarters at Trinidad, Colo.

Mr. Theodore F. Dreyfus has been promoted to the position of general foreman of the Erie & Ashtabula division, northwest system of the Pennsylvania lines west of Pittsburg, effective August 1. His headquarters are at Mahoningtown, Pa. Mr. Dreyfus is a graduate of Stevens' Institute of Technology, Hoboken, N. J., class of 1898. He entered roalroad work as a draughtsman with the Illinois Central and in 1901 completed a special apprenticeship at their Burnside shops. He went to the Pennsylvania lines west in September, 1901, and has filled the successive positions of motive power inspector, general foreman of the C. & M. V. R. R. at Lancaster, O., and general foreman at Pendleton shops, Cincinnati, which position he now leaves to assume his new duties.

Mr. C. K. Shelby, heretofore assistant master mechanic of the Pennsylvania Railroad at Altoona, Pa., has been appointed assistant engineer of motive power of the Philadelphia and Erie division and the Northern Central, with headquarters at Williamsport, Pa., to succeed Mr. John M. Henry, promoted.

Mr. L. B. Ferguson has been appointed master mechanic of the Vicksburg, Shreveport & Pacific, with headquarters at Monroe, La., to succeed Mr. A. L. Moler, who was recently appointed superintendent of motive power of the Chicago, Cincinnati & Louisville. Mr. Ferguson has heretofore been chief draughtsman of the New Orleans & Northwestern.

Mr. Charles E. Fuller has been appointed superintendent of motive power of the Chicago & Alton, with headquarters at Bloomington, Ill., to succeed Mr. A. L. Humphrey, who recently resigned to become connected with the Westinghouse Air Brake Co. Mr. Fuller has heretofore been assistant mechanical superintendent of the Erie Railroad.

Mr. W. T. Smith, heretofore master mechanic of the Chesapeake & Ohio at Richmond, Va., has been transferred to Covington, Ky., in place of Mr. C. H. Terrell, who has been made master mechanic at Huntington, W. Va., succeeding Mr. A. F. Stewart. Mr. Stewart has been appointed master mechanic at Clifton Forge, Va., to succeed Mr. J. R. Gould, who has been transferred to a similar position at Richmond, Va.

Mr. Theodore H. Curtis, who has been appointed superintendent of machinery of the Louisville & Nashville to succeed the late Mr. Pulaski Leeds, began railroad work on the Vandalia at an early age, and before the age of 21 he was chief draughtsman or the Cleveland, Cincinnati, Chicago & St. Louis. He successively served with the Brooks Locomotive Works and the Pittsburg Locomotive Works. For some years he was mechanical engineer of the New York, Chicago & St. Louis, and from there went to a similar position on the Erie. On January 1, 1902, Mr. Curtis accepted the position of mechanical engineer of the Louisville & Nashville, which position he has held up to his recent appointment. Mr. H. Swoyer, who has heretofore been general master mechanic of this company, has been appointed assistant superintendent of machinery, with headquarters at Louisville, Ky.

Notes of the Month

The Illinois Central has prepared an elaborate folder on the Louisiana Purchase Exposition, which is illuminated with half-tone illustrations and contains a map showing the historical expansion of the territory of the United States. The reading matter is in Spanish and English, as the purpose of the road is to circulate the folder extensively in Cuba, Porto Rico and the Spanish-speaking countries of this hemisphere.

Catalogue No. 4 of the Hamilton Machine Tool Company, Hamilton, Ohio, illustrates in an interesting manner the engine lathes, upright drill presses, radial drills, etc., manufactured by this establishment. In order to fully meet the demands of the best modern practice, their machines have been designed to embody the latest and most desirable features. The catalogue describes very fully these salient features, illustrates the application of individual motor drive, and contains several tables of useful information.

The Ajax Manufacturing Company, of New York and Chicago, are distributing a tastily arranged catalogue, many of which were in evidence at the recent meeting of the National Railroad Master Blacksmiths' Association. The booklet is well bound to withstand wear, and contains clear illustrations of their bolt heading, upsetting, forging die rivet making machines, bulldozers, etc., together with many of the parts made by these machines. Those interested in the quick and economical forgings of difficult and simple parts in the blacksmith shop will find much interest and information in this catalogue.

The United States Graphite Company, Saginaw, Mich., sole miners of Mexican graphite, who are offering through our advertising columns to send free on request a quarter-pound sample of dry lubricating graphite to any railroad man, believe their No. 205 lubricating graphite to be the handiest as well as the most efficient supply of its kind ever used in engine cab or round house. They recommend it for use dry or in connection with oils and greases. Firemen will be interested to know that this product is also urged by the producers as the ideal pigment for the preparation of a locomotive front end dressing. It is easily prepared, gives a fine, glossy finish, and it is claimed that it possesses unusual virtue for withstanding the trying conditions to which the front end is always subjected.

There are seashore resorts everywhere, but few sections can compare with the famous New Jersey Coast, and there is nothing more beautiful. The bathing is the finest, the climate delightful and the surroundings enchanting. There are fine roads in every direction, and the traveler is in the midst of a region in every way to his liking. Likewise the interior of Jersey is interesting from every standpoint. The general passenger department of the New Jersey Central has just issued a profusely illustrated book on New Jersey entitled "Seashore and Mountains," which is sent to any address upon receipt of 6 cents in stamps by C. M. Burt, general passenger agent, New Jersey Central, 143 Liberty street, New York.

John P. Allen, 370-372 Gerard avenue, New York city, manufacturer of the "Allen" portable pneumatic riveting machines, reports the following sales of complete machines for the month of July: American Structural Steel Co., East Carnegie, Pa., three machines; Handels und Transport Actiengieschaft, Vienna, Austria, 1; Locomotive & Machine Co., of Montreal, Canada, 1; V. Loener, Copenhagen, Denmark, 1; Baird Machinery Co., Pittsburg, Pa., 1; Pettibone, Mulliken & Co., Chicago Ill., 1; J. A. Mead Mfg. Co., Grand Crossing, Ill., 1; G. L. Bollinger Co., Verona, a., 1; Barber & Ross, Washington, D. C., 1; Noelke & Richards Iron Works, Indianapolis, Ind., 1; Kellogg Iron Works, Buffalo, N. Y., 1; American Hoist & Derrick Co., St. Paul, Minn., 1; Ratig Engineering Co., North Sidney, Nova Scotia, 1. Total, 15 machines.

Mr. Allen states: "At the ending of our third quarter, July 31st, our sales show an increase of 36 per cent over the corresponding period for last year, and our July sales were 10 per cent more than May or June."

A long fight, which was necessary to protect the rightful property of the Wheel Truing Brake Shoe Company, has recently been won by this firm. About two years ago it was discovered that the Toronto Railway Company were attempting to reap a part of the results of the labor of the Wheel Truing Brake Shoe Company, by using an abrasive shoe which was manufactured under patents obtained by Michael Power, an employe of the Toronto Railway Company. A suit was at once instituted in the courts of Canada against M. Powers and the Toronto Railway Company, settling the matter in favor of the Wheel Truing Brake Shoe Company, so far as Canada was concerned. In the meantime a company had been organized in Buffalo, N. Y., under the name of the Car Wheel Truing Brake Shoe Company, for the manufacture of the Power shoe under the United States patents. Upon learning of the operation of this company, suit was taken against them claiming an infringement, which was also won by the Wheel Truing Brake Shoe Company. The similarity between the company of Buffalo and the company of Detroit will be noted, this similarity being undoubtedly arranged, in order to hide, so far as possible, the true origin of the brake shoe in question.

Safety Appliance Limit Extended

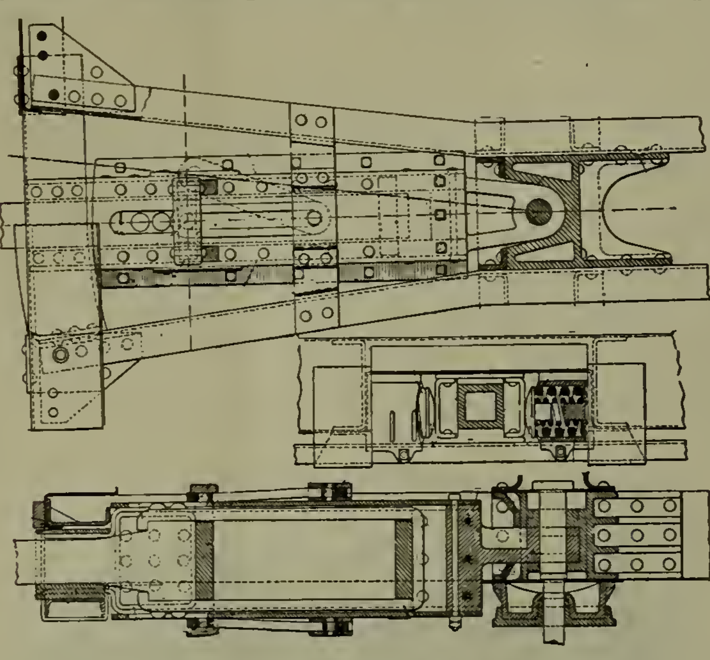
The Interstate Commerce Commission has extended until Oct. 15 the time within which railways must complete their equipment for compliance with the safety appliance act. The commission will meantime consider the further extension of the law and the question of the location of grab-irons on engines. In the setting of Aug. 6, the Boston & Maine appealed for time for putting automatic couplers on locomotives and making the coupling equipment on passenger cars uniform with the locomotive equipment. The Colorado & Southern wanted time for equipping its narrow-guage passenger locomotives with driver brakes, while the A., T. & S. F. wanted the requirement of grab-irons on fronts and sides of locomotives dispensed with. The appeal of the other roads related to the equipment of 50 per cent of the cars in all trains with air brakes.

Fast Time in England

A fast run was made between London and Brighton on a recent Sunday by a train on the London, Brighton & South Coast Ry. This train consisted of three Pullman cars and two guards' vans drawn by a new standard type of express locomotive, the "Holyrood." The total load was 130 tons. The train left Victoria station just before 11 and after surmounting the incline of 1 in 60 at Grosvenor bridge, a speed varying from 60 to 80 miles an hour was soon attained and well maintained. The run from Grosvenor bridge to the goods sheds at Brighton, where speed had already been slackened, a distance of 50 miles, was covered in 46 minutes 11 seconds, very nearly at the rate of 69 miles an hour. The officers of the company estimate that when work now under way on the line is completed the distance can be made in 45 minutes.

The Krakau Draft Rigging

Mr. Harry T. Krakau has assigned to the National Malleable Castings Co., of Cleveland, O., the patent rights recently granted him on a novel form of draft rigging, which we illustrate in the accompanying engravings. The purpose of the invention is to provide a radially-movable draft rigging in which the parts are of very simple construction and are yet adapted to resist the heavy strains to which draft riggings are subjected when in use. The draft rigging comprises a frame adapted to carry the drawbar or coupler and the resistance devices—that is, the springs or friction attachments—this frame being mounted at its rear end on a pin on

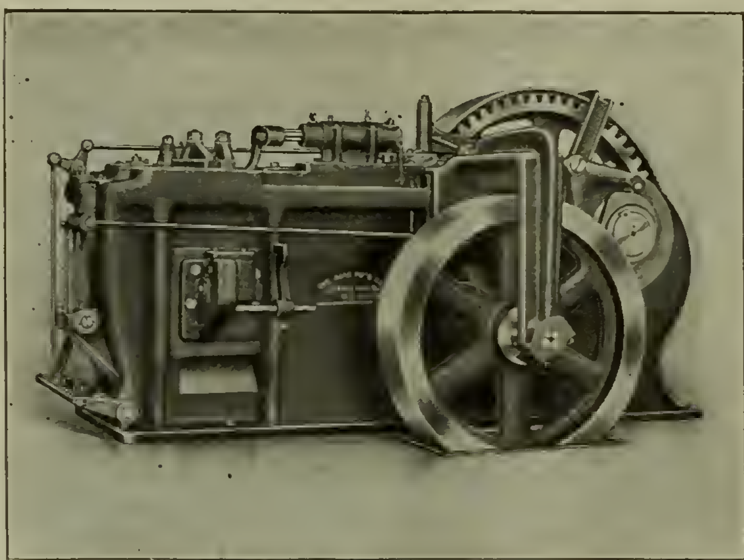


THE KRAKAU DRAFT RIGGING.

which it swings pivotally and being set in a socket constituted by an open frame or casting which is fixed to the car frame, preferably to the center sills at the position of the car bolster. This pin is preferably in line with the king-pin of the car truck, but is a separate pin independent of the king-pin. The draft-rigging frame is provided with a spring-actuated centering device by which the draft rigging is restored to the central line of the car when free, so that it may be adapted to couple readily with cars not provided with radial draft riggings. The center figure shows a modified centering device in which the links shown in the other figures are not used, but instead spring buffers, backed by springs, are secured to the carry iron in sockets, facing the sides of the draft-rigging frame.

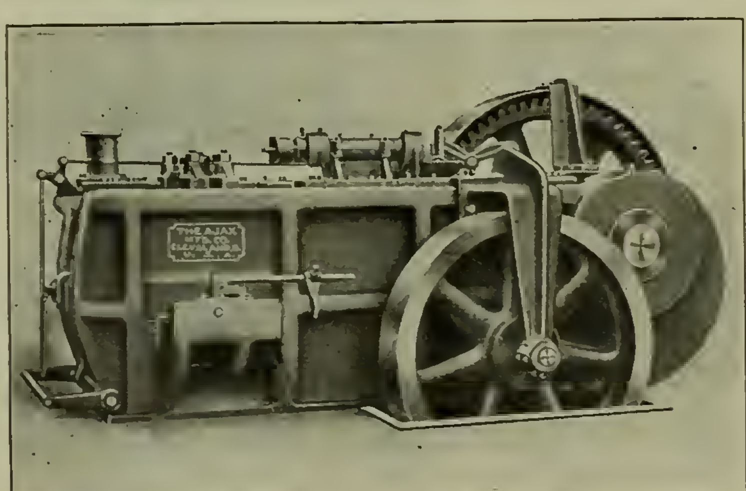
Ajax Forging Machines

The Ajax Manufacturing Co., of Cleveland, O., manufacturers of the Blakeslee bolt heading, upsetting and forging machines, bulldozers, brake lever rolls, bolt heading machines, automatic pin drills, etc., had on exhibition at the Master Blacksmiths' convention at Buffalo a large number of sample forgings made upon their different sized machines which created much favorable comment and proved a drawing attraction to the members of the Blacksmiths' Association in atteudance at the convention.



2-IN. BOLT HEADING, UPSETTING AND FORGING MACHINE, WITH RIVET ATTACHMENT.

Two machines are illustrated herewith, one a 2-in. heading upsetting and forging machine, equipped with automatic rivet making attachment, which turns out a rivet at each revolution of the machine. This attachment can be placed on any of the regular bolt headers or bolt heading, upsetting and forging machines if desired. The second machine shown is their 4-in. bolt heading, upsetting and forging machine, which has within the past two years become a very popular tool with railroad and car shops, and has demonstrated its ability to save labor and fuel and increase the output of forgings from the blacksmith shop. These machines are built ranging in size from ¾ in. up to 6 in.; bolt headers from ¾ in. up to 1¾ in. Their bulldozing machines, bolt headers and all other tools manufactured by the Ajax people have been redesigned and greatly improved within the past two years, and a new catalogue has just been issued showing the new model ma-

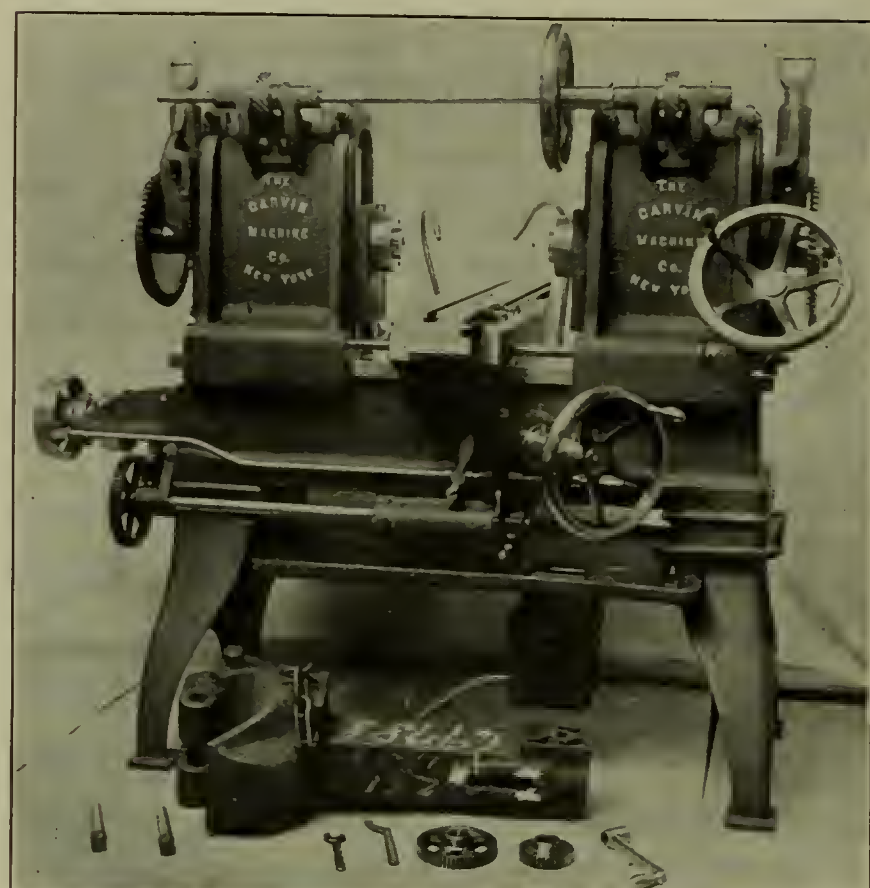


4-IN. HEADING, UPSETTING AND FORGING MACHINE.

chines, together with illustrations of the forgings on display at the convention, as well as many more. These catalogues can be had upon application to the home office at Cleveland, O.; the Chicago office, at 621 Marquette building, or the New York office, at 149 Broadway, New York. Any information desired concerning the tools the Ajax Manufacturing Co. manufacture, their capacities, operation, etc., will be cheerfully furnished by letter or representative upon receipt of inquiry. Write for the Ajax Brown Book.

Special Duplex Milling Machine

The machine illustrated herewith was designed for enlarging and lengthening the slots in car couplers, an example of which is shown lying near the machine. It is an excellent illustration of the convenience and labor-saving qualities possessed by a double-head machine on work requiring operations on opposite sides. The spindles are taper and run in solid bronze boxes, and are raised and lowered simultaneously. The saddle is fixed on the bed, and the headstocks are moved to and from each other simultaneously by the inclined hand wheel on the right-hand head. The table has a quick and easy movement by the oblique wheel on the bed. All operating handles are within reach of where the operator stands. The spindles are driven by telescope shafts from a special geared countershaft furnished. This method of driving is simple and effective, and does away with the difficulties of belts and gearing due to the changing



DUPLEX MILLING MACHINE.

positions of the spindles. The feed is driven from the countershaft by the two pulleys to the left, and in this case two rates, fast and slow, with automatic change, are provided. The fast feed is for milling out the open part of the slot, and the slow rate when the cutter strikes the solid end. Two trip dogs are provided, and the feed being started the first dog unlatches the bent rod reaching out to the pulleys and allows the spring to throw the clutch from one pulley to the other, and the feed then continues at the slow rate until the second dog trips the worm in the feed box on under side of bed. Ordinary changes are provided by change gears. The regular machine is made with a wide table with three T slots, and the spindle drive by worm gear, and independent instead of simultaneous adjustments are provided.

The weight of the machine is 1,900 lbs. Oil pump and piping are provided. Two sizes are built by the makers, the Garvin Machine Co., of New York.

New Band Rip Saw

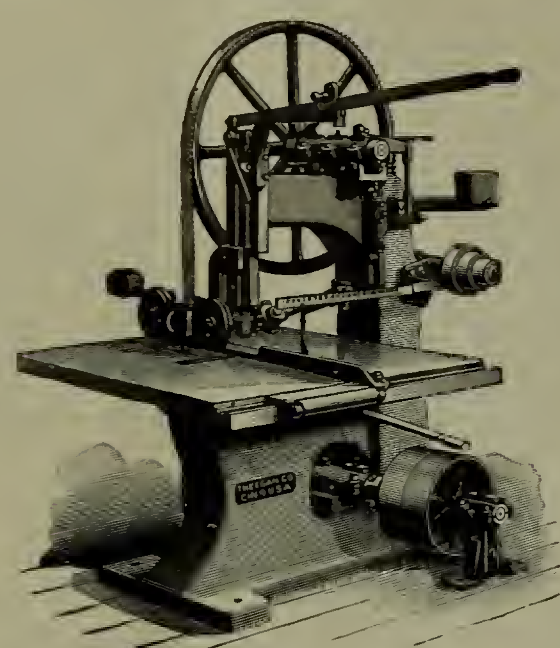
If any of our readers have any ripping to do, this machine here represented will without doubt prove of much interest. Its makers claim it will surpass in quality and quantity anything in this line they are now using. For ripping fine lumber it is far in advance of other models of this character, and represents an entirely original departure. There is no other like it, and it has met with unqualified success wherever used, as is attested by many letters from its users who praise its merits very highly. Copies of these letters will be sent to any desiring them, as it is the policy of the makers to prove as far as possible every claim they make concerning any machine.

The machine was patented February 27th, 1900, and October 2, 1900.

It will do either light or heavy work, and cut either soft or hard wood, with no possible danger to operator. Its many advantages that enable it to do good work and prove labor saving require detailed description, so cuts should be sent for in order to thoroughly understand what it can do. The thin saw blade will save an amount of kerf that will be readily appreciated by all users of fine lumber. The straining device, with knife edge balance, insures at all times an even tension on the saw blade, something so necessary to prolong its life, and yet so seldom found.

The lower wheel being solid there is no vibration, increased momentum and no possibility of its overrunning the upper. By the single movement of a lever the machine is changed into a hand feed rip saw, and where flooring is made in large quantities, it is fitted with a long table on which are rolls for quickly returning material. The feed rolls are placed close together, so that short work can be done to advantage.

The builders of this tool, J. A. Fay & Egan Company, of No. 145 to No. 166 West Front street, Cincinnati, Ohio, can be addressed for further particulars.



No. 1 Band Rip Saw.

Their new complete catalogue of wood-working machinery will be sent free to those interested who will write for it, mentioning this paper.

The Car Foremen's Association
of Chicago
August Meeting

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209 Masonic Temple, Chicago, Wednesday, August 12, at 8 o'clock p. m. Vice-President La Rue presiding.

Among those present were the following:

Ackerman, J.	Haig, M. H.	Nordquist, Chas.
Bossert, C.	Harris, S. H.	Powell, C. R.
Ackerman, J.	Jones, J. E.	Sharp, W. E.
Bates, G. M.	Johannes, A.	Spohnholtz, Fred.
Blohm, Theo.	Jones, R. R.	Schultz, A. E.
Bowen, E. W.	Josephson, E.	Schultz, F. C.
Cardwell, J. R.	Joseph, H. A.	Tabler, M. H.
Cook, R. J.	Kline, Aaron.	Wharton, R.
Depue, Jas.	La Rue, H.	Warlick, Geo.
Etten, L.	Marsh, Hugh.	White, P. W.
Guthenberg, B.	McAlpine, A. R.	Williams, Thos.

The entertainment committee reported progress. There were several places under consideration but they had not definitely decided as to which place would be selected. The plans for the entertainment were being carried out, badges being arranged for and also a brass band. A general good time is anticipated

Mr. La Rue: At the last meeting a nominating committee was appointed to present a nominee for second vice-president. Is the committee ready to report?

Secretary Kline: The committee has handed me their report. They present the name of Mr. C. R. Powell.

Upon voting ayes and nays Mr. Powell was declared unanimously elected.

Secretary Kline: The following have made application for membership:

Robert Briggs, painter, C., B. & Q., Chicago.
J. L. Conerly, foreman, I. C. R. R., New Orleans, La.
W. J. Freer, car record clerk, C., B. & Q., Chicago.
C. Gawl, chief inspector, B. & O. R. R., Chicago.
J. L. King, inspector, Ill. So. Ry., Sparta, Ill.

Mr. La Rue: This brings us to the regular program of the evening, the first number of which is: "Should the Rules as laid down in the General Superintendents' Agreement and that of the Local Freight Agents of Chicago in reference to the interchange of loaded cars be amended?"

Mr. Bates (C., B. & Q.): As I understand it, the rules laid down by the General Superintendents were entered into about four or five years ago, and were to the effect that foreign cars were to be delivered to the owners instead of to the line from whom received, regardless of their condition. For instance, if we received a C., R. I. & P. car from the I. C. in bad order, we would dispose of the load, and, instead of returning the empty car back to the I. C. we would turn it back to the owners, because it would not cost the C., B. & Q. any more to deliver that car to the C., R. I. & P. than it would to deliver it to the I. C., thereby saving the I. C. the trouble and expense of delivering the car to the owners, and also giving the owner the use of his car much sooner; and I believe that this plan has been followed pretty thoroughly, at least it has with our road. Of course once in a while if a car is damaged very seriously we then deliver it back to the line from which we received it, but that does not happen probably once in twenty times.

In regard to the Local Freight Agents' Agreement, that is a verbal agreement entered into some fifteen or twenty years ago, and is to the effect that all freight delivered from one line to another, that is to go out on the receiving line, must be accepted, regardless of the condition of the car. If the receiving line saw fit to transfer the load they could do so, but they would have to do it at their own expense, or else make repairs to the car, charging the same either to the owner or to the delivering line, as the case might be. So far as I know this has been lived up to, and I am at a loss to see what amendments could be made. I do not know who brought up this question, but that is the way things are being handled, as I have just outlined, and I fail to see where we could improve on it.

Mr. La Rue: I am a good deal of the same opinion as Mr. Bates in regard to the advisability of making any amendments. I had not given the question very much study or made very much inquiry about it, but it does seem to me that there ought to be a little more reciprocity in the interchange of loads destined in the terminal with reference to loaded bad-order cars. It seems as if lately there has been a considerable number of cars set back—that is, loaded cars that are brought into the city by lines to be delivered to connecting lines and by them delivered to the parties to whom the freight is consigned in the terminal. Those cars have been in bad order, but could be moved. These same cars have been set back to the delivering lines. Possibly that it what brought the question up.

Mr. Bates: I believe I have had a little experience in that line, and the general procedure among railroad men in Chicago is if they deliver you a car for a local switch point which is in bad order and cannot very well be repaired under load, those same individuals when the car comes back with additional defects will insist on a card for all of the defects. Now I believe you all know that these local switch cars are handled for a very low rate—at least they are over our way—and where there is such a large amount of local switching, as on our road, it would not be policy for us to accept bad-order cars and be responsible for a whole lot of additional damage which would in most cases exceed the amount we would receive for handling the freight. There would not be anything in it. Now I remember some years ago when roads were a great deal more liberal they would deliver us a car in bad shape; we would handle it for them and they would take it back if we told them that we had received the car in bad shape, and that would be the end of it. Such is not the case now. If we handle a car for our neighbor and damage it in any way we have to pay for the damage, if it forms a combination, regardless of the condition we received it in. We have carded cars on numerous occasions for defects which were in existence when the cars came on our line just because we handled the car in a defective condition and broke a few more items which made a combination in connection with those defects which were on the car when we received it.

And then again the per diem rules have a great deal to do with it. If we take a car from our neighbor and run it into the shop for repairs we have got to pay per diem charges to the owner while the car is undergoing repairs. All those things cut into the revenue of handling these cars, and no doubt that has brought about the conditions that exist today.

Mr. La Rue: I think, as Mr. Bates does, and as I said before, if we had a little more general reciprocity it would be better for all concerned. That is the way I feel about it. It may be that it is such matters as those that have brought this question up.

Mr. Jones (B. & O.): While they talk about their switching district, when we deliver a car we have to haul it thirteen or fourteen miles to make the delivery. Probably the car may have been all right when it left our yard, but by the time it got to the delivering point we might have broken an arch bar or cracked a truck bolt, and they will send that car back—will not accept it. They will not make repairs, but send the car back, and it has to make twenty-six miles again before we can make the delivery. There is where I do not think it is hardly just for the receiving road; and as for the per diem charge, one road has got to pay per diem charge as much as the other; it is not all on one road. We have had cars returned and the only defects was a broken truck bolster or a broken column bolt. We put a column bolt in and they accepted the car, but it had to make just twenty-six miles for that column bolt.

Mr. Schultz (C., B. & Q.): I believe where a loaded car is offered for a switch movement, and the repairs are such that they can be made without any unnecessary handling, I think it should be done. As far as the per diem charge is concerned in handling a switch car, you are allowed seven days to unload that car and get it back to the owner. That ought to be ample time to make repairs to a switch car and get it unloaded and delivered back.

Mr. Bates: In regard to the seven days' relief I can say this: While a road is given seven days to return a foreign car to where it was received, at the same time they have to pay the owner per diem for every day they have the car; and if the road that has the car in its possession runs the car in its shop and consumes seven days in making repairs they have got to pay seven days' per diem, although they get seven days' relief from the party that delivers the car. If we receive a Milwaukee car from the Rock Island we have got to pay the C., M. & St. P. per diem for every day we have the car in our possession, but we can get relief from the Rock Island for seven days. If we exceed the seven days we are out, and all of this time may be consumed in getting the car to the shops and out again.

Now what I wanted to say a minute ago is this: I think you all know that this association went on record several times in regard to additional damage. It was decided here not very long ago if a railroad company accepted a car in a damaged condition, and handled it without making repairs and thereby caused further damage, that they were responsible for the whole thing; and, strictly speaking, under the M. C. B. rules they are. On the other hand, strictly speaking, according to the M. C. B. rules a railroad company does not have to accept a car if it is not safe to handle. If you do a favor for your neighbor in handling a bad-order car he ought to be good enough to return the favor; and if he is not willing to do that he ought to take his medicine and have his bad-order cars returned to him.

Mr. La Rue: We grant all that—the medicine part with the other—but it resolves itself into a question of dollars and cents, and I think the question is a timely one; but in my opinion there ought to be others discuss it besides the Car Foremen's Association of Chicago. That is the way I feel about it. As you have represented, it is following out the M. C. B. rules we know, but we also know that there are other cities that have agreements of certain kinds that are not strictly up to the M. C. B. rules, but is a question of dollars and cents.

Mr. Bates: This Local Agents' Agreement is not in accordance with the M. C. B. rules, nevertheless it is lived up to; but it does not apply to local switch cars; simply to those that are going out on the line of the receiving road. They figure that the receiving line will get enough revenue to pay them to handle the freight, while a switch car is a different proposition entirely.

Mr. La Rue: As you are all aware, the convention at Saratoga in the rule where the proposed change by the Western Railway Club that in the interchange of cars was not allowed to come before the convention. The arbitration committee saw where they had probably made a mistake, and they recalled that part of it. I think this has bearings along the same line; but what we would like to get at—I suppose the idea of the committee on subjects is—is to find out if there was any light that could be thrown on this, or whether there was any better way of handling the interchange in Chicago. A gentleman spoke a little while ago of setting a car back and making a haul of twenty-six miles for one column bolt; and the delay I hardly think is right. The question is where to draw the line.

Mr. Schultz: I think the shippers and consignees should be taken into consideration, and it ought to be the business of both parties to handle freight promptly. I think the cars should be repaired whenever it is possible to do so without transferring the freight.

Mr. La Rue: I did not think there was any question as serious as that of setting a car back for one column bolt. We have had a considerable number of cars set back, but I will have to admit they were damaged. There was one or two cases where I did feel that after the car had been delivered that the party could have handled the car with ordinary care, as the car was loaded to the roof; and I felt at that time if there were many cases of that kind came very often it would be well to take the matter up; but as yet I have never done it. I was merely waiting to see what time and the future would bring forth, and I had not thought a great deal of it since. That was some months ago, and I had not thought of it since until I saw this subject on the program.

Mr. Cook (C., B. & Q.): In the remarks so far we have only heard of the inconvenience of the delivering line and have not of the cost it puts on the road handling the car. There are a few things, especially lumber loaded to the roof, where cars are delivered having short draft timbers and two or three bolts are broken. That looks like a very small defect and the delivering road thinks it unjust for you to return it; yet at the same time when you handle that car, which is an old car and the end sill is more or less decayed, and the rest of the bolts break, and the consequence is that when you pull the draft timbers out you damage the end sill and perhaps the draft timbers, and when the car is returned they want a defect card for all of it. I know of a case where a car so described had been received—the center sill was rotten and broken. It was patched up and the delivering line asked to take it back. Would they do it? No. They demanded a card for the center sill and end sill. If the car had been returned to them they would have thought it unjust, but I cannot see if they will not be lenient when their cars are received they will have to haul them the twenty-six miles.

Mr. La Rue: Yes, gentlemen, there are two sides to the question.

Mr. Bates: I can recall dozens of cases where the company I am with handled cars with broken draft timbers, draft bolts broken, in short draft timbers, with the consequence that the timbers were pulled out, splitting the draft sills and breaking the end sill. We had to make the repairs in this case at a cost of twenty-five to thirty dollars and got two dollars for handling the car. You do not have to break many cars like that to very materially eat into the profits of your local switch business; and I know of numerous cases where we tried to get rid of cars we handled that way, but we have not been able to do it, so we simply had to stop handling the cars.

Mr. Schultz: The question in my mind is simply this: Does it pay to refuse the small percentage of cars that get broken in that manner, or does it pay to make the repairs? That is all I can see in the question.

Mr. Bates: I can easily answer that question. It certainly pays the delivering line if they can get the other road to handle their bad-order car, but it does not pay the road that handles the bad-order car if called upon to pay for repairing it.

Mr. Schultz: We are not arguing on the revenues or benefits derived from handling the particular cars that may become damaged, but on all cars handled in such service—whether it would be better policy to make the repairs and handle the freight promptly or to send the cars back and delay the freight, which we all know is annoying to shippers.

Mr. Cardwell (A. C. O. Co.): It appears to me as though the car ought to be repaired under conditions of that kind before it is delivered, for the delivering road is, in nine cases out of ten, not delivering its own car, and it would be unfair to the owner to deliver his car to this line with defects which would endanger other parts, and agree to accept it back if further damage is done. The damage would not be simultaneous and the car owner would be the loser, when if the repairs were made before the car is delivered it would put it in safe condition to make the trip. I do not think an agreement between two lines to that effect would be in accordance with the M. C. B. rules at all, because the car owner then would be the loser. You could not collect, for the damage would not be simultaneous.

Mr. La Rue: This is rather a deep question when we get into it. As Mr. Cardwell says, the making of an agreement between two connecting lines with regard to somebody else's car changes the question entirely. The car that I had reference to was delivered by the owner of the car, and I believe that two connecting lines would hardly be justified in making an agreement detrimental to the owner of the car, which would certainly be if we delivered the car and agreed to accept it back in the same condition. There are a great number of things connected with the rules, while they seem like hardships in particular instances, that you take it as a whole and the way they finally work out, and have worked out under the present rules, seem to be equitable and just to everybody concerned.

Mr. Bates: That is true where the business is about equal; but where there is a decided amount of difference the road that does the most local switch business gets the worst of it.

Mr. La Rue: I am speaking about the general working of the rules in the past. That was one reason why the arbitration committee turned down that proposition in regard to the receiving of loaded cars, because the traffic of certain commodities was all in one direction; and another thing, the vital point of it was that the Master Car Builders undertook to place an arbitrary charge onto a department that had no voice and control in it, which could not be done.

Mr. Bates: It seems to me a whole lot of this trouble could be avoided if the delivering line would simply look over the cars before they make the delivery; but it is the general practice to make almost no inspection of cars coming in off the line, and of course all loaded cars are delivered regardless of their condition. I think a little closer inspection of these cars that come in off the line, to see that they are in good condition before delivery, would result in having them accepted instead of being refused, and much controversy and injustice would thereby be avoided.

Mr. La Rue: I think Mr. Bates' suggestion is timely. We have not had but very few instances of refusals of cars in interchange—that is, to my knowledge. I do not think that we have had enough that would warrant me in bringing up this question, but it is a good thing to discuss it and probably the discussion would bring out some benefits in the way of better inspection before the cars are delivered. Oftentimes questions are discussed and seemingly no results arrived at at a meeting, but still it will bring up the subject, and parties interested will take more interest and look into it closer in the future.

Mr. Cardwell: On those lines it seems to be a question of delivering line only. When the expense of hauling cars back to the repair shop becomes greater than the cost of inspection before delivery then you have got to have the cars inspected, because there is no question but the repairs should be made before the cars are delivered.

Mr. Jones: If Mr. Cardwell was out in the yard where they are handling the cars he would see things differently. Suppose the cars are inspected before they are delivered. They may be all right at the time they are inspected, but you cannot be sure that they will be all right after they are hauled twenty-six miles to the point of delivery. A car may be all right when it leaves, but when it gets to the delivering point there may be three or four draft bolts broken. It is not like it was three or four years ago when they hauled thirty or forty cars in the train. Now they stick on eighty cars and something has got to go. The breakage does not occur at the time cars are inspected.

Mr. La Rue: That is a risk we have to take in all railroading, and then oftentimes the party handling the car has no facilities for making the repairs at that end of the run. The car owner and shipper of the freight are in no way responsible for that. That is one of the incidents connected with railroad operation. We all bump up against that almost every day of our lives. As the parties who presented the subject are not here tonight I feel that we should hold it over and give it a little more thought.

Upon motion the question was carried over to the next meeting.

Mr. La Rue: This brings us to question No. 2: "What is the general practice of preparing the journals of freight wheels previous to applying same?"

I know of some roads that turn the journals and let them go at that. Other roads paint all journals with white lead paint. Others use a common grease; some common mineral paint. The Rock Island uses what is called "Anti-rust Grease." It is an article that does not get hard, and is a sort of a lubricant. We aim to keep that on the journal until it is applied to the car.

Mr. Schultz: I think the question refers to the methods employed in smoothing the journal previous to applying it, to prevent its running hot when first applied.

Mr. La Rue: I think a journal that is covered with paint, the paint should be removed, and I have always advocated that theory; although I very often see them put in and let go with hard white paint on them.

Mr. Wharton (C. & N.-W.): After the journals are turned we roll them with steel rollers perfectly smooth; then we have a kind of a mixture of mineral paint and some kind of grease put on the journal. As we use them we bring them up to the car where they are to be applied and clean them off thoroughly. If there is any rough spots or rust on them we take some fine emery cloth and take that rust off and polish the journal just as clean as when they came from the lathe. We then grease the journal well and fit the brasses to the journal that is put in. I think if you do that you will have good results. I remember once putting a pair of wheels in, painted with mineral paint and quite hard; it was a C. F. T. car. The men were in a great hurry and did not clean the journals, and before the car got into the Lake Shore yard the box was blazing and journal badly cut. We got a good shaking up over it, and from that time there has never been a journal put in on my premises without first being thoroughly cleaned and brasses fitted poperly.

Mr. Marsh (A. C. L.) I would like to ask if in cases of applying new journal bearings to a journal under the maximum size new do you fix the journal bearing to fit the reduced size of journal—that is, scrape them out to get the proper arc; or do you put in a standard brass for that size of journal and take your chances as to the results?

Mr. Wharton: When we put in old journals we sometimes take the old brass and scrape it out if the brass is of good size. We have a machine that we can bore it to any particular size. The machine was gotten up in our own shops and is a very simple and ingenious affair.

Mr. Marsh: I think they should be highly commended for the machine they use. I think the majority of people in applying journal bearings to journals that have become worn below the maximum size put in the standard M. C. B. bearing and let it go. I think there are very few people that use a machine or dress the bearing out in any way; simply put it in and take their chances. That of course results in hot boxes in many cases. We know the square inches of bearing surface is very small, and where we have so much pressure on the journal bearing we make it almost impossible for the film of oil to flow between the journal and bearing, the journal becomes gummy and starts heating, and there is nothing to prevent its burning off when it gets started.

Mr. La Rue: This question has reference to the journal, and I do not think it refers to the brass.

Mr. Marsh: As for preparing the journals for use, the steel rollers are used almost universally on new axles, but not generally on repair work. For instance when journals are returned they are almost as smooth when they leave the lathe as it is possible to get them. At our plant when the journals are taken out of the lathe they are given a coating of a mixture of tallow, black lead and graphite. That is a lubricant and it is a non-friction compound, and we have no trouble with it. Sometimes when the wheels have stood around for a considerable time it becomes caked and we have to remove it; but if the wheels have not been standing long we put them in, give the inside of the brass a coat of tallow, apply it, and let it go. We do not have much trouble from that source.

Mr. McAlpine: I agree with Mr. Marsh that the use of the steel roller in finishing journals is becoming general, but it is not the universal practice. On a recent visit to the Pullman works I noticed them turning up axles for some New York Central cars of 80,000 lbs. capacity, I think; and the steel roller was not used on the journals. They filed them and used a clamp with emery to give the finish.

Mr. La Rue: I believe there are some persons who do not advocate the practice of rolling. They think if there is extraordinary care used in turning and the same care used in the fitting of the brass that it will accomplish the same end that rolling will.

Meeting adjourned.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

JOSEPH CASTLE.

We take all the more pleasure in presenting herewith a likeness of the face of one of our members from the far west, because he is so situated that he can seldom meet with us. As the convention is in Chicago this time he will likely be among us, however, by the time his "phiz" is in print.

Mr. Castle was born in Baden, Germany, fifty years ago, and began car painting in 1867 with the Illinois Central Railroad, under Mr. S. McRoy, in Chicago. On account of failing health he went to California in 1869 and obtained employment on the Central Pacific at Sacramento under Mr. W. C. Fitch. Later he had charge of painting on the Market Street Railway system in San Francisco; also the Eureka & Palisade Railroad at Palisade, Nev., but drifted back to Sacramento, where he was appointed foreman of the sash, door and blind varnishing room by Mr. Fitch, which position he held until 1890, when he took his present place at Carson City, Nev., as foreman painter of the Virginia & Truckee Railroad. He has been a member of the M. C. & L. P. A. for seven years, and attended the convention at Detroit in 1900. We trust he will be able to attend and renew his acquaintance with us this year.

MR. JOSEPH CASTLE.

Chinese wood oil, prepared by the Orientals by pressure as from the seeds of a tree known as Aleurites Cordata, has been used by the Chinese for centuries in lacquers and varnishes for bamboo and wooden ware. It has been known in this country scientifically for some time, but commercially but a few years comparatively. It is being used in the manufacture of varnishes in connection with rosin, as varnishes made in this way resist water as exterior finishes like those made from harder gums. Rosin at three cents per pound can be used in place of kauri and other much higher-priced varnish gums. Indeed, we are told that there are few if any railway varnishes of American make on the market today that do not contain a percentage of rosin.

Chinese wood oil is in no sense a substitute for linseed oil. It costs about fifty cents per gallon, and can be used for purposes for which linseed is not adapted. It has not such a pleasant odor as linseed, having a sort of smoked-meat smell. The raw will dry in about eighteen hours, but does not dry clear and with the tough film of linseed. It dries out whitish in color, but may be treated by boiling to remedy this to some degree.

The Future of Our Association

There is one element entering the future welfare of the Master Car and Locomotive Painters' Association at the present time that may well be looked upon with grave concern by all those members and friends who have its interests at heart. We refer to the matter of free transportation by the exchange pass system, which hitherto excellent practice was revoked by the presidents of the trunk lines a year ago last fall, and all railway associations are alike affected. True, this blow may not have been aimed at them—far from it. It was incidental, doubtless, to the reformation of a bad practice that had assumed colossal proportions in other quarters, and they are the innocent and undeserving victims in this matter, we believe. We are prone to exercise the greatest charity and regard them as simply being overlooked. If this latter be the case, we should bestir ourselves and arise to a place where we can be seen and let our wants be known. There is not a man in the cemetery who would stay there if he could help it. We do not intend to lie buried in this land of forgetfulness if we can help it.

A year ago came the first effort to reach our convention under the new regime. It was expensive to some; this year will be expensive to others. We know of one man who, for himself and wife, spent $130 to attend the Boston convention, and all for transportation, we believe. Another railway system sent three representatives from the west into Boston on free passes, and just here, we may remark, may lie the solution of this problem of non-exchange of passes with other roads, viz., have one or two transcontinental lines absorb all the others, and then there will be no roads to exchange with! Here is the Rock Island, according to latest advices, taking to itself the Seaboard Air Line, which makes it possible to go from the Atlantic to the Pacific on a single pass. With all other lines gradually being absorbed, it will soon be so that all the roads worth consulting may be counted on the fingers of one's hands, and one pass obtained from the mechanical superintendent will send most of our members to our annual conventions.

Whether this would be the best thing that could happen, might be questioned. It might tend too much to one voice and one-man power in association work, instead of that diversified and independent expression of opinion that is symptomatic of health and vigor in any organization. Then, again, there is more or less of a well-grounded fear lest the

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consolidation of roads should make them less considerate at home in the matter of free transportation for employes and their families locally. Some roads are very good about this, while others are not. It would not take so very great many local fares to offset one round trip at reduced rates to an annual convention at some distance off, so that this may be about an even thing after all. What's made on the peanut might pay for the banana that's lost.

However, we are digressing somewhat to considering what might or might not be. The fact remains that another year has rolled around to find that expected modifications of this exchange pass rule have not materialized, and we are "up against it" again good and hard in getting to our annual meeting without paying our fare, and we have found that we have had to pull our pocketbook and "settle." Now, while some of us may be so situated in money matters that we can afford to do this, others just as deserving and whose opinions are equally valuable in our association work are not so fortunate. Our association has taken on new life and vigor in its work in recent years, but it is a question whether or not it can keep up this interest much farther under this regime of requiring their fare to attend. They will be apt to choose to go elsewhere so long as they must pay to go. It is true that "half a loaf is better than no bread," and we would be very glad to look at it in this light, if we were going on a personal junket, and thank them for allowing us our time. But we utterly refuse to so regard it. We stoutly maintain that the work that we lay out to do in this way annually is no picnic, but a task that often draws heavily upon our vitality to perform it instead of recuperating our energies, and is of primary importance for the financial benefit of the railroads and has been for thirty years. No sensible man can look upon it in any other light. We can neither spend our wages in this way nor put ourselves in the position of mendicants. If the railroads are so short-sighted that they cannot see the benefit of association work then let us quit proclaiming information about our trade upon the house top and paying for the privilege, and pull down our sign, put up the shutters, close the doors and quit the business, and let every man be for himself "and the devil for us all," as the saying goes.

The Value of Criticism and Suggestion

The successful foreman painter should not feel above criticism or suggestion from any source, high or low. He should be teachable—ever ready to learn or to adopt an idea imparted from anyone, that will improve the quality or quantity of his work. There is said to be "sermons in stones and God in everything" to those who are looking for things that point a moral. It is none the less true of the up-to-date, progressive foreman painter. Wherever he goes—and the more he goes the better— and whatever he sees, something suggests itself to him as worthy of imitation or adoption in part, so that with additions and changes something entirely new and startling seems to be evolved. This is all there is to originality anyway. "There is nothing [entirely] new under the sun." We copy something from everybody, if we are bright enough to see it, and putting various ideas together, we pose as original, but we are not. True, we could not give credits without seeming to be invidious in this gathering together, sifting out and adopting of the ideas of others, and we need not credit others for the little we extract from them in this way.

The successful foreman painter is such a busy gatherer of information that will help him in his calling, and one who imparts to others as well. It is a well-known law that he that scatters is the one who increases his store. And the annual convention of foreman car and locomotive painters is one of the most fruitful fields for the gathering and imparting of such information as will benefit and broaden each other that can be thought of. Here men from all parts of the country with their varying conditions, trials and perplexities come together and give and take such thoughts and experiences as to better balance each other for the year's work to follow. Happy are they who have the means, health and opportunity to attend these yearly gatherings. Some are blessed with the latter, but are deprived of the former. Doubly happy are those whose generous employers furnish them with the means in the shape of free transportation, or expenses, or both. Let us not be envious of them, but bless their lucky stars!

However, if they cannot go to the convention, after a little recreation in the country, they will be in condition to learn some things at home. And they should not despise the source of their information, if it is really information. It takes everybody to know everything. But if you would believe some foreman painters no one knows anything about this mysterious business but themselves! Now this is the surest diagnosis of their own ignorance, with aggravated symptoms, when they begin to hug their little possession of knowledge to their own bosoms for fear others will find it out! The fact is, everybody knows a thing or two, whether they are painters or not; and no progressive painter will be contented until he knows that thing or two that the other fellow knows. Audubon knew the number of scales on a partridge's legs, and, though not an artist, he could criticise an artist's work when he showed him the painting of one of these birds. "Jack Tar" knows the ropes in a ship, if he cannot paint one; so "Jack" is a good fellow for the marine painter to have call at his studio now and then.

Some car and locomotive foremen painters become restive almost to desperation at a suggestion, or to criticism from their superior officers as to their work, who are "supposed to know nothing about painting." Be calm. It is a mighty dull scholar who is around a railroad shop daily or weekly who does not pick up much by observation and add to it by reflection. Therefore, if the master car builder or master mechanic is candid and thoughtful and suggests an idea, take it and weigh it carefully and give him what it is worth.

In a word, be always ready to profit by the thought or suggestion of anybody, high or low, for what it is worth, and you will add to your stock of information right along.

Do not shut yourself up in your shell, like a clam in cold water; thaw out and come out! Let's see what you are like, and you'll see what others are like

A Letter From An Ex-President

Editor Railroad Paint Shop:

From the trouble which I hear our secretary has experienced in getting members to accept of the subjects assigned them by the advisory committee for discussions at our annual conventions, especially for the present year, it would appear as if the proper interest in the good cause was somewhat lagging. It does seem as if every member at such times should "lend a hand" and with patriotism for the association take enough interest in its welfare to accept at once such assignment, not only as a pleasure to assist in making our conventions a continued success, but to do their duty also.

There is not a member of our association but that, if so disposed, could give his experience and opinion on any subject that would naturally be selected by the advisory committee, and this is all that is asked or expected of any of us. There is no one who is pushed so hard in his labors but who could in seven or eight months—the time intervening between the receipt of the request and the assembling of the following convention—find time to write something of interest upon the subject assigned him, let it be short or long, and it would be most acceptable.

Brace up, "boys!" Some can talk "right out in meeting;" others can write. Those who do not enter as talkers in the discussions should make up in writing, and I hope all will see the importance of accepting promptly the requests of the advisory committee, or president, and when the assignments are sent out next year may they prove to be as a guarantee that they are as good as accepted.

Yours for the good of the association,

A. P. DANE.

Editor's Note—Another ex-president appends his "amen" to this.

Notes and Comments

The city of Concord, the capital of the Granite State, celebrated its semi-centennial, among other things, with a grand civic, military, firemen's and trades procession Aug. 20, in which the Boston & Maine Railroad shops, both locomotive and car, took a conspicuous and meritorious part. There was a full-sized reproduction of the first engine that hauled the first train into Concord in 1842. It was drawn through the streets by four horses. Old veteran locomotive men rode on it and acted as fireman and engineer. A working "power house," "machine shop," "smith's shop," "boiler shop," and the frame of an electric car in process of erection were drawn on floats in the procession that took over an hour to pass. It was intended to have a freight car built, painted and stenciled en route, but owing to the soft condition of the street after a heavy rain and the great weight of the fox trucks and wet oak lumber on this float, drawn by sixteen horses, it had to be abandoned. Our Mr. Warner Bailey's work in lettering, etc., was very much in evidence.

Cold water paint is much superior to whitewash for whitening the interiors of shops, and is adapted for wood work, plaster, or brick. Coming in casks in paste form, it looks like white lead when opened, and with the addition of a certain amount of raw linseed oil for greater durability and adhesion and thinned for use with water and applied with a kalsomine brush, or whitewash brush, one coat of it makes a good job. It may also be tinted to any shade desired. The writer is whitening the interior of his shops with it. It is also suitable for outdoor work by the roadside, such as fences, walls, sheds, etc.

July 15 a fire caused by spontaneous combustion in a barrel of varnish damaged the premises of N. Z. Graves & Co., 284-286 Pearl street, New York, to the extent of $1,500, says the Western Painter.

President Fitch writes under date of July 30 that he will not attend the Chicago convention and has formally notified Vice-President Cook to that effect.

In his letter he says: "I have been very busy since I left the railroad service. Have put up two houses of two flats each, which I am renting, and have established a paint business in a very modest way which is paying satisfactorily. I am selling paints to my friends and many others and am enjoying a freedom not known for over 34 years. I remember with much pleasure my many visits to the conventions and the kind treatment accorded me by its members. Had I not fully expected to be with you this year I certainly would not have accepted the office of president."

We clip the following from the Western Painter for July. We do not know whether this item refers to rolling stock or to road department paint shops: Michael Leahy, formerly of Anniston, Ala., has accepted a position as foreman of the paint shops of the Louisville & Southern Indiana Railroad at New Albany, Ind.

A Headlining Border by Warner Bailey.

Established 1878.

RAILWAY MASTER MECHANIC

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Bruce V. Crandall, Editor. Charles S. Myers, Manager.
Maham H. Haig, Associate Editor.

Vol XXVII CHICAGO, OCTOBER, 1903. No. 10.

A COMPENDIUM of the reports and discussions presented at the eleventh annual convention of the Traveling Engineers' Association, held in Chicago September 8, 9, 10 and 11, appears on page 435 of this issue Among the most important papers read may be mentioned the "Care and Handling of Compound Locomotives," by Mr. A. L. Beardsley, A., T. & S. F. Ry., and the "Combined Straight Air and Automatic Brake," by Mr. F. P. Roesch, C. & A. Ry. Both papers met with hearty discussion by the members and were highly appreciated by those present. The association will again meet in Chicago next year.

MUCH of the confusion existing relative to the amendment of the safety appliance act requiring the application of grab irons upon the front ends of locomotives and upon the ends and sides of tenders, appears to be due to the lack of a clear statement upon the part of the interstate commerce commission. While the law has been passed and a limit set, the requirements do not seem to be clear in the minds of the commissioners themselves. The fact that they have practically applied to railway mechanical men for an expression of the advisability of such applications would indicate that such a decision would have been more practical before the law was amended.

Some railroads have arranged specifications for the application of grab irons to conform with the act and are now awaiting more definite instructions before the final application, while others have either applied hand holds to their recent new equipment or arranged uncoupling rods to be used in lieu of the same. Others again are awaiting developments before attempting to comply with a law whose interpretation is confused.

The subject of grab irons as herein mentioned was discussed at length at the September meetings of the Western and North-West Railway Clubs. Both clubs passed resolutions expressing the sense of the meetings as believing it neither necessary nor advisable to equip the sides of tenders or front ends of locomotives with grab irons as safety appliances.

THE thirty-fourth annual convention of the Master Car and Locomotive Painters' Association was held in Chicago September 8, 9, 10 and 11. Never before in the history of this organization has the convention been better attended, nor has the quality and excellence of the papers presented ever been excelled. The convention in every respect was so very successful that the Master Car and Locomotive Painters' Association is to be congratulated upon the success of their recent meeting. The discussion of the papers was very lively and many interesting points were brought out. The Railway Master Mechanic will continue, as heretofore, to be the official organ of the association, and it is to be hoped that every member of the association will make it a point at some time during the coming year to contribute something of interest for publication in the department devoted to painting. Mr. Copp conducts a very interesting and useful department, and while his ideas in regard to railway painting are of the best, he is always exceedingly anxious to hear from the other members.

DURING the investigation and consequent discussion of locomotive tonnage rating and the amount of paying train load, little consideration appears to have been given to the constant dead load represented by the heavy caboose. While the caboose is a necessary addition to the train load in order to provide for the convenience and comfort of the train crew, it seems expedient to reduce this additional load to a minimum. The present condition of the country no longer makes it necessary for crews to sleep in cabooses as a regular thing, ample accommodation being available at each end of divisions. A caboose of large proportions is, therefore, no longer necessary and the types heretofore common may be improved by the design of a smaller caboose operated upon a four-wheel truck. The results to be obtained by such an arrangement are a reduction in the coal bill, lower cost of maintenance and lower first cost. The principal objection raised against four-wheel cabooses is the prevalent opinion that they will ride less smoothly than those mounted on double trucks. Presented on another page of this issue is an illustration of a four-wheel caboose designed by the Chicago, Burlington & Quincy Railway, embodying an arrangement of springs and equalizers, selected after three different systems had been placed in service and comparisons made with these and also with a double truck caboose, regarding their ease in riding.

SPECIAL interest attaches to the new steel side-door suburban cars placed in service during the past month by the Illinois Central Railroad in their Chicago suburban service, due to the novel mechanical features developed in their design and construction, and in view of the effect which this type of car is likely to have upon the question of rapid and efficient transportation of dense passenger suburban traffic. The Illinois Central is peculiarly well situated to observe the requirements of this class of service, as it maintains one of the best suburban systems in the world, operating in the second largest city in this country. Its experience in effectually handling the large crowds attending the Columbian Exposition in 1903 and the requirements of its daily suburban traffic suggested the facility with which passengers could be received and discharged in minimum time with side-door cars operated in connection with station platforms on a level with the car floor.

By reducing the time consumed in transferring passengers to and from station platforms the running time of trains is materially reduced. A method producing this end not only reduces the time necessary to convey a passenger to his destination, but also presents the opportunity of a greater number of runs in a given time with the same engine, train and crew, thus increasing the earning capacity of the property.

A valuable feature of the design in question is the admission of passengers into an aisle which extends the entire length of the car, from which it is possible to reach vacant seats either in the car initially entered or in one of the other cars of the train. A passenger may then enter the train at any point and locate a seat after the train is in motion, if one is not immediately available. By arranging a large number of doors in the sides of each car and providing entrances at any point throughout practically the entire length of the train, the congestion which usually occurs at end doors or single entrances is relieved.

The side door as usually applied in England and Europe admits passengers into a small compartment from which it is impossible to proceed to any other part of the car. It is, therefore, necessary either to enter an overcrowded compartment or walk up and down the platform until a vacant seat is located, delaying the train until all passengers have located seats to their satisfaction. A comparison of the two systems readily demonstrates the advantages of the new cars.

A complete illustrated description of these cars is presented on pages 424 to 430 of this issue.

MR. ALFRED H. SMITH.

GENERAL MANAGER OF THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

Twenty-five years ago Mr. Smith entered railroad service as a messenger boy in the office of the Lake Store & Michigan Southern at Cleveland, O. Having attained the position of office clerk, he concluded that such routine work offered no opportunity for advancement, and consequently entered the construction department, where his energy won him deserved recognition. After serving as a section hand, he received gradual promotion and was appointed Superintendent of the division between Elhart and Grand Rapids, being subsequently appointed to the Superintendency of four other divisions—each one of greater importance than the previous Mr. Smith was appointed Assistant General Superintendent in 1901, General Superintendent before the expiration of the year, and in 1902 became General Superintendent of the New York Central & Hudson River at New York City; his promotion to the office of General Manager being made in July of the present year. An unusual feature of Mr. Smith's career, other than his rapid advancement, is the fact that his service has been with a single system.

MORE than mere passing mention should be accorded the remarks of Mr. T. A. Foque delivered before the convention of the Traveling Engineers' Association, so clearly and conscisely did he outline the duties of the class of men constituting the organization. By demonstrating the influence of railroads upon the commerce and prosperity of the country he showed that filling a position of responsibility faithfully and conscientiously resulted to the advantage of the country at large. "In selling transportation a railroad disposes of its only marketable commodity. If the selling price decreases the cost of production must proportionately decrease." As it is the province of the road foreman to reduce the actual cost of transportation by keeping the cost of operation within minimum limits, it devolves upon him to assist in gauging the price of transportation. The many items effecting economy of operation received due consideration, evincing the fact that it was only after careful deliberation upon operating conditions and emergencies that he offered a brief address which left in the minds of his hearers much food for practical thought.

THE Master Steam Boiler Makers Association will hold its second annual convention at the Palmer House, Chicago, October 7, 8, 9 and 10, at which time it is expected that there will be congregated a large number of men interested in the design, construction and maintenance of steam boilers.

Appreciation of the value of associations organized to promote the sciences in the several branches of railroad work is evinced by the large membership of such organizations and the encouragement rendered subordinates by their superior officers to affiliate with associations furthering their interests. For this reason it appears particularly expedient that an association of master steam boiler makers should be successfully launched and accorded due consideration by higher officials. Boiler maker foremen can accomplish worthy results to themselves and therefore to the roads which they represent by meeting each year to discuss new and current features of boiler making and repair. In view of this fact it is hoped that the new association will meet with every success and receive the support which its efforts justify.

Topeka Shops of the Atchison, Topeka & Santa Fe Railway

Machine Tool Equipment

(Concluded from page 395.)

THE vertical hydraulic flanging press installed in the boiler department of the locomotive shop is of the largest type built and the largest machine of this nature yet placed in service by a railroad. This machine, illustrated in Fig. 2, was manufactured by Bement, Miles & Company and weighs over 240,000 pounds, having a capacity of 450 tons. The cylinders and operating valves are packed with hemp. The table is 10 ft. by 14 ft. and 8 ft. by 12 ft. between posts, large enough to press the largest boiler sheet. To form the upper and lower matrix which come in contact with the hot sheet, over 1,000 castings have been made. At the left of the illustration in shown the furnace for heating the sheets to be pressed. This furnace utilizes oil as fuel and is capable of heating a sheet equal to the capacity of the press.

The riveting machine and the interior of the riveting tower are illustrated in Fig. 1. There are two hydraulic riveters installed, one having a 17 ft. gap, equipped with a three-pressure outside hemp-packed cylinder, giving pressure of 50, 100 and 150 tons, controlled by hemp-packed operating valves, the second, and smaller machine, having a 12 ft. gap and giving a total pressure of 100 tons, the cylinder being of the same style as that of the larger riveter. The tower is served by two hydraulic cranes of 25 and 10 tons capacity respectively, each crane having a lift of 50 ft. The hydraulic accumulator, 12-ins. by 15 ft. stroke, supplying pressure for the riveting plant, is located in the basement of the power house, a very appropriate position, near the operating pump. The accumulator furnishes a pressure of 1,500 lbs. per square inch and is served by a duplex steam pump having a capacity of 100 gallons per minute. The relative positions of the power house and riveting tower may be seen by referring to the general plan of the Topeka shops, appearing on page 160 of the April issue.

The lifting beams and hangers for handling locomotives by the cranes in the locomotive shop are illustrated in Figs. 4 and 5, and may be seen in service

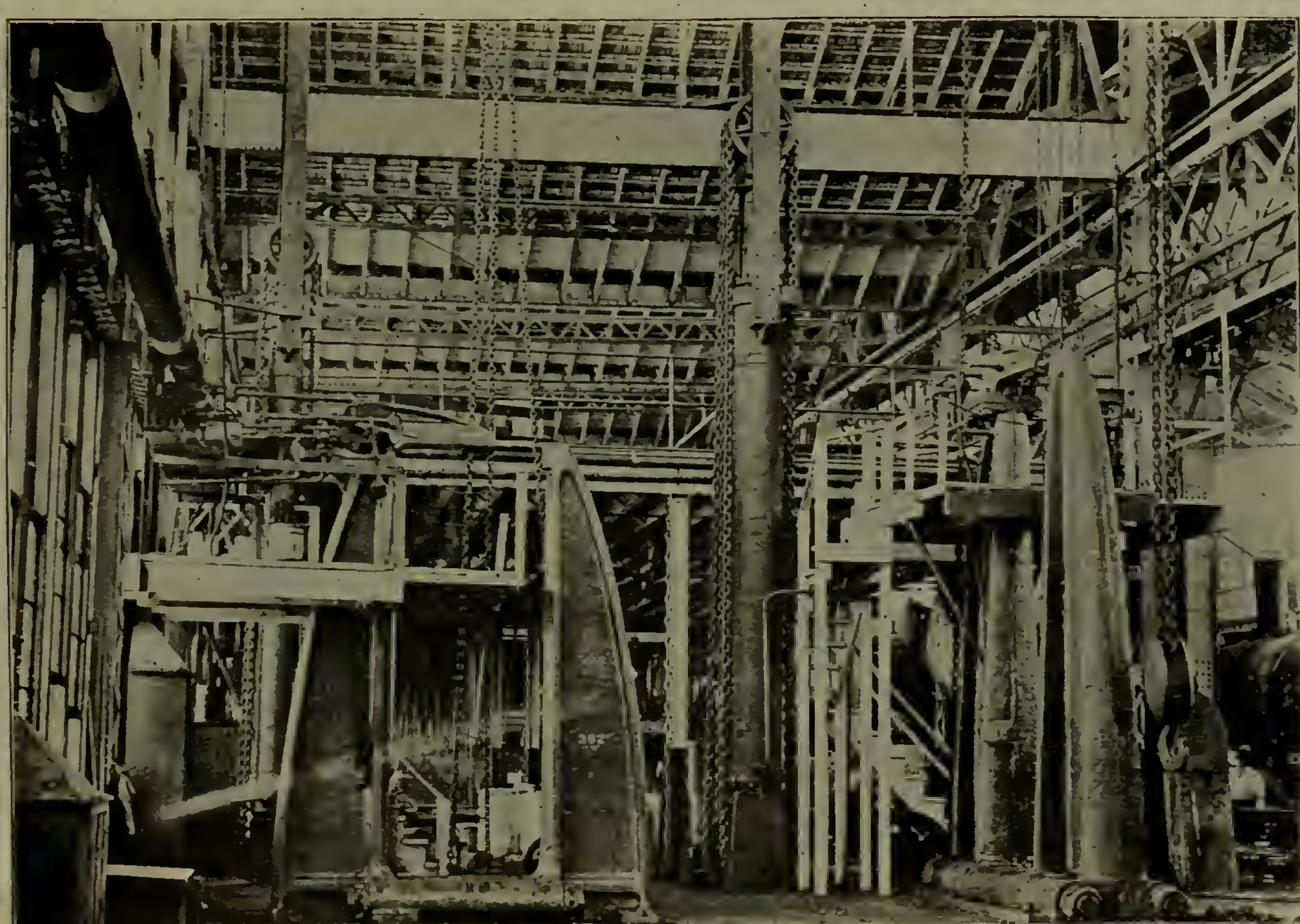


FIG. 1—TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—RIVETING PLANT.

Fig. 2—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Hydraulic Flanging Press.

position by referring to page 126 of our March issue, illustrating the initial test of the two 60 ton cranes which serve the locomotive erecting floor. Fig. 4 illustrates the lifting beam, hangers and bar for lifting the rear end of the locomotive, and for lifting the front end two shorter hangers are used in connection with chains which pass under the engine frames. Both cranes are used in lifting and transferring a locomotive, one hanger attachment being carried by each crane. The parts of the hanger attachments were made in the Topeka blacksmith shop from the ends of the best staybolt iron, the material being double worked and well hammered.

The machines in the blacksmith shop operated by electrical drive are divided into two groups. The location of the motors and their belt connections to the overhead shafting are shown by Fig. 3, which represents the interior of a portion of the shop. The steam generating furnaces and heavy steam hammers are located in the north end of the building. Two of the furnaces and several of the hammers with their attendant jib cranes, forges, etc., are illustrated in Fig. 6. The lighter hammers, bulldozers, heating furnaces, punches, shears, smith forges, etc., are arranged consistently throughout the shop, while the extreme south end is devoted to spring work. The smaller furnaces are arranged with relation to the machines which they serve, so that one furnace serves two machines. The shop furnaces are oil burning, with the exception of the steam generating and case hardening furnaces, which burn coal. Much of the equipment of the old shop has been installed in the new building, while new and up to date apparatus has been added and substituted for some of the older appliances.

TOOLS IN BLACKSMITH SHOP.

Pieces.	Kind of Apparatus.	Size.	Manufacturer.
3	Steam generating axle furnaces	90 H. P.	R. R. Co.
3	Heating furnaces	No. 3	R. R. Co.
7	Spring furnaces		R. R. Co.
6	Miscellaneous furnaces	Small	R. R. Co.
2	Feed water pumps	No. 8	Knowles
2	Double frame steam hammers	5,000 lbs.	Chambersburg
1	Double frame steam hammer	4,000 lbs.	Bement
1	Single frame steam hammer	2,500 lbs.	Bement
1	Single frame steam hammer	1,100 lbs.	Bement
1	Single frame steam hammer	1,100 lbs.	Morgan
3	Single frame steam hammers	250 lbs.	Morgan
2	Single frame steam hammers	250 lbs.	Bement
1	Single frame steam hammer	850 lbs.	Bement
1	Single frame steam hammer	350 lbs.	Sellers
1	Single frame pneumatic hammer		R. R. Co.
1	Bulldozer	Large	Williams & White
2	Bulldozers	Small	R. R. Co.
4	Bolt headers	1¼ ins.	R. R. Co.
1	Bolt header	2½ ins.	Ajax
1	Bolt header	¾ in.	Benedict
1	Bolt header	Large	R. R. Co.
1	Steam punch and shear	3 ins.	Hercules
1	Washer punch	½ in.	

Fig. 3—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Interior of Blacksmith Shop, Showing Location of Motors and Machines.

1	Punch and shear	¾ in.	Galesburg
1	Spring punch and shear		Evans
1	Taper rolls		Evans
1	Band press		Olsen
1	Nibber and trimmer		Evans
1	Spring tester		Riehle
1	Case Hardening furnace		R. R. Co.
1	Pressure blower	No. 7	Sturtevant
1	Pressure blower	No. 9	Sturtevant
2	Pressure blower	No. 8	Sturtevant
40	Smith fires		

An electric traveling crane is to be installed in the yard immediately east of the locomotive shop building, having a travel of 500 ft., which is to be used in unloading and storing boiler plate, castings and other heavy material for the shop. The crane is to be of the three-motor type, manufactured by the Whiting Foundry Equipment Company, spanning 35 ft. 9½ in. between centres of crane runaways. It is to have a capacity of 5 tons and a lift of 20 ft. As the crane is for outside work it will have a covered trolley and an enclosed cab for the operator. The crane girders are supported by wooden posts arranged in the form of a tripod, as shown in the accompanying line drawing Fig. 7. Old 65-lb. "T" rails are used for the crane runaways.

A switch track extends the length of the building between the post foundations, as shown in the plan Fig. 8. Cars placed on this track are conveniently unloaded by the cranes, material which will be unaffected by the weather being placed along the track in sections, according to the material and service in which it is to be used. For boiler plate a sheet steel storage house has been erected, shown in plan Fig. 8 and in elevation Fig. 7, in which such material is to be stored for protection against the effects of the weather. One-half of the roof is portable and may be lifted by the crane and placed temporarily upon the permanent section of the roof. This clears obstructions from the path of the crane hook, and in placing a sheet in position the hook is free to travel to the center of the building, a distance sufficient for all practical purposes.

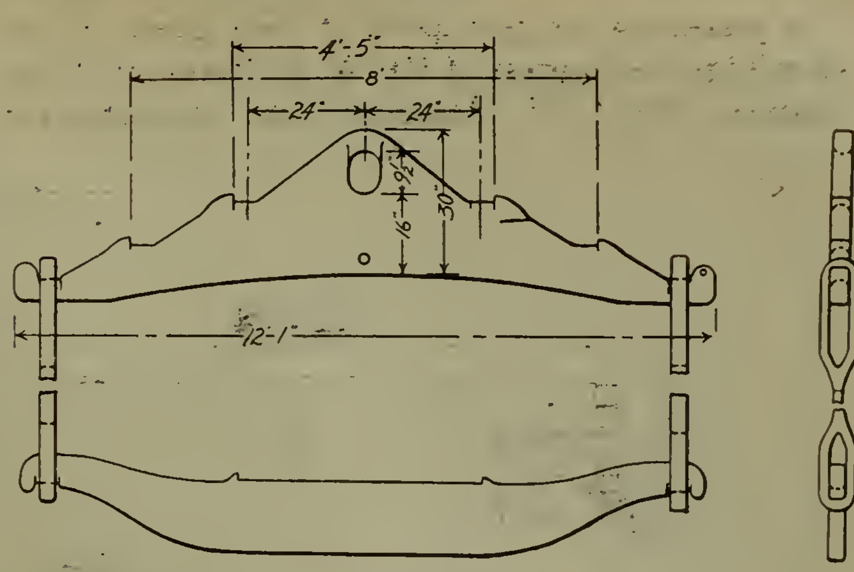


Fig. 4.

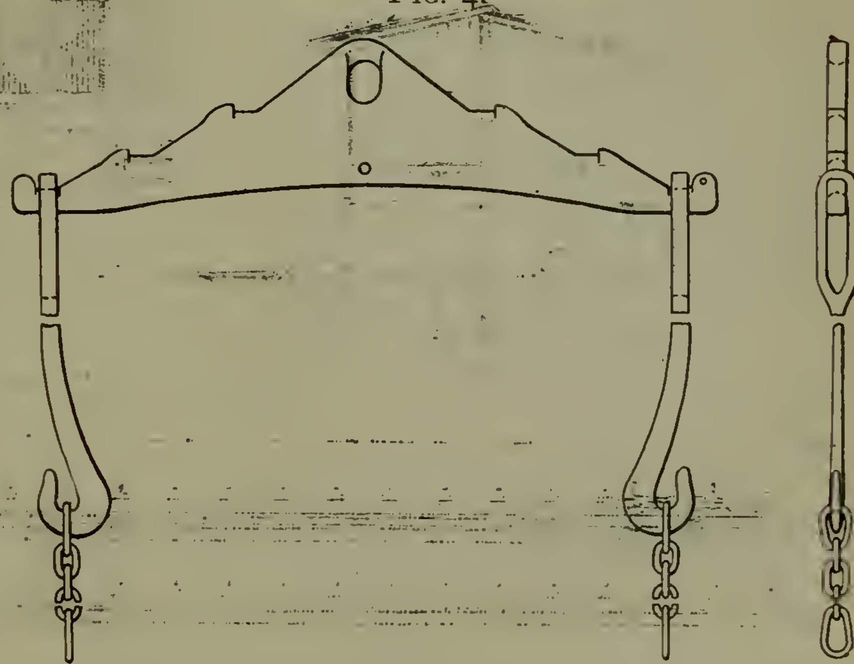


Fig. 5

Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Lifting Beams and Hangers.

Fig. 6—Topeka Shops of the Atchison, Topeka & Santa Fe Railway—Interior of Blacksmith Shop, Showing Location of Steam Hammers and Steam Generating Furnaces.

In presenting the description of these shops, we acknowledge the courtesy of Mr. W. B. Storey, Jr., Chief Engineer; Mr. G. R. Henderson, late Superintendent of Motive Power; Mr. F. H. Adams, Engineer of Shop Extensions, and Mr. L. M. Gazin, late of the L. L. Summers Co.

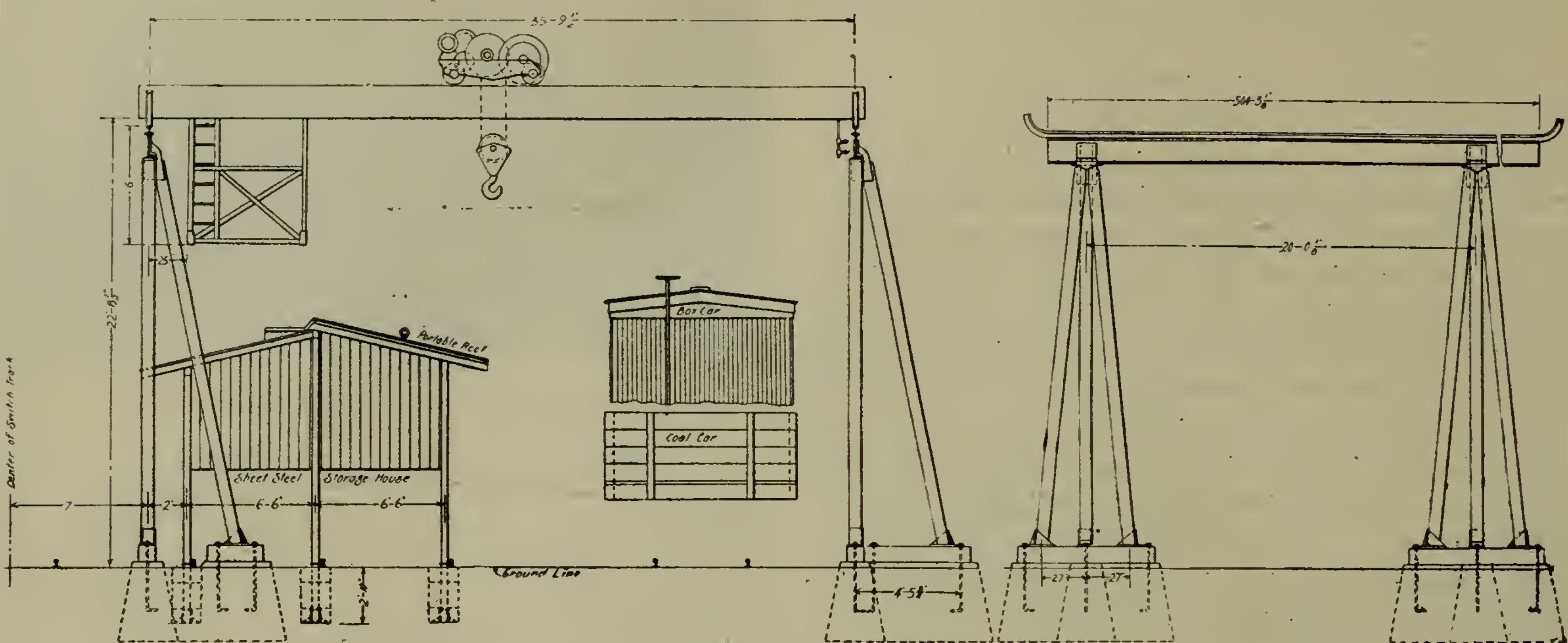


FIG. 7—ELEVATION.

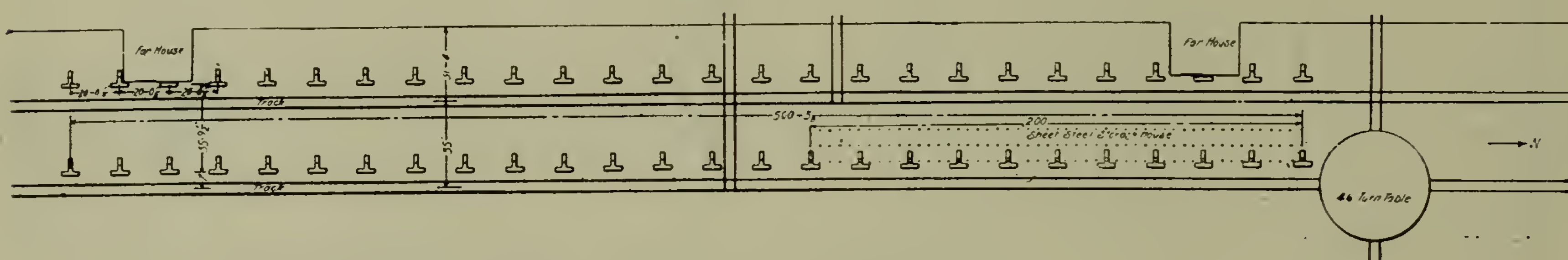


FIG. 8—PLAN.

TOPEKA SHOPS OF THE ATCHISON, TOPEKA & SANTA FE RAILWAY—YARD STORAGE CRANE.

A Plea for Better Boiler Water

By John H. Wynne

(Concluded from page 390.)

Purification of Water.

THAT most waters available for boiler purposes contain scale no one can deny, for chemical analysis shows it, and the dirt chipped from the inside of boilers and "tumbled" from the flues at railroad repair shops goes on piling up every day, unsightly but decisive evidence as to the truth of the chemist's testimony.

Various ways of alleviating trouble from boiler scale have been tried, but they may be divided into three general heads, viz., by feeding "compounds" into the boiler along with the water; by feeding a suitable oil into the boiler continuously while in use to hold the particles of scale-forming matter in suspension until some convenient point can be reached where it can be blown off, and by treating the water before it enters the boiler to remove the substances which give trouble.

Boiler Compounds.

A large majority of boiler compounds are humbugs. Others have been indifferently successful. Some are said to have given fairly good results. Upon this subject Mr. Kent has this to say: "Many substances have been added (to the water) with the idea of causing chemical action which will prevent boiler scale. As a general rule, these do more harm than good, *for a boiler is one of the worst possible places in which to carry on chemical reaction, where it nearly always causes more or less corrosion of the metal and is liable to cause dangerous explosions.*" The writer has taken the liberty of italicizing the phrases which contain the principal objection to the use of chemicals in the boiler. Another drawback is that they cause foaming.

Oil as a Remedy.

The following is taken from one of Mr. Kent's books: "In cases where water containing large amounts of total solid residue is necessarily used, a heavy petroleum oil free from tar or wax, which is not acted upon by acids or alkalies, not having sufficient wax in it to cause saponification, and which has a vaporizing point at nearly 600 degrees F., will give the best results in preventing boiler scale. Its action is to form a thin, greasy film over the boiler linings, protecting them largely from the action of acids in the water and greasing the sediment which is formed, thus preventing the formation of scale and keeping the solid residue from the evaporation of the water in such a plastic suspended condition that it can be easily ejected from the boiler by the process of 'blowing off.' If the water is not blown off sufficiently often, this sediment forms into a putty that will necessitate cleaning the boilers. Any boiler using bad water should be blown off every twelve hours."

There are many objections to this system of scale prevention. First and foremost the "blow-off systems" now on the market do not accomplish their ends in a locomotive boiler. Many railroads have used them faithfully and after a fair trial have abandoned them altogether, because, they said, the scale was just as thick as before the application of the apparatus and the flues had to come out just as often. In many cases the scale is worse, because the perforations in the blow-off pipes soon become clogged and will not permit as much sludge or mud to pass off when the cocks are opened as with ordinary blow-off cocks. Large first cost, large cost of maintenance and operation from two more items against this inefficient scheme. Also the injectors, check valves, throttle and other cab appurtenances are scaled up and in a worse condition than with the scale settling in a normal way upon the sheets. This is especially true in the case of injectors and check valves. The reason for this, no doubt, is that the particles of solid matter being in a stirred-up condition are carried over in the wet steam and deposited upon the seats and nozzles. When the injector or valve is operated, the scale cuts the seat with a leaky joint, and increased wear of the parts as a result. It may, therefore, be said that this remedy aggravates the disease instead of curing it.

Manufacturers of these devices claim increased engine mileage between boiler washouts and shorter delays for the engines at the roundhouse. Granting for a moment that such is the case, upon investigation we will find that we cannot only get this same result by the use of good water in our boilers, but also a decreased repair bill. Of this something will be said later.

PURIFICATION OF WATER BEFORE USE.

The most economical and in every way satisfactory method of taking care of bad water is to *treat it befor it enters the boiler.* This is a new field that has opened up in railway economics, although industrial plants in both hemispheres have for years past used softened water for boiler purposes. In a few years—perhaps in a few months even—railroads having bad water districts will wake up to the fact that water purifying plants are as much of a necessity at water stations as the pumps which keep the supply tank full. There are several water softeners on the market and they all follow the same general principles, more or less. The method is, briefly, as follows: Chemical reagents are automatically mixed with the water, the proportions and the kinds depending upon previously determined analyses. The lime and magnesium salts are precipitated and separated from the softened water by settling and filtering; the softened water is then delivered to the storage tank. Taking the results accomplished into consideration, most of the devices are of low cost. There is at least one company manufacturing the machines in question who guarantee in an ironclad contract that they will reduce the scale-forming materials to a certain low percentage at a specified cost per 1,000 gallons or remove their machines without pecuniary loss to the prospective purchaser. The results they are obtaining with their apparatus are satisfactory, for a trial of one, two or three machines has frequently resulted in contracts for complete division equipments, the number running up as high as twenty-five sold under one contract and no plant having a capacity under 10,000 gallons per hour.

The table appearing on the following page was compiled from a report of an examination of the water supply of the Middle division of the Atchison, Topeka & Santa Fe Ry. and was made by a reliable company. The first four columns are perhaps the most interesting, as they show the amount of incrusting solids contained in the water at each station before and after treatment, the amount of scale-forming material that would enter the boilers each day were the water not treated, and the cost of the materials for softening it per 1,000 gallons.

In connection with this treatment the following should be noted: The cost of materials for treatment of water is based upon Chicago prices of lime and soda ash, viz., lime at 50 cents per barrel of 200 pounds and "58 test" soda ash at $1.00 per 100 pounds. Each softener is designed for each station and its particular water as shown by analyses.

At Peabody water station (number 5 in the table) it will be seen that the water is very hard and undesirable, because it contains an abnormally large amount of sulphate of lime. The cost of treatment, eleven cents per 1,000 gallons, is exceptionally high. It is creek water and may, therefore, vary considerably in the amount of mineral constituents. In many of the above cases the samples analyzed show the presence of corrosive as well as scale-forming salts—a dangerous combination, the scale hiding the corrosion.

	Stations	Incrusting Solids Grains per Gallon Treatment Before	After	Pounds Scale-forming Solids Entering Boilers Each Station per 24 hours	Cost of Materials for Treating this Water per 1000 Gals	Average Daily Consumption Gallons	Hourly Capacity of Softener Gallons	Height from Ground Softener Will Deliver Water Feet	Hours Softener Would Run
1	Saffordville	1. 27.19	2. 5.0	3. 28.28	4. 3 Cents	5. 6000	6. 1000	7. ——	8. 10
2	Strong City	20.48	5.5	262.80	1.2 "	90000	10000	52	10
3	Clements	17.62	5.0	41.83	1.0 "	16600	2000	29	10
4	Florence	33.33	5.5	428.40	1.9 "	90000	4000	40	24
5	Peabody	105.42	7.0	376.50	11.0 "	25000	3000	28	10
6	Newton	13.94	5.0	696.50	1.5 "	350000	15000	40	24
7	Sedgwick	18.87	5.0	40.35	1.0 "	15000	2000	28	10
8	Wichita	23.39	6.0	160.32	1.8 "	48000	5000	——	10
9	Mulvane	19.46	5.0	250.20	1.1 "	90000	10000	28	10
10	So. Winfield	17.37	5.0	143.84	1.1 "	58000	6000	28	10
11	De Graff	9.61	5.0	24.66	Treatment not Necessary	18000	2000	29	10
12	Eldorado	37.71	5.0	161.70	1.3 Cents	30000	3000	28	10
13	Douglas	21.77	5.0	15.55	1.0 "	15000	1000	18	5
14	Jacobs	79.88	5.0	131.21	2.1 "	11500	1500	28	10
15	Abilene	13.95	6.0	25.87	0.8 "	13000	1500	40	10
16	Manchester	11.83	8.0	20.28	Treatment not Necessary	12000	No Treatment Recommended		
17	Miltonvale	14.48	5.0	37.26	0.8 Cents	18000	2000	28	10
18	Concordia	16.90	5.0	14.46	1.0 "	6000	1000	40	6
19	Superior	15.11	5.0	12.96	0.7 "	6000	1000	——	6
20	Salina	36.81	6.0	33.60	2.1 "	6500	1000	40	7
21	Minneapolis	12.98	5.0	11.10	1.0 "	6000	1000	40	6
22	Barnard	40.19	6.0	28.70	2.6 "	5000	1000	28	5
23	Marion	36.87	5.5	26.35	3.0 "	5000	1000	——	5
24	Canton	17.23	5.5	22.14	0.7 "	9000	1000	28	10
25	McPherson	24.06	5.0	11.35	1.8 "	3300	1000	28	4
26	Little River	23.23	5.0	56.44	1.2 "	17000	2000	28	10
27	Lyons	17.47	5.0	9.96	0.8 "	4000	1000	28	5
28	Holyrood	12.80	5.5	4.03	1.4 "	2200	1000	28	3
29	Augusta	26.60	6.0	125.40	1.6 "	33000	4000	29	10

TABLE 3.

The amounts of these substances contained in the samples taken from the above stations look small to you, perhaps, because they are expressed in *grains per gallon;* but glance at column 3 and you will begin to realize how many *pounds* of scale you are putting into your boilers every day. When one considers the great quantity of water that is required for the motive power during the many weeks and months of service, the total weight of dirt and scale amounts to a surprising figure. It does not take much scale to cause an unlimited amount of trouble. After you have thought this over, walk into the shop and look at an engine out of which the flues have been cut. A wagon-load of scale lies on the floor ready to be taken away, and over in the boiler shop under the flue rattler lies another large heap. Then bear in mind that almost as much more still remains on the sheets and staybolts which the boiler-washers have been unable to reach.

Another feature of water softening machines not to be passed by unnoticed is that of filtration. Mud and other suspended matter is removed in the process.

The machines on the market are of varying complexity and simplicity, but it is possible to purchase a machine that is durable, automatic, efficient and, taking into consideration the results it will accomplish, cheap; one that will require no more than the regular force of men in service at the water station; one that does not need an expert to operate it; one which does not necessitate repumping the treated water and automatically stops the operation when the storage tank is full and starts again when the water falls below a certain level; one which has few wearing parts, thus reducing running repairs.

ECONOMY OF WATER PURIFICATION.

At the February, 1903, meeting of the Western Railway Club, Mr. M. H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy Railroad, said in part: "I have figured that it would cost on an average, all things considered, about three cents per 1,000 gallons for treating water, over and above the cost of obtaining the water anyway. Taking this figure as a basis, the cost of furnishing a heavy freight locomotive with treated water would run up to something like $200 per year per engine. Of course, we do not want to spend that amount of money without getting it back again. The principal saving would come in, probably, from the decreased coal consumption and the decreased repairs." (The latter saving would amount to by far the larger sum.) "A locomotive will burn up say $5,000 worth of coal a year, and if there is any saving at all we can figure say 3 per cent; that would be equivalent to about $150 a year saving on the coal. The boiler repairs probably in a year run say $1,200, and there seems to be no question whatever that boiler repair expenses can be considerably reduced, and figuring that we can cut off 25 per cent, that would save about $300 per year per engine. But another material saving would come from the reduced number of boiler wash-outs. In very bad water districts engines have to be washed out perhaps in some cases as often as every 500 miles, perhaps every 500 or 600 miles; with good water, such as these plants would furnish, that might be extended to at least 3,000 miles; we could save by reduced washouts anywhere from $50 to $100 a year, say $60.

"Then another very important source of revenue would be the increased use we would get out of the locomotive. A locomotive is in the repair shop about 10 per cent of the time; then it is out of service in addition, due to washing out and repairs in the roundhouse, probably 5 per cent more, making probably 15 per cent of the locomotive's life dead time. By having good water we can save the greater part of the time due to washing out; we can save some of the time due to boiler repairs in the shop and a large part of it in the round house, the probable saving there being $100.00 or $200.00 a year more. I figure it as a very conservative estimate that the net saving would probably be $400.00 per year per engine and I believe that railroads in the very near future will have to consider these water-treating plants as a part of the equipment of a water station."

The only criticism of Mr. Wickhorst's figures that the writer has to offer is that they are undoubtedly too conservative. Of course, there are other points that cannot well be figured in dollars and cents although the bills for maintenance and operation of the different divisions of a road would be noticeably reduced. One of the principal items would be the great reduction in the number of engine failures directly due to the effect of bad water on the boilers.

The cost of repairing boilers will vary with the facilities of the shops. On small roads and on most large roads these facilities are not as up-to-date as they should be; consequently if the necessity for repairs is alleviated, it would be of greater advantage to such a road to install water stations than to the one of more progressive ideas and of larger means.

In many cases flues last but three and four months when they have to be removed and reset. But the average for bad water districts will run about six months. Furnaces frequently only go eighteen months to two years before side sheets are applied, but they will usually run two and one-half to three years. The whole fire box has to be renewed every three to five years. By the use of good water I see no reason why flues need be removed except when the engine is in the shop for general repairs, say every two years; also the life of fireboxes would probably be increased from four and five years to eight, ten or even twelve—perhaps more.

For a period of eight years on an engine of average modern size and taking into consideration *renewals and running repairs to boilers only* in a bad water country, the average cost per year per engine will run pretty close to $2,000.00. Of this probably $1,200.00 to $1,400.00 per year can be saved. The assumption is based upon figures taken from performance sheets and cost accounts. Taking the estimate above referred to and combine it with the one immediately above and we obtain the following:

Saving in fuel	$ 150.00
Saving in washing out boiler	60.00
Saving due to longer period of service	100.00
Saving in repairs	1,200.00
Total saving	$1,510.00
Cost for treated water per engine	200.00
Total net saving per locomotive per year	$1,310.00

In the above we do not include many items almost impossible to estimate.

On one division operating 60 engines this would mean an annual saving of about $78,000.00 and on a system operating 900 locomotives the saving would be about $1,000,000.00 annually.

Are the figures startling? If they are, go over the books of your road in which are accounted the expenditures of the last eight or ten years. Then think the matter over carefully, call your motive power superintendent into consultation and there can be but one result.

Some years would elapse before all the good results of purer water would appear but the effect upon such accounts as running repairs, coal consumption, boiler washouts, etc., would be felt almost immediately. In favor of bad water two things may be said the first of which does not redound to the credit of the management from the stockholders' standpoint. It demands the employment of a larger corps of boilermakers, machinists, etc., than necessary to keep the motive power in shape, and furthermore, it has probably done more than any other one thing to bring into practice some excellent examples of boiler design. A locomotive like any other machine should be designed to suit certain requirements, but where bad physical conditions exist that cause engine failures and retard service, the first and best thing to do is to *eliminate the elements of trouble* rather than cater to them by evolving a design to overcome or alleviate the evil *effects.*

Another advantage of better water—perhaps it is a sentimental thought and it has been said that the railroad business must necessarily be devoid of sentiment—is the effect upon the master mechanic and his subordinates of having fewer engine failures, smaller shop accounts and less frequent complaints about the service on his division. It is not economical to tax a man beyond the limits of physical or mental endurance when he is an efficient man.

In order to determine the merits of an instrument whether it be a method, a machine or a man, it must be given a fair trial. Departmental antipathy exists on almost all roads and where it exists the effect is detrimental to the interests of the road and the loss is that of the stockholders. For example, department A must furnish apparatus which only B uses and from which A derives no return; B sees a scheme whereby its expense will be cut say ten per cent by improving the old apparatus or replacing it altogether with another device. Nine cases out of ten, department A will veto the proposition (without considering the saving to the owners) for the simple reason that the necessary appropriation would be charged to his account. Many problems warranting investigation and fair trials are thus thrust aside and are never carried to the executive officials.

At first glance the above remarks may seem somewhat irrelevant to the subject briefly treated in this paper—that of water purification for locomotive boilers. But they have been made with the hope that this may reach the eyes of some executive whose road is not investigating water softening.

It behooves every general superintendent or general manager to have the water analyzed from each station under his jurisdiction whence it may readily be determined whether or not the installation of treatment plants will pay. The general manager is seeking results and any steps taken in the direction of reducing operating expenses should not only receive his interest but his closest attention and co-operation.

Steel Frame Side-Door Suburban Cars of the Illinois Central R. R.

IN this country, with the steadily increasing density of passenger traffic upon railroads having a suburban business, and particularly upon the elevated and subway lines handling a heavy metropolitan traffic, the limitations of the end-door cars have become too plainly apparent, as demonstrated by the unreasonable detentions of trains at stations in discharging and taking on passengers during the rush hours of the morning and evening. These detentions have a material influence in diminishing the earning capacity of the properties, to say nothing of the inconvenience to the public occasioned by the inability of the lines to afford the requisite accommodations. The remedy usually applied of increasing the number of trains at such times does not afford the desired relief, for the reason that no improvement can thus be effected in the crowding of passengers at the ends of the cars, with the incidental surging, struggling efforts of many persons to gain immediate entrance through the narrow gateways and end-doors. The system is a defective one and must necessarily remain so, as it produces a concentration of passengers at the ends of cars and congests the passageways whenever the traffic becomes heavy, and the congestion continues to increase with the density of traffic until finally the blockade is complete and movement ceases.

In these circumstances it is evident that the remedy lies in preventing the formation of the crowded groups at the ends of cars, and of distributing the passengers evenly over the entire length of the station platform, so that when trains arrive they may step directly and conveniently from the platform to the side-doors of the cars and avoid the uneasy movement up and down the platform to get opposite the end entrances at their more or less uncertain points of stoppage. Such distribution can be effected only by the use of cars having a sufficient number of side-doors that there is no choice of position on the station platforms when awaiting trains. This result is obtained in the new cars, built by the Illinois Central Railroad, which have twelve sliding side-doors on each side, spaced five feet from center to center throughout the length of the car, each door being directly opposite a section of eight

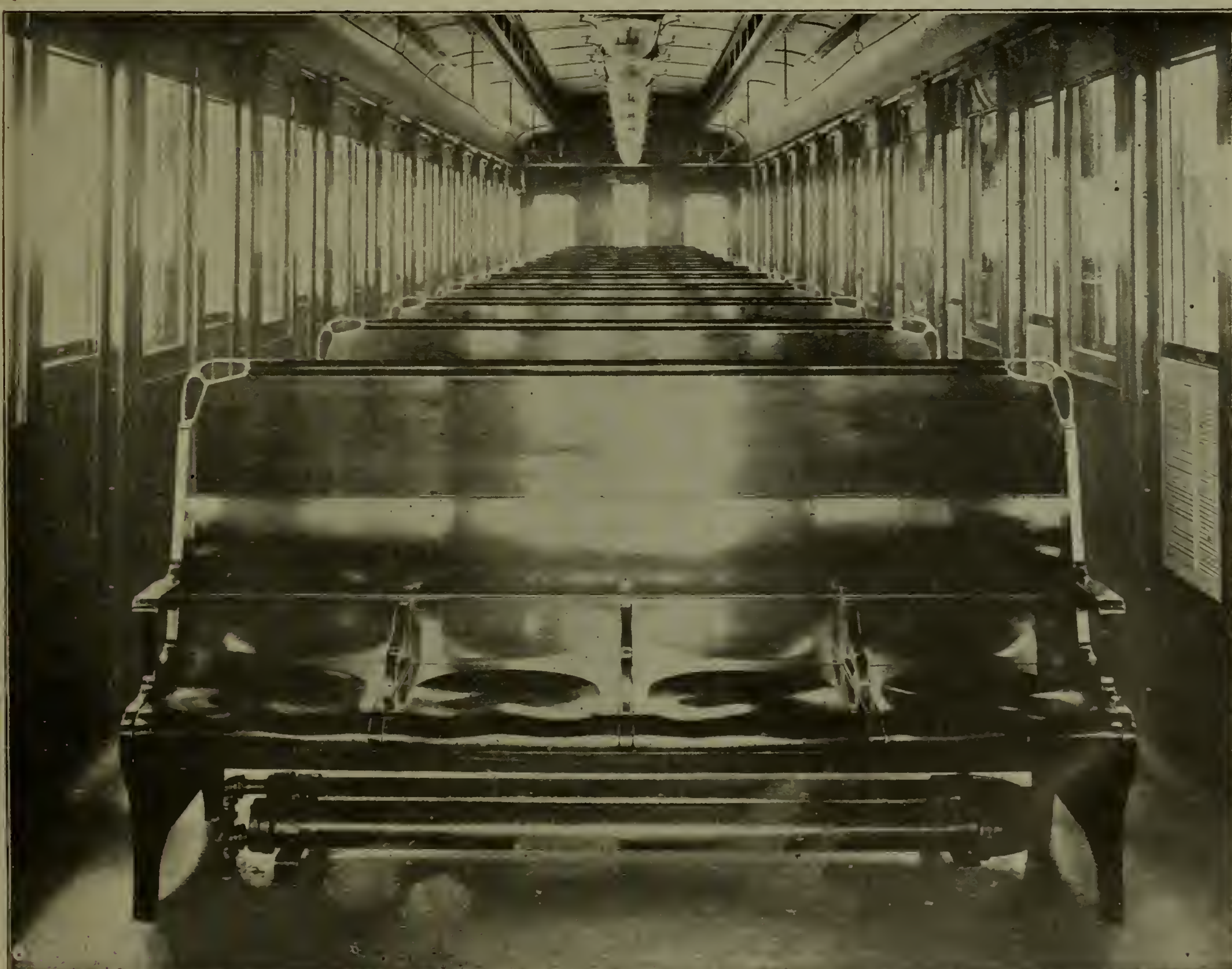
Steel Frame Side-Door Suburban Car—Doors Open.

Steel Frame Side-Door Suburban Car—Doors Closed.

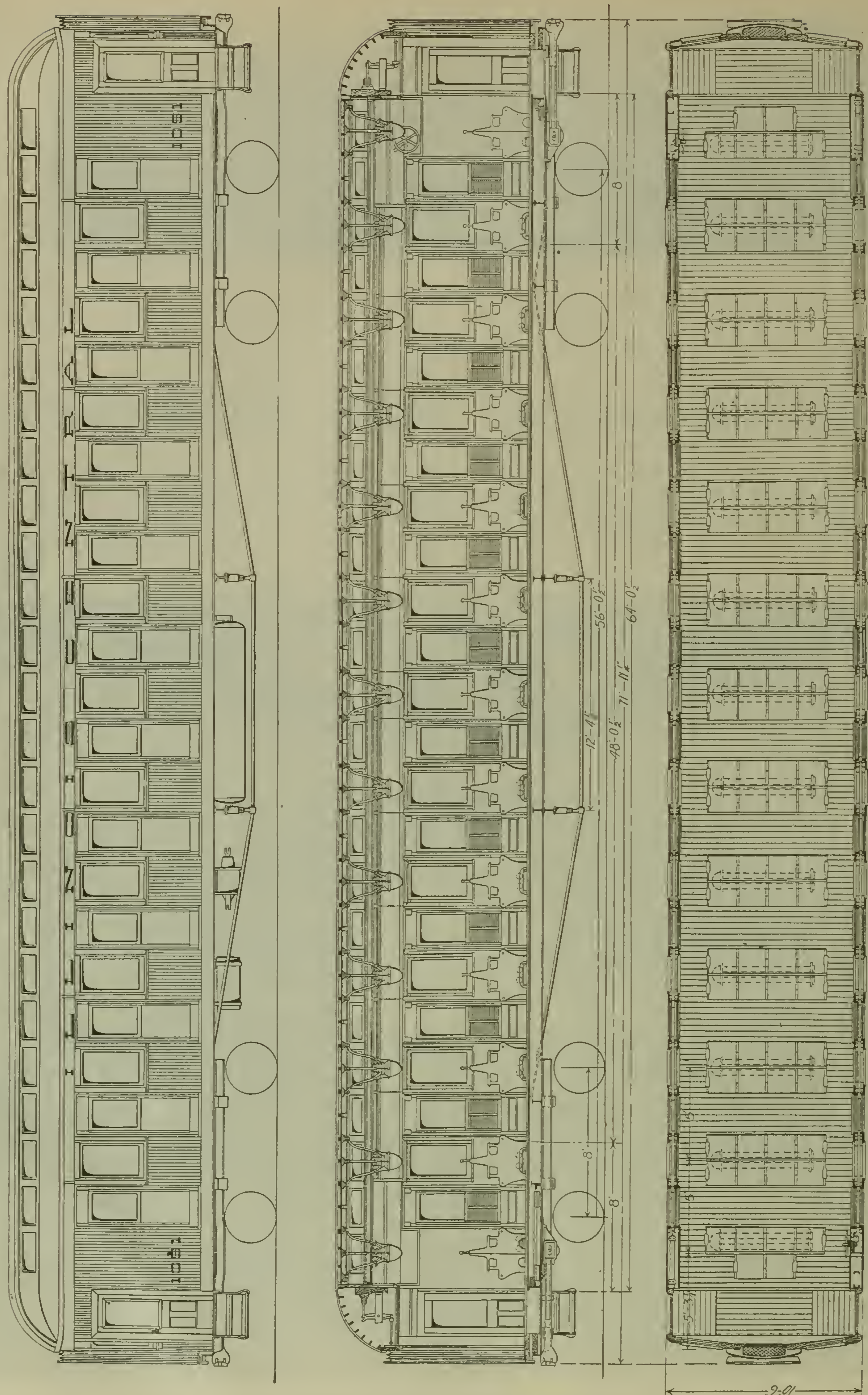
seats, with aisles on both sides just inside of the doors extending the entire length of the car.

The idea ordinarily suggested by the term "side-door car" is that of a car divided into separate compartments in which the seats are arranged transversely from side to side of the car, with no communication between the compartments, access to which is provided by doors swinging outwardly from each compartment over the station platform. This style of car is still in general use in Europe and Great Britain, but offers no advantage over the end-door car used in America, as it is even slower in its operation. In fact, the disadvantage of the side-door car as used in England is so great that serious consideration is at this time being given there to the end-door car used in America as offering means of relief from the difficulties they now experience.

The side-door car of the Illinois Central is quite



Steel Frame Side-Door Suburban Car—Interior.



Steel Frame Side-Door Suburban Car—Elevation, Longitudinal Section and Plan of Seating Arrangement.

unlike that used on English railroads, not alone in the details, but in the principles of its design. In the first place the swinging door is discarded, and the danger to which passengers on the station platforms and in the car are exposed by doors opening unexpectedly when trains are in motion, is eliminated. Instead of the swinging compartment doors of the English cars, each one of which has to be opened and closed separately, sliding side-doors are used which are operated and controlled by ingenious mechanism within the walls of the car, so that all the doors may be opened and closed together or separately, as occasion may require, by the trainman in charge of the car. This arrangement admits of the instant and perfect control of all the doors from either end and both sides of the car, effecting great saving in time over the swinging door method.

Next to the sliding door, the abolition of the interior compartments and the opening of the side aisles are the most noticeable differences, affecting not only the appearance, but the use of the car. In English practice, when a train arrives, the passengers to take it must go along the station platform, looking into first one compartment and then another until vacant seats are found, this proceeding consuming much time and greatly delaying the train. By the use of aisles extending the entire length on both sides of the car, as in the new cars, the passengers may enter at once any of the side-doors, and if vacant seats are not found immediately at the entrance, they can pass along the aisles to other parts of the car, or if necessary, through the communicating end-doors of the vestibules to other cars where seats may be found; the train meanwhile having resumed motion, no time is lost waiting for passengers to find seats.

The several advantages of this method of transportation are shared alike by the passengers and the company. The absence of crowding and of the necessity for struggling to gain entrance to the car, with nearly double the number of seats readily accessible than are to be found in an ordinary car, are changed conditions readily appreciated by the passengers, while the rapidity of the movement of receiving and discharging passengers will materially facilitate train movement and increase the transportation capacity of the road. As between an end-door and a side-door car the relative quickness of movement in receiving and discharging passengers is represented by the relation of the length to the width of the car and the number of doors available. In a car of sixty feet in length with two end-doors, passengers may leave the car in single file at the rate of one per second from each door, requiring thirty seconds to empty the car, whereas in a car ten feet in width with twelve side doors, passengers may leave the car at the rate of one per second from each door, requiring but five seconds, or one-sixth of the time, to discharge the same number of passengers.

The underframe of the car consists of four 9 ins. by 21 ins. steel I beams, 64 ft. in length, spaced nearly equal distances apart and of a total width over the flanges of 10 ft. 4 ins. The end sills are 9 ins. 25 lb. steel channels set with backs to the squared ends of the longitudinal sills and riveted to them with double angle plates reinforced by gussets. Four truss rods passing over the inner body bolsters and anchored to the outer body bolsters, are used to support the middle of the car. These rods are solid, that is, without the usual swivel connection in the middles; their adjustments being obtained by eight vertical screw queen posts resting with their lower ends upon the rods and their upper ends supporting two steel middle beams of 7 ins. 15 lb. I beams extending entirely across the car under the sills, with their upper flanges riveted to the lower flanges of the sills, thus bracing as well as supporting the underframe.

Over the body bolsters and over the middle beams 6 ins. 12¼ lb. I beams in short sections are placed between the longitudinal sills as stiffening members and riveted with angles to the webs of the sills.

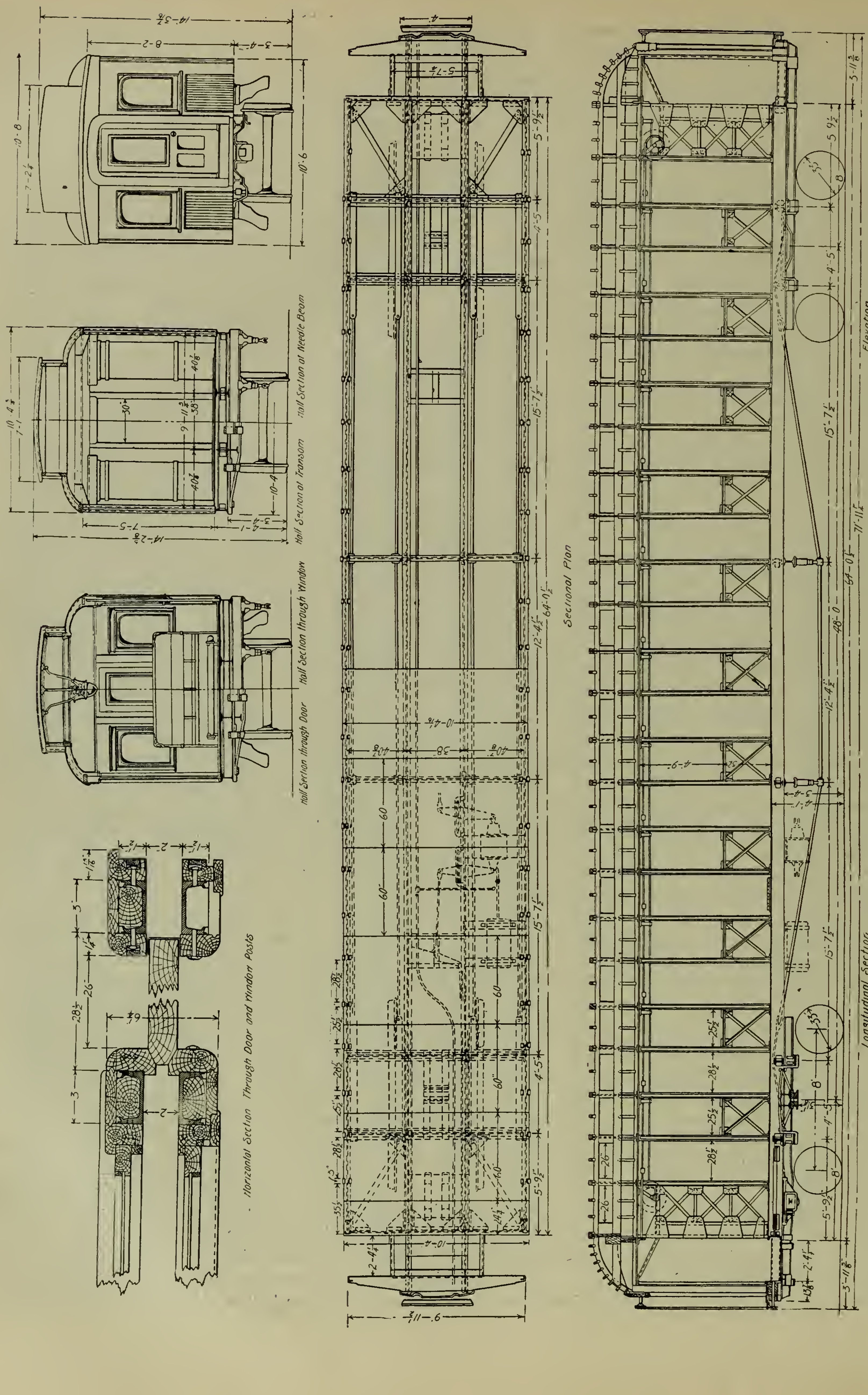
Upon the metal sills a steel floor of ¼-in. plates, 60 inches in width, is laid with butt joints formed by the planed edges of the plates and extending entirely across the underframe. This floor is riveted to the upper flanges of the sills with double rows of ½-in. rivets. There is thus obtained a continuous metal surface extending the entire length and width of the car, insuring perfect rigidity of the underframe and giving complete protection from fire underneath the car.

The underframe is carried upon four body bolsters made of 7 ins. by 1 in. steel bars in the upper and lower members. The bolsters are arranged in pairs, 4½-ft. centers, and belted to the lower flanges of the sills. Heavy truss connections extend between the bolsters, to which are bolted the center plates.

Four-wheeled trucks of standard construction for passenger service are used, with rolled steel wheels, 33-in. diameter, and steel axles with 5 ins. by 9 ins. journals.

The cars are equipped with Standard steel platforms and couplers, and the Sessions friction draft gear. A novel method of attaching the draft rigging to the car has been adopted in consequence of the distance, 36 ins., between the center sills of the car. This consists of a steel plate, 2 ft. 5 ins. by 3 ft. 6 ins. by ¾ in., which is placed between the main sills of the underframe and the sub-sills of the platform and bolted through their flanges with twenty-four ⅝-in. bolts, accurately turned to round holes with a driving fit.

The upper frame is constructed of 3 by 4-in. steel channels with solid forged ends, which are riveted at the bottom to the top flanges of the side sills, and at the top to an iron plate, 4½ by ½ ins., which extends in one piece throughout the length of the car and the vestibules. The channels are spaced to form the window and door posts, and are set back to back 2 ins. apart so as to form hollow side walls, within which the



Steel Frame Side-Door Suburban Car.

doors slide when opened and closed. Below the windows a girth brass of 1¼-in. angle is riveted to the posts with gusset connections, to which the diagonal bracing of 1¼-in. angle and 1¼ by ¼-in. flat steel is riveted; this bracing at the lower end is shaped to form a foot, which is riveted to the lower part of the channel post and to the top flange of the side sill, thus reinforcing the post in its connection with the sill and forming a braced panel between each of the side-door openings. The corner posts consist of two 4 by 5¼-in. channels set transversely on the side sills and spaced 11 ins. apart. On the outside and inside of these posts four triangular gussets of ¼ by 15½-in. steel plate are riveted to the flanges, tying them firmly together; the corner posts are riveted securely to the side sills and to the upper plates with angle connections. The space between the corner posts and the adjoining side-door posts is braced with a double set of diagonal bracing, formed of 1¼-in. angles in three vertical panels and riveted to the gusset connections. This arrangement of corner bracing gives stability to the upper frame and forms a collision bulkhead of great resistance. Across each end of car the corner posts are connected by ¼-in. gusset plates to 3 by 4 by 7-16-in. angles and support oak end plates, to which are secured the side arms for buffing mechanism of upper portion of vestibule diaphragm plate. Diagonal braces of 4 by 5¼-in. channels are riveted to corner post and to extreme end at side plates, which extend beyond the corner post of body of car to the corner post of the vestibule carried by the platform and sill. The vestibule corner posts are further reinforced by upright angles, ⅜ by 2 by 2½ ins., with flanged ends, which are bolted to the platform sills and at their upper ends riveted securely to the side plates and the end braces.

The carlines are of ⅜ by 2-in. iron and are placed directly over each set of side-door posts, each carline resting directly on the side plates and secured thereto at each end by four ½-in. rivets, which pass through the forged foot of carline, the plate and the forged ends of the channel door posts, tying them all securely together. There is thus formed a continuous connection of metal framing throughout the entire body of the car.

The exterior finish is of poplar sheathing in vertical tongued and grooved strips, 2½ ins. in width; the interior finish is of mahogany panels, inlaid with delicate border design in marquettry, and is continuous throughout the walls and the vestibuled ends of the car.

An unique method of securing the exterior and interior finish to the metal frame has been adopted. Within the hollow of the channels forming the posts of the side doors and windows, strips of hard maple, 1½-in. thick and neatly fitted to the channels, were placed before the posts were assembled. The channel posts were placed in a chuck upon the bed of a planer with the maple filled upwards, and with a specially designed tool the upper edges of the channel flanges were split to a depth of 3-16 in. and the inner portion of the flanges rolled down cold and turned over onto the filler, compressing and firmly enclosing it within the channel walls without the use of screws or bolts, thus making the filler an integral part of the channel and affording a secure and permanent foundation for attachment in the usual manner of the exterior and interior finish. Between the channel posts below the windows, horizontal nailing strips of oak, 1½ by 3¼ ins., are tightly fitted and bolted to the metal frame, and on top of the metal plate nailing strips of hard pine, 1½ by 4 ins., are tightly fitted between the metal carlines and bolted to the plate. Between the door posts threshold plates of malleable iron are tightly fitted, with curved lugs hooked over the outer flanges of the side sills and the back of the plates screwed fast to the floor. There is thus formed a secondary system of continuous horizontal bracing throughout the walls of the car, adding materially to the resistance offered to a raking, corner or end thrust above the level of the floor. On each side of the metal carlines nailing strips of poplar, 1¼ by 2¼ ins., are bolted and framed into the deck sills and plates and to the nailing strip on top of the wall plates. The roof is of 13-16-in. poplar, nailed to the strips in the usual manner. The floor is laid in three courses; first the steel plates forming part of the underframe, upon which is laid over the entire surface a covering of asbestos ¼ in. in thickness, and upon this a light flooring of wood is laid crosswise in tongued and grooved strips, ¾ by 2¼ ins., and bolted to the steel floor underneath.

The interior of the car is open throughout its entire length to the end platform sills of the vestibule, the floor of the car and vestibules being continuous, thus permitting the space of the vestibules to be utilized as a part of the interior of the car. The platform lids open against the ends of the car, and the vestibule side doors swing across the ends of the side aisles to serve as a barrier to passengers walking into the opening for the vestibule steps; provision is made in the seating arrangements for a passage around the vestibule side doors so that the steps can be approached in the usual manner when the vestibules are used by passengers leaving the car at places where the station platforms are on the ground level. The vestibules are also provided with swinging end doors to close the ends of the car and to afford passage from one car to another throughout the train.

The seats are of an entirely new design, in bench form, arranged transversely in sections, each section seating eight passengers. They are constructed throughout of mahogany, with straight backs 42 ins. high, provided with swell panels for back rests. No upholstering is used. The seat bottoms of solid mahogany are of molded form, mounted on trunnion bearings in front and supported on springs in the rear; each passenger having an independent seat separated from adjoining seats by short arms. There are twelve sections of seats, with two additional seats at each end of the car, making a total of 100 seats.

Between the seat ends and the walls on each side of the car is an aisle 16 ins. in width, extending the entire length of the car, connecting with the vestibule area and affording a passageway on both sides throughout the length of the train.

Opposite each section and directly in line with the section aisle is a side door on both sides of the car, making a total of 24 side doors, 12 on each side. The doors are mounted at the top on ball-bearing rollers and slide in and out of the spaces in the walls of the car. The thresholds are flush with the floor, equipped with safety treads and grooved to receive the lower ends of the doors. The side doors are connected by mechanism concealed within the hollow walls of the car, and arranged to be operated in series by compressed air or by hand. The controlling mechanism is located at the ends of the car and is operated by the trainmen. The mechanism is arranged so that the doors can be operated by either of two systems—that of the positive opening, closing and locking of all the doors on a side at one time, or the closing, locking and unlocking of all the doors at one time, leaving the opening of such doors as are to be used to be done by the passengers from either the inside or outside of the car.

The side doors are provided with sliding sash and blind self-contained, so that any adjustment of the sash or the blind can be made without interfering with the movement of the doors in and out of the hollow spaces within the walls of the car; the maximum opening of the glass sash in the doors being 21 by 24 ins. To insure a tight joint when the sliding side doors are closed the front edges of each door are beveled and trued to fit closely into similarly beveled edges of the door strips, making an air-tight fit without the aid of weather strips. At the rear the square edges of the doors are made to fit closely by strips of plush or felt, which also prevent rattling.

The unusual height of the side walls has made it possible to carry the glass in the doors and windows to a height of six feet above the floor, thus giving an outside view to standing passengers without the necessity of stooping. Another convenient feature resulting from the use of side aisles is found in the arrangement of the roller shades and blinds in the windows and doors, which in their drawn position leave exposed a strip of the window glass ten inches high and extending the entire length of the car on the line of vision of the seated passengers, so that a clear view of the outside can be had at all times of the day without exposing the passengers to the direct rays of the sun.

The deck sash are fitted with opalescent glass and are mounted to operate in series by means of levers, one at each corner of the deck. The ceiling is of canvas covered veneer, painted a light shade of green to harmonize with the interior finish of polished mahogany. The ceiling of the lower deck is mounted in hinged sections five feet in length to admit of ready access to the door operating mechanism within the side walls of the car. The moldings forming the upper and lower edges of the movable ceiling panels also serve as racks for the display of advertising cards.

Pintsch gas is used for interior lighting, the lamps setting about 16 ins. lower than is usual to give a better distribution of light for reading. This arrangement is made possible by placing the lamps over the backs of the seats, one lamp of three burners being used for each section, and quite out of the way of passengers using either the side or cross aisles when entering or leaving the car.

Arrangements for heating are provided by direct steam from the locomotive, the system of the Safety Car Heating & Lighting Co. being used. The pipes are arranged transversely of the car under the seats. Special attention has been given to avoid the pocketing of heated air under the seats, and to insure free circulation in order to maintain an even temperature throughout the car. Ventilation is secured by adjustable sash in the upper deck and by sliding sash in the side doors. The car is equipped with the Westinghouse quick-action automatic brake. The total weight of the car, including the wide vestibules, is 84,600 pounds; the weight of the body being 61,400 pounds, and of the trucks 23,200 pounds.

This new type of car is the result of careful study, based upon long experience in the handling of a large suburban traffic on the part of Mr. A. W. Sullivan, assistant second vice-president, and of Mr. William Renshaw, superintendent of machinery, of the Illinois Central Railroad, who have designed the many original features set forth.

The Rocky Mountain Railway Club

By A. D. Parker

ON April 20th, 1900, a number of men, representing the various railroads centering in Denver, organized the Rocky Mountain Railway Club. There had been previous to this organization a Superintendents' Association and a Denver Car Club. The new organization consolidated these two clubs with a view of taking in members from all the different lines of railroad work from the Missouri River to the Rocky Mountains.

J. H. Manning, superintendent of motive power of the Union Pacific of Cheyenne, was elected president. The first meeting was held in May, 1900, and at that time there were seventy-four applications for membership. From that time on the club grew in numbers, though the subjects for discussion were limited to mechanical lines.

C. H. Quereau, assistant superintendent of motive power of the D. & R. G., succeeded Mr. Manning as president, and his energy caused many additional members to join the club. He extended the sphere of subjects for discussion, taking up questions in the mechanical, operating and accounting lines. Mr. Quereau resigned to accept service with the New York Central road, and Mr. G. W. Rhodes, assistant general superintendent of the B. & M. R. R. R., who was vice-president of the club, performed the duties of president during the remainder of Mr. Quereau's term of office.

Mr. A. D. Parker, Past President of the Rocky Mountain Railway Club.

In May, 1902, Mr. A. D. Parker, general auditor of the Colorado & Southern Railway Company, was elected president, and under his presidency the sphere of discussions was enlarged to take in general subjects of all descriptions pertaining to railroad work. One of the most interesting papers and addresses was given by Dr. Von Schrenk on the subject of "Treatment of Lumber," which brought out a very large attendance.

At the annual meeting in May, 1903, Mr. Parker felt that it would be better that a mechanical man be made the president of the club, and resigned, when Mr. Mertsheimer, superintendent of motive power of the Denver & Rio Grande, was elected in his place.

The club, at the close of the year, showed that all bills were paid, and that there were two or three hundred dollars in the treasury. It therefore begins its new year in September under favorable auspices, having three hundred members and with no debts. It is to be hoped that the same unflagging interest in the club will exist as has existed in the past.

The Capacity of Railroad Shops

FURTHER evidence of the interest existing with regard to the relation between machine tool output and pit capacity is shown by the additional communications presented herewith, which have been received since the publication of the September issue. This correspondence refers to an editorial appearing on page 347 of our August issue.

Editor Railway Master Mechanic:

I have read your editorial in the August Railway Master Mechanic, and while I am inclined to think that the majority of shops are not sufficiently well equipped with machines, I can hardly agree that fifteen (15) machines per pit would be an economical investment, unless the shop is one which turns out an unusual amount of machine work for other purposes aside from that required by the locomotives on the pits.

We have a very well equipped plant here at Cleburne. We turn out from ten (10) to twelve (12) engines per month, which is about four (4) in excess of the former output. This increase has been brought about primarily by better shop organization, secondarily by the addition of a few tools. We have, however, thirteen (13) pits and a total of fifty-two (52) machines, which includes grindstones, emery wheels and hydraulic presses. Our pit work could be slightly increased and the cost per engine somewhat reduced by the addition of a few more machines which we have under way.

It is false economy to allow an engine to stand in the shop awaiting machine work; the cost for one day would amount to more, in my opinion, than the loss of a half dozen machines which might stand idle a portion of the time, and I have yet to see a shop provided with unnecessary facilities in the way of too many shop tools.

Yours truly,

W. E. Symons,

Mechanical Superintendent, Gulf, Colorado & Santa Fe Railway.

Editor Railway Master Mechanic:

Referring to your editorial discussing the output of shops, I agree with you in the assertion that the output of a repair shop is not determined entirely by the pit capacity, but rather by the number of machine tools available for finishing different parts of locomotives promptly. If the cylinders on an engine do not require renewal and no heavy repairs to the boiler, it does not take very long to reassemble the different parts of an engine together, if they are machined promptly.

On roads having a large number of the same class of locomotives, I would consider it good practice to keep extra parts on hand finished, ready to apply to engines when they come in shops for general repairs, such as rocker boxes, eccentrics, eccentric straps, driving boxes pistons, crossheads, valves, also an extra set of driving wheels (this where it becomes necessary to change the driving axles and crank pins or a broken wheel center, which would delay the engine somewhat). In this way engines could be turned out from the shop in a much shorter time, thereby increasing the output materially and obtaining a much greater mileage from the engines.

For the past couple of years, however, with the great rush of traffic, shortage of power, shop facilities, men, etc., it has been, of course, difficult at all times to systematically arrange matters as might be considered best.

Very truly yours,

J. F. Dunn,

Supt. Motive Power and Machinery, Oregon Short Line.

Editor Railway Master Mechanic:—

I have read the editorial that appeared in your August issue and also the answers that have been made to it and I have to agree with all those who have answered your inquiry, that the number of pits in a shop does not determine the capacity. In fact at our most important shop we have cut down the number of engines on the pits leavings 8 empty pits per month and our output has not been decreased but the maximum number of days for the engines to be kept out of service has materially decreased, simply because we have just about enough tools to handle the work promptly which enables us to keep the men constantly at work on the engines.

Concerning the number of machines per engine pit, I fail to see where that has very much to do with the output and the further fact of whether the machines are worked up to their maximum or not. We do not claim to have enough machines to keep up with the number of pits that we have and as I said before we have found that we can increase our output by decreasing the number of engines waiting for machine work.

I believe that this whole matter is not so much the amount of space you have in the erecting shop but how quick material can be furnished to replace the material to make repairs on the engines. I believe the proper way to handle this is to have material waiting for the engine instead of the engines waiting for the material to be manufactured.

I would like very much to see some of the mechanical papers take hold of some method of getting comparisons of output of shops. At the present time there seems to be no way to make a comparison between shops of a neighboring line running in same territory and if we could only get an intelligent comparison of shop outputs we could tell a whole lot more about tools.

Yours truly,

R. D. Smith,

Supt. Motive Power, B. & M. R. R. R.

Editor Railway Master Mechanic:

Referring to your editorial in the August issue, "Necessity for Improved Methods of Handling Large Motive Power Equipment of the Present," it is a self-evident proposition that if you increase the efficiency of your locomotive power by building larger engines and increase their weight and hauling capacity from 50 to 100 per cent, old accommodations must necessarily be adjusted to meet the new conditions. This involves the output of repair shops, and in the increase of machine tool equipment and pit force, or the machine and pit sides, a careful adjustment must be made to get the best results. These can be arrived at by experience better than by theory. General managers, as a rule, watch the expenditures of the machinery department and limit their allotment, then we proceed carefully, cautiously and economically. We find good results where the forces of the two mentioned shops are about balanced, but to insure the best results and keep orders from outside points promptly filled, and occasionally fit up a few pieces for stock, the machine side force should show, in my opinion, an increase over pit side of about 20 per cent, yet, as I say, to simply keep up repairs, about an equal division of the force will do it.

To illustrate, I will say that in one of our large main shops, where general repairs are made and material furnished to outside points, we have in operation 64 machines of different kinds, and 11 pits. This would be about 6 machines to a pit. Our force is distributed as follows:

Erecting side—27 machinists, 6 apprentices, 10 helpers, 35 laborers and handy men; total, 78.

Machine side—28 machinists, 36 apprentices, 21 helpers; total, 85.

The above force takes care of 155 engines, about 50 per cent being of the larger type. To do this, force must be properly distributed over different pits and not permitted to bunch up into gangs. Operating a machine shop under above distribution of force, as between the two sides, will hold "engines in shop and waiting" down to from 10 to 12 per cent. Of course, there are occasions when, through no fault of shop organization, the percentage will advance, especially when a bunch of casualties occur, or perhaps in these days when the flotsam and jetsam of floating mechanics is at high tide, your organization may be temporarily handicapped and your percentage run up on that account, but ordinarily I believe good results may be obtained in shop work by following out the practice above mentioned.

Yours truly,

J. B. Barnes,

Supt. Motive Power and Machinery, Wabash R. R.

Editor Railway Master Mechanic:

In reference to your article in Railway Master Mechanic of August, 1903. Your article has many good points which have to be endorsed, but we cannot agree with the remark that the output of the shop is governed by number of machine tools alone, as there are other factors to be considered.

A combination of ample pit room, the use of modern machinery, and a sufficient number, also a skilled class of men to handle them successfully, and a good class of men to assemble the work, coupled with a fair system of piece work prices, and a thorough shop system to handle the above combination on business principles, are all factors in the output of the shop.

Taking into consideration the present modern machinery and high-grade tool steel now in the market, we consider eight (8) machine tools per erecting pit should suffice.

Yours truly,

David Brown,

Asst. Supt. M. P. & E., Delaware, Lackawanna & Western Railroad.

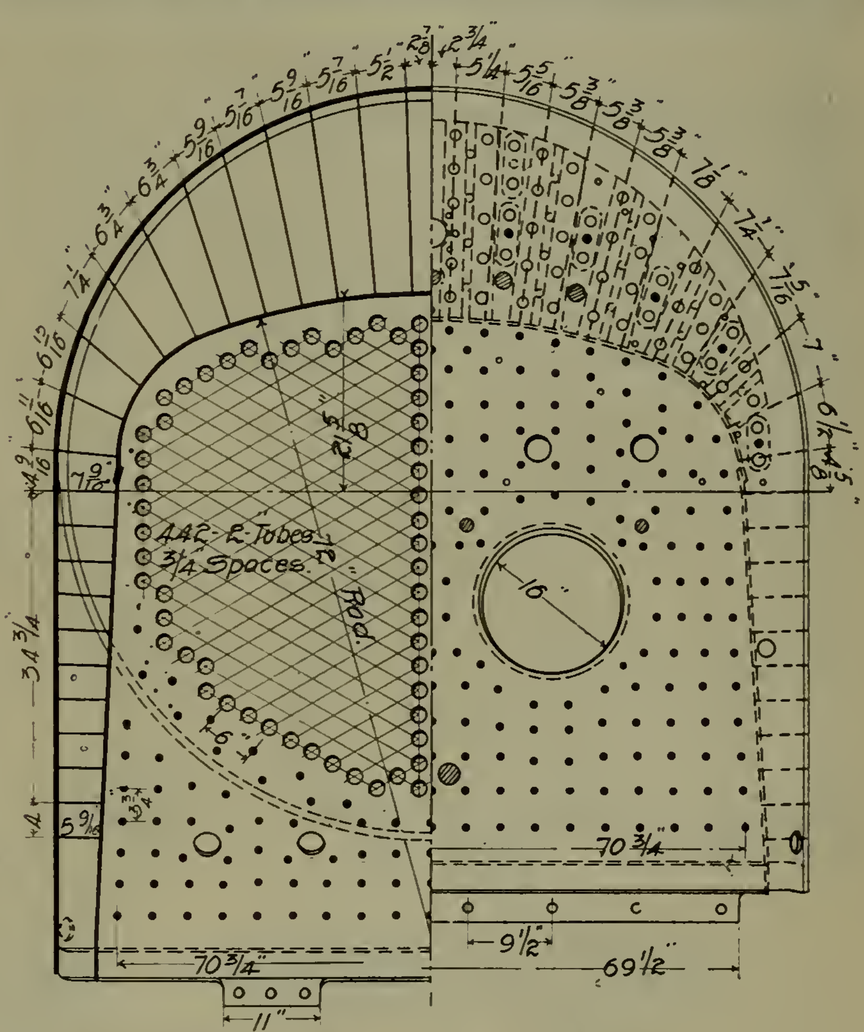
Editor's Note: The communication from Mr. Brown evidently implies our stand to be that the machine tools alone govern the output of the shop, while the editorial referred to states "that the number of machine tools determines the output *rather* than the number of pits in a shop arranged transversely, or the number of engines which may be placed upon longitudinal pits."

Consolidation Locomotives of the Northern Pacific Railway

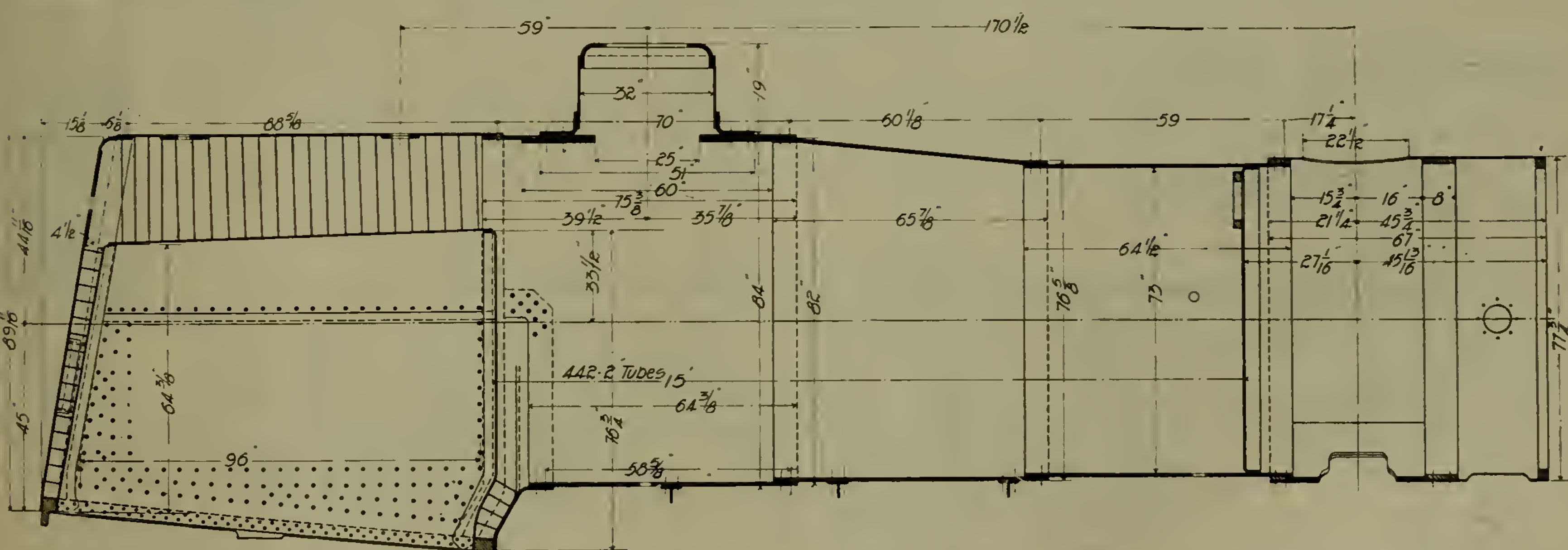
THE Northern Pacific Railway has placed in service a number of heavy consolidation locomotives to be used as helpers on grades where it is more practical to assist the road engines than to reduce the tonnage rating to the maximum which may be handled by the road engine over the ruling grade. In the road's individual system of classification these engines constitute class Y_5. They are built by the Schenectady Works of the American Locomotive Company, and are illustrated herewith.

The locomotives of this class have been placed in service in the Pacific division, between Ellensburg and Tacoma. Locomotives entering Ellensburg from the east with trains weighing from 1,300 to 1,400 tons are helped to the summit of the grade on Stampede mountain with two Y_5 engines. From the west trains enter Tacoma weighing 900 to 1,100 tons and are helped to the summit of the grade by one Y_5 locomotive. From the summit the helping engines drop back light to bottom of the grade.

A type of engine similar to the Y_5 class, and known as class Y_4, having smaller weights and surfaces, has been designed for road service in handling through and time freight trains over division where the maximum grades are about 1.7 per cent. The grades on divisions



Consolidation Locomotive of the Northern Pacific Railway—Cross Sestion and End View of Firebox.



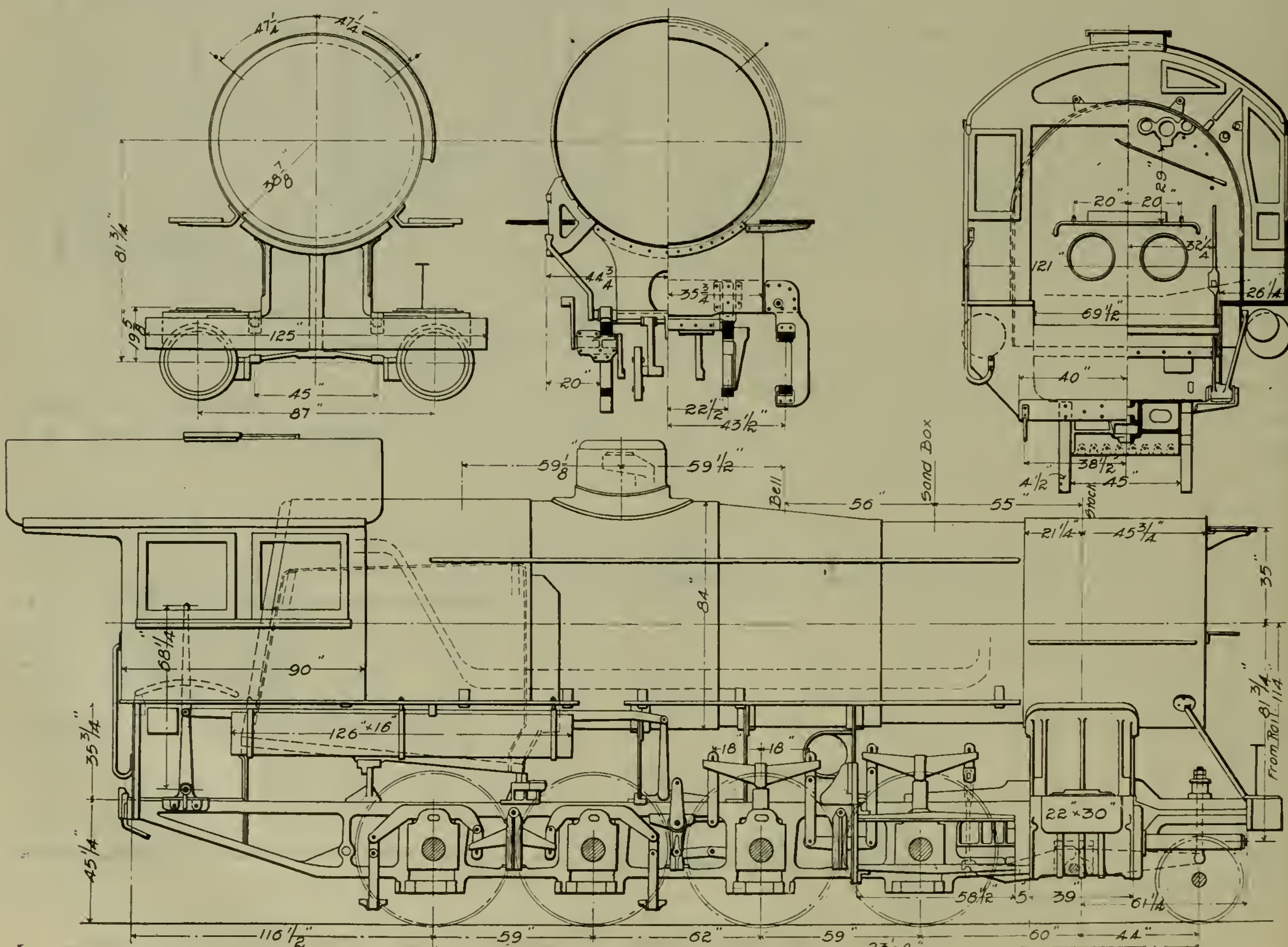
Consolidation Locomotive of the Northern Pacific Railway—Longitudinal Section of Boiler.

Consolidation Locomotive of the Northern Pacific Railway.

both east and west of this one are very low and the conditions on the division in question are such that it is not practicable to use helper engines over the heavy pulls. For that reason this large engine is designed so that it will handle over the division practically the same tonnage as is delivered to both ends of the division by the lighter engines, weighing 126,000 lbs., working on the lower grades.

An engine with 55-in. wheels and 34-in. stroke had previously been used for this work, but it was found that with the small wheels and the long stroke the engine obtained such high piston speeds in making satisfactory running time over the division, that the wear and tear on the machinery and the consequent cost of repairs was rather high.

These engines were built at the Schenectady works and the service received from them since they have been put into service has been satisfactory and so far they have filled the requirements for which they were designed.



Consolidation Locomotive of the Northern Pacific Railway—Cross Sections and Elevations.

The following tables, presenting the principal dimensions of the two classes, appear of interest:

Class	Y5
Tractive effort	44800
Ratio of adhesive weight to tractive effort	3.98
Ratio of tractive effort to total heating surface	12.21
Ratio of total heating surface to grate area	69.8
Weight in working order	198,000 pounds
Weight on drivers	178,500 pounds
Weight engine and tender in working order	309,850 pounds
Wheel base, driving (rigid)	15 feet 0 inches
Wheel base, total	23 feet 8 inches
Wheel base, total, engine and tender	52 feet 10 inches
CYLINDERS.	
Diameter of cylinders	22 inches
Stroke of piston	30 inches
Size of steam ports	19 inches by 1⅝ inches
Size of exhaust ports	19 inches by 3 inches
Size of bridges	1⅜ inches
VALVES.	
Kind of slide valves	American high pressure
Greatest travel of slide valves	6 inches
Outside lap of slide valves	⅞ inch
Inside clear of slide valves	0 inch
Lead of valves in full gear	Line and line front, ⅜ inch lead at 7½ inches cut off
WHEELS, ETC.	
Diameter of driving wheels outside of tire	55 inches
Diameter and length of driving journals	9½ and 9 inches diameter by 11 inches
Diameter and length of main crank pin journals	Main, 7¾ by 4¾ inches; 7 inches diameter by 6½ inches
Diameter and length of main crank pin journals	Internal, 5½ by 4¾ inches; 5 inches diameter by 3½ inches, F & B
Engine truck, journals	6 inches diameter by 11 inches
Diameter of engine truck wheels	30 inches
BOILER.	
Style	Extended wagon top, wide firebox
Outside diameter of first ring	74¾ inches
Working pressure	200 pounds, built to stand 225 pounds
Material of barrel and outside of firebox	Worth basic steel
Thickness of plates in barrel and outside of firebox	⅞, 1, 9-16, ¾, ⅝, 13-16, 15-16 inch
Horizontal seams	Butt joint, sextuple riveted
Firebox, length	100 1-16 inches
Firebox, width	75¼ inches
Firebox, depth	Front, 77¼ inches; back, 64½ inches
Firebox, material	Carbon acid to Northern Pacific specification
Firebox plates, thickness	Sides, ⅜ inch; back, ⅜ inch; crown, 7-16 inch; tube sheet, 9-16 inch
Firebox, water space	4½ inch front, 4 and 6½ inch sides, 3½ and 4½ inch back
Tubes, material and gauge	Charcoal iron, No. 12 B. W. G.
Tubes, number	442
Tubes, diameter	2 inches
Tubes, length over tube sheets	15 feet
Heating surface, tubes	3,448.48 square feet
Heating surface, water tubes	24.23 square feet
Heating surface, firebox	178.58 square feet
Heating surface, total	3,651.29 square feet
Grate surface	52.27 square feet
Exhaust nozzles	5¼, 5½ and 5¾ inches diameter
Smokestack, inside diameter	18½ inches at top; 16 inches at choke
Smokestack, top above rail	15 feet 2⅝ inches
TENDER.	
Style	Water bottom
Weight, empty	46,000 pounds
Wheels, diameter	33 inches
Journals, diameter and length	5 inches diameter by 9 inches
Water capacity	5,500 U. S. gallons
Coal capacity	10 tons

Class	Y4
Tractive effort	44,000
Ratio of adhesive weight to tractive effort	3.91
Ratio of tractive effort to total heating surface	12.87
Ratio of total heating surface to grate area	65.35
Weight in working order	194,000
Weight on drivers	172,000
Weight engine and tender in working order	305,800
Wheel base, driving (rigid)	17 feet 0 inch
Wheel base, total	26 feet 2 inches
Wheel base, total, engine and tender	53 feet 10½ inches
CYLINDERS.	
Diameter of cylinders	22 inches
Stroke of piston	30 inches
WHEELS, ETC.	
Diameter of driving wheels outside of tire	56 inches
Diameter of engine track wheels	33 inches
BOILER.	
Style	Extended wagon top
Outside diameter of first ring	73½ inches
Working pressure	200 pounds
Tubes, number	387
Tubes, diameter	2 inches
Tubes, length over tube sheets	16 feet 0 inch
Total heating surface	3,418.1 square feet
Grate area	52.3 square feet
TENDER.	
Weight, empty	47,000
Wheels, diameter	33½ inches
Water capacity	5,500 gallons
Coal capacity	20,000 pounds

Traveling Engineers' Association

Eleventh Annual Convention

THE eleventh annual convention of the Traveling Engineers' Association was called to order on the morning of September 8th, at the Stratford Hotel, Chicago, by President David Meadows. In the usual course of opening events the association was led in prayer by the Rev. M. P. Boynton. The meeting was then addressed by Hon. L. S. McGann, acting mayor and controller, speaking in behalf of the City of Chicago. Mr. A. L. Humphrey of the Westinghouse Air Brake Company, addressed the organization, calling attention to the most important duties of the members present, the results of their energies upon the operation of the motive power on the roads which they represent, and their influence upon the men under their charge, who are to be intelligently instructed in the operation and management of locomotive engines. He was followed by Mr. F. W. Braizer, assistant superintendent of rolling stock, of the New York Central and Hudson River Railroad, who addressed the convention briefly.

In his presidential address Mr. Meadows emphasized the necessity of road foremen keeping ahead of the rank and file, great assistance in this direction being offered by the frequent assemblage of such men in convention, in order to enter into discussions of subjects presenting difficult problems, and by reading the reports giving the opinions of different representatives who are widely scattered. Touching upon the personality of road foremen, he directed attention to the effectual use of a certain amount of tact and diplomacy, as the road foreman is called upon in many instances to act between the men and the superior officers.

Immediately preceding the business meeting of the association, an intermission was allowed to permit ladies present and others not particularly interested in the operation of the locomotive, to retire. The report of the secretary and the treasurer showed the membership to have increased 9 3-10 per cent during the year, the present number of members being 446 and the number at the same time last year having been 408, and a balance of $400 in the treasury of the association.

Mr. David Meadows, President of the Traveling Engineers' Association.

Memorials were read by the secretary on J. R. Belton, J. V. Murray, P. M. Arthur, F. W. Mavin and H. C. Fraser, individual committees having reported on the death of each member mentioned.

REPORT OF COMMITTEES.

Fire Brick Arches.

The report of the committee appointed to consider the use of the brick arch in deep, shallow and wide fire boxes, was read in full by Mr. W. G. Wallace, chairman. This report shows that the committee favors the use of the arch on engines where the conditions are such that more satisfactory results can be obtained with than without it. This would be in good water localities and where there would be sufficient time at terminals to clean off the grates, bore out and calk flues and do necessary firebox work. As to the manner of supporting the arch, it is a matter of opinion whether studs or tubes should be used. The height of the arch above the grate will range from 16 to 22 inches. The objections to the arch, in poor or bad water localities, where engines have short time at terminals, are that they are more of a detriment than an advantage, for the reason that flues become stopped up and flue sheets will honeycomb behind the arch, where it is impossible to remove it until a terminal is reached. Then the flue and firebox cleaner cannot bore out the flues or clean off the sheets and grates as well as he could if there was no arch in the box, and the time cannot be allowed to let the arch cool off; this also applies to leaky flues.

Taken from the standpoint of economy in dollars and cents, the committee believes that on shallow and wide firebox engines the arch is not a benefit except in instances just stated, where work can be done properly and conditions will warrant its use. Following a short discussion, resulting more or less favorably upon the use of the fire brick arch where practical, the report of the committee was accepted.

Lubrication of Piston Rods.

Mr. E. W. Brown, chairman of the committee, read the report discussing the most satisfactory method of lubricating piston rods, presenting therewith several diagrams of swab cups and replies to lists of questions which had been forwarded to the members of the association. While a difference of opinion existed with reference to feeding oil direct to the rod or through a swab, the association finally passed a resolution in favor of the use of the oil cup together with a swab. During the discussion, Mr. G. W. Wildin mentioned the lack of alignment which often exists and which he believes to be responsible in many cases where the trouble is attributed to lack of lubrication. Too little is frequently allowed for vibration and in some engines the amount has been changed from 1/8 of an inch to 3/8 of an inch. He further described a successful method of applying a swab in connection with an oil cup. By this method the swab is placed in a cavity within the gland, this cavity being connected with the oil cup by a small pipe. An advantage of the application here mentioned is that the pipe leading from the cup is kept within the cylinder head and is thus maintained in all weather at a temperature which permits a free flow of oil.

ADDRESSES.

General Charles Miller, of the Galena Oil Company, addressed the association briefly, and in his remarks directed attention to improvements resulting from educational developments. Continuing, he paid a tribute to railroad training, saying that there were no better men in his employ than those he had secured from railroads. As the association is being promoted for the education of railroad men, he showed wherein this organization is responsible for many effectual developments.

Following this address, Mr. J. H. Setchell, of the American Locomotive Company, endorsed the words of the previous speaker, referring to the competence of railroad men. He believes that the character of engineers has been advanced materially in recent years, an improvement which he attributes to the Brotherhood of Locomotive Engineers. He duly directed attention to strict sobriety among the men in charge of locomotive engines, as their senses must always be necessarily keen and in the event of promotion, the higher officials select men who habitually carry themselves soberly.

INDIVIDUAL REPORT.

Master Mechanics' Association.

Mr. W. G. Wallace, who had attended the recent convention of the Master Mechanics' Association, presented an excellent analysis of the work accomplished by that organization at the meeting which he attended. He quoted abstracts from the address of the president and presented a compendium of the results of the reports of the several committees, discussing the various subjects brought up for consideration.

ADDRESSES.

Mr. T. A. Foque, being introduced by President Meadows, addressed the members present in words which left in their minds much food for thought. He spoke of the representative men selected from the army of engineers, who by their conscientious work and attention to duty were promoting the efficient operation of railway motive power. As transportation is the only marketable commodity of railroads, when the price of transportation is reduced the price of production must be correspondingly reduced, and it is in this matter that those responsible for locomotive operation can evince their ability. While a certain amount of coal cannot be expected to do an abnormal per cent of work, the wastes in the coal pile and other necessities can be materially reduced. He directed especial attention to the loss consequent upon such waste and emphasized a large number of "mechanical leaks" which effect economy of operation.

Mr. Angus Sinclair followed with a few brief remarks, bearing largely upon the difficulties encountered by the mechanical department of railroads, and the responsibility placed upon this department.

The secretary then presented for consideration two subjects which had been suggested to him by a large number of members. These questions are the "Examination of firemen for promotion and new men for employment," and "Who ought to be our future engineers." These points were introduced at this time in the meeting. in order that the members might give them due consideration before the final vote upon the list of subjects to be taken up for next year.

REPORT OF COMMITTEES.

Locomotive Front End Arrangement.

The report on locomotive front ends was read by Mr. W. A. Corbett, who had prepared an individual paper on this subject. He presented illustrations of several front end arrangements. The discussion consequent upon this paper evidenced the subject of locomotive front ends to be still a live one in the association. The result of the continued discussion while of much interest might be considered as a revised edition of the same matter considered by last year's convention, embracing the experiences of a large number of members during the intervening time. While many experiences were exchanged, no definite arrangement was recommended by the association by which any radical changes might be made in present designs, as it was generally considered that each individual road had to design to meet existing conditions and kinds of coal in use. Upon motion of Mr. W. G. Wallace, the association decided to recommend no new front end at this time, and that the present front end features recommended by the Master Mechanics' Association and the experiments of Professor Goss of Purdue University be used as a basis for research work.

The Compound Locomotive.

Mr. A. L. Beardsley presented an interesting, comprehensive and intelligent paper considering the care and handling of the compound locomotive. While calling attention to the systematic use of several parts in order to receive efficient work from the compound, he emphasized the need of careful use of the starting valve which should be used when starting the locomotive and not as an auxiliary with which to pull an excessive tonnage. The reverse lever should be hooked up a notch at a time until the engine can handle the train at the desired speed. With regard to the policy of locomotive establishments in turning out engines with blocked quadrants so that they cannot be worked in less than one half stroke when new, Mr. Beardsley's experience does not justify concurrence with this practice. When the engine wears it is well known that the effect is similar to lengthening the reach rod or cut off, and the engine is soon found to be working from 2 to 4 inches more steam than was intended with the first notch and it is either necessary to maintain a nearly uniform cut off or go without a blocked quadrant. His experience has led him to believe that by first regulating the throttle opening, the compound can be worked to advantage when cutting off at a little less than one half stroke, for instance, a 12-inch cut off with a 28-inch stroke.

Following Mr. Beardsley's paper Mr. W. J. McCarroll of the Baldwin Locomotive Works, read a description of the balanced compound locomotives, four of which have been recently placed in service on the Santa Fe Railway. As an argument in favor of balanced locomotives, Mr. Carroll circulated a blue print showing the effect of a poorly balanced engine upon the rails. Much interest in the economy and performance of compound locomotives was displayed by the ensuing discussion, many remarks centering upon the location of blows and the discovery of defects. Mr. F. P. Roesch considered that it was unnecessary to require an engineer to indicate the precise location of a defect, saying that an intelligent report of the side on which the blow occurs is sufficient for all practical purposes, rather than the na[illegible] of the identical ring which may be broken. The piston valve must be removed in the event of any ring being broken, so that it is unnecessary for the engineer to go into exact details. Upon the close of this subject Mr. Beardsley was extended the thanks of the association for his able paper.

ADDRESS.

Before the close of the last subject, Mr. Robert Quayle was requested to address the members. His remarks centered largely upon the work of men observing the details of railroad operation. By intelligent report on the parts of such men, heads of departments are enabled to keep in touch with and thoroughly control the more intricate parts of the operation of the system. Being in charge of men it devolves upon traveling engineers to become familiar with governing conditions, in order to act wisely under emergencies which are constantly arising. For this reason Mr. Quayle thought it policy for men to place themselves in positions where the greatest benefit results to the company which they represent. Respectful criticisms of higher officials, close observation of working conditions and the presentation of information relative to failure, materially assist the heads of departments, edifying the representatives and adding to the welfare of the department.

REPORT OF COMMITTEES.

Location of the Main Check Valves.

Mr. L. S. Kneass presented a report of the committee discussing the advisability of locating the main check valve above the water line of locomotive boilers. The committee failed to see the advantage of locating the check valve in such a position, and so reported to the association. There was little discussion following the presentation of this report.

Combined Straight Air and Automatic Brake.

Mr. F. P. Roesch presented a comprehensive paper discussing the use of the combined straight air and automatic brake on engine and tender. The discussion was opened by Mr. Charles Cotter, who gave his approval of the straight air brake, referring to it as a device which he believes capable of reducing the parting of trains and the consequent effect upon coupling attachments. The ensuing discussion indicated the approval of the convention, and upon motion it was decided to adopt Mr. Roesch's paper as expressing the sentiment of the association with regard to straight air. The advantage of this equipment as expressed by the members present appears especially adaptable to switching service. It is also well adapted to freight service, reducing the number of break-in-twos when the speed of a freight train has been materially reduced and air is released in order to regain the original speed. It is on such occasions that break-in-twos are more liable, and as the straight air attachment prevents a sudden surge of the locomotive, the forward part of the train is held in check until all brakes have been released throughout the entire length of the train. An instance of advantageous application of this system to passenger service was suggested in connection with the dining car. Without such a system, upon release of brakes in order to regain speed the sudden surge of the locomotive before the brakes have been released on the rear end often causes uncomfortable results due to the overturning of effects placed upon the tables. As the straight air prevents the surge, its application to passenger trains was considered advisable.

The Water Glass.

Mr. C. B. Conger presented an instructive paper discussing the water glass as a valuable adjunct to the successful operation of a locomotive, in which he favored the use of the water glass, believing it to add to the economy of fuel consumption and as an effectual indicator of the precise location of water in the boiler. He further directed attention to the necessity of placing water glasses where they may be seen readily by both engineer and fireman without distracting their attention from their duties. The ensuing discussion evidenced much interest in the subject at hand, and finally centered largely upon the location of both gauge cocks and water glasses. Mr. G. W. Wildin emphasized the fact that water glasses should be considered as an auxiliary in showing just what height of water is above the crown sheet, and frequent use should be made of the gauge cocks as the principal telltale. Mr. F. P. Roesch remarked upon the small drain pipe leading from the dipper beneath the gauge cocks. He believes that this pipe should be sufficiently large to insure against its being clogged by pieces of waste and other material falling to the bottom of the dipper; for in the event of water remaining in the dipper it is hard to see whether steam or water is being emitted from the gauge cocks. The sense of the meeting was represented by a resolution offered by Mr. W. G. Wallace and amended by Mr. J. A. Talty, in which it was recommended that the association favors the use of water glasses on all locomotives, and if the construction of the locomotive is such that one water glass cannot be conveniently seen by both engineer and fireman the equipment should include two water glasses, one of which should be in clear view of each man on the engine. The amendment considered the most suitable location for the water glass and gauge cocks to be as near as possible to the center line of the back head of the boiler.

Subjects.

Reports.

The following list of subjects presented by the committee has been adopted by the association for the 1904 convention:

1. Grease for locomotive bearings.
2. Revision of questions for the examination of firemen for promotion.
3. Fire cleaning.
4. Locomotive front ends.

Papers.

1. The future engineer; how to obtain and retain good material.
2. Water scoops.
3. High-speed brakes.
4. Headlights.

The report of the committee favoring the change of name to "Road Foremen of Locomotives Association" was put to vote and defeated by a ballot of 66 to 14.

Upon motion it was decided to present all past presidents of the association with a suitable badge, and a committee was appointed for this purpose.

The ballot for the election of officers resulted as follows: President, R. D. Davis, I. C. R. R.; first vice-president, G. W. Wildin, C. R. R. of N. J.; second vice-president, J. D. Benjamin, C. & N. W. Ry.; third vice-president, A. L. Beardsley, A., T. & S. F. Ry.; secretary,

W. O. Thompson, N. Y. C. & H. R. R. R.; treasurer, James McDonough, G. C. & S. F. Ry.; members of the executive committee for one year: J. A. Fox and F. P. Roesch; for two years, E. W. Brown and L. D. Gillett.

NEXT PLACE OF MEETING.

Chicago was decided upon for the meeting place of the 1904 convencion.

AMONG THE SUPPLY MEN.

The following companies were represented at the Traveling Engineers' Association:

Aurora Metal Co.—Gustav Thurnauer.

Railway Appliances Co.—George Sargent, B. T. Lewis, E. H. Symington.

Crane Co.—F. D. Finn.

Storrs Mica Co.—Charles P. Storrs.

Dayton Malleable Iron Co.—Charles N. Hickok.

Shelby Steel Tube Co.—O. D. Hogue.

Homestead Valve Co.—C. B. Ault, who also represented the Superior Chemical Co.

Brush Lubricating System—Charles A. Crane, Charles B. Moore.

Peerless Rubber Manufacturing Co.—George Morrisson, C. S. Prosser.

Zehnder Valve and Brake Manufacturing Co.—M. R. Zehnder.

Galena Signal Oil Co.—General Charles Miller, W. E. Amann, D. J. Justice, R. E. Webb and others.

Pyle-National Electric Headlight Co.—Frederick E. Pyle, M. A. Ross, J. W. Johnson, Edward E. Bishop.

Rogers Improved General Packing Co.—W. H. Werner, J. G. Scott.

National Tube Co.—F. K. Shults.

E. L. Pence Switch Operating Device—John F. Boland.

Jos. Dixon Crucible Co.—Curtis M. Harding.

Electric Locomotive--Baltimore & Ohio Railroad

A DISTINCT advance in electric locomotive design is presented by the electrically propelled machine recently built by the General Electric Company, of Schenectady, N. Y., for the Baltimore & Ohio Railroad. This locomotive, the heaviest and most powerful ever built, whether electrical or steam, will handle all the freight traffic of the B. & O. through the tunnel at Baltimore and will operate the same service as the present electrical locomotives built by the General Electric Company, which have been in successful operation for the past eight years. The section of the road to be operated runs from Camden Street Station through the tunnel to the summit of the grade outside the tunnel, a distance of three and one-half miles. Under practical operating

Electric Locomotive—Baltimore & Ohio Railroad.

conditions the motors have sufficient capacity to maintain this service hourly, running loaded up the grade and returning light.

In designing this locomotive the specifications called for an electric locomotive capable of handling a 1,500-ton train, including the steam locomotive but excluding the electric locomotive, at a maximum grade of 1½ per cent at ten miles per hour, with a corresponding higher speed on lighter grades. This required a locomotive weighing approximately 160 tons on the drivers for purposes of adhesion, and the engineers of the General Electric Company decided that the most practical scheme was to build an articulated locomotive consisting of two complete 80-ton units operated together as one locomotive by means of the Sprague-General Electric multiple unit control.

The whole locomotive consists of eight G. E. 65 motors, four on each half. These motors have each a capacity of 225 horsepower, making a total capacity of 1,800 horsepower. Each section is equipped with four G. E. 65 motors and Sprague-General Electric multiple unit control so arranged as to be able to operate each section independently, or two or more sections coupled together. The controlling apparatus consists of master controller, engineer's valves, etc., in duplicate, a complete set being located in diagonally opposite corners of each cab so that the engineer, when it suits his convenience can stand in the front end of the locomotive when running in either direction.

In order that the locomotive may round curves easily, the axles are given considerable lateral movement in the journal boxes, thus reducing the effective rigid wheel base. The main body of the truck frame consists of a rectangular frame work of cast steel built up of four pieces, two side frames and two end frames, made strong and heavy. The parts are machined at the ends and securely fitted and bolted together, thus forming a very strong and rigid structure capable of withstanding the most severe shocks without injury. The journal boxes are made quite similar to standard car boxes; the parts, however, are made larger and stronger. The brasses can be easily removed, and by dropping down the wearing shoes it is possible to remove a journal box complete without removing the wheels and axles or other parts of the truck. The truck frames are supported at four points on equalizers. Each equalizer rests on a pair of half-elliptic springs, the ends of which are supported on top of the journal boxes through suitable wearing plates. This construction forms a simple and effective arrangement of parts.

Each section of the locomotive has eight steel-tired, spoked wheels. The tires are 2⅞ inches thick with M. C. B. standard tread and flange, and are held in place by approved fastenings. The axles are made of forged steel turned throughout, 6 inches by 12 inches in the truck journal bearings, 8 inches in the wheel fit and 7½ inches in the motor bearings. Wheels, axles or motors can be easily removed from the trucks by dropping into a suitably constructed pit or by raising the truck frame. All wearing surfaces have been made large for the purpose of insuring long life. At the same time special provision has been made for their easy replacement whenever it becomes necessary. The end pieces form the buffer beams and to these a suitable standard draft gear of approved design is attached. The side frames have machined jaws, protected by wearing shoes, between which the journal boxes slide.

The cab is large and roomy. The floor rests on the truck frame. The lining floor is made of 1¾-inch hard pine tongued and grooved; the upper floor is of hard pine ⅞ inch thick, tongued and grooved and laid in the opposite direction from the lining floor. The sides and roof are made of sheet steel. On each side there is an entrance door, and at each end there is an additional door which permits of ready communication between sections when coupled together. Large windows afford a practically unobstructed view in all directions. Beneath the cab floor is a large space in which a man can stand to inspect the motor and truck gear.

Each section is equipped with one bell, one whistle, two locomotive headlights, approved air brake mechanism, including two engineer's valves and air gauges, necessary brake cylinders, foundation brake, air reservoirs, couplers and drawheads. Also Leach pneumatic track sanders.

Railroad Shop Tools

By Charles H. Fitch

VI

THE trend of modern improvement in the manufacture of machinery has been almost entirely in the development of uniformity. The product has been modified in the interest of economy of manufacture. At the Baldwin works, for example, several hundred different types of locomotives are built, but much ingenuity is shown in the department of design to reduce the number of patterns required, and to make the shop work conform to an established system.

Great as have been the gains due to the uniform system, its limitations are obvious. The functional requirements to be satisfied in the product are such that much variety of process must be employed. There must be specialization. Again, the practice of the Baldwin works is suggestive in the extent to which they make use of finished material, not attempting, as some do, to produce everything from the raw material themselves, but relying upon the product of other works, subject to tests and guarantees. This is precisely the policy which causes a judicious man to use the services of a skilled specialist in work which can best be accomplished by such a specialist.

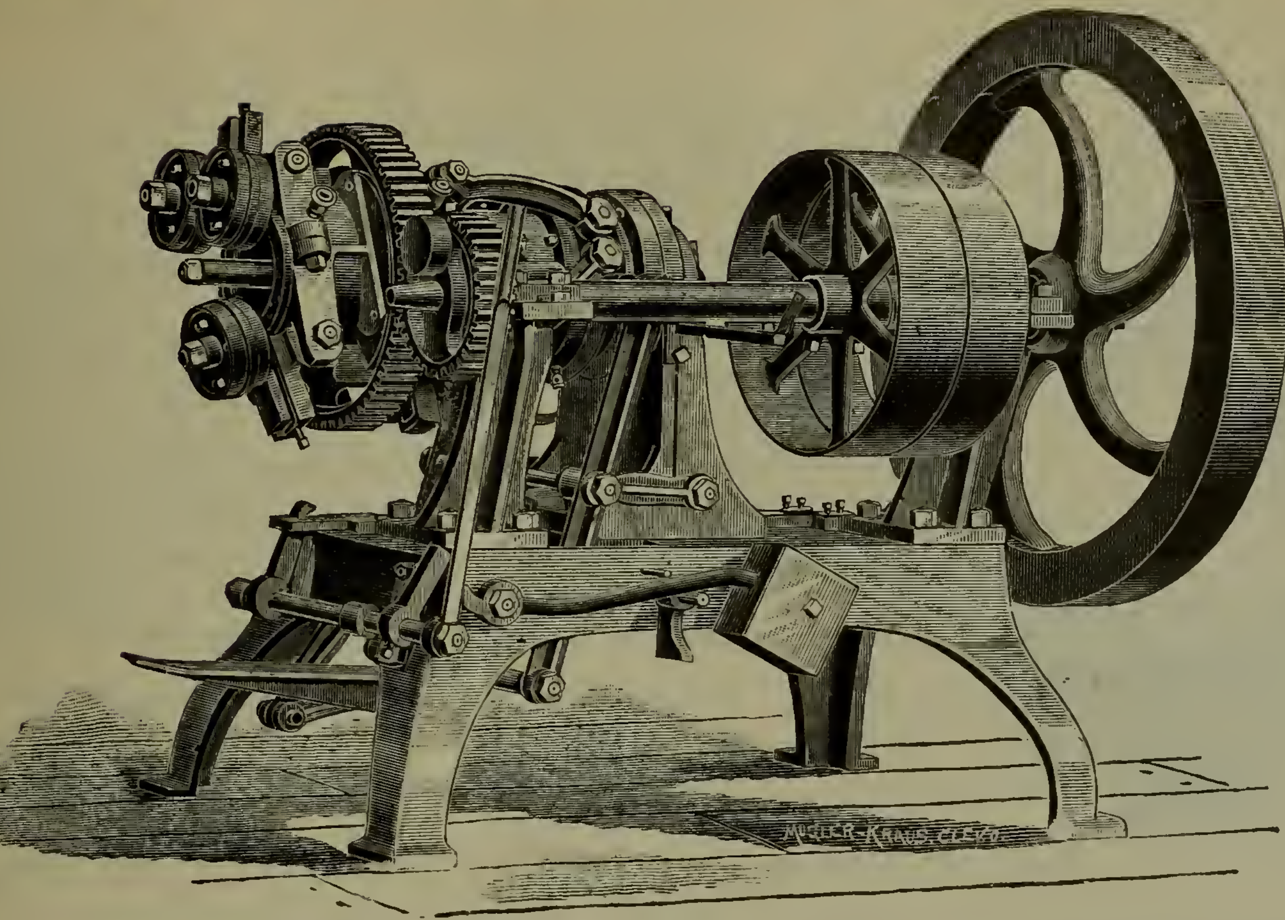


Fig. 1—Hartz Flue Welding Machine.

The same economic policy appears in the practice of our great railroad division shops in concentrating certain lines of repair work at points where enough of such work can be furnished to do it on a large scale and make a complete shop system of it. In this way the best economy of specialization is secured in those parts of the work which can be specialized to good advantage.

Flue repairing is one of these departments which is equipped with a special line of machinery. Flue welding or patching out the ends of flues has been more or less practiced since some time in the seventies, and for fifteen or twenty years past some machinery has been used, but there has been a great waste of valuable material, and only within recent years has there been a general use of complete and effective plants of machinery for this purpose. It is now considered an economic sin that any shop of considerable size should not be equipped with such machinery.

The flue rolling and welding machine in most common use is that made by H. V. Hartz & Co., Cleveland, O., and shown in Fig. 1, while the successive operations of scarfing, spreading and welding are shown in Figs. 2, 3 and 4.

The machine has a mandrel on which the tube to be welded is pressed, a treadle forces a collar forward and by levers brings three idle rollers to bear on the outside of the tube, which revolves with the mandrel.

An interesting design of flue welding machine was originated by Mr. H. A. Ferguson, until recently assistant superintendent of motive power of the Chicago Great Western, and placed in service at the Oelwein shop. The welding operation is accomplished by compressed air. The air cylinder is situated at the top of the machine and the admission of air is controlled by a lever manipulated by the foot of the operator. A system of levers is so arranged that when the upper roller is forced down against the flue, the lower rollers are forced against the flue from below. Rotary motion is obtained

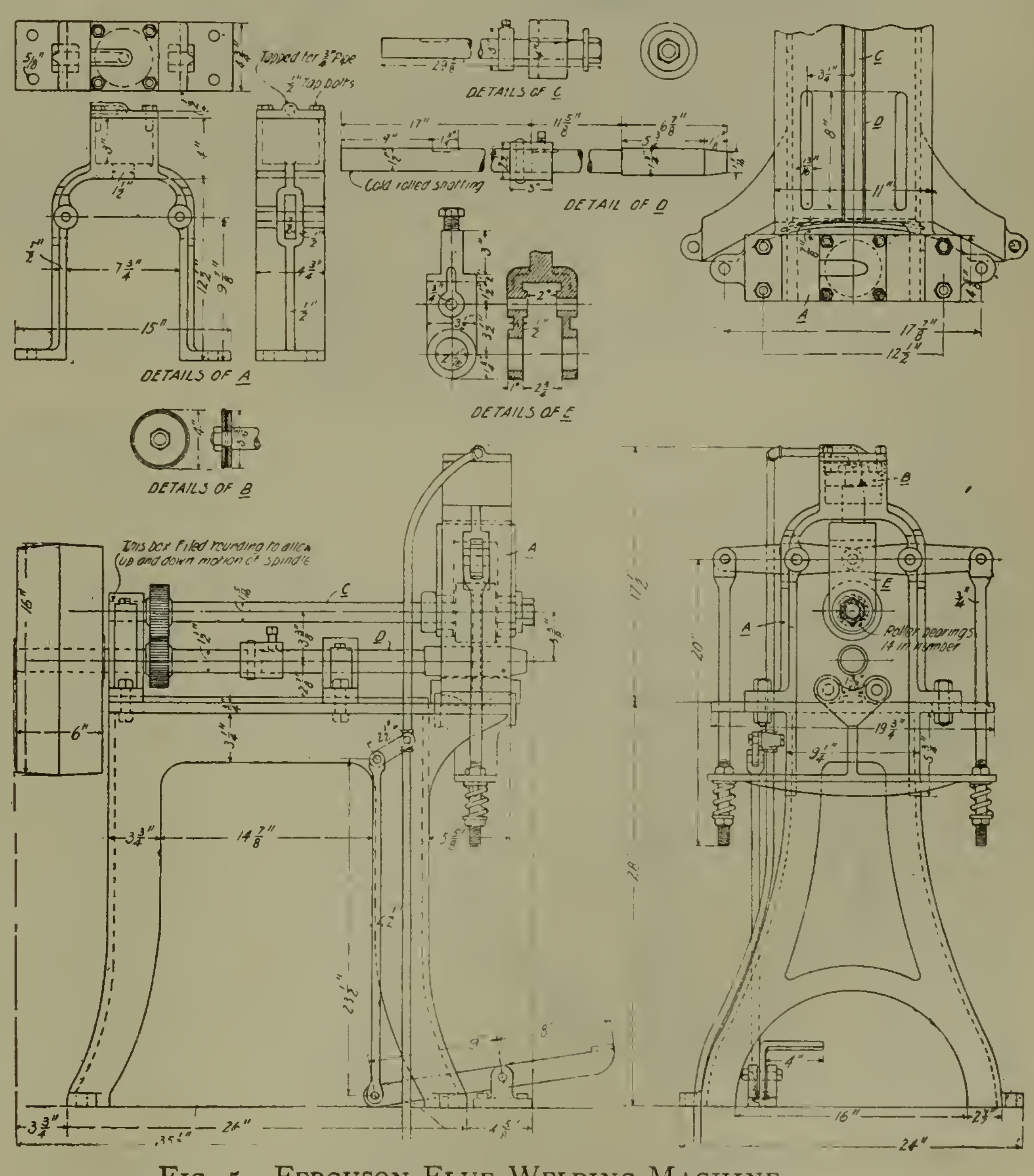


Fig. 5—Ferguson Flue Welding Machine.

from a pulley at the rear of the machine, which receives its motion from a belt applied thereto. A weld is made complete in four seconds, and the output of the machine is limited only by the number of flues which can be heated in the furnace. The flues are welded without having been previously scarfed.

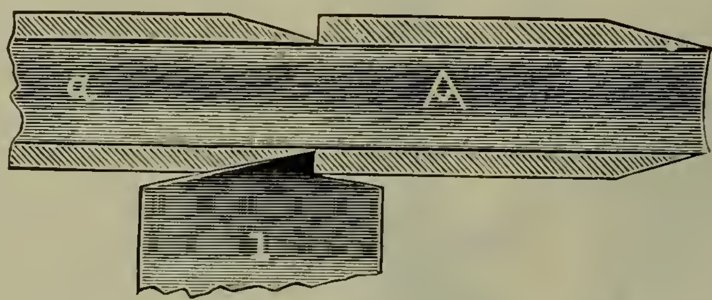


Fig. 2—Scarfing.

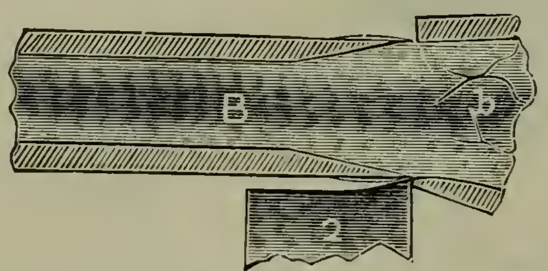


Fig. 3—Spreading.

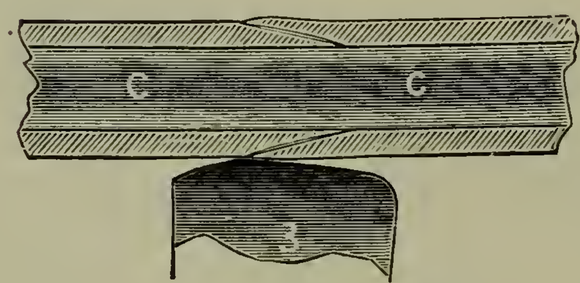


Fig. 4—Welding.

This machine is now marketed by Jos. T. Ryerson & Son, Chicago.

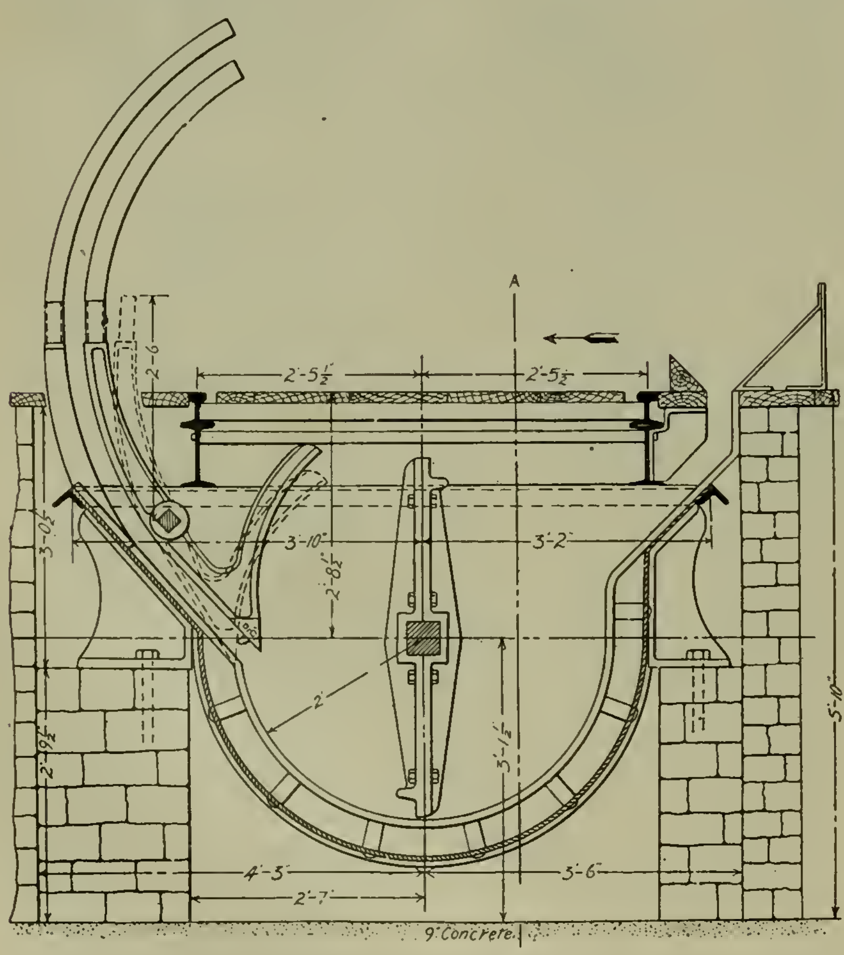


Fig. 6—Flue Rattler, C. & N. W. Railway—Cross Section.

At many shops the swaging of ends of tubes is done by pneumatic presses of simple construction, but finishing the ends to a nicety.

Flues are destroyed only at the ends when being removed for cleaning, and may be repaired many times by cutting to length and welding on short pieces of uniform length—six inches. The flue ends, after proper heating are coned internally by pressing upon a beak, and are then pressed into the short pieces and welded on the rolls.

As many as 600 flues have been welded in ten hours by two "helpers." The flues are plugged and tested for tightness under 300 lbs. water pressure. At different shops there is quite a little difference in the arrangements for cleaning, storing, heating and testing the flues.

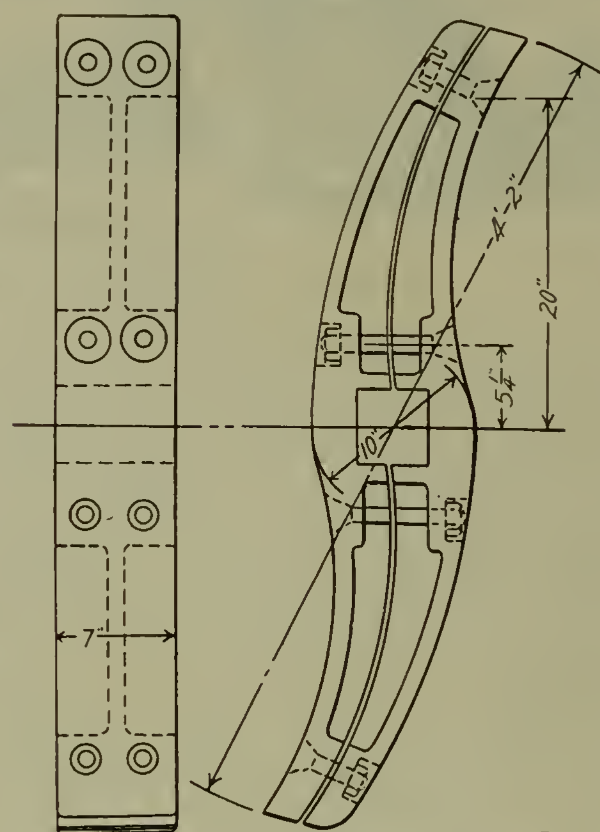


Fig. 9—Flue Rattler, C. & N. W. Railway—Rattler Lever.

At the Nickel Plate shops, Chicago, the practice in flue repairs was very fully demonstrated to the writer by Mr. J. F. Ryan, foreman, through courtesy of Mr. George James, master mechanic. Here they make four tests of tightness of repaired tubes, first with ends plugged and water run inside while flue is rapped to prove all solid, second with flues in boiler filled with water, while the flues are filled with compressed air; third, with water heated to 210 Fahr., and fourth with steam 20 lbs. above working pressure.

At some shops revolving racks are used to facilitate the handling of the flues. At the C. & N. W. shops, Chicago, fiues are cleaned by the Westmark patent flue rattler. This is illustrated in Figs. 6 (cross section), 7 (sectional elevation), 8 (general arrangement) and 9 (improved rattler lever), from blue prints kindly furnished by Mr. W. E. Dunham, M. E.

The rattling is done in a tank of water and the mechanism is operated by a frictional clutch. Noticeably ingenious is the system of guides constitutig an automatic discharge. These discharging guides are socketed

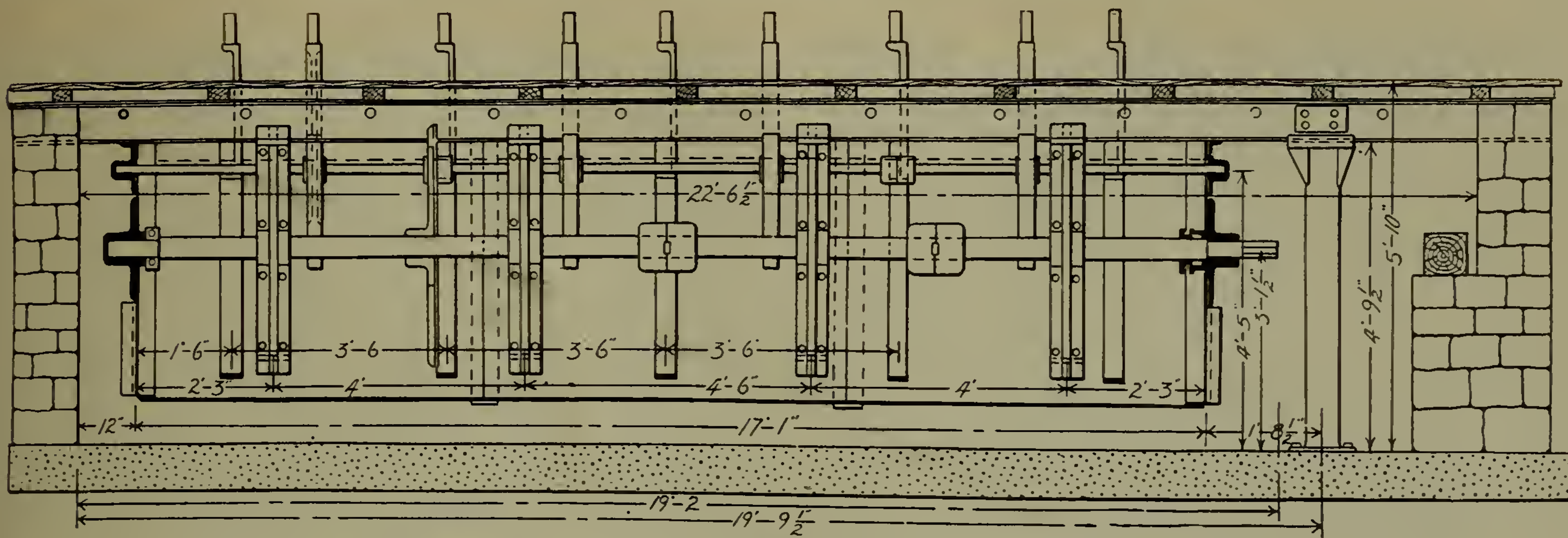


FIG. 7—FLUE RATTLER, C. & N. W. RAILWAY—SECTIONAL ELEVATION.

above so as to turn either way, and they are hinged to open or close the passage, and provided with latches so that the rattler levers feed the flues up when the passage is open.

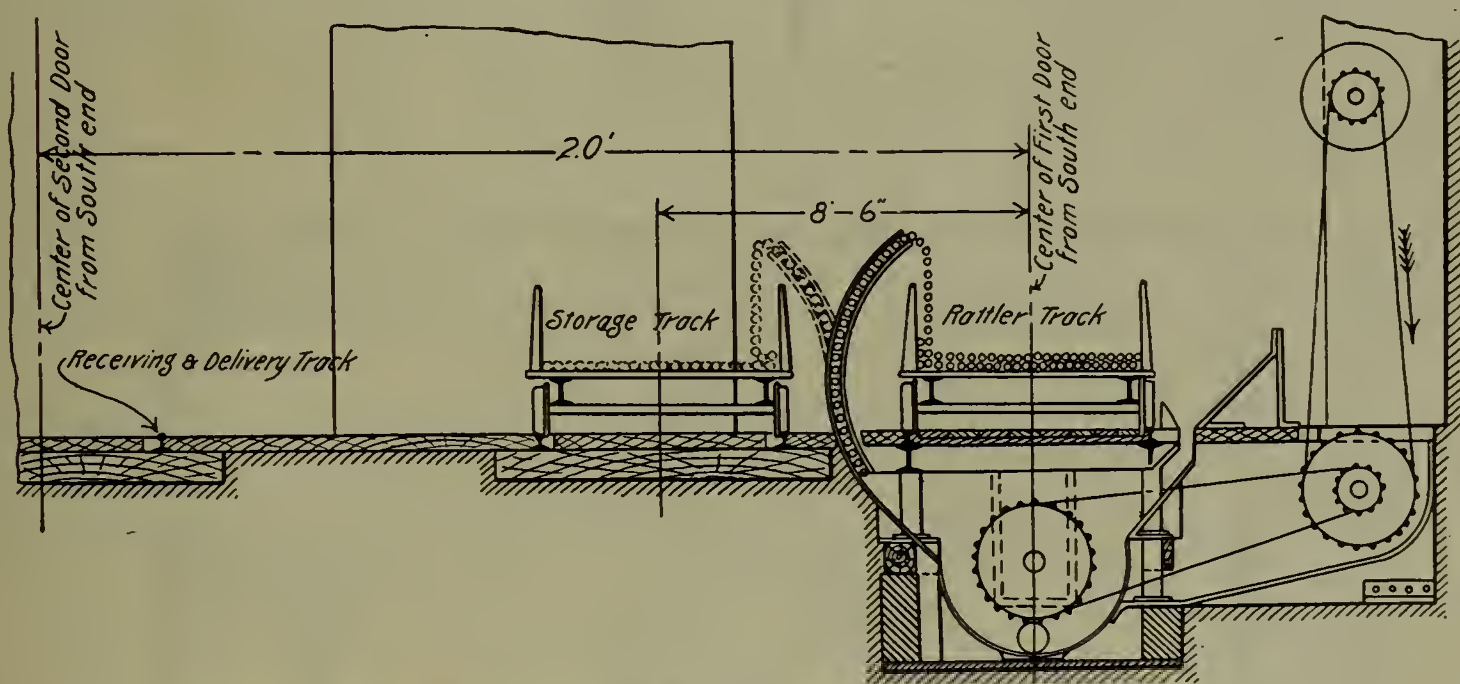


FIG. 8—FLUE RATTLER, C. & N. W. RAILWAY—GENERAL ARRANGEMENT.

Four Wheel Caboose

Chicago, Burlington & Quincy Railway.

TO diminish the cost of hauling and maintaining heavy cabooses heretofore mounted on double trucks, the Chicago, Burlington & Quincy Railway has designed a type of four-wheel caboose which is gradually to supplant those of the heavier class. The line drawings presented herewith illustrate the features of this design and it is interesting to note that the resultant car weighs but 23,900 lbs. as against 32,900 lbs. which is the weight of the double truck caboose. This difference is a considerable item in view of the smaller dead load, and the lower cost of maintenance and reduction of first cost consequent upon the removal of one truck, represent a further economy in favor of this simpler form of construction.

The underframing is essentially divided into an upper and a lower system—the former constituting practically a truck framing, while the latter system is that upon which the superstructure is built. The draft sills are continuous throughout the length of the car and combine with both upper and lower systems of the underframing. It will be noticed that on account of the reduced length of the car ample lighting is secured with few windows. The cupola is braced with rods containing accessible turnbuckles and the braced stove chimney is carried above the line of the cupola to avoid possibility of smoke obscuring the outlook. The upper bunks fold up against the walls when not in use and the lower ones are in the form of cushioned seats made upon the lids of the tool and equipment boxes. The corner clothes locker can obviously be fitted as a water closet should such provision be desired, and the present construction embodies a flap desk placed, as shown in Fig. 2, upon the partition which forms this locker. The massing of the water tanks, sink and stove at one point appeals as a most convenient arrangement for such cooking as is customarily done by crews on long runs.

In preparing this design an effort was made to provide an arrangement which should ride most easily. To this end three of the four-wheel cabooses were fitted with a different spring and equalizing system in

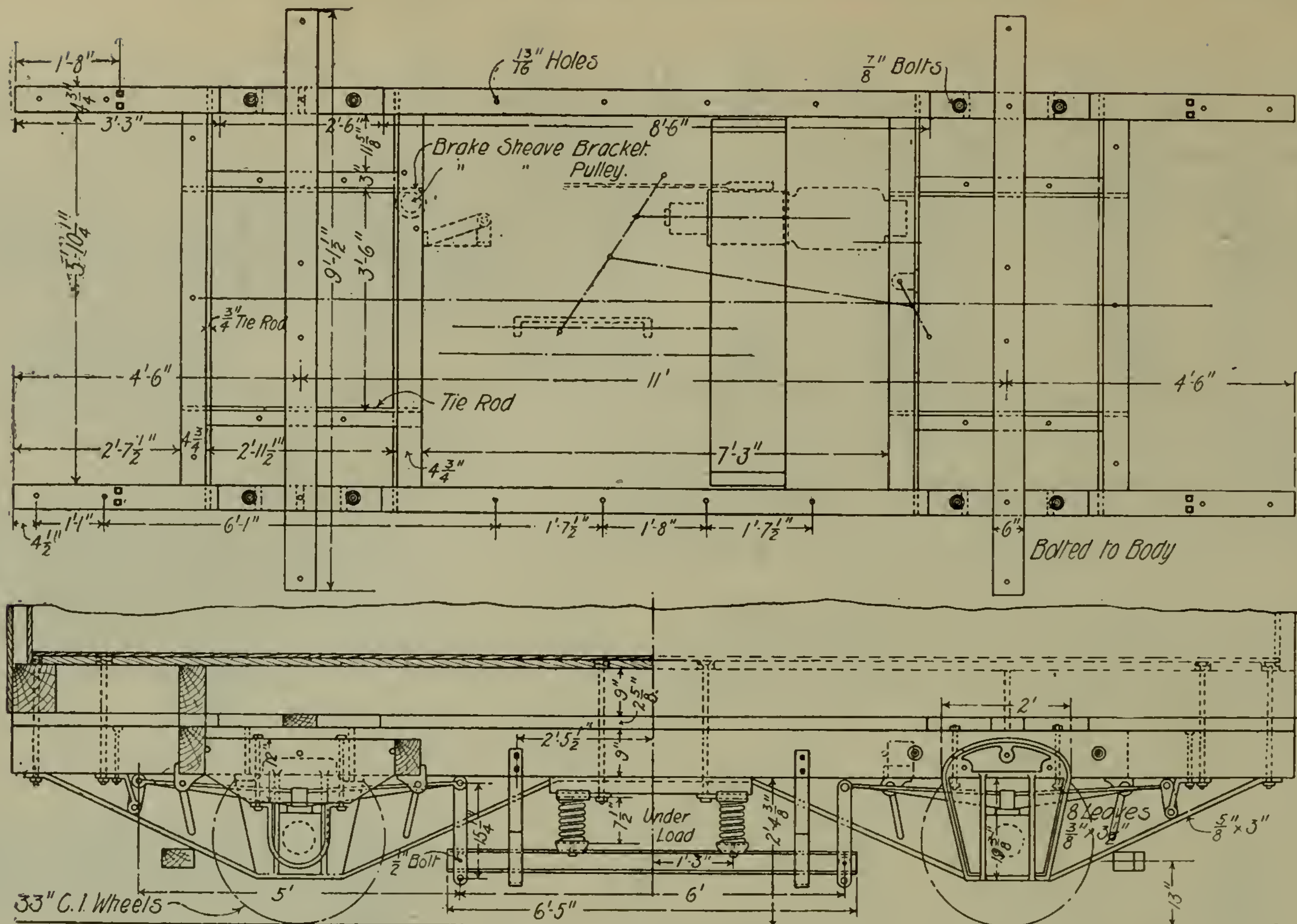


FIG. 1—FOUR-WHEEL CABOOSE, C., B. & Q. RAILWAY—SUBSTRUCTURE.

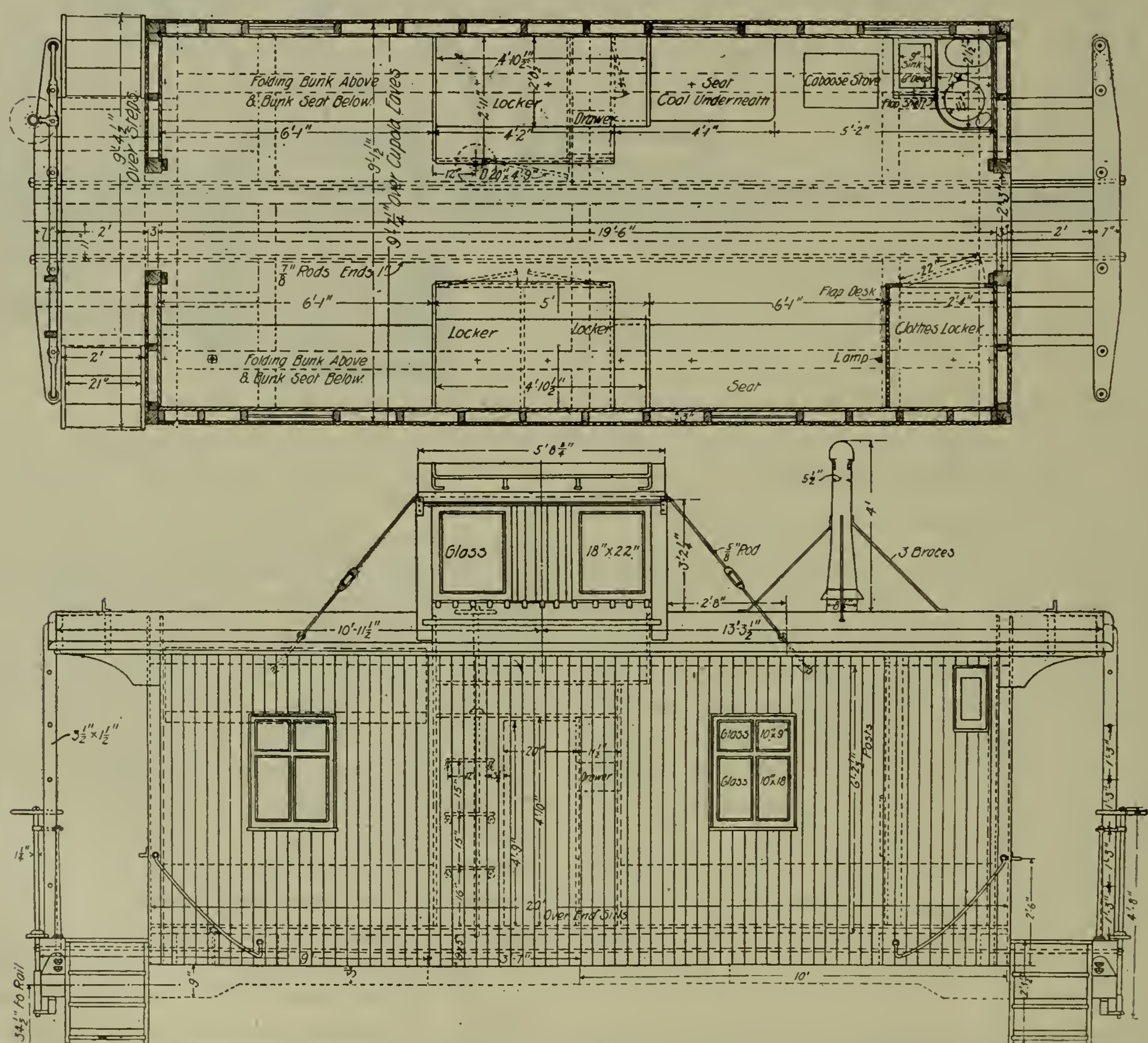


FIG. 2—FOUR-WHEEL CABOOSE, C., B. & Q. RAILWAY—SUPERSTRUCTURE.

each. These three cabooses, together with a standard double-truck caboose, were then coupled together on the end of a train and sent over a division in charge of a committee who should decide upon the easiest riding car of the number. Among the members of this committee was a trainmaster who had previously expressed himself as decidedly opposed to the four-wheel caboose on the score of rough riding. The caboose most favored by this committee was the one whose spring and equalizing arrangement is shown herewith—which was then adopted for all cars of the lot. As shown in Fig. 1, this arrangement consists of an 8-leaf (3/8 by 3½ leaves) 5-ft. semi-elliptic spring whose band rests directly upon the journal box. Either end of the spring engages with swinging equalizers—the inner one of which connects with the end of a 4-in. 75-lb. eye beam whose equalizing is done through two coil springs so disposed as to exercise a cushioned steadying effect. Fig. 1 also shows the system of brake hangers which contemplates the use of four brake beams in order to avoid the tipping tendency when brakes are applied, which would otherwise become apparent.

The interior arrangement provides sleeping capacity for five men without encroaching in any manner upon the space and arrangements used by the train crew in the performance of their duties upon the road, while there is sufficient space for further temporary sleeping accommodations if needed. The locker space is as extensive as in the double-truck caboose, and the stove, sink and water arrangements are ample and convenient to an exceptional degree.

The courtesy of Mr. C. B. Young, mechanical engineer of the C., B. & Q., is acknowledged in presenting the illustrations appearing herewith.

M. M. & M. C. B. Association

Subjects for 1904.

THE executive committee of the Master Mechanics' and Master Car Builders' Associations have arranged the following list of subjects and committees for the 1904 conventions:

MASTER MECHANICS' ASSOCIATION.

1—Ton-Mile Statistics. To confer with the American Railway Association regarding the mileage allowance for switching engines, and make positive recommendation to the Convention of 1904. C. H. Quereau, Chairman, G. R. Henderson, G. L. Fowler.

2—Coal Consumption on Locomotives. As affected by enginemen, size of boilers and grates, loss of time on side tracks, ash pits, terminals, etc. H. T. Herr, Chairman, S. K. Dickerson, R. L. Ettinger.

3—Locomotive Front Ends. To assist in tests being conducted at Purdue University, Lafayette, Ind., by the American Engineer & Railroad Journal, and carry on the tests outlined in its report at the 1903 convention. H. H. Vaughan, Chairman, F. H. Clark, Robt. Quayle, A. W. Gibbs, W. F. M. Goss.

4—Locomotive Driving and Truck Axles and Locomotive Forgings. To follow up the proposed specifications as submitted, and make final report after the meeting of the International Railway Congress in 1905. F. H. Clark, Chairman, E. B. Thompson, F. W. Lane.

5—Boiler Design. To investigate (1) the proper location of water glasses and gauge cocks in relation to the crown sheet and center line of boiler; (2) the proper slope of crown sheet expressed in inches per foot of length; (3) is the automatic low water detector, a desirable attachment for general use on locomotives; (4) the destruction of side sheets in wide fireboxes, and the reasons therefor; (5) the best form of radial stays; (6) boiler tubes, with especial reference to length, arrangement and spacing to improve circulation and reduce the trouble from leaky flues. D. Van Alstine, Chairman, C. E. Fuller, O. H. Reynolds, H. T. Bentley, Prof. W. F. M. Goss.

6—Revision of Standards. To revise the present standards on (1) shrinkage allowances, to provide for the necessary difference between cast iron and cast steel centers, providing for the larger diameter tires, 70-90 inches; (2) to revise boiler and firebox steel specifications; (3) to revise specifications and tests for boiler tubes, providing for both steel and iron tubes; (4) to revise specifications and tests for cast iron wheels for engine trucks and tenders. T. A. Lawes, Chairman, Wm. Forsyth, Wm. Garstang.

7—Air Brake & Signal Instructions. To revise the present Air Brake and Signal Instructions. To confer with committees of the Master Car Builders' Association and Air Brake Men's Association. A. J. Cota, Chairman, T. R. Browne, G. W. Wildin.

8—Piston Valves. To conduct tests as outlined by report of committee at the convention of 1903. Wm. McIntosh, Chairman, J. A. Pilcher, H. F. Ball, G. R. Henderson, C. B. Young.

9—Electrical Equipment of Shops and Shop Power Houses. To investigate (1) what do the manufacturers need to consider in order to more fully and satisfactorily meet the special requirements of railroads as to electrical machinery; (2) motor driving for shops; what are the essential principles of successful systems? What are the possibilities and limitations of variable speeds in railroad shop practice; (3) all things considered, what is the most satisfactory system for railroad shops as developed in actual practice? C. A. Seley, Chairman, L. R. Pomeroy, R. V. Wright, R. Atkinson, E. D. Bronner.

10—Automatic Stokers. Has past experience led to the belief that they may be satisfactory for general service on locomotives? J. F. Walsh, Chairman, H. T. Herr, J. G. Neuffer.

11—Locomotive Frames. To consider (1) the question of large locomotives with reference to a study of the causes of breakage; (2) how shall distortions, both vertical and horizontal, be provided for, and which deflection is most necessary to provide for or prevent; (3) which is the better material, cast steel or wrought iron? S. M. Vauclain, Chairman, J. E. Sague, Reuben Wells, S. Higgins, Alfred Lovell.

12—Cost of Locomotive Repair Shops. The following sub-headings are suggested: 1. Power Plant. Cost per horse-power, separating boilers, engines, generators, buildings, coal and ash handling facilities, piping, switchboard, etc. 2. Locomotive Shops. Cost per cubic foot, and cost of machinery on basis of horse power of tools and tool list. 3. Countershafting. Relative cost of direct drive as compared with countershafting. 4. Piping. Cost of air, water and steam. R. H. Soule, Chairman, L. R. Pomeroy, T. H. Curtis, S. F. Prince, Jr., A. E. Manchester.

14—Subjects. H. Bartlett, Chairman, J. F. Deems, A. W. Gibbs.

13—Safety Appliances for Locomotive Front Ends. J. F. Deems, Chairman, W. S. Morris, J. Milliken.

MASTER CAR BUILDERS' ASSOCIATION.

(Standing Committees.)

On Arbitration—W. S. Morris, Chairman, P. H. Peck, J. J. Hennessey, T. W. Demarest, E. D. Bronner.

On Supervision of Standards and Recommended Practice—W. P. Appleyard, Chairman, T. W. Demarest, T. S. Lloyd.

On Triple Valve Tests—A. W. Gibbs, Chairman, W. S. Morris, Wm. McIntosh, C. A. Schroyer, A. J. Cota.

On Brake Shoe Tests—Chas. Coller, Chairman; Wm. Garstang, Prof. W. F. M. Goss.

On Tests of M. C. B. Couplers—R. N. Durborow, Chairman, W. P. Appleyard, Jos. Buker, W. S. Morris, F. H. Stark.

On Draft Gear—E. D. Bronner, Chairman; W. F. Kiesel, Jr., S. F. Prince, Jr., Mord Roberts, T. A. Lawes, Le Grand Parish.

(Committees for the year 1903-04.)

On Standard Location of Third Rail for Electrical Operation—A. S. Vogt, Chairman, F. M. Whyte, W. P. Appleyard.

On Stenciling Cars—H. M. Carson, Chairman, F. W. Brazier, Jos. Buker, W. R. McKeen, Jr.

On Coupling Chains—R. P. C. Sanderson, Chairman, R. L. Klein, R. B. Rasbridge, Jas. Macbeth.

On Stake Pockets—J. S. Chambers, Chairman, W. E. Fowler, J. E. Keegan, R. P. C. Sanderson, M. Dunn.

Best Preventative of Rust on Steel Cars—H. S. Hayward, Chairman, J. S. Lentz, W. G. Gorrel, T. H. Russum. One additional member to be named later.

On Outside Dimensions of Box Cars—W. P. Appleyard, Chairman, C. A. Schroyer, Jos. Buker, A. S. Vogt, F. H. Clark, H. F. Ball, J. J. Hennessey.

On Cast Iron Wheels—Wm. Garstang, Chairman, J. J. Hennessey, W. H. Lewis, E. D. Nelson, Alex. Kearney, H. J. Small.

On Air Brake Hose—Le Grand Parish, Chairman, T. S. Llyod, J. Milliken, F. H. Scheffer, H. Swoyer.

On Prices for Repairs of Steel Cars—T. H. Russum, Chairman, R. F. McKenna, D. N. Kalbaugh, E. B. Gilbert, Geo. N. Dow.

On Tank Cars—A. W. Gibbs, Chairman, C. H. Bloxham, R. Gunn.

On Subjects—J. T. Chamberlain, Chairman, J. S. Lentz, C. A. Schroyer.

Personals

Mr. C. H. Prescott has had jurisdiction extended over new Spokane division, Great Northern Railway, to Leavenworth, in addition to Spokane & Northern Railway System.

Mr. W. H. Conry, for tweney years identified with the Santa Fe shops at Topeka, and recently in charge of the tool room at that point, has been appointed superintendent of the engineering laboratory at Purdue University.

Mr. M. D. Strout, for twelve years superintendent of the engineering laboratory of Purdue University, has resigned that position to enjoy in his declining years a well-merited release from routine duties.

Mr. A. Harrity has been appointed division master mechanic of the Atchison, Topeka & Santa Fe at Raton, N. M., in place of Mr. D. A. Sullier.

Mr. B. Julian, foreman of the Union Pacific car shops at Denver, Colo., has been appointed general foreman of the car shops at Omaha, Neb., to succeed Mr. A. M. Collett, resigned.

r. A. V. Manchester, of Austin, Minn., has been appointed master mechanic of the Chicago, Milwaukee & St. Paul at La Crosse, Wis., to succeed William E. Kittridge, deceased.

Mr. T. J. Cutler, master mechanic of the Northern Pacific at Glendive, Mont., has been appointed to a similar position at Jamestown, N. D. He is succeeded by Mr. C. E. Allen, heretofore traveling engineer at Mandan, N. D. Mr. B. Johnson, engineer of the Yellowstone, succeeds Mr. Allen.

Mr. A. W. Greenwood has resigned as superintendent and master mechanic of the East Broad Top Railroad at Rockhill Furnace, Pa. He has been connected with that road for nearly twenty-five years.

Mr. Carl H. Metzgar has been appointed foreman of shops of the East Broad Top Railroad at Rockhill Furnace, Pa.

Mr. W. H. Whittaker has resigned as master mechanic of the Denver, Enid & Gulf, and has been succeeded by Mr. J. J. Shaw, with headquarters at Enid, Okla.

Mr. J. H. Sally, heretofore traveling engineer of the Northern Pacific, has been appointed master mechanic at Livingston, Mont., to succeed Mr. W. S. Clarkson.

Mr. W. D. Crown has been appointed general foreman of the Baltimore & Ohio at Columbus, Ohio, to succeed Mr. M. Elsner, resigned.

Mr. James E. Pickering, general foreman of the car department of the Boston & Maine at Boston, Mass., died at his home in that city recently. He was born in Salem in 1847 and received his education there. On leaving school he entered the employ of the Eastern R. R. in the freight yard. On the absorption of the Eastern by the Boston & Maine R. R. he came into the employ of that road. From car inspector of the Salem division he advanced to the position of general foreman at Boston, which position he held at the time of his death.

Mr. F. A. Torrey, heretofore master mechanic of the Chicago, Burlington & Quincy at Creston, Ia., has been appointed assistant superintendent of motive power of that road. Mr. A. S. Wilson has been appointed acting master mechanic at Creston, Ia., to succeed Mr. Torrey.

Mr. Robert C. Blackall, consulting mechanical superintendent of the Delaware & Hudson Co., died at his home in Albany, N. Y., on August 31. Mr. Blackall was born at Albany in 1831 and had been in railroad service for about 53 years, having commenced as a journeyman machinist on the Saratoga & Washington at Saratoga in 1850. In 1853 he was made machinist and gang foreman on the Hudson River Road and in 1860 was appointed master mechanic on the Albany Northern. From 1863 to 1870 he held a similar position on the Albany & Susquehanna, and in the latter year (1870) was appointed superintendent of rolling stock and superintendent of motive power and machinery of the Delaware & Hudson Canal Company, remaining in that position for twenty-nine years. He was from 1888 to 1899 superintendent of motive power and machinery of the Adirondack Railroad. About four years ago Mr. Blackall was retired by the management of the Delaware & Hudson Canal Company with the title of consulting mechanical superintendent. He was a past president of the American Railway Master Mechanics' Association and was successively from 1892 to 1894 second vice president, from 1894 to 1895 first vice president, and from 1895 to 1896 president. He was also for many years an important member of the executive committee of the Master Car Builders' Association, and has always taken an active part in the work of the association.

Mr. Frederick M. Denzig, general foreman of the Delaware, O., shops of the Cleveland, Cincinnati, Chicago & St. Louis, has been transferred to Sandusky, O., in a similar capacity. Mr. Thomas Zinkan has been appointed general foreman at Delaware, O., to succeed Mr. Denzig.

Mr. John H. Dacey has been appointed master mechanic of the Kansas City, St. Joseph & Council Bluffs at St. Joseph, Mo., to succeed Mr. C. E. Lamb.

Mr. John P. McSteen has been appointed traveling engineer of the northern district of the Chicago, Rock Island & Pacific, with headquarters at Cedar Rapids, Ia.

Mr. Henry M. Lane, a graduate of Purdue University, has been appointed assistant mechanical engineer of the Delaware, Lackawana & Western.

Mr. George H. Gilman has been appointed master car builder of the Northern Pacific, with headquarters at St. Paul, Minn. Mr. Gilman has heretofore been superintendent of shops at Tacoma, Wash.

Mr. J. W. Warren has been appointed acting foreman of the Texas Midland shops at Terrell, Texas, the position made vacant by the recent resignation of H. F. Whiting.

Mr. J. H. Driscoll has been appointed master mechanic of the Cincinnati, New Orleans & Texas Pacific at Chattanooga, Tenn., to succeed Mr. J. E. Gould, who recently resigned.

Mr. Robert H. Rogers has ben appointed general foreman of the Cumberland (Md.) shops of the Baltimore & Ohio, to succeed Mr. W. S. Galloway, who retires on account of ill health.

Mr. J. J. Shaw has been appointed master mechanic of the Denver, Enid & Gulf, with headquarters at Enid, Okla., vice Mr. W. H. Whittaker, resigned.

Mr. W. S. Clarkson, master mechanic of the Northern Pacific at Livingston, Mont., has been appointed shop superintendent, with jurisdiction over the shops and motive power of the Montana division of the road.

Notes of the Month

The Washburn Company, Minneapolis, Minn., have acquired and control the stock, property and business of the Washburn Coupler Company of that city, and all business will be done in the name of this corporation. The change in ownership does not include any great changes in the management, the Washburn Company having been organized to take over the business of the Washburn Coupler Company in order to extend its operations in regard to car couplers and other lines of railroad supplies.

The Central Railroad of New Jersey is publishing a monthly magazine principally devoted to the interests of those concerned with suburban life. The paper is entitled the "Suburbanite," and is published monthly at 143 Liberty street, New York City. Illustrations of the country near New York, through which the Central Railroad of New Jersey passes, are particularly attractive, as well as the illustrated articles descriptive of the types of suburban homes and methods employed for convenience and sanitary conditions.

The Rock Island System, coming into possession of the St. Louis, Kansas City & Colorado Railway, is pushing the completion of this line between St. Louis and Kansas City. This line is being constructed through an exceptionally good agricultural and mining district of Missouri and is expected to develop this district in a wonderful way. One hundred and thirty-eight miles of track are already in operation, both passenger and freight service being established between St. Louis and River View, Mo. It is expected that this line will be completed the latter part of next year.

The executive committee of the American Railway Master Mechanics' Association has awarded the Joseph T. Ryerson & Son Scholarship in Purdue University to Arthur B. Marsh, of Boston, Mass. The committee, consisting of W. H. Lewis, of Roanoke, Va.. president of the Association; Peter H. Peck, of Chicago, vice-president, and Joseph W. Taylor, also of Chicago, secretary, held a meeting at Purdue and reviewed the results of the examination of all candidates as presented by the university authority. It was found that seventeen candidates had submitted to the prescribed examination. Mr. Marsh was certified to by the university authorities as having obtained the best results in his examination.

John F. Allen, 370-372 Gerard avenue, New York City, reports the following shipments of Allen Portable Pneumatic Riveters for the month of August. This list comprises complete machines only:

Oregonia Bridge Co., Oregonia, O., 1 riveter; N. J. Bridge Co., Manasquan, N. J., 1; Manning, Maxwell & Moore, New York City, 1; Meehan Boiler & Con. Co., Lowellville, O., 1; Steel & Wike, Philadelphia, Pa., 1; Canton Bridge Co., Canton, O., 1; Am. Car & Foundry Co., Berwick, Pa., 2; Builders Iron Foundry, Providence, R. I., 1; Worden-Allen Co., Milwaukee, Wis., 1; Chas. Churchill & Co., London, England, 1; Carolina Steel Bridge & Con. Co., Burlington, N. C., 1; F. B. Tait Mfg. Co., Decatur, Ill., 1; Locomotive & Machine Co. of Montreal, Can., 1; East Chicago Bridge & Iron Co., East Chicago, Ind., 1; Levering & Garrigues Co., New Market, 1; total, 16 riveters. Our output, says Mr. Allen, "is up to our regular standard, taxing us to our utmost capacity. Orders are on hand sufficient to keep us going for the next three months at the same pace. At the same time collections are found to be exceedingly good."

The Whiting Foundry Equipment Company is distributing a comprehensive pamphlet presenting illustrations of cranes furnished various railroads, covering practically the full requirements of railroad service. Among them may be mentioned two Electric Traveling Cranes, 60 tons capacity, lifting one of the Santa Fe's heaviest locomotives, and among the heaviest in use in the entire country. Auxiliary hoists on main trolley, 5 tons capacity, are furnished with each crane. A similar outfit, but operated by alternating current induction motors, has been installed by this company in locomotive repair shops of the Michigan Central at Jackson, Mich., and is now in most successful operation. In both of these shops, locomotive pits are longitudinal, and consequently, two cranes are required. In the Missouri Pacific, pits are transverse, and one crane only is used, illustrated also. Double trolley cranes for this arrangement are offered in capacities up to 120 tons and larger.

The appended list indicates the numerous railroad purposes for which the Whiting people have supplied Electric Travelers and other types of their cranes: Locomotive repair shops, locomotive boiler shops, machine shops, foundries, forge shops, axle shops, car shops, power houses, coaling stations, transfer stations, yard cranes.

One of the new growing industries of which St. Louis is proud is the Commonwealth Steel Company. It was just a year ago this month that this strong firm started their plant, and since they organized they have booked the following orders: For separable body bolsters: By Missouri Pacific for 5,300 cars; by D. & R. G. Ry., for 750 cars; Wabash for 1,500 cars; by Mexican National for 500 cars; by New York Central for 500 cars; by Santa Fe for 1,200 cars; by National Coal Dump Co. for five cars.

Special trucks on the following lines as follows: Chicago Great Western for 700 cars; St. Joseph & Grand Island for 250 cars; Interborough Rapid Transit Co. for 350 cars; Lawson Dump Car Co. for five cars.

Standard truck and body bolsters: C. B. & Q. for 2,250 cars; Mexican Central for 1,100 cars; Atlantic Coast Line Ry. for 400 cars; Mexican National for 500 cars; Bellington & Beaver Creek for 300 cars; Union Pacific for 100 cars; Cold Blast Trans. Co. for 100 cars; Cudahy Packing Co. for 100 cars; Stewart-Peck Sand Co. for ten cars; K. C. Refrig. Car Co. for 20 cars; New York Central for 250 cars; M. K. & T. for 1,100 cars; C. R. I. & P. for ten tenders; C. N. O. & T. P. for two tenders; E. & T. H. for 137 cars; Coal & Coke Co. for 400 cars; Lehigh Coal & Coke Co. for 20 cars.

This is considered a splendid record for the first year's business of a new concern

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WORTHY APPRECIATION.

We have been requested by one of our readers residing in Topeka, Kas., to acknowledge the courtesy of the World Railway Publishing Company in supplying him gratis with a full set of "Science of Railways" by Kirkman, to replace his editions lost in the flood. Upon his application to the above mentioned company for rates on the set of books, the company, evidently appreciative of the distress occasioned by the recent floods, immediately presented the volumes to the intended purchaser.

THE NEW CENTURY CLEANER.

The New Century Cleaner is especially adapted to remove dust and dirt from carpets, upholstered furniture, cushions, car seats, mattresses, etc., discharging the dust into the open air, or convenient receptacle, without removing any article from its permanent position. It is operated by a current of air under low pressure forced over an opening, thus creating a vacuum which sucks the dirt from surfaces over which it is passed. Car cushions and backs may be cleaned without removal from car, and it will extract dust from and under steam pipes. The New Century uses compressed air, which does not moisten the fabric cleaned, as it sucks the dirt from the surface, and does not permit the compressed air to reach it. This cleaner is manufactured by The New Century Cleaner Company, 31 Equitable Bldg., Boston, Mass.

A NEW OKLAHOMA LINE.

The new line of the M. K. & T. Ry., from Oklahoma City to Agra, Okla., a distance of 55 miles, through the towns of Witcher, Arcadia, Luther, Fallis, Carney and Tyron, opens up a magnificent agricultural country of surprising possibilities—a country bound to be the homeseekers' Mecca for several years. The line is completed through to Bartlesville, I. T., giving the M. K. & T. Ry. a direct line between Oklahoma City and Kansas City, St. Louis and all important points north and east.

TESTS OF FALLS HOLLOW STAYBOLT IRON.

We present herewith the results of three tests of Falls Hollow staybolt iron; two from McGill University and a comparative test made by the Grand Trunk Railway:

Specimen—Hollow, 1 in. outside diameter and 3-16 in. inside diameter.

Dimensions in inches	1
Yield point in lbs. per square inch	27,520
Ultimate strength in lbs. per square inch	48,420
Per cent of elongation in 8 inches	32.5
Per cent of reduction of area	53.7

Specimen—Solid.

Dimensions in inches	1
Yield point in lbs. per square inch	33,790
Ultimate strength in lbs. per square inch	50,150
Per cent of elongation in 8 inches	29.2
Per cent of reduction of area	56.4
Actual maximum load in pounds	39.390

Grand Trunk Railway Test: This was a vibrating test as near as possible to the strains in a boiler, but much severer, to discover which make of iron would endure the strains longest without breaking, and to learn the number of vibrations at 32 per minute each staybolt iron would endure:

	Size.	Duration.	Broke on—
Falls Hollow charcoal iron	1 in.	157 min.	5024 Vib.
Falls Solid charcoal iron	1 in.	131 min.	4192 Vib.
No. 1 iron	⅞ in.	120 min.	3840 Vib.
No 2 iron	1 in.	95 min.	3040 Vib.
No. 3 iron	1 in.	75 min.	2400 Vib.
No. 4 iron	1 in.	75 min.	2400 Vib.

The actual duration of the Falls Hollow charcoal iron was 161 minutes, equal to 5192 vibrations, but the resistant strength of the sample caused intermittent attention by the tester, with wooden wedges to keep the sample taut and for this 4 minutes was deducted

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A great deal of interest is being taken in the new L. & K. No. 1 Piston Rod Packing, which was exhibited at Saratoga this year and is being placed on the market by the Aurora Metal Company, of Aurora, Ill. This company, which has heretofore devoted itself exclusively to the manufacturing of "R. R. Special Metal" for filling brasses under cars, coaches and locomotives, has issued a very neat pamphlet setting forth the excellent points of this packing very clearly. This pamphlet is at the disposal of all interested in packing and can be obtained by application to the company. A number of the prominent roads are at present making very thorough tests with this packing, and all indications point towards results proving the excellence of this device.

Pneumatic Baggage Handler

To facilitate the handling of baggage in and out of baggage cars a 60-ft. experimental bagae car, now in service on the Michigan Central Railroad, has recently been built, emboding a device for elevating and lowering material by air power. This car was designed for the Safety Baggage Handler Co. of Manistee, Mich., by Stevens & Blume, Architects and Engineers in accordance with patents of Mr. George H. Wall of Detroit.

Pneumatic Baggage Handler in Operation.

The car is built upon an all-steel underframing having three center sills, of 24 ins. and 20-in. I-beams, extending from bolster to bolster, and four side sills, of 9-in I-beams from ends of the car to sides of the door openings, leaving an opening in the side of the underframe 2 ft. 6 ins. wide by 5 ft. 6 ins. long. The seeming weakness at the center of the car which may be thought to result from the removal of sections of the side sills is designed against by the application of a cover plate of ½-in. steel, 60 ins. wide by 10 ft. long, securely riveted to the three center sills.

The body is practically built on the same lines as the average wooden beam baggage with the exception of the arrangement for the elevators and doors. The elevator platform is made in two parts hinged in the middle so that the platforms when the elevator is used is 5 ft. 5 in. x 5 ft. When closed the platform forms part of the floor in the carfi making a tight joint with the door when shut. The elevator is operated by air led from the train pipe to two auxiliary reservoirs, connected with each other and with the two 10-in. air hoists. A check valve keeps the pressure in the auxiliary reservoirs constant when the pressure in the train pipe is reduced by setting of brakes, thus leaving ample supply of air for operation of elevators as soon as the train comes to a stop. The air hoists are capable of handling about one ton of baggage or freight per lift.

The car is 60 ft. long inside, weighs 80,000 lbs. and is calculated for a load of 40,000 lbs. In addition to a factor of 5 used in calculations, the figures of load were assumed from 50 per cent to 100 per cent larger than supposed actual condition to provide for all shocks, etc.

Sand Blast

The sand blast machine manufactured by the J. W. Paxson Company, 1021 W. Delaware avenue, Philadelphia, is an American machine and embodies many new and improved features, and is a most durable and economical device.

It has no inside hopper. Every part is accessible, and all pieces liable to wear can be replaced. The top is cone-shaped and has a valved opening for sand in the center. The valve on the bottom is for regulating the sand discharge.

To operate machine first fill with dry sand, close charging valve and turn on air, the sand falls into the air as it goes through the air pipe at the bottom of the sand-blast machine, amount of sand discharged being regulated by sand valve. The sand and air are conducted through a hose to the nozzle and directed against the piece to be sand blasted, the face of the operator being protected by a special helmet. Can use any length hose to 50 feet. Unless otherwise specified, a 12-foot length of hose, one helmet, one nozzle and 12 tips are furnished with each machine.

The Sand-Blast process is the best and most economical method of cleaning and casting metals which are to be machined, electroplated, enameled, japanned, bronzed or painted. For removing paint and scale from all kinds of metals it is invaluable. On brazed work it is a freat labor saver for cleaning off the spelter. It is especially adapted to frosting builders' hardware, gas fixtures, etc. Railroads make use of the Sand Blast to clean paint and rfust from steel bridges preparatory to repainting. For removing discoloration from stone and masonry work it is of great service.

Paxson Sand Blast Machine.

One man wtih the Sand Blast will do more cleaning than six men with brushes, and on core work will get at places otherwise inaccessible. On castings to be machined, there is less wear on the cutting tools. On stove castings, the appearance of the finished stove is much approved. Ornamental castings are cleaned so that every detail is brought out.

Improved Drill Socket

An improved drill socket has been recently designed by Mr. George R. Rich to facilitate the use of drills from which the tangs have been broken, the construction being such that by friction alone the shank is prevented from slipping within the socket.

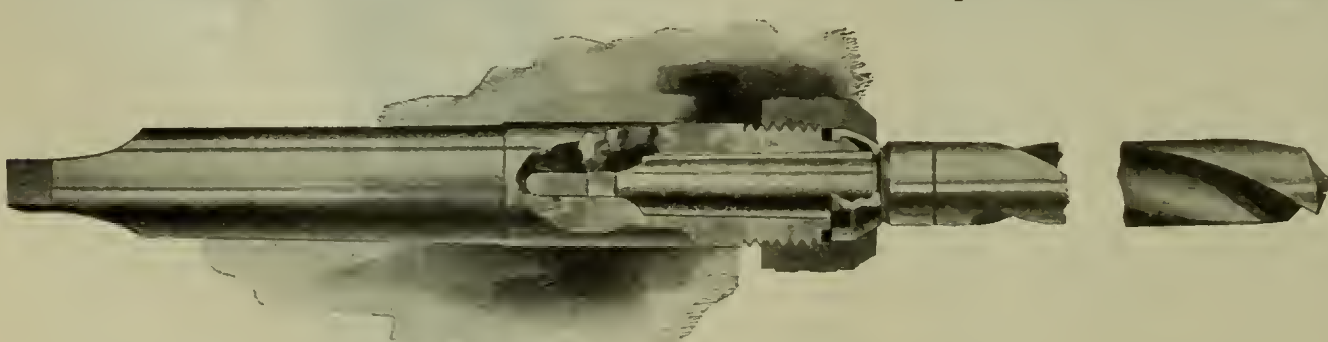
The device is very simple and the interior so formed that a new drill with the tang in position may be used. The slot for drifting out the drill is made longer than in the ordinary socket, so that the drift may bear against the top of the shank which is lacking the tang. The exterior of the lower portion of the socket is threaded to take a thumb nut, the nut being applied to manipulate two small jaws which surround the extremity of the sleeve and whose vertical positions are maintained by a small shoulder in which the sleeve terminates. The interior of the nut is turned to conform to the taper of the jaws so that screwing up the nut applies a pressure of the lips of the jaws against the drill shank. A shallow groove is turned in the shank at the butt so that the lips of the jaws engage the groove preventing the drill from being pulled out of the socket after having been applied and insuring against a relaxation of the friction hold between the shank and socket.

Sleeve Socket. (Patent Pending.)

The drill is applied in the usual manner, being tapped lightly on the bottom to drive the shank securely home within the socket. The nut is then tightened by hand and tests of service have proven the device capable of holding drills securely in both high and low speed work.

The principal feature of the device is the economy resulting from the continued use of drills without breaking the tangs. With the ordinary socket, when the tang is broken, it is necessary either to scrap the old drill or remachine the shank. The necessity of annealing and retempering the drill adds to the expense of machining, an argument which speaks highly in favor of the device.

This socket is manufactured by the George R. Rich Manufacturing Company, 171 South Canal St., Chicago.



Extension Socket. (Patent Pending.)

Burgess Rail Anchor.

Burgess Rail Anchor

The accompanying illustration shows the application of a device which has proven effective in replacing derailed cars and locomotives. Facility in replacing derailed cars bespeaks the necessity of an anchor which may be readily adjusted, for without a convenient appliance much time is lost in preparing a suitable contrivance which may be used temporarily.

The rail anchor here shown consist of two arms, or levers, pivoted to a short cross bar. Attached to the lower side of each bar is a gib so formed as to engage the rail splice, or fish plate, the anchor to be applied to the rail near a joint. A stress applied to the chains attached to the ends of the arms tends to draw the ends together, thus increasing the gripe of the gibs against the rail web and insuring against their slipping past the shoulder formed by the plates. The application of this device occasions no injurious effects similar to distortion of the track resulting from wrapping a chain about the rail. The anchor is designed to fit any size of rail from fifty to one hundred pounds per yard and weighs but 110 pounds. It is, therefore, applicable to any rail now in standard service and may be handled easily by one man.

The patents covering this device are owned by Mr. B. Burgess, 507 Hazel St., Danville, Ill.

Army and Navy Liquid Glue

This liquid glue is a preparation entirely different in its composition and process of manufacture from any other liquid glue made. It has in its composition new ingredients so blended as to make it the strongest and most perfect glue or cement ever made. Mr. Machter, its discoverer, has succeeded in producing an article superior to anything heretofore known in the way of glue or cement. It has been fully tested and found to

Army and Navy Liquid Glue.

withstand all changes of temperature and climate, wet and dry,cold and heat. Under all conditions it remains firm as rock and strong as steel. On account of its great strength and tenacity, less is required to perform a given work than any other now in use. Its liquid form makes it convenient for use at all times and under all conditions.

Among its advantages may be mentioned the wide range of articles upon which it can be used. Some glues are good for one purpose and worthless for others. This glue seems to be equally good on all substances on which it has been tried. It cements equally well leather, all metals, all woods, cotton and woolen fabrics, paper and every other substance. Its use in this respect may be said to be universal.

Another element of superiority is its strength under varying conditions of heat, cold, and dampness, and under pressure, or strain or mobility. It has been tested under the most trying conditions and has proved perfectly satisfactory.

Finally, it is smooth, volatile, uniform in thickness and hence easily applied, and is capable of being used for fine work, such as cementing crockery and mending articles where it is essential that the seam should be invisible. It may be added that this glue does not sour by standing, or become moldy and disagreeable, but retains its form in a very remarkable degree.

Farlow Draft Rigging

It is a recognized fact that the draft riggings constitute troublesome parts of modern car construction. While the tail bolt has practically been discarded, and the riveted yoke substituted, the use of the latter has rendered repairs most difficult, it being necessary for two or more persons to either apply or replace any part of such riggings, and at such places where the facilities for doing this work must be at command. In most riggings no provision has been made to take up the lost motion in the springs. When a spring has to be replaced, the services of two or more men are required to take the entire riggings down, and some means must be provided for the compression of the spring before it can be replaced between the followers and riveted yokes. One of the most objectionable features of these riggings, however, consists in the arrangement of the follower plates in such a way that the shocks of drawing and the buffing are transmitted to the draft timbers or sills, and concentrated at a single point in each.

With these difficulties in view in order to produce a draft rigging capable of surmounting them, the Farlow draft rigging has been designed, embodying many practical and desirable features. By reference to the figures it will be observed that a radical departure in construction has been introduced, doing away with the riveted yoke entirely.

Fig. 1A.—The Farlow Draft Rigging.—Fig. 1B.

Figure 1A shows the cheek castings applied to the ordinary draft timbers. In drawing, motion is imparted to the front and rear equalizing pins, the draw bar yokes, and the rear follower block simultaneously. As the front follower block is anchored against forward movement by the central equalizing pin, and the central slots of the yokes are elongated,

Fig. 2A.—The Farlow Draft Rigging.—Fig. 2B.

the spring undergoes compression until the front and rear equalizing pins travel the length of the slots, when further transmission of energy is taken by the draft timbers, through the equalizing pins, at three separate points in each.

In buffing, the slotted bar moves over the front equalizing pin and the spring is compressed against the immovable rear follower block. When the spring has been compressed, the three equalizing pins transmit the additional energy of the blow to the draft timbers, at three separate points in each.

Figure 1B shows the same spring arrangement attached to metallic draft pieces.

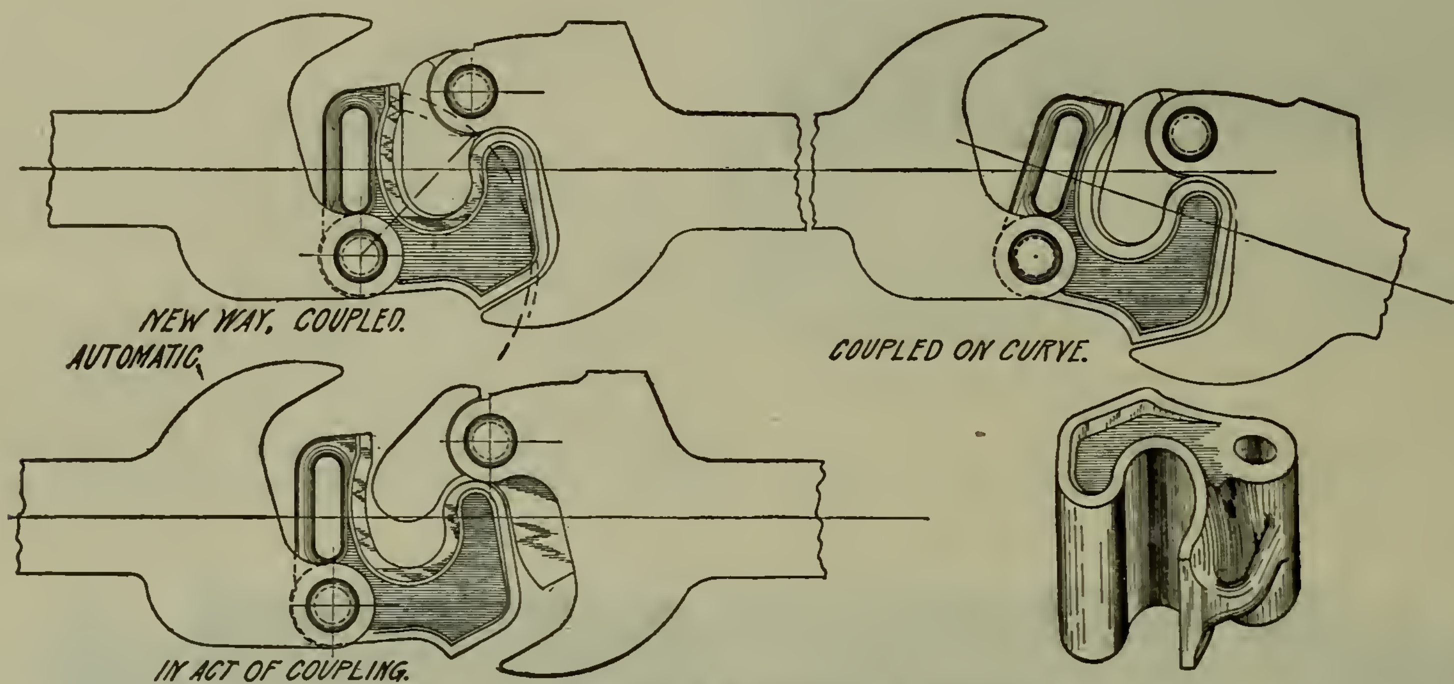
Figure 2A illustrates the tandem principle applied to channel shaped steel center sills. In this construction the draw bar yokes are provided with lugs engaging the follower plates, and elongated slots extending each side of the central equalizing pin, the front slots in the cheek castings are elongated each side of the front equalizing pin, and the drawbar is without an elongated slot. In drawing, while the rear follower block compresses the rear spring, the lugs upon the drawbar yokes, engaging the front follower plate, compress the front spring. In buffing the front equalizing pin moves rearwardly with the yokes, and the lugs upon the yokes and the spring spindle compress the rear spring. Both springs are thus equally compressed in drawing and buffing.

Figure 2B shows a construction having two springs arranged one above the other, the follower blocks being enlarged to present ample bearing areas for springs. The operation is the same as in Figure 1A.

The principles presented herewith are embodied in patents owned by the South Baltimore Steel Car & Foundry Co., Baltimore, Md.

The Hinson Emergency Knuckle

Another of Mr. J. A. Hinson's ingenious devices is presented herewith. It is on emergency knuckle, to be used when a knuckle is broken from a coupler and the proper knuckle is not at hand, instead of the old link and pin with slotted knuckle. It can be used in all couplers that use a pivot pin, and all couplers will couple with it automatically, no matter how short the curve. It is provided with a handle so that it may be conveniently carried. It has been thoroughly tested and a large number sold, which are giving perfect satisfaction. The coupling is just as secure as though they were both straight M. C. B. couplers. This is shown by the radial dotted line in the drawing, where they are closely coupled.



The Hinson Emergency Knuckle.

They cannot come uncoupled, for to do so the knuckle must move on a radius of dotted line from the pivot pin, and it is prevented from so doing by the arm that carries the handle bearing against the face of the mating knuckle. The concave face of the guard arm permits the easy coupling and uncoupling of the coupler that couples with it. It is obvious how much closer the coupling is than with a link, besides entirely eliminating the old, dangerous way of coupling with link by hand. It is also obvious that all future knuckles can be made solid face, and the old slotted knuckles discarded as they wear out, by the use of this knuckle.

The emergency knuckle is manufactured by the National Car Coupler Company, 525 Monadnock Block, Chicago.

The Car Foremen's Association
of Chicago
September Meeting

The regular meeting of the Car Foremen's Association was held in Room 209 Masonic Temple, Chicago, Wednesday, Sept. 9th, President Parish presiding.

Amoug those present were the following:

Bates, G. M.	Harvey, H. H.	Nordquist, Chas.
Bowen, E. W.	Jones, R. R.	Parish, L. C.
Bossert, Chas.	Jett, E. E.	Rohrback, G. T.
Carney, Jas.	Kline, Aaron	Roney, J. H.
Cardwell, J. R.	Kilian, H.	Stevens, C. J.
Depue, Jas.	Kramer, Wm.	Shannan, S.
Dahm, J.	Krischel, M.	Sielaff, R.
Elkin, J. L.	Krump, M.	Toweson, Otto
Fravel, G. B.	Kroff, F. C.	Treptow, A.
Griffiths, Geo.	La Rue, H.	Wensley, W. H.
Goodnow, T. H.	Longfellow, F.	Whartou, R.
Guthenberg, B.	Murphy, T.	White, P. W.

President Parish: The minutes of the previous meeting have been printed in the Railway Master Mechanic and if there are no objections they will stand approved as printed.

Under the head of Reports of Committees we would like to hear from the Entertainment Committee who had charge of the picnic.

Mr. Cardwell: I do not see Mr. Sharp here tonight to report for the committee, but as for myself I can report a mighty good time at the picnic. As treasurer of the committee, I will say that it was entirely independent of the treasurer of the Association and the expenses have all been arranged for and deferred and will not come out of the funds of the Association.

Mr. Wensley: I think a vote of thanks should be given the committee who had the entertainment in charge. I was unable to go myself but my family reported a most excellent time and I think Mr. Sharp and the other gentlemen should have the thanks of the Association. Motion put and carried unanimously.

President Parish: I want to say that a vote of thanks can not half cover what we ought to say to Mr. Sharp and his committee. It would be impossible to put it into words. The committee worked hard and made the picnic a success and I am sure all had a good time that were there.

Secretary Kline: The following have made application for membership:

H. Brandt, Car Inspector, C. & E. I., Chicago.

Chas. A. Doughesty, Storehouse Foreman, L. S. & M. S. Ry., Chicago.

Jas. G. Frank, Clerk, L. S. & M. S. Ry., Chicago.

Geo. H. Hanes, Foreman, L. S. & M. S. Ry., Chicago.

Fred Kittell, Chief Inspector, C. M. & St. P. Ry., Minneapolis, Minn.

John J. Martin, Clerk, L. S. & M. S. Ry., Chicago.

E. H. Nettels, Clerk, L. S. & M. S. Ry., Chicago.

C. W. Owsley, Clerk, I. C. R. R., Chicago.

W. O. Smith, Clerk, L. S. & M. S. Ry., Chicago.

P. M. Schmitt, Clerk, L. S. & M. S. Ry., Chicago.

L. H. Wessendorf, Piecework Inspector, L. S. & M. S. Ry., Chicago.

John E. White, Car Inspector, C. & N. W. Ry., Chicago.

Johu P. Wilson, Clerk, L. S. & M. S. Ry., Chicago.

President Parish: We will now take up the program of the evening. You will note from the notice sent out by the Secretary that the entire evening will be devoted to a discussion of the new M. C. B. Rules. There have been quite a number of chauges made this year and there are no doubt several points on which there will be a difference of opinion or which are not understood, therefore we wish to have as full discussion as possible. I would like suggestions from the members as to whether they wish all the rules read or only those in which changes have been made.

Mr. Bates (C. B. & Q.): Inasmuch as the whole evening will be devoted to this discussion of the rules I move you that we read the whole book and get as far as we can, the same as we did last year. Seconded and carried.

(It should be understood that those rules which did not elicit any discussion were thoroughly understood and found satisfactory.)

Rule 5. "If a car has defects for which the owners are not responsible, but which do not render it unsafe to run, nor unsafe to traiumen, nor to any lading suitable to the car, the receiving road may require that a defect card be securely attached to the car with four tacks, preferably on the outside face of intermediate sill, between cross-tie timbers."

Secretary Kline: Under the present method of handling cars at Chicago I would like to know how you are going to get that card on.

Mr. Bates: Some time ago we had a discussion here in regard to that matter and the question of exchanging defect cards as we did some years back was brought up. I think that it would be a very wise move, if we were to go back to that way of doing business for the reason that we receive a good mauy foreign cars, and even our own cars, with defects, that we cannot repair under load, which, if we used these cards would be allowed to go on, the repairs to be made wherever the car lands. Under the present way of doing business we have to accept the car without making repairs or carding it, and request the card by letter from the delivering line. When the card is received it requires a whole lot of tracing to locate the car and find where the repairs were made. Only a few days ago we had four or five different bunches of papers in our office referring to cars which we have not yet been able to locate. By applying these defect cards we could avoid all this unnecessary work and I think the matter should be brought to the attention of the heads of the different car departments with a view of getting their consent to resume the old plan.

President Parish: I might say that a short time ago this same question came up at Detroit. We were having a great deal of trouble there passing cars through the city, and one of the lines asked to have a meeting called to discuss this question of issuing cards at the time that the defect was discovered and they have at present practically gone into the practice that we had in Chicago a few years ago of placing defect cards in the hands of the other roads. There uever was auy objection to furnishing these cards and the matter simply died out when the rules were changed, but I think we are issuing as many cards to-day as we ever did under the old rules.

Mr. Kroff (P. F. W. & C.): I think the way the rules are uow we do not seem to have a great deal of trouble. Years ago when we had that scheme the rules were not as clear as they are now. It might help in some cases but I do not think there is enough of it to go to the expense of furnishing each road with these duplicate M. C. B. defect cards. We have not experienced a great deal of trouble on our line. It is true there are a good many defect cards furnished at the present time, but that is mostly due to missing material and as a rule this material must be applied before the cars can go out on the road, brake shoes and the like of that. and I do not know whether it would be a good scheme to recommend it or not.

Mr. Bates: As far as the expense is concerned I believe it would hardly be anything. I think it would be a saving. If we should receive a car from the Ft. Wayne that was going out ou our line, with the whole side of the roof raked, and under load, it would be much better if we had a defect card to put onto the car at the time and let it go than to request the card by letter and trace for the car afterwards. There is considerable expense in trying to locate a car or to find out where the repairs were made, whereas if the card is put right onto the car when received there would not be the expense of tracing. You would have to furnish the card anyway, unless you received the car from us in the same condition and in that case we could furnish you an offset card. I think that cases of this sort would be very few, because if we had any understanding of this kind it would have to be understood that the cards would be used only in case of new defects.

Mr. La Rue (C. R. I. & P.): I think that your statement in regard to the defect card business very appropriate, and that was that it died of its own weight and also I think the resolution passed here in regard to roads exchanging defect cards, died of its own weight. I never did believe in anybody giving a signed blank check book to anybody else, with a lien on your account. and I do not think any defect card should be issued without question. We have worked all right under these rules as they are, and as I said before, I am utterly opposed to allowing somebody else to make out your defect cards for you, and I believe that I can firmly say there will be one road that will not be a party to such an arrangement, because we have discussed it pretty thoroughly.

Mr. Kroff: I would like to ask Mr. Bates whether he would have many occasions to apply these defect cards under the per diem ruling that is in existeuce now.

Mr. Bates: As far as I can see the per diem rules have nothing to do with the application of defect cards. If you deliver us a car with new and cardable defects which do not make it unsafe, I simply apply your defect card. I cannot see where dishonesty can play any part as it does not make any difference whether I apply that defect card or ask you to furnish it. Now if we issue a card, and send you the stub, you have just the same right to question that, as you have when we send you a request for a card. I canuot see any difference between the two methods.

President Parish: I think nearly all the roads recalled their cards. I will say that I discovered a book the other day that had never beeu recalled, and it set me to thinking. I asked our chief inspector to go into the matter and he found a number of roads that said they had quite a number of cards that they were unable to get on the cars because they could not locate them and we have a great number of such cards in our office at present, I cannot say how many, on which we have traced all over the country trying to find the cars. Understand it makes a great deal of difference in this matter of cards whether you handle many foreign cars or not. One road might not have many occasions to use them. The Pennsylvania Company may have a very small foreign mileage while the Lake Shore has a heavy foreign mileage. That would make quite a difference in these cards.

Mr. Wensley (C. & E.): About the only objection I see to this is that it would make more work for the inspectors, and they have about all the work they can do now. It would be taking work off the clerks and putting it on the inspectors, and the inspector puts in about three hours a day more than the clerks now.

Mr. Bates: I would like to ask Mr. Wensley what extra work that would make for the inspectors. I cannot see that it would make any more.

Mr. Wensley: The inspectors now have to carry a bunch of the different bad-order cards, etc., and their books for writing the records they take and if they had to carry around a bunch of everybody's defect cards they wouldn't be able to get around at all.

Mr. Bates: For the information of Mr. Wensley I would say that we never found it necessary to let the inspector carry this book around in his pocket. In fact he could not do it as we would require a dozen different books and he would need a dray horse to take them around with him. We would keep them in the shanty under lock and key and make them out there when they are needed. If the inspector does not have this card he would have to write out a report and it would amount to the same whether he writes in on the defect card or on some other paper.

Mr. Goodnow (L. S. & M. S.): In line with the extra work on the inspectors in making cards out, I think if it was followed up and take the number of cards that we cannot locate repairs and bill on would more than offset one man's time in taking care of that. The number of cards we get where we cannot locate cars and consequently cannot make any use of card, you have no idea of what it runs to in dollars and cents and that means money to the company the same as any other revenue. Lots of these cars we trace east and especially in case of damage by raking and similar nature we find they are delivered to the New York Central on notation, and are passed to some other road on notation and so on all over the country and finally they become old defects and nobody takes record of them.

Mr. Wensley: That might be all right so far as the clerical force is concerned but it seems to me this Association is trying to place more work on the inspectors, and at the present time there is no inspector that has any time to play. There are times when we have a half hour to write up our records, but where the trains come in, one, two, three, four, or maybe all come in at the same time, and there are no more inspectors placed in the yard when there are ten trains than when there is only one. You have got to get those trains looked over in a half an hour, often. There is no company that I know of at the present time that is going to put on extra inspectors in order to get defect cards on the cars, and I think instead of taking work off the clerks and putting it on the inspectors we should take it off the inspectors and put it on the clerks.

Mr. La Rue: As I said before, the defect card died of its own weight and we have got motions, etc., on our books that are dead letters, and that motion that was referred to some time ago went through with a hurrah. I am in favor of some other Association taking this up. I am not in favor of any defect card being issued without first being questioned.

Mr. Jones (B. & O.): During the time those M. C. B. defect cards were furnished the different roads there were several cases where a card would be put on for defects and the defects did not exist on the car. I know of a case at the Stock Yards where a card was put on for two sills cracked and a coupler cracked and when the car came back we called the inspector that attached the card to the car, over to inspect the car,—it was a new car, and he could not find the defects on it. I know a good deal of crooked work was done at the time those cards were furnished the different roads. I would not be in favor of placing those cards back again.

President Parish: This is purely a local matter that we are discussing, not the M. C. B. Rules. The Car Foremen's Association of Chicago is looking after the interchange at Chicago, in this case and not the M. C. B. Rules.

Mr. Goodnow: I do not see where you have any protection if you issue cards on the receiving road's record, as is done at Chicago. We are issuing cards and tracing for our own protection afterwards.

Mr. La Rue: That is just the reason why the defect card should always be questioned and I think it is the rule with nearly all roads to question every defect card that is issued.

Mr. Fravel (Penna. Co.): In the first place the idea of having the defect cards in the hands of foreign lines, not only existed at Chicago but was in effect at other places some years ago. So far as the Pennsylvania Co. is concerned it has been entirely abandoned and I think the management would refuse to sanction such an arrangement. It does not seem to me that such an arrangement is necessary. The condition generally exists on your own car that is going out on your own line, and if you cannot make the repairs and you cannot get hold of a defect card, which is generally the case at Chicago on account of conditions peculiar to the place, you can place a card of your own on the car, stating the defects and where card can be procured and if your defect card accumulation is enough to warrant it that will certainly overcome the trouble and will leave the defect cards where they belong,—in the hands of the road issuing the card. That, I believe, would overcome the trouble entirely, at least so far as your own cars are concerned.

Rule 10. Wheels under cars of 80,000 pounds capacity or under with flanges 1 inch thick or less. Wheels under cars of over 80,000 pounds capacity with flanges less than 1 1-16 inches thick.

Mr. La Rue: I do not think that is just right, there. In the first part it says "1 inch thick or less" and in the last sentence is says "less than 1 1-16 inches thick." Now is 1-16 to pass or condemn it?

Mr. Bates: As I understand this, a car of over 80,000 pounds capacity having a flange 1 1-16 inches thick is condemned and whenever the opening on the notched end will go down on the flange of a wheel under a car of over 80,000 pounds capacity it is condemned under these rules.

Rule 35. Locks, side doors, grain doors and all inside or concealed parts of cars missing or damaged under fair usage, and failure or loss under fair usage of any part of the body of the car, except as provided for in Rules 39 and 85.

Mr. Wensley: I would like to ask the Car Foremen what they intend to do with that side door question,—whether they will pick them up and put them back in the cars or make kindling wood for the engines.

Mr. Kroff: I wonder why they left out the end doors.

Rule 39. Material missing from body of cars offered in interchange, except locks, side doors, grain doors and all inside or concealed parts of cars.

Mr. Kroff: I think we ought to talk this matter of side doors over. The yards will be laying full of them if we do not come to some conclusion. I do not think we ought to let that question drop. I think we ought to come to some understanding as to what is to be done with them.

Mr. Bates: As far as the C. B. & Q. is concerned we shall try to put the side doors back in the cars where we find them, but when they are lost in the yard there is nothing we can do but let the cars go home to the owners and they will have to put on doors and stand the expense themselves.

Mr. Wensley: Supposing the delivering line will not take the car if the side door is missing.

Mr. Bates: They do not have to. They can compel the delivering line to make the repairs, but if it is their own car they must accept it with the door missing.

Mr. Wensley: Now if Mr .Bates on the C. B. & Q. gets a C. M. & St. P. or an N. P. car on his line and sends it over to me about seven o'clock in the evening to go out on our 7:15 train, the car is loaded and there is a side door missing, should I send that car back to him and delay the freight twenty-four hours, or make repairs? I am making a rack forty feet long to hold foreign side doors. I think the best thing the car men can do is to get together and agree to pick up all the side doors and put them on the cars.

Mr. Bates: In regard to what Mr. Wensley has just said relative to a loaded car coming to his line with side door missing, I can see but one way to handle them and that is the way in which we have handled them in the past. If we receive a loaded car from another line, that is going out on our line, we have to make the repairs or transfer the freight, as we see fit. If we receive a foreign car from another road with a side door missing, and the contents require it, we replace the door. Under the old rules we got a defect card but under these rules we can charge the owner for the door which we apply. If we are given a foreign empty car with missing door we will not accept it but will send it back and let the other fellow put on the door and charge the owner for the same and that is the way we will have to continue handling this business. It ought to be the duty of every road to put these side doors in the cars where they belong, wherever possible, because we should not beat the owner out of a door when it is lying before us.

Mr. Kroff: I would like to ask Mr. Bates why he would not accept a foreign car with side door missing.

Mr. Bates: One reason is that if we should take a car into our shop we would have to pay per diem to the car owner while the car was undergoing repairs. This being the case I think it no more than right for the party who lost it to apply the door. He can bill the owner just as well as the receiving line and he is the one who should pay the per diem.

Mr. Wensley: That is something we do not do on the Erie, is to return any man's car. We make all repairs to foreign cars that come to us. I went out in the yard to-day and counted the side doors and found that we had 115 doors standing in our yard. We have doors of all description. If we make a request on the Belt, or the C. B. & Q. or the C. M. & St. P. for a side door missing, they will generally send a side door in place of furnishing a defect card, but it does not make any difference, as we can generally find a door that can be made to fit properly. We can still charge 20 cents for re-hanging side doors and I think the doors should be put on in all cases.

Mr. Kroff: If we go to returning those foreign cars, would not that tie up a good many cars and make unnecessary switching for side doors? It seems to me that the switching cost is a great deal more than the side door. There ought to be some understanding as to how we are to handle those things. Chicago is quite a receiving point and it is quite a job nowadays to get rid of a foreign car. You have got to put the foreign car in the best of shape in order to get it home. It is more trouble to you than to make a new side door. I think we ought to come to some agreement as to the best way to handle it around Chicago.

President Parish: That is where this Association can be of great benefit, to settle such questions as this locally.

Mr. Wensley: The switching charge for a car going over the Belt is $1.50 I think. That would pay for a new side door. I think we should all get together and agree to put the doors on. If we get a car from connecting line with a side door missing we put the door on and keep the car going.

President Parish: I would like to ask how many Chicago roads are returning empty cars to conections for missing side doors?

Mr. Shannan (L. S. & M. S.): The Rock Island and the C. B. & Q. send empty foreign cars back to us on account of side doors missing.

Mr. White (C. & N. W.): In regard to Rule 35 and 39 in the new Book of Rules will state that it is a very good rule to have for all the roads in general. We refuse cars on account of side doors missing when coming to us, going for a load. We cannot accept them or put door on, on the road. For instance we receive an ampty Erie or B. & O. car with missing side door. That car is not fit to load as an order car, so we refuse car or have the delivering road repair it and we would not expect the same road to take our order cars with side doors missing from us; but if we receive a car, for instance a U. P. or an O. S. L. car coming home loaded, we accept car in that condition and send it home loaded, or if it is empty we load it with coal or other rough freight and send it home or board up doors if other freight and I would think the other roads would do the same with the R. W. & O and L. V. cars and others that are home via their lines under the same circumstances and let car go as an owner's defect. I further think this is a very good rule for the reason it will simply make some of the roads put on doors that will stay on. We receive and deliver about 800 cars a day, to and from the Belt, on records, and we do not issue or receive any cards for 30 days after the cars pass us. We have no trouble whatever to get anybody to issue cards when called for.

Mr. La Rue: If the car door is hung with suitable fixtures and fastened at the slide I do not think there will be much trouble with those doors dropping off. As the gentleman says, I think when this side door question is thoroughly ventilated, some of the means to further this end are mis-construed, but I think that there will be considerable more progress made in making doors less apt to fall off of the sides of cars. Some companies spend considerable money to get fixtures that the doors will not drop off and the cars will have to be side-wiped or something of that kind before the doors will be lost, and other companies pay no particular attention to it at all,—more especially some private line companies. They think any old door that hangs on until the car inspector gets through with them, is good enough, but under these rules they must do something to keep the side doors on or pay for new doors. If he gets pinched he must not squeal.

Mr. Wensley: I was out in our yard a few days ago and saw a 60,000 pound capacity car, a brand new car, with a side door supposed to be No. 1. A bunch of cars came down with what the switchmen call a "gentle tap" and struck that car, the door went up in the air and came down on the ground. I don't believe there is a door made that will stand the switching the cars receive and stay on the cars.

Mr. Treptow (L. S. & M. S.): I agree with Mr. La Rue that the owners should try to make doors that will stay on. There are two kinds of doors that are causing us trouble. One has a rail for a slide at the bottom and at the top it catches about half an inch and everytime the car gets a kick it jumps up and the door falls off. The other door has the hangers fastened with wood screws. It does not take long for the hangers to work loose and let the doors fall off. If the door hangers were secured with bolts in place of wood screws I think we would not have half as much trouble. Others have the door caps and distance blocks not properly secured. I think it would pay the owners to put on doors that will stay on. Of course now a side door is not a cardable defect and the owner will have to pay for new doors and also pay 20 cents for re-hanging a door, which would soon pay for making a door and hangers that will stay on.

Mr. La Rue: I do not want you to go away thinking that all our doors and fixtures are so they will not come off, because on cars of some of the lines that have been acquired the doors are just as bad as any other doors, but when this comes up it will be a double incentive to companies to furnish means whereby these doors can be fastened so that it will be impossible to get them off without having to side-wipe the car and I am just as anxious as any body else to see that we have fixtures that will keep the doors on.

Rules 46 to 54.

Mr. Guthenberg (C. M. & St. P.): I would like to know from some of the gentlemen here whether a coupler pocket and a coupler stop forms a combination.

Mr. Bates: I should say it does not. Rule 47 mentions "Damaged coupler pocket, spindle or their substitutes, accompanied by damage to either draft timber or its substitute, or end sill." It does not include the coupler stop.

Rule 58. In making repairs for which the owners are responsible, 30-inch and 36-inch wheels may be replaced with 33-inch wheels if practicable. If changes are necessary in order to bring the car to the proper height, the cost of so doing shall also be chargeable to the car owner.

Mr. La Rue: In regard to Rule 58, does anybody know anything about the rejection of cars with less than 33-inch wheels?

President Parish: I understand that some roads refuse to accept cars with wheels less than 33 inches.

Mr. Treptow: I believe the Santa Fe has refused to accept cars with wheels less than 33 inches.

Mr. Carney (M. C.): They have gotten out a circular to that effect.

Mr. La Rue: I think that statement is right, that a western road has issued a circular that they will accept no more cars with wheels less than 33 inches in diameter. I think that is done on account of through car shipments of freight, they not having wheels to replace the small ones in case of worn out wheels. I think it is a very good plan.

Rule 63. Center sills or draft timbers must not be spliced. All other sills, etc.

President Parish: I would like to bring up a question which is liable to bring forth a lively discussion, and that is, is it not good practice to splice center sills? The rules say it shall not be done, but would it not be good practice to splice center sills on your own cars instead of throwing the sills away when they are damaged but slightly on the ends?

Mr. La Rue: You have brought up a question that I have not thought much about. I have spliced center sills, but they were on our own cars that were used in the center pit or something of that kind, never to use in interchange. Mr. Parish has brought this question up and I hardly think he is doing right or doing justice to the car owner.

President Parish: I refer to home cars.

Mr. La Rue: Granted, but your own cars are not always on your own road. Your cars are interchanged from one ocean to the other and to open the gate for the splicing of center sills at the present time I would protest very emphatically against. I know there are times when you have a foreign car on your repair track, the sills are slivered a little on the ends. You look at it and you say, "Well, I can bolt that up but I dare not do it." It does seem sometimes that it is a useless expense, and then again with the great number of roads that repair cars, and that repair foreign cars, and the class of men that we have got at this time and age making these splices on these cars are not men that we can brag about their skill in making a joint. Now if the center truss rods to the car are between the center sills, then there would be some justification in making a splice on the center sill, but on a great many of the cars, especially old cars, that have damaged center sills, to splice them,—there are a good many cars that have only two truss rods in them—that brings too much strain on the center sills to admit of splicing, in my opinion, and as I said before, I am not ready at this time to favor splicing center sills. The time has not yet come to do that.

President Parish: My object in bringing this question up is simply to bring it before the public. All sills in a great number of sleeping cars are spliced and a great number of sills are spliced in freight cars, including center sills, which are covered up so you cannot see them. This question is a little radical. That is the reason I brought it up.

Mr. Fravel: I would like to take exception to part of Mr. La Rue's statement wherein he says the time has not yet come for splicing center sills. It seems to me the time has come if it ever is to come, because it will not be long before we will see the wooden sill disappear entirely. It seems to me the time has come if we want to economize on car repairs, to make repairs to wooden cars as cheap as we can. Everybody knows that all passenger cars which are built to-day have spliced sills, including center sills, and if we do it in passenger cars why not in freight cars? I do not see any objection to it. I think it would be good practice where the sill is damaged on the ends, that instead of putting in a new sill we splice the old one, as it would save considerable money in the cost of repairing cars in the ends. We figure that the wooden car is going out of date, in fact they are being destroyed very rapidly, and we expect the future car will be a car with steel sills at least,—in fact we know that the car of the future is to be a metal car. If the wooden sill is going out of date why should not we repair them as cheap as possible?

Mr. La Rue: What I had reference to in saying that the time was not here for splicing a center sill was, as Mr. Fravel has stated, that the steel underframing is surely here to stay and the time will be here soon when the wooden car sill will possibly not be used in interchange. Then will be the time when you can splice center sills.

President Parish: We will probably have a few million wooden cars here for some years yet.

Mr. La Rue: If you are tied down to weight, as I have been, you will be tied down to the wooden sill because I do not think I can keep within the limits and use a steel sill.

Mr. Roney (S. O. Co.): It seems to me with the length of trains being used to-day and the powerful lading and tonnage that is carried in those trains that it would certainly be folly to begin weakening cars. Instead of that I think we ought to advance every possible means to strengthen them, as certainly splicing a center sill weakens it, especially in an old car where the body is humped up and if it is empty there is nothing to keep those sills from going up in the air when the cars come together and perhaps causing a serious wreck.

Mr. Jones: I believe a spliced center sill is just as good as any other sill. You will find that the sill will break each side of the splice. The road I was with has furniture cars and they did not have sills long enough and they had to splice the center sills. They have never had any trouble with them and they seem to be standing it as well as any sill that is not spliced.

Mr. Elkin (S. R. C. Co.): I will say this about splicing center sills: I have gone into the shop and seen broken center sills. It was a good solid sill, split a trifle at the end. I have wanted to splice it but I never have. I did not dare do it. I believe it could be spliced and leave the sill as solid as when it was new.

Rule 64. Wheels on the same axle must be of the same circumference. No wheels to be applied to foreign cars that the dates cast show them to be over six years old.

Mr. Wensley: That seems to be a hardship on the railroad companies throughout the country. I had a car go out on our line, it was a refrigerator car, and we ran it twenty-four miles. We received it, presumably in good condition, loaded with cabbage. The car came back with a hot box. I jacked the car up and found a badly cut journal. It was a rush car and we had to take the wheels out and I looked at the wheels and found that both of those wheels were over six years old. I looked over the wheels in the yard and could not find any second-hand wheels that would fit and had to apply a new pair of wheels. I could not take that same pair of wheels and put them on another axle and apply them to that same car. I think there ought to be some change made in that rule right quick.

Mr. Treptow: I believe this change was recommended by the Arbitration Committee. I remember when they decided a case where a western company put in a pair of second-hand wheels and they ran this car over that division and at the next division point another inspector found the wheels defective and applied another second-hand pair of wheels within eight days, and they stated at the time that some change should be made to keep one company from applying old, worn out wheels under another company's car.

Mr. Wensley: In this case the wheels were both good and I think we should allow second-hand credit for second-hand wheels and no charge for truing up the journal.

Mr. Jones: I think if I had a case of that kind I would press the wheels off and put them on another axle and use those wheels again.

Mr. Knoff: I do not understand what you could do, only condemn it under old age. What is not good enough for the other fellow is not good for you and the only thing to do was to condemn the wheels. Of course on your own cars you can work to suit yourself as to the age of wheels.

Mr. Wensley: Rule 87 reads: "Bills rendered for wheels and axles shall be in accordance with the following schedule of prices for material, with the proper debits and credits; and with an additional charge for all labor for each pair of wheels and axles removed from all arch bar trucks of $1.75, and from all solid pedestal trucks of $2.00. If new wheels and axles are substituted for second-hand wheels and axles, proper charges and credits shall be allowed."

Mr. Kroff: That is true, but a wheel over six years old is no good.

Mr. Wensley: The wheels I removed were not defective at all only they were over six years old, at the same time the wheels were sound and good. I could not scrap the wheels on account of any defects.

Mr. Kroff: The only way I understand this rule,—No wheels to be applied to foreign cars that the dates cast show them to be over six years old. Now then, the point is, if I remove a pair of wheels from a foreign car, one wheel is scrap and the other wheel is good for use yet. Now the car owner says I cannot put under his car a wheel that is over six years old. Now then it is worth scrap so far as the car owner is concerned. Of course I believe owners of cars can handle that thing to suit themselves.

Mr. Wensley: Do you think the rules would bear you out in scrapping that wheel? Suppose you send that wheel to the shop and the shop inspector looks at the wheel and finds it good. Do you think he will scrap that wheel?

Mr. Kroff: As long as the foreign road does not accept it why should the other fellow pay for a second-hand wheel? That is the point.

President Parish: Then would you consider if you removed that wheel as scrap on account of being over six years old that you would have the privilege of using it if you saw fit?

Mr. Kroff: I do. It would work a hardship on some roads handling a lot of foreign cars in a case of that kind, but it is not right that we should give second-hand credit for wheels that we cannot place under their cars. Where one wheel is worn out and the other seems to be good, but over six years old, I think it is the proper thing to scrap the wheel and bill the owner.

Mr. Bates: I am of Mr. Kroff's opinion. If I take a pair of wheels from under some foreign car on account of one wheel over six years old, I would certainly scrap both the wheels. If the owner objected I should refer the matter to the Arbitration Committee to get a ruling on it. But if I take out a pair of wheels on account of a cut journal that our road had cut I could not make any charge whatever against the owners of the car.

Mr. La Rue: I do not know any way except as Mr. Bates says, to get a ruling on that is to scrap the wheel and the ruling might be contrary to what we would conclude here this evening. The idea that a wheel being worn out would condemn the other, I think is hardly right. You will often find in mounting second-hand wheels that there will be two or three years' difference in their ages. It seems to me that such a rule as that would be a good idea. This was brought very forcibly to my mind a few years ago in tearing up one of our outlying repair stations that had been closed. There were two pair of wheels with odd sized journals for foreign cars returned and I found they were cast in 1893 and of course the gauge for 1893 and the gauge at the present time are totally at variance, possibly ¾ inch, and if those wheels had happened to have been applied it is more than likely that the damage caused would have been more than the few times we would have to apply new wheels in place of second-hand in circumstances like Mr. Wensley has noted. I think the idea of this rule has particular reference to the heavy capacity cars. It seems to me to be a firmly established fact that the high capacity cars, the service on the wheels is too severe and that the guaranty of cast iron wheels for five years and five and a half years will hardly be carried out by the service of the cast iron wheels and that is my impression was the reason why this rule was put in here.

Meeting adjourned.

The Thirty-Fourth Annual Convention of the Master Car and Locomotive Painters' Association of the United States and Canada

The thirty-fourth annual convention of the Master Car and Locomotive Painters Association of the United States and Canada was held in Chicago at the Steinway Recital Hall, rear of Victoria Hotel, on September 8 to 11, 1903. In the absence of President W. C. Fitch, the convention was called to order at 10:25 a. m., September 8, by the first vice-president, Chas. A. Cook, who acted as chairman throughout the convention. The meeting was opened by singing "My Country 'tis of Thee," Mrs. Kahler presiding at the piano. After remarks by First Vice-President Cook, prayer was offered by Rev. Mr. Wolcott in the Episcopal form, preceded by the recital of the Lord's Prayer, in which the convention joined. In the absence of any city official to offer welcome, Mr. James A. Gohen made an address and the convention again joined in singing the hymn, "Nearer My God to Thee." When the chairman had made opening remarks and the irrepressible Samuel Brown had recited the poem, "Old Glory"—"'Neath the Banner That Betsy Made," the ladies retired and the business of the convention proceeded, a full report of which follows:

Chas A. Cook, President.

The Chairman: It is quite time that we were opening our session. We have been waiting for the delinquents to come in, and we do not feel justified for those who are already here to wait any longer. First of all we will unite in singing "America."

Song.

The Chairman: I wish to explain to the ladies present, and to the members of the association, that this is your vice-president's first appearance upon the stage. A year ago at the city of Boston, the association elected Mr. W. C. Fitch as president. Since then Mr. Fitch has retired from railroad service and gone into business on his own account. I received a communication from him, asking me, as your first vice-president, to assume the duties of the president. That is the reason I am presiding at this meeting.

It has been our custom for years to invoke the Almighty's blessing, both upon our business proceedings and upon our innocent pleasures while in convention assembled. To that end I have invited Rev. Mr. Wolcott, of Trinity Church, Hyde Park, to be present with us this morning; he has kindly accepted and is now here, and while we are standing, I will ask Mr. Wolcott to open the thirty-fourth annual meeting of the Master Car and Locomotive Painters' Association with prayer.

Prayer.

The Chairman: In assuming the duties of the presiding officer of this association ,I will rely entirely upon the hearty sympathy and co-operation of each individual member. The measure of success which we aim for can only be attained where there is a common bond of interest which unites each unit into a compact mass. The conventions of the past have always been characterized by a high order of things, and I sincerely trust that this convention will not only be no exception to the rule, but may, by your individual zeal and interest and ambition, be fraught with more than the usual amount of interest and benefit to the association. On your part, kindly accord to me the sympathy, courtesy and invariable thoughtfulness that you have always given to my predecessor, and that will enable me, on my part, to preside at the sessions of this convention, I trust, to your entire satisfaction.

We have had impressed upon us yesterday that this is one of the greatest cities of this great country of ours. Yesterday we saw thousands upon thousands of the toilers as they passed in review before us, and we could not but wonder at the great results of that enormous volume of labor within the confines of one municipality.

We have come to Chicago as representatives of the great railroad systems of the country; for the time being we are co-workers with the citizens of Chicago. We have come here in the interests of progress and advancement as applied to the maintenance of railroad equipment. It is with no little disappointment that I have failed, and others with me, in securing some one in an official capacity to welcome us to this great city. I am loath to believe that we are not welcome. I fully believe we are, and that the hospitality of the city will be ours. Still, I had hoped that some one would have been here to represent this great city. As no one is here to make an address of that character, I am going to ask Mr. James A. Gohen, who, I do not think needs any introduction to the members present, or the ladies, to say a few words to the convention.

Mr. Gohen:: Mr. President, Ladies and Gentlemen: It does seem somewhat strange that we are not welcomed to the city of Chicago by some official. It has been customary for a number of years past, notably so at Philadelphia, Detroit, and other cities; Buffalo also, and you will remember we met there when our beloved president was in the throes of death, yet the mayor of the city, although very busy at that time, found ample time to come down and say a few words of welcome to us. Our committee last night tried to find some one to welcome us to the great city of Chicago, but the mayor, it seems, is out of the city, the corporation counsel is out of the city, the attorney is out, and the acting mayor, who, I understand, is a very eloquent man, is so busy that he could not come. He is the only man that is actually running the great city of Chicago, and in his behalf I want to apologize, for I know he must be so much occupied that he could not possibly come down and see a few painters.

However, as we are cosmopolitan and metropolitan, and all those things, we come here to Chicago whether the mayor wants us to come or not, and if he does not like us, he can stay away from our convention. However, that is all right.

Ladies and gentlemen, in behalf of the Master Car and Locomotive Painters' Association, we welcome you to the city of Chicago. One hundred years ago there was a little wooden fort and block house standing right up here at the corner but a few blocks away. Mr. Bigelow and myself and some other gentlemen passed by there only a short time ago, and we saw there, upon the wall of a large mercantile establishment, a tablet, showing where this great city of Chicago had sprung into existence just 100 years ago. Mr. Bigelow explained to me as we came along, about the escape of the people who were in that fort from the Indians; they had driven them out of this blockhouse, and it seems they had gotten down about as far as Mr. Pullman's residence when the Indians overtook and massacred them. That was the foundation, the beginning of this great city; there is no question but what it is the greatest city on earth, taking everything into consideration. New York, London and Paris, none of them can compare with Chicago so far as its years go. It is undoubtedly a thriving, bustling, great city, and I know that those of you who are not in the habit of coming here, who are strangers here, will find many pleasant places of interest, and that, when you go back home, will give you plenty of food for thought for a long time to come.

Now, I am not prepared to make you any extended speech, or talk to you about this great city, about its fine parks, its great buildings, or fine streets, or anything like that, but I will just say to you that I welcome you in behalf of the Master Car and Locomotive Painters' Association to the city of Chicago; go out and enjoy yourselves, and I know you will have a good time. I thank you. (Applause.)

The Chairman: Before we permit the ladies to retire, we will unite in singing, "Nearer My God to Thee."

Song.

The Chairman: Just one other word before the ladies go, and that is to say, I do not think it is necessary to tell them

Robert McKeon, Secretary and Treasurer.

how glad we are that they are with us. Our conventions would not amount to anything if they did not come along and attend our opening sessions. We are always glad indeed to have you with us, and it is a great privilege and pleasure that we look forward to at our opening session, and also at our closing session. You will probably recognize the fact that I am rather in the character of an accidental president, and I have no address ready for the convention at this time. In fact, I do not think it is necessary that I should say anything further than I have already said, and the ladies are now at liberty to retire, so that we may begin our business session.

Mr. Brown: I beg pardon, but I would respectfully ask to interrupt the retiring of the ladies for a few moments.

Invariably we have had mingled with our gatherings the flag of the country; it is absent today, and it seems to me that really God and country ought to go together. The reverend gentleman called our attention to that part of it. The ladies have assisted us very largely in singing hymns that are somewhat connected with it, and, if you will kindly excuse my presumption, I will read a few lines that bear on some of the grand work that the ladies are entitled to share in. No doubt we all know that the first flag of the our country was made by a lady, Betsy Ross, and I feel the ladies are entitled to a great deal of consideration, and certainly they ought to feel proud of the fact that one of their sex was the maker of the first flag of the United States, and in connection with that I quote the following:

"We have christened it "Old Glory,"
As it floats upon the breeze,
Rich in legend, song and story
On the land and on the seas.
Far above the shining river,
Over mountain, gorge and glade,
With a fame that lives forever,
Floats the banner Betsy made.

When at last her needle rested
And her cherished work was done.
Went the banner, love invested,
To the camp of Washington.
And the glorious Continentals
In the morning light arrayed,
Stood in ragged regimentals
'Neath the banner Betsy made.

H. M. Butts, Second Vice-President.

Years have passed, but still in glory,
With the pride we love to see,
Laureled with a nation's story,
Waves the emblem of the free.
From the rugged pines of Northland,
To the deepening everglade,
In the sunny heart of Southland,
Floats the banner Besty made.

Now she sleeps, whose fingers flying
With the freedom ever true,
Mingled colors, bright, undying,
Fashioned stars on field of blue.

It will lack for no defenders
When the foreign foes invade,
For our nation rose to splendor
Aye, 'neath the banner Betsy made."(Applause.)

An intermission of a few minutes was here taken, during which the ladies retired.

Mr. Gohen: We have been invited to visit the stockyards and packing houses. The Armour and Swift people wrote a letter some time ago to Mr. Taylor, whom you all know, and he referred the letter to me. I have told the parties that I would bring the matter up immediately on our convening, and I think we ought to appoint now the time when it would be most suitable for the convention to go there. We would have to go some afternoon, however, because it would take a full half day, they say, to visit all the packing houses and stock yards, so I wish to make this announcement to you and then let the convention take action upon it, and you can decide what afternoon you wish to go there. I would suggest you make it either Wednesday or Thursday afternoon; it would not do to go today, nor would it do to go Friday. We ought to let them know right away.

Mr. Quest: Would not that interfere with the supply people?

Mr. Gohen: That is why I make this announcement now. I am going down to the supply men and notify them when the association decides to go over there, and it will be all right for the supply men; I am going down to see them immediately when the decision of the association is made.

The Chairman: Does the association wish to take some action on a motion as to when we shall make this visit?

Mr. Gohen: Mr. President, I move that we go there on Thursday afternoon. That will give us time to do considerable of our business in the meantime, and we can hurry the thing up, if possible, and would not let it interfere with our business.

Motion to accept invitation for Thursday afternoon was put to vote and carried.

Mr. Brown: I understand that the Traveling Engineers are in session almost in the next block to this. I move that a communication be sent to them, congratulating them on their meeting and wishing them success and good luck and God-speed in their sessions. Will the secretary frame that in proper shape, as my language is not just right?

The motion made by Mr. Brown was carried, and the following communication was sent in compliance therewith:

Traveling Engineers' Association, Chicago, Greeting:

At the opening session of the Master Car and Locomotive Painters' Association it was voted that a fraternal greeting be extended to the Traveling Engineers' Association, now in session in this city.

A. P. Dane, Acting Secretary.

The Chairman: We have with us one of our honored members whom we are always delighted to welcome, and who always says to us words that we are glad to hear. Owing to press of business, Mr. Brazier cannot remain with us as long as he would like, so I am going to give him an opportunity to speak to us at the present time.

Mr. Brazier: Mr. Chairman and Members: When the acting chairman, or accidental president, as he calls himself, and which I trust he will make as good a one as the President of the United States, stated that no one had been found to extend a welcome to you from the city of Chicago, I had a hard time to keep my seat, for I think I could have acted in that capacity, having been for about seven years an Illinoisan, and I assure you that we are glad to see you here. However, I would like to say something else to you now.

I think you made a little error when you sang, "My Country, 'tis of Thee," in your opening. You represent the United States and Canada, and of course we want the good feeling and sympathy of our Canadian brothers, and I know they pitched right in and sang the song with us, and it meant no offense to them. I have a right to say this, being an honorary member of this association. I want our Canadian members to know that we feel that America is so big and strong that we sometimes forget and think that we own the whole country, yet we have a warm spot in our hearts for our English brethren, and we trust that you know you are welcome here.

It has been my pleasure to meet with you before. They say I am myself a painter since meeting with you and you honored me in St. Paul by making me an honorary member. Today I have the pleasure, and not only the pleasure, but the honor, of being the president of the Master Car Builders' Association. I want to say that the Master Car Builders' Association, which is the mother of all railroad associations, has a deep interest in your association, and I am glad we have four representatives here. We believe thoroughly in men attending conventions, in fact, we send our men; they have the privilege to go and examine and hear; and in that way we learn, and in that way men get promoted, by learning. Mr. Butts has been here for two weeks, simply learning something, finding out whether we are behind the times or not, and in that way we get the benefit of the information he gets.

I spoke this morning before the Traveling Engineers; I spoke with a great deal of feeling, because I have a warm spot in my heart for the engineers; I know of no braver set of men, or men that we ought to respect more, men that require courage, men that must be sober, industrious and safe men, than the engineers, and I will perhaps repeat what I said to them, it will fit in so nicely, and it is along the line of what I said to you in Boston last year. We have so many associations; we have the general managers to plan, then we have the engineers who design the roadbed, and we have the roadmasters who maintain the roadbed; then we have the master mechanics and the master car builders, who plan and build the locomotives and cars; then we have the blacksmiths' association that fits in their line; then we have the painters, who come along and cover up the defects that the rest of us make and make the cars look smooth and nice, and keep them clean; and most of all, when we have the roadbed made and the engines and cars built, the engines and cars are utterly useless without the trained engineer to run the train. And so I say, we are all interested and our interests are identical, and we all work toward the same end, each in his own line.

Well, this is an educational meeting, and I am glad today to see so many of you here, and you certainly are going to do your own roads good by coming here and discussing these subjects. Right here there are three or four that I am very greatly interested in, that I have watched very closely, and that I want to call your attention to. One, I think, is the painting of galvanized iron, and I refer to it because that is a subject which I am trying to learn something about all the time.

I do not know what I can say to you of interest, any more than that I know of no city in this country where a painter or railroad man can go and learn as much as he can in and around Chicago. If some of you will start in the cleaning and painting department and go through the yards and see their coaches, you can learn something. Don't think because you are working with a pretty good company, that you know it all. You will find that you can learn a great deal by going to some small roads, and the cars in Chicago offer you educational advantages that will be of great assistance to you.

I feel that I have been honored a great deal by you, gentlemen, and am fortunate in being able to come this year. I thought I was going to be deprived of that pleasure, but since I was going to be in Chicago anyway, I thought I would come a day earlier just for the sake of coming here and saying, God-speed and God bless you. Our men are here, and when they come back I will look for results from them that will be beneficial. I do not like to boast, but I think sometimes it does you good to know what the other fellow is doing, and I think I have got some figures here in my pocket of pretty large jobs during the last year, and a large part of the credit belongs to the efficient force of painters that we have. For the year ending June 30 we turned out 1,530 cars; in the month of April, 8½ cars per day for every working day went through our paint shop, and there has not been a ripple, everything goes on pleasantly as far as painting is concerned. To the painters, to Mr. Butts, Mr. Allen and their assistants, the New York Central is indebted for this fine output. Fifteen hundred and thirty cars for the year; but for the months of June, July and August only damaged cars come to the shop, which would cut it down in fact to only nine months of the year that we made this good showing. (Applause.) I thought you might be interested in knowing this.

I spoke in Washington my maiden speech before the painters' convention. I made a break there; I said then that painters could not get good results unless they had good material, and that you should have something to say about the material. The purchasing agents did not like that very well, and I do not want that to go down in the record, but it is so. Now, I want to say a word on that point, about material. We are very apt to think Brother Smith's varnish best, and Tom Brown's colors best, and it is astonishing how good results you can get. Now, they all make good varnishes; I think I have been up against all kinds of varnishes, paints, etc., but you can get good results if you do not get too narrow-minded and not think, "I have got to have Brother Smith's varnish or I cannot do well." You can do good work and do it with all American varnishes. Don't think because you have got a friend or a son in the varnish business that that company is the only company in the world, because there are other companies. Keep that in mind.

I will wind up by saying that the Master Car Builders' Association have this year referred to you on the subject of stencilling cars, and that you are being recognized. You are not only recognized by our association, you are recognized by the officials. Keep on doing good work and if you will do that, you will make your work pay better and our cars will be in better shape—that is what we are interested in, keeping cars clean. I hope you will have a very entertaining and very interesting convention. (Applause.)

The Chairman: In behalf of the association I thank Mr. Brazier for addressing us. He always says something good and always interests us. I did not know he carried a welcome to the city of Chicago in his pocket, or I certainly should have given him an opportunity to fire it off.

Mr. McMasters: I want to declare myself. I have been in correspondence with the honored gentleman who spoke just now, and while he is one of us, virtually we consider him a painter, he has been honored by making—I do not know but we have been honored by making him an honorary member of our association. He has been vice-president and president of the Western Railway Club, vice-president and president of the Master Car Builders' Association, and I do not know what other honors we can give him now unless we make him president of the painters' association. (Applause.) I know we are all glad to have Brother Brazier with us, and I do not know as we have ever had a man who has spoken such kindly words right straight from the heart, and straight from the shoulder, and I also thank him on behalf of the association.

Mr. Brazier: That to me is a little deeper than many of you may know, for Mr. McMasters and I both worked together on the Illinois Central, and our relations were those of two brothers. That is my relation today with painters, and that is our relation, I trust, with every man we come in contact with. it is the only way to handle men, to have their confidence and they to have yours. (Applause.)

The Chairman: Next in order will be the secretary's reports. I will say I have appointed Mr. Dane as assistant secretary, owing to the secretary's affliction.

SECRETARY AND TREASURER'S ANNUAL REPORT FOR THE YEAR ENDING AUGUST 31, 1903.

To the Officers and Members of the Association:

It is my pleasure to present you today the annual report showing the transactions of the Association for the year ending August 31, 1903. Our convention held at Boston one year ago was well attended, although the anti-pass law undoubtedly kept many away who would have otherwise been present and enjoyed the meeting with us. Immediately after the meeting we sent out statements to the hundred and fifty members who were in arrears for dues and special assessments, to which a majority responded; those who neglected to do so will have an opportunity to pay all indebtedness while here. The Railway Master Mechanic, our official journal, was subscribed for by the association for one hundred and fifty-three members. This included all active members in good standing, November 1, 1902. The proceedings of the thirty-third annual meeting held at Boston were published and copies sent to all members not over one year in arrears. We regret that they were so late, but a delay in the printing made it impossible to get them out earlier. We hope this may be remedied in the future.

The Advisory Committee met in Cleveland, February 21st, and adopted the program for the present meeting. On August 1st the annual circular was issued and sent to seven hundred car and locomotive foreman painters throughout the country, reminding them of the annual gatherings of the Association and inviting them to meet with us in convention, hoping to interest them in the objects of the association and later receive them as members.

Last year we added to our number, ten active members, two associate and two honorary. All members over two years in arrears for dues were dropped. Three have died: A. S. Baner, Alex. Campbell and W. R. McMasters. We also note the death of A. A. Nicoll (Senior) who belonged to the association until recently.

September 1st we have a membership of 200 active members, 22 associate and 8 honorary, making a total of 230 members.

For the past two years we have been obliged to report a deficiency in the treasury, which we regret to say is not wiped out, but considerably reduced. We have for three years past hired our own stenographer, which previous to that time was furnished by the Railroad Car Journal, and this adds considerable to our expenses.

Receipts for the year from fees and dues	$655 00

DISBURSEMENTS FOR THE YEAR.

Due Secretary on last year	$ 72 09
Sept. 10, W. O. Quest, express	85
Sept. 14, Pres. Dane, stationery, postage, typewriting	12 00
Secretary's salary	200 00
Feb. 2, Express on reports	4 20
Feb. 10, Printing 250 reports	158 68
Feb. 21, Secretary's books	1 85
Aug. 13. 800 circulars and members' receipts	8 00
Sept. 14, G. R. Conroy, stenographer	90 00
Oct. 10, W. S. Kent, paper and envelopes	4 75
Nov. 3, 152 copies of Railway Master Mechanic.	76 50
Nov. 15, 500 Tension envelopes	7 35
Nov. 15, Express on envelopes	65
Postage for the year	45 00
Total expenditures	$681 92
Leaving a deficiency of	$ 26 92

ROBERT M'KEON,
Secretary and Treasurer.

The Chairman: Gentlemen, you have heard the reading of the report. We find that our old friend, the deficiency, is still with us. That will have to be taken up later on. Next is the report of committees. Mr. Gohen, have you anything to say?

Mr. Gohen: Mr. President, I have just had a talk with the entertainment committee of the supply people, and they requested that we change the date of visiting the stock yards to tomorrow or Wednesday afternoon, because of the fact that they wish to give the convention an automobile ride, and they cannot get the automobiles together and make arrangements until Thursday, and they asked me if I would not come up and change the date, so I presume it will be satisfactory to us.

The Chairman: I think I can say on behalf of the association that that will be acceptable.

A Member: Mr. Gohen, how are we going out?

Mr. Gohen: The Armour people will furnish a train to take us out there.

The Chairman: I will ask Mr. W. C. Reynolds, chairman of the supply committee, to make a few remarks.

Mr. Reynolds: Gentlemen of the Convention—As president of the Supplymens' Association, I have the pleasure of welcoming you to our city; the gentlemen desired me to step over and extend to you a hearty welcome. We have your interests and pleasures very closely at heart, and have appointed an entertainment committee, of which Mr. G. P. Coffin is chairman, with the idea of supplying some entertainments, which will be announced later on in the hotel. I am very much pleased to see you all, and hope you will have a pleasant and profitable time.

The Chairman: I trust, gentlemen, that you all realize the importance of these sessions, what we are here for, and stay in the room, stick to the business of the association just as long as possible; do not let us have a lot of empty chairs. We are not here for pleasure as the prime object, we are here for business, and if we will all get down to business we can get through in plenty of time, and have all the time we need for these entertainments.

Reports of committees come next in order. Of course the result of the meeting of the advisory committee we have before us, Mr. Gohen is chairman of it. I do not know whether he has anything further to say, he has gone out of the room, so we will have to let that go. Committee on information.

Mr. Brown: I have no written report. I have received communications from quite a number of the members on minor matters, nothing really that would be worth while repeating at length, but I have endeavored to answer the questions to the best of my ability, and those that I could not, I have corresponded with other people and got the information in that way. I will say that in connection with that there were some few things that I did attend to and answer. I also received a note in reply, thanking me for my feeble efforts in finding out the little matters I did unearth, and of course it is very good to know that a person appreciates even a small favor, which our members do; they all appreciate everything that they can do or what others do for them, and I was only too pleased to be prepared to furnish what little information was required.

The Chairman: Thanks, Mr. Brown. We have these committees appointed, and it seems we ought to make use of them and have something to report from them.

Mr. Bishop: I believe I was one of those appointed on the committee on information. During the year I received quite a number of requests for information, all of which I have answered, and those who have written me to say that they have received those answers have been very thankful for the information received.

The Chairman: The next committee is one that we have invariably left until the closing hours of the convention, and I think it is a mistake. I do not think there is any more important committee than the committee on tests, and it seems to me that that is a matter that should come before the convention while we have time to listen to it, and not be crowded into the remaining hours of our session. Mr. Copp is chairman of the committee. I do not know whether he is prepared at the present time to make a report.

Mr. Copp: I would say, Mr. President, I judged by the program that that would come in last, so I left my report in my room at the hotel.

The Chairman: All right. As I said, Mr. Copp, that seems to me to be a mistake.

Mr. Copp: I will be ready to report at any time.

Mr. Quest: That has been put in as No. 10 on the program.

The Chairman: It strikes me that that should come in sooner; it seems to me it is so important that we should change our program in that regard.

Mr. Copp: I can arrange to do that tomorrow morning.

Mr. McMasters: I was going to make a motion that we bring that subject up tomorrow, change the rule a little bit. It is an important committee, and there are always some very good things brought up, and, as you say, it is usually left to the last minute and it is hurried over, as it should not be.

Mr. Quest: I would like to speak a word in regard to that. The advisory board could be instructed, in order to avoid changing the program; that would be the better plan.

The Chairman: Yes, it really comes under the head of reports of committees—standing committees.

Mr. Quest: Well, formerly it was that way, a standing committee, until three years past.

The Chairman: Without taking time to put it to a vote, I will just say that we will consider that tomorrow morning as the first thing.

Now, there was a committee appointed at our last convention on the Bulging of Putty. Mr. B. E. Miller is chairman of the committee. Is Mr. Miller ready this morning to make his report?

Mr. Miller: I must confess that I did not know I was chairman of that committee on the bulging of putty.

The Chairman: Yes, you will find that in the minutes, Mr. Miller.

Mr. Miller: I know that I was on the committee, and I have been conducting experiments along that line. I have, however, nothing more than a verbal report; I did not make a written report. I experimented in every possible way, and I have come to the conclusion that nearly all the bulging of putty is caused by unseasoned lumber. I cannot make it out any other way. That is about all the report I have to make on it at present. I have tried putties mixed in different formulas; I have tried it on all kinds of wood, and the better seasoned the wood, the less the bulging of putty, and I think the real cause of so much bulging of putty is nothing more or less than unseasoned lumber, and lumber shrinking, the nail remains stationary and forces the putty out over the surface.

The Chairman: The members will remember that that was a very important topic at our last convention; it caused a great deal of controversy and became of deep interest, and a committee was appointed, as I find by the minutes of the last convention, to look into the matter. You will remember, perhaps, that it was suggested that the carpenters punch the nails too deep, and so on, and I thought perhaps that committee was ready to report. Mr. Miller has made his report verbally; I cannot remember who the other members were; Mr. Pitard I think was on that committee also. Is Mr. Pitard present? Were you not on that committee?

Mr. Pitard: Yes, I regret, Mr. President, that there has been no concerted action between members of that committee. As Mr. Miller was appointed chairman, I naturally waited for him to take the initiative in the matter, and that we would take up the subject and make a report. No move has been made in that direction; Mr. Miller was made chairman, and naturally all devolved on him.

I am sorry that I am not quite in accord with Mr. Miller as to the course given by him this morning of the bulging of putty. Of course it is somewhat unusual for a committee to be divided in its opinion upon any particular subject or point upon which they have been selected to formulate a report, but on account of our having had no talk on the subject, we naturally differ as much as we did at the last convention. My opinion, individually, on that point is, that the bulging of putty is caused by injury to the fiber of the wood as the nail is driven in, forcing the wood in, and then when the wood regains its natural position, it forces the putty back. That is my opinion of the matter.

I have no doubt that it would be better to refer that subject again, if it is agreeable to the convention, and let us formulate a report, one on which all the members will agree, rather than include it in this way, each one presenting an individual opinion.

Mr. Miller: I certainly wish to apologize to this convention for neglecting my duty. I did not know that I was chairman of the committee; I knew that I was on the committee and was conducting experiments, more or less, all during the past year, but it escaped my notice that I was put on as chairman, and I, like Mr. Pitard, was waiting for the chairman to do something, but I was experimenting just the same, working on the duty that was put upon this committee.

Regarding the assertion just made, that the wood forces out the putty as it straightens out, as it were, I do not believe there is anything in that. I have moistened up nail holes until the fiber had fairly straightened out and resumed its natural position, and allowed it to dry out and thoroughly prime, and the putty would swell just the same if the wood was not seasoned. Another thing, the putty does not swell until some time after the car has been in service, has been out in the sun and the wood has had a chance to shrink and thoroughly season. I must disagree with friend Pitard on that.

Mr. Bishop: Before taking up any further time in the regular order of business, it appears to me, if my memory is right, that there is no provision there for the reception of new members, and I would like the president of the association to so inform some of our older members who are now present, where they may apply for membership to this association. I know there are some twenty or thirty older members from the South who are not members of this association, and I think they should be informed where they should apply for their membership.

The Chairman: I am very glad Mr. Bishop spoke of that. We heartily welcome those gentlemen with us and hope they will attend the sessions of the convention. First of all, I trust they will go to the secretary, make themselves known and become members of the association. We have got room for you all, and we will be glad indeed to increase our membership at once. The secretary is in the little room here to the right.

Now, under the head of unfinished business, Mr. Orr, do you want to say something?

Mr. Orr: I would suggest we fix up that deficiency as soon as possible.

The Chairman: You are right.

Mr. Orr: I think it would be well to make that an assessment, as some of the members are now paying their dues, and it will cause some confusion at the end of the session.

The Chairman: The probability is that we will have money enough now; better wait.

Mr. Orr: We better rest on facts and not probabilities.

The Chairman: I will appoint Mr. McMasters and Mr. Bruning as an auditing committee and expect them to let the association know the amount that will be necessary.

Mr. Bruning: It will take some time and some calculation to get that report in. After we get those names in the box we can get at it instantly.

The Chairman: Mr. Orr, does it meet with your approval to wait until tomorrow afternoon, until after we get the census in?

Mr. Orr: It does not make any difference, as long as we get it adjusted.

The Chairman: Gentlemen, it is so understood, that the auditing committee will make a report tomorrow, and state the amount of the assessment.

I find from the reading of the minutes that there was a letter received from Mr. Joseph W. Taylor, secretary Master Mechanics' Association, on page 61, stating that a subject was referred to this association. I do not think the subject was ever considered. Now there is another thing that should receive our prompt attention. If the Master Mechanics' Association or Master Car Builders' Association are going to refer subjects to us, and we are going to take notice of them, I think we will get into trouble. If you will allow me, I will read the letter. (Reads)

Mr. Dane: Mr. President, that was referred to the advisory committee last year, and this fifth subject I think was intended to apply to that; that is, "The Proper Method of Painting and Maintaining a Locomotive Engine."

The Chairman: You see they asked for a report at our last convention; nothing was said about it, and they will infer that no notice was taken of it; but I am glad to see that some notice has been taken of it; that will let us out, not altogether, but in a measure.

The secretary then read a letter, inviting the association to come to St. Louis next year:

The Chairman: This comes naturally under the head of unfinished business, but we will refer that to the committee on next place of meeting. At our last convention Mr. Dudley was expected to present a paper on the relation of chemistry to painting. Dr. Dudley was not in good condition at that time to present the paper, and a motion was made at the last meeting that Dr. Dudley be asked to present the paper at this meeting. I understand the secretary has opened up correspondence with Dr. Dudley, but I do not know what the result has been.

Mr. Little: I do not know whether he replied to the secretary or not, but I had conversation with Dr. Dudley within the last ten days with reference to that matter, and I think the doctor has got out of it some way or other; he does not want to write the paper; he had none to offer at that time.

The Chairman: Well, that disposes of that matter, I presume. Is there anything else under the head of unfinished business that any member can call to mind that I have neglected? The next in order is the election of officers for the ensuing year. I will appoint Mr. Butts and Mr. Miller as tellers. Nominations will be in order for president for the ensuing year.

Mr. Bailey: Mr. President, I move that Mr. Cook, the present first vice-president, be nominated for president, and that the secretary be authorized to cast the ballot of the association for Mr. Cook.

The foregoing motion was put to vote and carried, and Mr. C. A. Cook was declared duly elected as president of the association for the ensuing year.

President Cook: Gentlemen, I am not going to take up your time by making any speech at present; of course you will work another in on me at the close of the session. I thank you sincerely and appreciate the honor very much. It is a very honorable position, and I think that every master painter ought to aspire to some time or other get to the top notch in this respect. I thank you very kindly indeed for the evident appreciation of what I can do for the association.

It is now in order to nominate the first vice-president.

Mr. Little: Mr. President, as it has been in order for several years to have the second vice-president succeed to th office of the first vice-president, I think it will be in order to pay the same tribute to our worthy second vice-president, and give him the first vice-presidency, as has been our precedent, and I therefore nominate John Lanfersiek as our first vice-president.

It was moved by Mr. Bruning that nominations be closed, and the secretary authorized to cast the ballot of the association for Mr. Lanfersiek. The motion was carried, the ballot was cast by the secretary, and Mr. John Lanfersiek was declared duly elected first vice-president for the ensuing year.

The president then declared nominations in order for second vice-president.

The following nominations were made: Messrs. H. M. Butts, B. E. Miller, George W. Lord and J. W. Houser.

A motion was made, and carried, that nominations be closed.

President Cook: I think we can do two things at once, so while the ballots are being distributed, we will listen to the auditor's report.

Mr. McMasters: Mr. President and Gentlemen—We find the regular dues are $2.50, and it has been suggested by your committee that the dues be increased from $2.50 to a regular due of $3.50. That will save all this extra assessment that we have been going through each year. We find there is a deficiency at the present time of $26. The matter will have to come before the association as a vote, and if you agree to it, and some one will make the motion that we will increase our dues, we will avoid all this each year.

It was moved by Mr. Stroud that the dues be increased permanently to $3.50 per year, such increase to commence with the present year, and that all members who had already paid their dues be requested to pay one dollar additional.

President Cook: Gentlemen, can we do that without changing the by-laws?

Mr. Little: That is the reason we have this deficiency. I asked our friend McKeon why he did not keep on collecting dues of $3.00; he said if we had done that we would have come out a great deal better, but he could not do that under the constitution and by-laws, so he went back to the $2.50 rate.

Mr. Ball: That would require a reconsideration or amendment of the by-laws. I would move an amendment, that the dues remain as they are, and that an assessment of one dollar each be made in addition.

Mr. Nichols: It would be first in order to accept the report of the committee, then we can take up the other question afterwards. I move that we accept the report of the auditing committee.

The motion to adopt the report of the auditing committee was put to vote and carried.

It was moved by Mr. Bruning, and seconded, that the by-laws be changed to conform with the report of the committee.

Mr. Denny: This will necessitate another receipt being made out to every member who has already paid his dues.

President Cook: Yes, that will have to be done.

The secretary then read from the constitution the article regarding dues and fees; also Article 14, providing for changes in the constitution by two-thirds vote.

Mr. Bruning: You see there is nothing irregular about my motion.

President Cook: It requires a two-thirds vote. Gentlemen, are you ready for the question?

President Cook: All in favor of the amendment will say aye; contrary, no; it is so ordered.

Mr. McMasters: Is the committee discharged?

President Cook: Yes, we discharge the committee, with thanks. While the tellers are counting the ballots, I ought perhaps to mention that there are some badges here that the members can obtain at the close of the meeting. There are also some buttons which the supply men have furnished as souvenirs, and it is suggested that as each man pays his dues, he will get a button. Of course we intend all members to have a button, but you will get your button in that way. We do not want to interfere with the business of the convention by distributing the souvenirs. I want to announce that the motion that has just prevailed in regard to the amendment of the by-laws requires that those members who have paid their dues this morning shall go back to the secretary and pay an extra dollar; that will straighten the matter out. Understand, the dues have been raised from $2.50 to $3.50, and those members who have paid their dues this morning at $2.50 will return to the secretary with the extra dollar. Gentlemen, the tellers are ready to make a report.

Mr. Miller then made the following report on behalf of the tellers: Total number of votes cast, 78, of which Mr. Butts received 35, Miller 18, Houser 18, Lord 3, Orr 3, Wheeler 1. No choice.

President Cook: No choice has been made. Gentlemen, you will have to ballot again.

Mr. Lord withdrew his name in favor of Mr. Butts.

It was moved that on the next ballot, should there be no election, the two lowest be dropped.

President Cook: Mr. Lord has withdrawn; that leaves three, and the names now are, Mr. Butts, Mr. Miller and Mr. Houser.

The result of the next ballot was announced as follows: Total number of votes cast, 155; necessary for a choice, 78. Mr. Butts received 73, Miller 27, Houser 39, Orr 7, Lord 5, Pitard 4. No choice.

A motion was made, and carried, that all names be dropped except the two receiving the highest number of votes.

Mr. Butts: It seems to me that it would be advisable, as I am a candidate, to not act as teller.

President Cook: The gentlemen I appointed were to act as tellers on all candidates. It happened that Mr. Miller and Mr. Butts were both nominated; both acted as a check, one on the other.

Members: That ought not to make any difference. That's all right.

The ballot resulted as folows: Total number of votes cast, 63; necessary for a choice, 32. Mr. Butts 43, Mr. Houser 20.

President Cook: Mr. Butts is duly elected to the office of second vice-president for the ensuing year.

On motion, the election of Mr. Butts was made unanimous.

Cries: "Speech! Speech!"

Mr. Butts: Gentlemen, I certainly am no speech maker. Time is short, and I shall say no more than to thank you kindly for your votes, electing me to what I consider an important office. Possibly some day I may, if I live and remain a faithful member of the association, fill a more important office, if possible, and I assure you that whatever the duties are that are conferred upon me, I shall to the best of my ability fill them. I think a great deal of the association, and shall try to do its work, whatever is given to me to do. I again thank you for the honor of being elected second vice-president.

President Cook: Nominations are now in order for secretary and treasurer.

Mr. Dane: I take great pleasure in presenting the name of our former secretary and treasurer, Mr. Robert McKeon, and I move the secretary be required to cast one vote for the election.

Mr. Gohen: The only objection I have got to that is simply this: That I have been in the habit of making that motion myself, and I feel awfuly hurt that Mr. Dane took that pleasure away from me today. (Applause.)

The motion was duly seconded and carried, the ballot was cast by Assistant Secretary Dane, and Mr. McKeon was declared elected as secretary and treasurer for the ensuing year.

Mr. McKeon: I did not suppose I would have to come up here again to thank you for the election as secretary. This is the thirtieth time I have been elected, and I hardly ought to have accepted it, for you know that my failing in the matter of vision has left me out of the race in the business proper, but I will accept it this year, as I have my daughter to do the work for me, and if it is being done satisfactorily, I can only thank you for the honor you have conferred upon me. I feel that it is better for any one to have something to occupy their mind after they are laid aside, like I am, and that is the reason I accepted, thanking you for it. (Applause.)

President Cook: Gentlemen, it is within twenty minutes of adjournment, and it is too late to take up another subject, and I will entertain a motion to adjourn.

Adjourned until 9 o'clock next day.

SECOND DAY'S SESSION.

September 9.

The meeting was called to order at 9:30 a. m., President Cook in the chair.

President Cook: Gentlemen—Yesterday I spoke about what we are pleased to call a souvenir button. That button was issued by the supply committee, and that indicates that you are entitled to all that takes place in the way of amusement. The badge that you wear is not official; that is merely a gift of a private concern. Those badges are on the secretary's table and I would advise every member to secure on.

Now there is another matter of great importance. There are quite a number of master painters who came to Chicago who are not members of this association. I hope that every one came here with the intention of becoming a member of the association. I am aware that some of them have connected themselves with us, and I want to say if any of them merely came here to see us, not intending to become members, we will give them our hearty welcome to the sessions of our convention. We hope they will come in here and listen to all that is said, but I think that if members of the association get hold of them, they will secure them as members. Please look after them.

The first matter this morning is the report of the Committee on tests. That is one of the most important committees we have.

Mr. Copp: Mr. President, I will say by way of explanation that last fall I communicated with each member of the committee and told them to make such tests as in their judgment would be of interest. I dictated none, and have not heard from any of the members since. I stopped off at London, Ontario, and spent the afternoon with Mr. Hutchinson, of the Grand Trunk, who is one of the committee, and I find that he has some interesting tests, but we shall not be able to have the benefit of them; he has a very sick sister in Massachusetts whom he has been to see, and has but just returned, so I think he will not be here. We have no joint report. With the exception of my report, probably Mr. Koons has the only writen report. There may be some verbal statements made, however. I will now read my report.

REPORT OF COMMITTEE ON TESTS.

Mr. President:

Speaking for myself personally, will say that I unwisely accepted an appointment as chairman of this committee because my duties are such, on the road on which I am employed, in traveling from shop to shop, as to render me not of much service in the line of tests and experiments over and above what I must do in the regular routine of duty to the road itself. Appointments of this character should be made of men of an investigative turn of mind, who are located at given points and who have more time to spare than I have. However, not wishing to disappoint you, I have attempted to do what I could toward something of value to report to this convention.

VARNISH TESTS.

Again I may say, by way of apology, that the time from one convention to another, including time for necessary thought and preparation, is rather too limited to do much in the line of weather tests of a satisfactory nature. Early in the year, however, I started a series of three weather tests of ten leading railway finishing varnishes, one of which was a board 1 foot by 11 feet, painted the same as a car panel and divided into ten equal spaces, on each space of which was applied two coats of the same amount of varnish. This board was given a perpendicular south exposure February 23 last, and after six months, Nos. 3, 5 and 9 show a marked difference in gloss from the others. This test I intend to let remain the full year, and perhaps longer, exposed to the weather and gas from passing engines.

Another test was made for quicker results by taking lights of clear glass about six by eighteen inches and painting one side with one coat of Pullman color and then giving each one coat of an equal amount of the ten varnishes to be tested and laying these, fastened to a board, flat upon the gravel roof of the shop. On account of an accident to this test it was unsatisfactory.

Another test which was highly satisfactory, and one which I recommend for a six months' test, consisted in taking lights of ground glass eight by ten inches and painting the clear side black and then taking each varnish to be tested and pouring the same on the ground side until it flows over the entire surface, and then standing each in a vertical position until it drains off all that will, and, when dry, fastening these to a board, numbering each, and placing them at an angle of 45 degrees to a south exposure, where they will get the smoke from passing engines and all the storms. At the end of six months white spots will be seen to be so thinly studded as to be nearly run together on those that begin to perish first, while some remain fairly intact. I have this test of ten varnishes, numbered from one to ten, if anyone desires to examine it.

VARNISH REMOVERS.

While the elements are getting in their work upon these tests, I cast about to see what I could profitably bring to your attention in the line of chemical tests, and I decided to make some tests of varnish removers, inasmuch as they are being much exploited of late and many are being constantly put upon the market, some of which are of a decidedly harmful nature. I concluded that I would be doing the association a good turn in this way.

That there is an important field for a good article of this nature no one can deny. Necessity, the mother of invention, has brought out a numerous brood. It has been but about ten years since anything of this character has been in use. Previously all varnished interior finish was very plain, and whenever it was required to dress it off to the wood, the brittle varnish was scraped off in a dry state with steel scrapers, and this worked very well. But of late years cars have been made more ornate on the interior in carving, fluting, molding and beading, until renewal by the old methods is out of the question, and useful varnish removers have been brought out by a kind of natural evolution. We painters once had anxious thoughts how we should ever renew this elaborate wood work when it became necessary to do so. To-day our worry is over, because the chemists have come to our assistance with various solvents for this purpose. But some of them are unsuitable because they contain acids or alkalies to injure the wood, or poisons to injure the workmen. The former can readily be detected and rejected by their immediate effect in the discoloration of the natural wood, but the latter are not so easy to detect, yet the baleful effects of carbolic acid in its injury to the skin of the hands and in its remarkable stench upon the persons working it, wherever he goes, is soon discovered. Fusel oil also is readily discerned by its effect upon the respiratory organs, producing constant hacking and coughing by all those subjected to its fumes until these delicate membranes are subjugated, if it can be said that they can be, until destroyed, or the victim dies.

But there is another poison worse than all, yet so subtle as hardly to be discovered by an expert, or by chemical test. I refer to bisulphide of carbon. This is a very volatile liquid, resembling naphtha, and a solvent of some power. But those who put it upon the market in this disguise should be indicted for carrying concealed weapons until somebody is killed by it, and then for murder. And they who order it and bring it into the shop and put it in the hands of unsuspecting men to use may be culpable, by their ignorance, under the employers' liability laws of some states. J. Ogier, a French chemist, says in a Treatise on Toxological Chemistry, that "Carbon bisulphide possesses very marked poisonous qualities. Diluted with a very large quantity of air, it can be breathed for a while without inconvenience. After a while, however, one observes effects on the workmen as follows: Vertigo, vomiting, anorexy (i. e., want of appetate, without loathing of food), weakening of the sight and hearing, and paralysis. Some people attribute to bisulphide of carbon the property of weakening the genital function and of diminishing muscular powers." He also says that a proportion of this substance that reaches a twentieth part, or four per cent, is very dangerous. And yet there is a well-known varnish remover on the market that contains 30 per cent! Do you wonder that I have thought this an important matter to bring to your attention? This same author says that symptoms of poisoning of the workmen who work in bisulphide of carbon occur in two stages: First, the period of excitement; second, of weakening bordering on decline and on cachexy, or impoverishment of the blood. Weber, a German chemist, in "The Chemistry of India Rubber," says that "the presence of carbon bisulphide is objectionable only from a hygienic point of view; that as small a quantity as 0.1 per cent is quite sufficient to make itself noticeable in the atmosphere of even a well-ventilated room, and the baneful effects of carbon bisulphide upon the workers render the absence of this substance in the solvent naphtha absolutely imperative. This substance is employed in rubber factories only as a solvent, its volatility, inflammability and very generally its bad odor being actually objectionable for this purpose." It is, however, employed in enormous quantities as a solvent for chloride of sulphur in the process of cold vulcanization, and strict laws had to be adopted in England to regulate its use so as to avoid its poisonous effects upon communities.

The Journal of the Society of Chemical Industry, June, 1903, says that carbon bisulphide decomposes the blood. An aqueous solution containing 0.5⁄8 parts per 1,000 will accomplish the result. In animals, various organs, such as the gall, intestines, lungs, etc., were affected, the liver most of all. Absorption of carbon bisulphide by the blood takes place in the lymph glands and veins.

But I need not cite further authorities. How shall we detect this subtle poison? That is the purpose of this report, among others. A friend, who is a chemical expert, gives us the following

TEST FOR BISULPHIDE OF CARBON.

Dissolve 1 ounce pure caustic potash in 1 quart grain alcohol. This forms an alcoholic potash. Mix together in a test tube equal parts of the remover to be tested with alcoholic potash. Use only very small quantities. Warm by putting test tube in hot water for a minute or two. Avoid getting it hot, or it might drive off the bisulphide by evaporation and thus it will escape the test. Then let it cool five or ten minutes, then dilute with two volumes of water and add a few drops of blue vitriol solution (blue vitriol dissolved in water). A yellow precipitate denotes bisulphide of carbon. A blue color, or bluish precipitate, indicates absence of bisulphide of carbon.

Tests for bisulphide of carbon in paste removers may be made by first distilling the paste over an alcohol lamp and then testing the distillate in the manner before described.

Following is a

TEST FOR CARBOLIC ACID.

Shake up a little of the remover with some water. Separate the water by distillation and add to the water a few drops of chloride of iron. If it contains carbolic acid, a blue color will indicate it. But some may say, carbolic acid can be detected by ordinary smell. Not always. A refined article may be smothered with some perfume, which perfume becomes equally loathsome by continued use.

Having a dozen samples of different removers on hand, they have been put to some tests, and I find that

No. 1

Is a liquid remover. Contains no carbolic acid or carbon bisulphide, but does contain fusel oil and wood alcohol, with a perfume oil of citronella, and objectionable on this account. Its cutting power is deficient and its evaporation medium.

No. 2.

A liquid remover. No carbolic acid. Cutting power not rapid. Odor is enough to rule it out. Contains 25 per cent wood alcohol and balance largely benzole, with coloring matter.

No. 3.

A semi-paste remover. No carbolic acid, but contains wood creosote. Nothing to say in its favor, but much in its disfavor on account of bad odor.

No. 4.

A liquid remover. Contains alcoholic bodies 42 per cent, coal tar and naphtha 53 per cent, oily matter 5 per cent, but no fusel oil, carbolic acid or carbon bisulphide. Cools and evaporates quickly and separates, leaving an oily residue. Not adapted to tank work on this account. It is perfumed with oil of lemon grass to disguise its odor, which would be sickening by constant use.

No. 5.

A paste remover of fair cutting power. Contains carbolic acid, creosote and fusel oil. Objectionable on account of bad odor and its injury to skin of hands.

No. 6.

A liquid that contains no carbolic acid, but cools and evaporates rapidly, and therefore has comparatively slow cutting power. It contains alcohol 35 per cent, benzole 40 per cent, and amyl acetate, or "banana liquid," 20 per cent, and fusel oil 5 per cent. It has a sickening smell, worse by continued use.

No. 7.

A liquid which contains no carbolic acid, nor fusel oil, but contains 40 per cent alcoholic bodies and the balance of naphtha and bisulphide of carbon. Odor disagreeable. Cutting power second to No. 8, very rapid. It emits very poisonous vapors.

No. 8.

A liquid containing alcoholic bodies 36 per cent, carbon bisulphide 30 per cent, benzole 30 per cent, but no fusel oil or carbolic acid. It has slow evaporation, remains at room temperature practically and cuts very rapidly, but very dangerous to use on account of the large per cent of carbon bisulphide, the poisonous effects of which are similar to lead colic.

No. 9.

A black liquid that contains strong, crude carbolic acid as one of the active solvents, and therefore very objectionable on account of odor and poisonous effects.

No. 10.

A liquid that contains fusel oil, kerosene, coal tar naphtha and alcohol in about the following proportions: Light kerosene 30 per cent, fusel oil 50 per cent, naphtha (coal tar) 15 per cent, and alcohol 5 per cent. Very objectionable odor and poisonous vapors.

No. 11.

A liquid remover which contains no carbolic acid, amyl acetate, sulphide of carbon, fusel oil or alkali. Contains alcohols (mixed) 20 per cent, ketones (mixed) 35 per cent, benzole and toluol 45 per cent. Remains at room temperature practically and evaporates slowly and cuts very rapidly. A first-class liquid remover. Best we have tried so far. Emits no poisonous vapors.

No. 12.

A paste remover made on the same lines as No. 11, by the same parties, stiffened to form a paste to render it applicable to vertical surfaces without running off or evaporating. A neutral paste and very effective. Best paste remover yet tested. The improved form lately developed is practically odorless. Respectfully submitted. Chas. E. Copp,

General Foreman Painter, B. & M. R. R.

Lawrence, Mass.

President Cook: Mr. Butts is next on that committee. Has Mr. Butts any remark to make?

Mr. Copp: Mr. Koons has a report.

Mr. Koons: I will have to admit to this association that I am in somewhat of a predicament. I had no idea that we had to make reports similar to Brother Copp's. However, I had quite a valuable lot of actual tests in high-class colors that I wanted to bring to this association. After I was appointed on the committee I made up my mind to do it, but you know we had a little disturbance at the World's Fair city and I was put out of business. Of course, that destroyed all my tests. However, since coming to the convention I have jotted down a few general remarks that may cover part of the ground.

Mr. President and Gentlemen of the Master Painters' Association:

There is only one idea in my mind connected with this subject that should be first and foremost above all others, i. e., tests are made to find the best and most durable material for the painter's use, always considering, however, a happy medium in the matter of cost. The vital question of time hampers somewhat this proposition with the preparation of foundation paints in the way of quick systems. In the way of quick-drying colors, paint manufacturers have reached the limit, and we can't improve on the speed that has already been in use for thirty years past. Japan colors dry as quick as it is possible to make pigment dry. But in the richness of coat and durability of color, there is an open field for improvement all along the line, in both the mediums and in the preparation and manipulation of the pigments. There is a vast difference in the prepared japan color. The richness that is shown one above another has been brought about by long and continued experiments, by possibly some "knight of the brush" in some far-off corner, and has been given up to paint manufacturers and eventually comes before the public as a finished product admired by all.

It is through this kind of painter's work that we get the improvements and advances that we have the privilege to enjoy in the paint shop. This was part of painters' work in years gone by, but has now been mostly superseded and taken up by experts in large paint plants. However, it does not stop the painter from comparative tests. He still has this privilege before him at all times, when he can see the value of one product above another, by simply comparing and exposing to the elements. I haven't time to go into any detailed explanation of any kind of a test, but wish to make a positive statement regarding prepared colors.

As far as durability is concerned, quick-drying colors will not stand as long as slow-drying, either as a protection or long service as a color. Elasticity adds certain life to a color, as well as it does long service to a foundation paint. Regarding oils and varnishes, the painter's knowledge is overwhelming. He knows more about the working nature of these materials than the makers themselves. The manipulating of oils, varnishes, japans, and paint pigments constitute the painter's vocabulary of paint material. From either of these four emanate all the paint formulas that come from his experiments and long and arduous tests in innumerable ways of finding the best and most durable products. Our experience has taught us that that the extreme limit has been reached in some things connected with the paint business, while in a general way the field of improvement is unlimited. Every day proves to us more and more the fact. I don't think we can improve upon the ways of our forefathers of fifty years ago in the matter of medium or vehicle for foundation paints. Linseed oil was the first, has been used through the past decade, and is now at this date the best foundation vehicle for any and all kinds of pigment known to painters. There are innumerable paint oils of all kinds and qualities, but none have satisfactorily displaced linseed.

Linseed oil is nature's own protection for its own. Man has tried to improve it and substitute it by every imaginable oil product known, but it has never been accomplished satisfactorily. This, however, cannot be said of paint pigments. The field is long and broad for improvement. There is plenty of room for the present, and yet the rising generation, to advance along this line. In this respect the limit has not been reached as yet. Every day brings forth some new idea and combination that gives better results than old-time standards. There is, however, an old-time saying that has been handed down from our grandfathers that oil is the life of the paint. We wish to take issue to a part of that statement and substitute a better one: Elasticity is the life of any paint, and when a pigment or combination of pigments adds elasticity, it surely proves that the pigment has something to do with the life, hence the improvements that are constantly going on in paint making.

To prove the above, let us take a mixture of pure carbonate of lead and carbon and oil for another test. Expose the two, and the first will give way first. The reason is simple. The second has been made more elastic by the combination of carbonate of lead and carbon, or, to use common shop parlance, lead and lamp black will make a better lasting paint than pure lead, using the same oil in both mixtures.

The question of elasticity has more to do with the pigment than the oil. Oil and whiting will not make a very elastic paint, and hence will not wear. Carbons, carbonates, oxides and sulphites have different degrees of elasticity, one different from another. Combinations of pigments with certain elastic nature will make better paint than straight pigment products, and herein is room for improvement and advance along the line of protective paints.

There is also a constant growth in our color lists of new colors in almost every shade known. New discoveries and combinations of color pigments are bringing this about in every color house that has the demands of the trade at heart. The painter is like every other natural thing: he is always after the latest and newest improvement for his work. The painter that does not listen to new ideas and new improvements, and passes them up as something too bothersome for attention, will sooner or later find himself up against propositions that will surely floor him, and his past experience and ability will not come to his aid in these shop dilemmas.

Very respectfully, CHARLES E. KOONS.

President Cook: Mr. Butts, have you any report?

Mr. Butts: Mr. Chairman, I have no written report to make as a member of the tests committee. I have not been altogether idle during the year, however, but knowing of the report on tests handed in by our able chairman, I did not consider that it would be necessary for me to make a written report. That is not the only reason. The tests which I have under way I have not had sufficient time to complete so as to bring the evidence here to make it of particular value as a report. Another reason why I did not make a report is touched upon by Mr. Copp in his paper. I find it almost impossible for me, in the position I occupy, to carry on tests as should be made to be of special value, getting at all the facts as to the evidence to prove statements that might be made. It is absolutely necessary for a man to have considerable time at his command at one place in order to watch a test thoroughly. This I am absolutely unable to do, as my headquarters is not more than one day a week at one place, therefore the tests I have made are exposure tests of different materials, which I did not commence in time to be of any special value, therefore I have not made any special report.

President Cook: Has Mr. Beyer any report?

Mr. Beyer: I made a few tests on steel tanks, but they have not been out long enough; did not deteriorate enough to show any difference. I would like to have it passed over to the next year.

President Cook: It seems from the reports that perhaps something more ought to be brought out on this topic at our next convention. Are there any further remarks, or papers to be read?

Mr. Lanfersiek: Inasmuch as some of the members of the committee on tests have not made a full report, I move that the present committee be continued for another year.

Carried.

Mr. Copp: I desire to decline the Chairmanship of that committee, or membership in it. I think I have done my duty this year. I hope you will appoint my successor.

President Cook: Well, Mr. Copp, get the committee together and elect another chairman, then consider you have done your duty. Stay on the committee; give them your assistance.

Mr. Copp: I am not in the habit of being on any committee as an honorary member. I calculate to do my duty wherever I am put. I think I have done it this year, therefore I wish to retire, with your permission.

President Cook: I will see if I can find some one else.

Mr. Koons: I do not know as I am now a member of this association. I am out of that line of business and gradually working into another line, so I am not a proper person to take up that work; in fact, I could not give the time as I would if I were in a practical way engaged in the work.

Mr. Bailey: The president of the association has the power to fill vacancies, and if the members of the committee that have been appointed resign, the president has the power to fill their places.

President Cook: Yes, I was aware of that, and will fill those vacancies if the members feel that they ought not to serve.

Mr. Butts: I feel that I ought not to be on that committee. Not that I want to shirk the duty—not by any means—but there are men in this room that can serve the association better than I can and I think they should be put on that committee, and if I could be relieved of any important work on that committee I should like to be, and, in fact, I should like to resign entirely.

President Cook: The motion has been passed that the committee be continued, and it is within the province of the president to fill any vacancies that exist. I think that will dispose of that matter.

We will now take up the first subject, "Best Method and Material for the Interior Finish of Modern Passenger Cars, Including Hardwood Acid Burning Treatment, Filler, Stain, etc." The first paper on this subject is by Mr. John T. McCracken, of the Jackson Sharp Co., Wilmington, Del. I would say, before the secretary reads his paper, that Mr. McCracken called in to see me just before I left and expressed his regret at not being able to be present with us today. He took care to present his paper and wished to be remembered to the members of the Association, and asked me to express his regret. The secretary will kindly read the paper.

MR. McCRACKEN'S PAPER.

Mr. President and Gentlemen:

Subject No. 1, on which we have been asked to write, reminds us at present of a burning process that was enacted within our midst a few weeks ago which attracted the attention of the entire civilized world. Through the failure of the laws of Delaware to speedily make the "punishment fit the crime," the people resorted to a burning process, not "acid-burning," however, but just an old fashioned "smoker." We do not countenance a burning process of this kind any more than we favor the acid-burning process on wood. We trust, however, that an outraged public will not be called upon to inflict a similar punishment upon the inventor of the "acid-burning treatment" on wood.

We have been fortunate (thanks to the intelligence of the craft who have the drawing of specifications and deciding upon the color-scheme of the interior finish of passenger car work) not to have been called upon to use the acid-burning treatment on but two occasions; but our experience in our achitectural mill department has been varied and extensive. It is in no boastful spirit that we say that in no case have we failed to obtain the same color-effect from the use of oil or water stains as that produced by the acid treatment, and moreover a more durable surface, as the acid not only destroys the fibre of the wood but also the protecting qualities of the materials that follow its use. We presume that the committee who formulated this subject had in mind a car finished in oak, and as the modern passenger cars of today contain more or less marquetry or inlay work of white holly, satin wood, etc. (which should be kept light in color), we are of the opinion that the best results can be obtained by adhering to a light color finish throughout, both in point of beauty and durability.

Now as to the best method and material for the interior finish of modern passenger cars we would reiterate that which we have given on several previous occasions. To protect the inlay work from discoloration by filler, etc., carefully pencil with a thin coat of best bleached white shellac. We find shellac more suitable for this purpose than fish glue or mucilage. Then fill the wood with a good paste filler of an inorganic substance, such as terra alba, or kindred articles. The filler can be colored to the desired shade. After allowing sufficient time for filler to dry, apply first coat of rubbing varnish; on this coat putty all nail holes and defects. After putty has become hard, sand with No. 1-2 sandpaper.. Dust off thoroughly and apply second and third coats of varnish; sand-paper lightly between second and third coats.

When varnish has become dry and hard, rub to a perfectly smooth surface with No. 01-2 pulverized pumice stone and water, and polish with rotten stone and oil.

Regretting my inabiity to be present, I am,

Fraternally yours,

JNO. T. M'CRACKEN.

President Cook: The next paper is by Mr. D. L. Paulus, of Dayton, Ohio.

MR. PAULUS' PAPER.

To the President and Members of the Master Car and Locomotive Painters' Association.

Gentlemen:—I submit to you my paper on best methods and material for the interior finish of modern passenger cars, including hardwood, acid burning treatment, filler, stain, etc.

The first consideration of this subject is the design, style, architectural treatment, etc.—second, the color scheme, and last, but not least, the manner of filling, varnishing and polishing—all under the master hand; the object being to provide every comfort, convenience and decorative feature known to the car builders' art.

Note the improvements that have taken place in the last few years. There are today leaving Chicago, and numerous other large cities, over various railroads, trains palatial in all their appointments. These consist usually of buffet, library, smoking, parlor, dining and sleeping cars, also chair and day coaches and, with but few exceptions, none under 72 feet in length.

The structural design, decorations and furnishings of these trains are of the highest order, the most noticeable feature being the extreme simplicity and the fine quality and beautiful finish of the wood, San Jago mahogany predominating. The upper deck, or headlining, is of the new dome, or the effective empire design, mostly colored in soft blended greens and ornamented in a neat design in gold: the latter broken by art deck glass and by handsome combination gas and electric fixtures; heavily carpeted and the color-scheme including especially designed upholstering, forming a harmonious effect. This interior finish has simple but beautiful lines and ornaments of marquetry of plain and smooth architectural effect; none of the heavy carved and moulded finish of the past, where the principal object seemed to be to catch and hold dirt, which has been one of the hardest and most trying features of terminal cleaning, particularly at the shopping, the experience of those of us who have a dark shop and are at the mercy of the interior car scrubbers being that, after the car is tracked ready for service, we will discover the majority of the crevices and carvings well filled with dirt and sealed under varnish. This new feature of plain finish has also the advantage of being thoroughly sanitary, through being so easily kept clean at terminals.

Regarding the hardwood acid burning method and staining; these are all false methods and have a tendency to destroy the beauty of the wood in that it places an opaque finish over the grain. I am of the opinion that this method is not used by any reputable car building establishment, as I know our firm (The Barney & Smith Car Co.) use nothing of the kind, but select first class lumber and matched as to color, discarding 10 to 20 per cent. in order to get an uniform effect, but, however, you are compelled to stain your wood filler slightly with burnt sienna and vandyke brown in order that the filler does not show wnite or milky. After the filler has been applied and dried over night, there should be applied two coats of inside car rubbing varnish, each coat allowed 48 hours to dry, and each coat well sandpapered. The third coat of varnish allowed 48 hours for drying, then rubbed with F. F. F. pumice stone and water. The fourth coat of varnish 48 hours for drying, then rubbed with F. F. F. pumice stone and water and allowed to stand 24 hours and then re-rubbed with rotten stone and polished. Age will give mahogany that rich effect of which no stain is capable. Please note sample boards on secretary's desk which has had 3, 6 and 9 months exposure respectively. You can readily see the different tones acquired as it reaches its perfection. Also please note sample of marquetry which relieves and embellishes that plain sanitary finish. I also submit samples of high grade woods used in modern passenger cars, tiger, padouk or vermillion. Circassian walnut, English and domestic oak.

D. L. PAULUS,
The Barney & Smith Car Co.

President Cook: The next paper is by Mr. A. L. Allen, of the New York Central. The secretary will kindly read that paper.

MR. ALLEN'S PAPER.

Subject: Interior Finish Passenger Cars.

As there is a great many different opinions as regards the inside finish of passenger cars, and we all think our own is about the best, I will submit my practice for the casual observance of the craft.

In the first place the wood should be thoroughly seasoned and then put in the best of the condition as regards surface, as a finisher had no chance to level a piece of varnished work on wood as he does on outside surface. Being in proper condition, I would proceed as follows: Fill all open grain woods thoroughly with a good filler made quite short so as not to pull out of the pores of the wood, and let stand for 24 hours, then sandpaper lightly, proceed with varnish (not shellac) of the best quality, three or more coats, as the occasion may require. Sandpapering between coats is very essential and facilitates greatly in rubbing. I think rubbing should always be done with water and pumice stone (not oil and pumice stone), then oiled off, or a still better finish may be obtained by rubbing with pulverized rotten stone (after water rubbing) as it gives a finish between what is termed a flat finish and a hard polish, and I think greatly improves the appearance. Shellac, I think, should be used only in case of hurried work as it dries on the surface and will not permit the varnish to penetrate through the fillers to resist moisture from the wood.

I have the best results from corn starch as a filler. A filler that is very objectionable by men who do scraping is a filler that is full of grit, such as terre alba and similar fillers; white corn starch has no grit at all.

Ample time should be given after each coat of varnish is applied to harden before the next is applied.

A. H. ALLEN,
N. Y. C. & H. R., West Albany.

President Cook: Gentlemen, that finishes the reading of the papers on this subject. Before the discussion opens I want the secretary to announce two committees that should be announced at the present time.

The secretary announced the following committees:

Committee on Next Place of Meeting—J. W. Houser, C. D. Beyer, A. R. Lynch.

Committee on Resolutions—C. E. Mance, A. J. Bruning and H. M. Butts.

President Cook: The gentlemen on those committees will please get ready, if possible, for to-morrow morning, so that we can hear their reports.

We are now ready to hear a discussion on these papers that have just been read. Has any gentleman anything to say? If not, we will proceed with the next subject, "Heating and Ventilating Car and Locomotive Paint Shops." The first paper on this subject is by Mr. John F. Lanfersiek.

MR. LANFERSIEK'S PAPER.

To the President, Officers and Members of the Master Car and Locomotive Painters' Association of the United States and Canada.

Gentlemen:—When I received the letter of our honored Secretary notifying me that I had been one of those selected to prepare a paper on subject No. 2, "Heating and Ventilating Car and Locomotive Paint Shops," I must confess that I was somewhat disappointed because I felt that the subject was incomplete for the reason that it did not include lighting; but on reflection I thought that the Advisory Committee took it for granted that all car and locomotive paint shops that are properly heated and ventilated are so constructed as to have plenty of natural, as well as artificial light. I therefore cast that thought aside and began to think of the subject as I had received it.

In presenting this question I do so with the knowledge that it is a very important one and I feel that I will do well if I can do it justice.

The object of a car or locomotive paint shop is, as its name implies, to have a place where cars and locomotives can be painted. Its construction should be such that the greatest number of cars or locomotives can be gotten through it in the least possible time. If, therefore, a paint shop is so constructed and its appointments are such that the paint used in it will not dry proerly, the whole construction is a failure. Paints, as generally used on cars and locomotives, are air-dried and the drying is one of their important properties. To know just how long it will take paint to dry is economy. It is well known that paint dries by absorbing oxygen from the air. It is also a well settled fact that a humid or cold atmosphere retards the drying of paint. Consequently the drier and warmer the atmosphere the quicker and better paint will dry; therefore it is reasonable to suppose that, in the construction of car and locomotive paint shops, provision should be made for heating them in such a manner that paint will dry fast enough, that is to say, that it will dry in the time desired. This insures a rapid output, which is also economy.

Now as to the manner of heating: There are various systems, such as stoves, steam, hot water and hot air. The old and original stove system has had its day and is now seldom used. While very creditable work was turned out of the old time stove heated paint shops, it was never certain and was always dangerous. Thus we have the steam, hot water and hot air systems to choose from. All of them receive their heating properties from the same source, that is, the boiler at the engine room. In the steam and hot water systems, the steam and hot water are conveyed about the building by a system of pipes and radiators, placed at suitable places, which throw off the heat from the steam and hot water and warms up the surrounding atmosphere. This produces a fairly good heat. It of course can be regulated by a system of valves as desired. If either of these systems is used the pipes and radiators should be placed close to the floor in order to get the best results, as we all know that heat naturally rises. Therefore it is almost impossible to place a system of pipes in a shop where they will be completely out of the way, thus causing objections by taking up room that could be used to better advantage, besides, the constant flow of steam and water corrodes the pipes, causing leaks which are a constant source of trouble and expense to keep them in repair. Oftentimes a pipe will spring a leak near a car that has been newly varnished and ruin the job, thus creating annoyances that are gall and wormwood to the painter.

These disadvantages make the steam and hot water systems objectionable. Thus we have remaining the hot-air systems, which in my opinion is the ideal for heating a paint shop. The apparatus for producing the heat is partitioned off in one corner of the building so that it will not interfere with the working of the shop. It is composed of one or more nests of steam pipes, a fan wheel, main conduit pipes, which are put up against the ceiling and run the full length of the shop with small branches containing regulating valves and running to within 5 or 6 feet of the floor, and a small stationary engine or electric motor to furnish the power. The fan-wheel and nests of steam pipes are housed up with an iron box of suitable size and shape, except that the outside faces of the nests of steam pipes are exposed and the whole connected with the main conduit pipes. When it is desired to heat the shop, the engine or motor is put in motion. This creates a draft, which draws the air between the pipes, heating it as it passes through and the fan forces it into the main conduit pies, and it is allowed to escape through the small branch pipes by opening the valves. The heat obtained by this arrangement is uniform and perfect for a paint shop. After this system is once installed it is inexpensive, as it will last for years without repairs. There is some objection to this system on account of the constant agitation of the air, thereby causing too much dust; but this, I think, does not overbalance the real advantages derived from it. After taking everything into consideration, I believe it to be the simplest, cheapest and best system for heating car and locomotive paint shops.

Now as to ventilating. I believe this is also very important and should be considered when building shops. The air we breathe is free and is necessary for our very existence, and should be always pure and fresh. It is also necessary to dry paint. When shops are so constructed that the air in them is confined and becomes contaminated with the fumes of paint and varnishes and it cannot escape properly, the workmen become languid and depressed. They leave their work to open the doors to let in fresh air, thus causing draughts, which are injurious to newly varnished cars, and even go outside of the shop for fresh air, thus retarding the output to that extent. Confined and impure air also retards to some extent the hard drying of paint and varnish, leaving them tacky. Consequently, from the standpoint of health, as well as economy, all paint shops should be supplied with a ventilating system, which should be placed at the highest part of the building and be made adjustable so that a constant source of fresh air could be supplied.

Fraternally submitted,

JNO. F. LANFERSIEK.

President Cook: Next paper is by Mr. William Mullendorf.

Mr. Mullendorf: My paper is on the table. I would like to have the secretary read it.

MR. MULLENDORF'S PAPER.

To the President and Members of the Master Car and Locomotive Painters' Association.

Gentlemen:—It affords me great pleasure, I assure you, to be called upon to serve as one of the committee on subject No. 2, namely: "Heating and Ventilating Car and Locomotive Paint Shops." When we consider carefully the importance of this question, it will readily be perceived, this is the first and most essential step in the accomplishments of successful work.

As a feature of ventilation, special reference is made to the floors usually found in paint shops. In nearly all cases they are made of wood, and when washing, clearing and rubbing rough stuff, considerable water accumulates between the cracks, forming a slime which becomes foul and in permeating the atmosphere in the shop is not only unhealthy to the workmen, but injurious to the work. This also results in a higher percentage of moisture in the air from continued dampness of floor, which it will readily be understood, is objectionable. For these reasons, also facility in keeping the floors clean and free from dust and dirt, I favor the cement floor, having sufficient pitch towards the center and between each track to drain all water to sewer connections. They can be very easily washed with but slight expenditure of time and in drying from fifteen to twenty minutes insures a satisfactory and dry condition of the floors. With the wooden floors, the time required to dry after being washed, would be a large part of the day.

In the matter of ventilation, it is found in many shops that this feature is overlooked, resulting in conditions detrimental to the work. It is usually found that ventilation is relied on through windows and doors alone. This affords sufficient fresh air when no varnishing is being done, but which must be closed in order that the varnishing work can be carried on. As we all know from a practical standpoint this work can best be performed with least disturbance in the air; but as the doctor says, "what cannot be cured must be endured." It will, however, prove more satisfactory with accomplishment of better results if shops are provided with sky-lights equipped with ventilators which can be opened or closed and adjusted to admit as much air as desired, also to ventilate the shop. These conditions can readily be attested by experiences of those who are accustomed to shops of this description, as it will readily be seen that this system quickly disposes of the foul air arising from the shop without creating any disturbance in the atmosphere. As a precaution for too much fresh air at the wrong time entering shops at bottom of doors at the tracks, rubber strips are used fastened to the bottom of doors, fitting snugly to the floor, thereby preventing wind and dust blowing in when door is closed.

As to the heating system employed for obtaining the best results, there are several systems in use at the present time, including steam, hot water, hot air, etc. In my opinion hot water produced the most satisfactory and ideal conditions in that a steady dry heat is obtained; but in large shops it is difficult to obtain high enough temperature to properly heat the shops. Steam seems to be very largely used at the present, especially in factories, railroad shops and other plants having steam for power, thus affording the most convenient system of heating without additional expense incidental to other systems. I consider the steam to be unsatisfactory, as it invariably occasions a certain amount of moisture which is disastrous and detrimental to the work. The system of heat that seems to be gaining prominence is hot air forced through pipes by blowers; having had experience with this system for the past eight years, I am enabled to speak very highly of it. You may say when you hear this, that it is no wonder, therefore, I can furnish so much "hot air;" but the hot air I speak of is of a decidedly practical nature, as I have in no instance had trouble in repeating coats of color or varnish the next day when necessary. By way of description, will state that this system comprises a large blower which draws air over coils heated by steam and blowing the hot air through a large galvanized iron pipe, extending through center of shop and having branch pipes to each side, terminating about ten feet from the floor, thus equally distributing the heat. Furthermore the blower can be regulated to a proper speed according to the season of the year for obtaining the average temperature of 70 degrees, and which can be easily maintained.

WILLIAM MOLLENDORF,
Foreman Painter, Car Dept., Illinois Central, Chicago, Ill.

President Cook: The next paper is by Mr. W. H. Dutton, of the Lehigh Valley Railroad.

MR. DUTTON'S PAPER.

No doubt by far the larger number of railroad paint shops recently erected are equipped with the hot air fan blast system of heating, and to this system your attention is particularly invited.

In providing for the installation of a heating plant for a car and locomotive paint shop at least three important considerations are involved.

1. Capacity for heating the shop at the floor line to any desired temperature consistent with requirements.
2. Uniform distribution of heat, maintained at a low air velocity.
3. A re-circulating system which works without sufficient draught to stir up dust or inconvenience the workmen, and which furnishes a means of ventilation, and the expulsion of bad air as well as giving an ample supply of fresh air.

Under properly adjusted conditions the heat furnished by the so-called hot air blast system is more reliable and generally better adapted to paint shop uses than steam or hot water heat. It affords convenience in handling, the heating system for a building being controlled at one point, and there is less danger from fire as the heating apparatus is confined in a steel housing with no good partitions to be looked after. Moreover, by the hot air blast system it is possible to obtain better ventilation during the cold months when windows and doors are tightly closed than by direct steam or direct hot water, and in the summer ventilation is provided by forcing outside or cool basement air through the shop.

This ventilation, if rightly utilized, becomes immediately effective in promoting the drying of paint and varnish and contributing to the comfort of the workmen.

Naturally, opinions differ concerning the hot air blast system of heating best adapted to the paint shop, but all will agree upon the necessity of a system that will furnish adequate heat with a low air velocity. The modern paint shop requires a greater quantity of heat to fit it for the purpose intended than its predecessor, because, as a rule it is better lighted, and with more artificial light more heat is needed by reason of the greater radiation from glass surfaces.

The hot air blast system to best serve in its heating capacity the needs of the paint shop, should be furnished with an air circulating system that insures a return of at least a part of the air to the blast apparatus.

There are three ways of establishing this return of air, namely, by an underground duct system, by an overhead galvanized iron pipe system, and by an overhead pipe system which delivers the hot air in a way to drive the cold air to the floor of the shop, and thence to the fans by means of a suction connecting directly with the steel air chamber of the blast machine.

In reference to the distribution of the air it is manifest that to get the most benefit from hot air it should be furnished where it is most needed. This leads to the suggestion that the greatest quantity of available heat is to be had from establishing the heating apparatus around the walls of the shop, and for the paint shop it is an open question if the most satisfactory results are not obtained by forcing the air through an underground pipe or duct, using short outlet pipes for the discharge of the air along the walls at the floor line. By this method the air is furnished directly at a point where it will do the most good, and the full strength of its heating power secured at a low air velocity.

By the overhead pipe system of delivering hot air it becomes necessary in order to get the heat well down to the floor, where it is needed, to employ a higher air velocity than is usually safe to have in the paint shop.

The re-circulating system for paint shops, in connection with the hot air fan blast system of heating, may easily be made to retard the drying of paint and varnish, and delay all processes of work. The constant re-circulating of air without taking at least 50 per cent or more fresh air from the outside, except in extremely cold weather, is productive of both moisture and a poisonous air which are alike detrimental to freshly painted or varnished surfaces, and to the health of the workmen.

This danger from moisture and foul air may of course be considered greater in a low shop, or in a shop with a low ceiling, than in a shop with a comparatively high ceiling, the principle being based upon the fact that, proportioned to the size of the heating system, the greater the volume of air that can be safely taken from the shop for heating purposes.

While the paint shop should be provided with a series of ventilators which open from the highest point in the roof or ceiling of the shop, and operate effectively in removing the foul air naturally accumulating at that point, it is nevertheless true that a thorough recirculating system which takes from 50 to 75 per cent of pure air from the outside furnishes in itself a valuable method of ventilation and brings it at once and continuously where both the work and the workmen most need it.

To summarize, in brief compass, what the foreman painter has a right to expect in the matter of shop heating and ventilation is to urge the importance of furnishing ample heat to the shop at a location along the wall, and sufficiently close to the floor, to give thorough and uniform distribution of dry heat throughout the entire shop from floor to ceiling at a very low air velocity and with a re-circulating system entirely effective in furnishing fresh air and plenty of ventilation.

The installation of such a system will mark the disappearance of many difficulties confronting not a few painters at the present time.

W. H. DUTTON,
Lehigh Valley R. R., Sayre, Pa.

President Cook: Gentlemen, that finishes the reading of papers on this subject. If any one present has any hot air to let loose on the subject, we will put up with it.

Mr. Butts: I have no hot air to let loose, but I want to say a word. I think if it were put to a vote of the membership, those that have had experience in heating paint shops, that it would be largely in favor of the hot air system. But there seems to be quite a diversity of opinion as to where this air should be discharged into the shop, or the point from which it should be discharged.

The writer of the first paper states that the shop is equipped with the hot air system and that the air is discharged five or six feet from the floor. The writer of the second paper gives the discharge is ten feet from the floor. The writer of the third paper thinks that the best result is obtained by discharging the air at the floor line. There certainly are three opinions, all differing considerably.

In my experience that is a very vital point, where the hot air should be discharged to get the best results, and I agree with the writer of the last paper that by far the best results can be obtained by discharging the air at the lower line at slow velocity. I once heard an argument on that subject a number of years ago that went right to the point, in fact, I thought it settled the matter; it did with me, so far as I was concerned. I did not feel like continuing the discussion.

In a Western shop where I was located and had charge, some years ago, we had the steam-heating system. The steam pipes were all above the tops of the cars in the shop; nothing in the radiators below the highest point at the top of the car. We found it very difficult to heat the shop, indeed, the floor was sometimes so cold that ice would form in the winter up in that northwestern country where it gets very cold. One day there was a man working out on the track, an Irishman, who came into the shop, and the temperature outside was about 32 below zero, and his feet were nearly frozen. He came stumbling along into the shop to find a place where he could get warm. He looked around the shop, under the cars and all around, trying to find a warm place. Finally the old shop foreman followed him up and said, "I want to know what you are doing here?" "Well," he said, " Iwas in here to get warm; where do you get warm in a place like this? I looked all around and I am sure I discovered no stoves in here. I do not see how you fellows stand it." "Well," said the foreman, "we have no stoves in this shop; we heat our shop by the pipes up there." "It seems to me that is a queer kind of arrangement," said the Irishman; "sure enough, I don't see how you can get warm." "Well," said the foreman, "that is a new idea; that is the scientific way of heating a shop. Our mechanical engineer tells us we get the best results." "Oh, it is the scientific way, is it? Well, it may be all right, but I would like to have you ask your Mr. Scientific Man why it is that my fur cap does not keep my feet warm." (Laughter.)

I think it takes a great deal larger percentage of hot air discharged ten feet from the floor to warm the floor than if it is discharged at the floor line; it does not seem to me it is worthy of argument. It certainly requires a higher velocity to force it from a point six feet above to the floor than it would require to discharge at the floor line, the only proper place, it seems to me. Our shop is equipped that way. The main leading pipes come down to the posts at the front, run through the shop, and discharge the air about 12 inches from the floor, at very low velocity, and it is certainly highly satisfactory in every respect.

Mr. Lord: It seems to be a unanimous opinion that hot air is preferable to anything else. Now, my experience has been with steam heat, with the exception of where I have visited shops equipped with hot air. Our shops are equipped with steam, and the pipes go oper the tops of the cars and the heat remains with the pipes above; we get nothing below that rarely, unless we have an extreme heat to drive it down. It is always up there cut of the way just the same as the pipes are, and I have been obliged to close the shop on cold days because I could not drive the heat down to the floor where we wanted it. One day I put the thermometer about a foot from the floor and it stood at 34, and that was as hot as we could get it, and I put one up near the pipes and it stood at 96, which shows that there was heat in the shop, but it was up out of the way, the same as the pipes are. This overhead heating is all wrong and of no account in paint shops. You want your heat down at the floor, from where it will rise without any trouble: the trouble is in driving it down.

A Member: I thought everybody understood, in this enlightened age, that hot air goes up and cold air goes down.

Mr. Lord: I have heard it explained that in having these pipes out of the way it did not interfere with the shifting of the cars, or anything of that kind. A man was looking around the different shops in the building and they were showing him these modern shops and explained to him that these pipes, being out of the way, did not interfere with doors and windows and were not in the way on the floor, and telling how nice and slick it was to have them up out of the way—did not think anything about having the heat out of the way, too.

Mr. Bailey: I do not know what the best method is, but the shop I have charge of is heated with hot air, the pipe running through the center of the shop. This pipe is about twenty-five feet above the floor and at alternate places on each side there are openings perhaps about 15 feet apart at the same height of the pipe. The air is returned to the heating coils on the floor line. We sometimes have there 25 degrees below zero for outside weather, and we do not have any difficulty in heating that shop to 75 degrees heat; it is simply the circulation that does it. The cold air at the surface is returned, and the warm air brought right around and takes its place. Everything is up out of the way, perfectly safe, does not take up any room, and I do not know of anything better. You talk about your hot air up there; the trouble is in the lack of circulation. If Mr. Lord's shop had some means of circulating that air, he would get all the heat he wanted below; that is the whole secret of it. You talk about these openings coming down five or ten feet from the floor; you want your opening up there out of the way. The farther up your opening, the wider the distribution of the heat. You bring it down here to the floor. You can yourself see the idea, that the opening is like a tunnel; the higher up you get that, the more distribution, the more circulation of the heat. I was in Mr. Hibbard's shop at Allston, Mass., when it was built, and the pipes come down to within perhaps ten feet from the floor, and he said it could not heat the shop properly on account of those openings being so high; he was going to bring them down nearer to the floor. I said, "You want your openings up there, where your large pipe is; all your air, when it comes down, diffuses." I do not know whether there has been any change made or not, but I think that is the right way to do it.

Mr. Gohen: It seems that great minds differ. Here comes one man and says you want to get down close to the floor, and the other man says to take it up to the roof. Now, of course, this scientific way of heating shops is all right, but I think the practical method is better.

Some time ago my friend Quest wrote me in regard to this thing and wanted to know what I thought of warm air for heating paint shops. Well, we have no warm air shop on our road—we heat all of ours by steam—but we have our roundhouses and some of our machine shops that are heated with hot air, and before I replied to Mr. Quest I went to our mechanical engineer, who is a very bright young fellow, and I said: "Mr. Ettinger, will you please give me the necessary information so that I can answer my friend Mr. Quest?" He said, "I will give you my experience. You know in our Brightwood shops we had hot air, and the pipes were about six or eight feet above the floor, possibly higher than that, and we could not succeed in heating the shop at all. It was hot up above, but down below it was very cold. We are now heating our roundhouses, which you may see for yourself, by putting the ducts down in the pits; we get them down as low as we can, and you go up to Brightwood any day (this was in the winter) and see if it is not comfortable." I did, and I know that where we had it in the shops above the floor, six or eight feet above, that it did not heat the shops, but our roundhouses, where they have the heat down in the pit floor are very comfortable places. But in heating the paint shop, you must be very careful about the draft or force of the air which comes into the shop, or you are going to create a vacuum; you must have a low velocity of air and large opening of the pipe. I think those of you who are going into the hot air method, if you will get the pipes right under the floor, or level with the floor, you will have success in heating you shops.

Mr. Copp: When I first visited the new Concord shops of the Boston & Maine, I felt very much disappointed to see the outlets from the main pipes so high from the floor, having seen them in the West low down, several on the Pennsylvania Road among others, where the outlets were within reaching distance from the floor; I felt disappointed, as I say, that our shop up there was so constructed; but when we got into it and got to work there, I was happily surprised to find that we had in that cold country, in the winter, plenty of heat. Mr. Bailey's shop has a capacity of twenty cars; it is a large shop; and Mr. Bailey is quite a fancier of flowers, and he has some flowers in the extreme far end of the shop, where he keeps his plants and flowers in the winter time and they are in perfect condition. The fact is, I believe on one occasion there was a committee that waited on some of the officials to say that Bro. Bailey kept the place too hot. I believe he said something about getting them into training for a still hotter place. (Laugher.)

Mr. Quest: I did not know I was going to raise such a disturbance when I suggested the subject of heating and ventilating, as a member of the Advisory Board. My object in seeking information was to find out as to what damage they were going to do the varnish in circulating dirt. I never questioned the ability of the Sturtevant system to heat the shop, but it struck me at the time it was proposed to put a mechanical plant of that kind into the new paint shop of the Lake Erie Company's buildings at McKee's Rocks that we would better find out how the varnish would fare; of course, having a natural pride in the shop, they wanted clean varnish if they could get it, and when I raised the point, they met me with the understanding that if I could prove to them that it was a detriment, they would put in some other plant. I would like to ask of Mr. Dutton, who speaks of having his pipes discharge low down to the floor in regard to the controlling of the velocity of the air, as to whether he has had any trouble through irregularity of air as furnished by this mechanical system that he has now in his shop. I would like to ask Mr. Dutton that question, whether there is any irregularity that would make his speak of that as being one of the essentials.

President Cook: Is Mr. Dutton present? He is not here. Is there any other gentleman here with a shop equipped with the hot air equipment who can answer?

Mr. McMasters: I have had considerable experience with the hot air system of heating, commonly known as the Sturtevant system. I wish to say also that I have had experience with every other kind of heating, and I would say that I consider that by far the most satisfactory, all-around system of heating that I know of.

There is one thing that we seem to have lost sight of, and that is the ventilation. You have talked about hot air, but you never said anything about pure air, which is really as essential in arriving at good results in the paint shop as warm air. If your air is not pure, you are in a bad way. I wish to say that I have seen that system work for four years, and I do not recall half a dozen days that the heat was not perfectly satisfactory. The only improvement I could suggest in it would be in lowering the outlet pipes closer to the floor and regulating the ventilators, so that the heat would pass through the shop and the foul air would pass out above.

I think, gentlemen, that we ought to take some action at this time. There may be somebody in years to come—it may not be in our day, but it may be in years to come—that some of the railroads may want to build a modern paint shop, a good paint shop, and if they want to heat it, I think we ought to take some action on the matter.

Mr. Quest: I want to find out whether the velocity of the air is so great that it would circulate the dirt.

Mr. McMasters: It does to a certain extent; that is really the worst feature, and that may be overcome somewhat if the outlet pipes are closer to the floor, and also it has occurred to me that possibly if under these outlet pipes there was a pan of water, it would stop that air as it comes down and keep it from directly hitting the floor. The dust created is usually directly under the outlet, which creates more or less dirt, but at the same time I have seen in other shops which were heated by steam heat that the work was as dirty as it is with the Sturtevant system.

Mr. Butts: In answering the last question I think I can speak with some authority on that subject. Our shop is one of the largest individual paint shops I have ever seen; it is seven track wide and nine cars in length, and we have the Sturtevant system—used it all last winter—and the air is discharged about fourteen inches from the floor and the circulation is as nearly perfect as I have seen in any shop. The air comes out of the pipe at a very low velocity, and I have watched it closely and I see no bad effects. There is not pressure enough to stir up any great amount of air so as to carry the dust up onto the cars.

Mr. Quest: It can be controlled?

Mr. Butts: It is controlled in our shops perfectly.

Mr. Miller: I would like to ask if Mr. Butts gets sufficient heat at the center of his shop, or other places far removed from the walls where the outlets are. As I understand it, he has a very large shop and I would like to know if he has difficulty in that regard.

Mr. Butts: These discharge pipes are at sufficient intervals all over the shop, in the center and on the walls, everywhere; they come down from two lead pipes and carry each way from the center pipes. We have two large leading pipes running through the shop, up in the cupola, so to speak, a little above the cars, higher up, and the pipes radiate in each direction from those two main leading pipes, giving us air along the wall and also in the center of the shop. There are two lines through the center of the shop and one at each side of the shop, so we have four lines of leading pipes through the whole shop.

Mr. McMasters: I will say for the benefit of the members that if they have time to visit the Burnside shops they will get an excellent idea of heating, lighting and ventilation. I do not believe there is, taking it all around, a better shop in the United States, and they can see very readily there the effects of hot air.

Mr. Brown: Mr. Bailey refers to circulation, which would lead me to think that they have some method of handling or conducting that circulation of air. He says the heat comes out from the pipes in the upper part of the building, and I would like to know if he has some method of conducting that down near to the floor?

Mr. Bailey: There is a brick wall between the heating apparatus and the paint shop proper; near the floor, or down at the floor, there is an opening right in front of the heating apparatus four feet high and ten feet long. All the cold air is drawn out of the shop through that opening, is heated and returned, and there is no perceptible movement of air in the shops except right in front of the opening. I do not have any trouble from the circulation of dirt; nothing of that kind.

Mr. Brown: That is why I think that is a different method than most of the other gentlemen have called our attention to. that method of circulating air, using it over again, and so on. In regard to dust and dirt, I have not had any experience with hot air in any shop whatever. But invariably the shop floors, where they are supplied with the hot air system, are of such a nature (of concrete) that the dust does not accumulate the same as in other plants. When I visited Mr. McMasters at the Illinois Central he told me that they washed their floors; did not attempt to sweep it, and there was not that accumulation of dust—there was not that kind of dust that would be blown all about, and then when we get the method of circulation that Mr. Bailey describes it seems to me we are getting pretty near to the right point.

I visited Mr. Dutton's shop at one time and the air was coming out of those pipes just where it struck a man in the back of the neck when he was working on staging. He told me that down on the floor, at some seasons of the year—his shop is in a sort of valley—the water would remain on that floor and be almost ice nearly all day long, while the upper part, of course, was very warm. Now, if he had the same facilities that Mr. Bailey has to circulate that air he would not have this difficulty, and it seems to me that is a very essential point.

Mr. Copp and I visited the new shop at Readville that is being built by the road that I am employed by, and they have the same system; but I am at a loss to say whether they have the circulating part, which I think would be very essential.

Mr. Pitard: Like Mr. Brown, I have not had much experience with hot air, but mention was made in one of those papers in regard to steam heat producing moisture in the shops, and I am rather inclined to think that that point is erroneous, and I think my experience will contradict it. We tested that. One of our officials was rather inclined to that opinion just after we installed steam heat through our paint shops and he expressed a doubt that steam heat would dispel moisture. One morning the cars were sweating very badly and I remarked to him that we were going to fire up and test the matter and see what it would do. He said, "All right, go ahead, but I do not believe it will dry up that moisture there, because it is producing moisture." He seemed to think that the heat produced by the steam had moisture in it on account of the fact that it was steam and that steam contains moisture. Well, I told him I thought it would be all right and we fired it up, and in about three-quarters of an hour the moisture was all gone, the car was perfectly dry, we had complete success with it and it was working very satisfactorily. It works very quickly, takes a very short time to bring the temperature of the shop up to the desired point, but with the hot air I have had no experience.

Mr. Brown: It certainly is evident to a great many that steam heat is the driest air we can get, but I think the remark that Mr. Pitard referred to was on account of the pipes being likely to leak and the steam coming out and thereby distributing moisture, but steam heat itself is really considered one of the driest air arrangements that is used, very dry, suffocating almost.

Mr. Gohen: Mr. Brown spoke about the floors in the shop, and that is one thing that I think we ought to bring up very particularly at this time. There are a great many laboring under the erroneous impression that a concrete floor is the proper thing for a paint shop. I was under that impression myself a few years ago, but I am not now. I would rather have anything else in the paint shop than a concrete floor; it is the dustiest and dirtiest floor we can get into a shop. If any of your are going to have new shops and have floors laid in them, do not put in concrete floors; put a creosoted block floor in. A concrete floor is too cold in the winter time and dusty at all seasons; a man walking over it raises a cloud of dust, and if you sweep it will raise large quantities of dust.

Mr. Copp: How about granolithic floors?

Mr. Gohen: Mr. Copp says granolithic, but I would prefer creosoted block if I had anything to say about it.

It was moved by Mr. Miller that it be the sense of this meeting that a system of hot air heating, which will heat the floors as well as the upper portion of the shop, is the proper system of heating a car or locomotive paint shop.

Seconded by Mr. Quest and carried.

President Cook: I am informed that Mr. J. H. Tinker, Master Mechanic of the Baltimore & Ohio Railroad, is in the room. If that is the case, allow me to extend, on behalf of the association, a cordial welcome and also to express the hope that he will say something to us.

Mr. Tinker: This is a subject that I am not very familiar with. I came especially to hear the subject of steel car painting discussed. Our people have done away with steel car painting, merely brush it off with steel brushes and let it go at that. I thought I would like to come up and hear what was said on that subject, but I am very much afraid I will be compelled to return before the subject is brought up.

Mr. Gohen: We might bring that up at this time. I suggest we switch subjects and bring that up next; we can do that; we are not bound to abide by our program.

President Cook: We will be pleased, indeed, to take up that subject now instead of the one marked No. 3. This will be subject No. 6, "Best Method and Material for Painting and Maintaining Steel Cars." Mr. H. C. Lafferty is down for the first paper.

Mr. McMasters: I see in the room, trying to get out of sight, a pretty good looking man, and furthermore, he is a very good friend of the painters, a man who takes a great deal of interest in painting affairs; that is Mr. White, Superintendent of Motive Power of the Lake Erie Road. I am sure we will all be glad to hear from Mr. White.

President Cook: It will give me a great deal of pleasure to allow Mr. White the privilege of addressing the convention at the present time.

Mr. White: Mr. President and Gentlemen of the Master Painters' Association: I do not know why Mr. McMasters has asked me to speak to you, because I feel that if there is anything that Master Mechanics know very little about it is painting; if there is any line of work in the locomotive and car departments where the master mechanics can rely to the largest extent on their foremen for information, it is in the line of painting.

I had a case demonstrated to me quite thoroughly a few days ago—my painter is here; I think he knows his business, at least he convinced me that he did—the question came up in regard to mixing certain colors out of lead. Now, I know that he thought that I thought that I knew it all; that was not the point. I notice that he does not talk very much in conventions, and I was glad to get him to talk to me and he convinced me that he knew his business better than I knew it. I feel that master mechanics cannot come to a painters' convention and tell you very much about your business.

In glancing over the subjects on the program I see that No. 7 says, "Is the Authority and Responsibility of the Master Painter Co-Equal?" I do not know how it is on most roads, but on the Lake Erie & Western I believe it is distinctly understood that the two are co-equal. I feel that if I undertook to run the painting line of the locomotives and car works that we would have some pretty shabby jobs.

There are other subjects here—Query No. 2, "Do We Pay Enough Attention to the Front Ends of our Locomotives?" That is a subject that I have been trying to get my painter to get hold of, take it in his own hands, handle regardless of me and regardless of the locomotive foreman, and I do not believe on the various roads that the painters do give the care of front ends particular attention. I do not believe they give enough attention to the maintenance of the locomotive when it is in service. We hear a great deal about the care of the cars at the terminal division, etc., but the cleaning of locomotives is left more largely to cheap and inefficient roundhouse help, and very little attention is given to that line of work by the painters. I believe that is a subject that you can well handle, that you should feel your responsibility does not cease as soon as the locomotive is turned out of the paint shop, that you should follow the care of that locomotive, both the front ends and sideboards, the headlights and the balance of the locomotive. If you would follow that up you can bring about some system in the care of locomotive paints.

I said in the first place I did not feel that I could tell you anything about the work. I thank you and thank Mr. McMasters for his kind expressions, and I wish to say that I am friendly to locomotive painters and I am here to show my friendship, and I thank you, gentlemen, for your kindness. (Applause.)

President Cook: Mr. White, we thank you for your kind remarks, and there is one point you touched on that I am glad to have you bring to the notice of the convention. There are a good many painters who come here who are just as full of intelligence and know their business as thoroughly as it is possible for them to know their business, yet the impression goes forth, because they are kept in their seats owing to an unconquerable diffidence, they go back to their respective places without ever having opened their mouths, and the impression goes forth that those men do not know as much as they ought to know. That is a mistake, for, in fact, all of us know pretty well what we are here for and that we are unable to get on our feet and express our ideas, and let Mr. White's criticism of this morning have its effect upon each one of us.

Gentlemen, I am very sorry, particularly on Mr. Tinker's account, that we will be unable to take up the subject of painting steel cars. It is so far down the list that the two papers that were furnished were loaned to the Railway Age, for an abstract or copy for their paper, and they are not yet returned. I am very sorry it happened so, but we did not expect to reach that this morning.

Mr. Tinker: I hope you would not change your program on my account.

President Cook: Mr. Tinker, it would have given us great pleasure to do so if it were possible.

"Which Is the Best Method to Pursue, Touching Up or Cutting In?"

MR. GEARHART'S PAPER.

Subject: Which is the best method to pursue, touching up or cutting in?

To the President and Members of the M. C. & L. P. Association.

Gentlemen:—In answer to the above question, it would depend on the condition of your job, also on the kind of material that is used for body color. Some years ago it was a common practice to touch up a car at least two or three years in succession after car had received class 1 repairs, or was turned out new. But since the advent of so much cleaning at terminal points, it has become almost obsolete. Whether the color that we are using at the present time is more fugitive, or the dirt and smoke protected the color, is an open question in some painter's minds.

Some colors being so much more fugitive than others that after a car has run 12, 14 or 16 months, the color has become so faded and stained that it would be a physical impossibility to match it. If your equipment received the amount of terminal cleaning that some roads do, you would have very little color left on to match to. And in cases like the above, the best method would be to cut in your job. To touch up a job properly you must have an expert to match the color, and as all shops do not have an expert color-mixer in their employ, their best method would be to cut in. To touch up a job and not have the color properly matched certainly does not make as pleasing an appearance as a job that has been cut in. As to the difference in the cost of the two methods it would depend a great deal on the amount of striping and lettering that the different roads use. So it would depend on the condition of your job, the color and the amount of striping, whether "Touching up, or Cutting in," would be the best method to pursue.

Respectfully submitted,
JOHN F. GEARHART,
P. R. R., Altoona, Pa.

President Cook: The next paper is by Mr. H. C. Herron.

MR. HERRON'S PAPER.

Mr. President, and Gentlemen:

I do not know if I can by my remarks cast any light on this already masterly handled subject, No. 3, namely: "Touching up and cutting in"—in alternates. However, if I happen to say anything that has not come to your mind, a cause that you and I are interested in will have been benefited. I had this said to me by a painter of Columbus, Ohio, that "about everything that could be has been said through the official organ." I do not say this to get Mr. Butts, or Mr. Ball, into a controversy. Mr. Butts wrote me that he could not refrain from answering Mr. Ball's letter, for his views were so much the reverse from his that he must say something. I recite this to show where the writers on this subject are placed, with the permission of a well-known magazine. I will take an article that appeared in its columns as a foundation for my paper with your consideration. I am of the opinion that the first part of this subject should be more universally adopted. But by the time this convention is over with, the discussion that will follow the different opinions brought to "light" that subject No. 3 will have its remedy well applied.

In car construction and the use of gold leaf on a newly made surface, it can be cut in several times and the gold leaf will show up against the dark ground of the new color to a very good advantage, for, I say a number of times, and still its aristocratic lineage will be plainly visible after all the abuse it receives in the hard usage it is supposed to stand while in service. While the cutting in with color will show its economy to the car painters in a very few words. I have seen cars that were on a trunk line running out and in on one of our terminals that would have given some of the painters here a "nervous chill." Wherever it was done it must have been cleaned up for varnishing by a gang of scrubbers under the supervision of somebody that did not care, for I know of a place where this part of the work is done by the car foreman, and when it got to the painter, he was certainly in a hurry, for the color had not been even matched;—it must have been taken out of the can as it came from the paint concern, and it looked something like a burnt meadow patch. It was on a parlor car at that!

This illustration that I have been trying to draw should not, however, be set down as totally blinding yourselves to the fact that a car cannot be touched up and varnished; but a car that comes to the paintshop only needing a coat or two of varnish should be a car on which the fulness and depth of the color is unimpaired and should retain its vigor and vitality and have lost none of its original tone; also, that the varnish should be in condition to receive the subsequent coats that follow; and another thing, if it has perished so that it has lost its brilliant surface, or it has been cleaned too much with the emulsion or any other cleaning agency, if it can be. That if it gets the two regulation coats, the first will be taken up in suction, or it will strike in, while the second one will not stand out with the depth and fulness it should have on going into service for another year.

After looking over the general run of cars, I think you will find that the cars to be touched up and varnished will be few and far between as compared with the number that are cut in with color. The car that requires very much touching up, no matter how expert you are at the color-matching art, will be cheaper to you to cut in—in this way: By having your passenger equipment all of one color with nothing lacking and nothing to explain to your superior officers, "why." On the other hand, the car that goes through the shop and gets a general cleaning and painting, or is burned off and re-surfaced and gold leaf is used (which is the only striping and lettering material in reality) all the rest look cheap, as they are.

The road I represented at one time thought to cheapen the painting by using aluminum. They got them all done then the management thought they looked too cheap, so it was reversed; they were put through the shops again and received the gold leaf, and it has been cheaper. I refrain from saying why, because there are so many things and reasons that I could not explain them in a week's time, and I know you won't allow me that much time; but with the varnish as applied over a cut-in car body, and two coats is what they generally get, it stands out to a degree of fulness not obtained otherwise, and depth of brilliancy which sends a reflection as a mirrored surface, which results in a piece of work that any road can be proud of; a piece of work which, as one of the foremost workers of this association said at St. Paul, is "The best piece of advertisement any railroad can have."

I thank you.

H. C. HERRON.

The President then declared the subject open for discussion.

Mr. Gohen: I do not want to be the one to start the ruction, but I know there is going to be one on this cutting-in business, so we may as well put our gloves on and spar it out.

In our friend Gearhart's paper he very evidently conveys the idea that it is a better and cheaper and more practical way to cut in a car than it is to touch it up and varnish it, and why so? Mr. Gearhart says in his paper that you require an expert to match your colors; you do not have to have an expert to cut in a car, and he goes on to tell that this car can be cut in three or four times, but the reason they have to cut them in is on account of so much terminal cleaning. Well, it seems to me to be a very peculiar affair that this terminal cleaning only affected the color and did not affect your ornamentation. Now, you have got the same varnish over your gold, your letters, your numbers and everything of that kind and why does not this terrible terminal cleaning, why does it not clean the varnish off the gold as well as the rest if it is so destructive? The simple truth is, it is easier and cheaper to cut in than it is to touch up and varnish, and where the fault is laid to terminal cleaning I say that it is certainly a mistake on the part of somebody. There are today, and I venture the assertion that there are men in this room who have never used one pint of emulsion cleaning, or very little, and when the cars come into the shop they are there cleaned up and varnished and painted, and I will say if those men will get up and express themselves you will find that there are more men cutting in cars today who do not use emulsion cleaners than there are those who do use them. That is a broad assertion, but I think it will be verified.

Another thing, this emulsion cleaning business is just a few years old; only six or eight years ago, or possibly ten years ago, there were not half a dozen railroads in this country using emulsion cleaners, and I know of my own personal knowledge that long before an emulsion cleaner was thought of that there were many painters that felt and believed that cutting in was the proper thing to do instead of touching up. Why don't they do it? For the simple reason that those cars are so highly ornamented and it costs more to cut it in than to touch it up, but the whole secret is right here, you cannot match one color in a dozen that you have on your cars today. There is not a man, I do not care how good a painter he is, who can make a permanent match on any of the roads today. The nearest approach you can make in that is in the color they are using on the Chesapeake & Ohio and Big Four, where they use the cadmium yellow, and I know we have touched up cars that had been running twelve to fourteen or fifteen months, which were brought into our shops and nobody but a painter could tell that those cars were touched up, and they invariably remained in that condition.

In one of the papers, I do not know whether in Mr. Gearhart's or the other, I believe it was in the last one, it was said that some painters would take the colors as they came out of the can and use them. Now, gentlemen, that is a proposition; that is the right thing; that is the proper way to touch up a car if you are going to touch it up; take the color, provided you are going to use the same kind of color that the car was painted with, take that same color and touch it up. It will not look right at first, but it will after awhile; it will come to the right color. But you match that color and in three days you will not have the same color, and the longer you run the more it gets away from the color of the car. I do not think you can attribute this to the emulsion cleaner, and I take issue with the gentleman in the paper. I say, too, and I know it to be as true as anything, that a good emulsion cleaner, I do not care who makes it. I say it will prolong the life of the varnish instead of destroying it. I know we have kept our cars six to eight weeks longer than under this soap and water proces, and I will say to any man that will come to me, and Tom Byrne included, that a car will stay longer in better condition with an emulsion cleaner than with the soap and water, and the varnish and paint are not scraped off.

Mr. Ball: I do not blame the brother who has addressed you in his remarks on behalf of the emulsion cleaner, but I must beg to remind him that neither in Mr. Gearhart's paper or in the other paper was emulsion cleaner attacked; there is no attack made on emulsion cleaners. The statement was simply made that by reason of the continuous and general cleaning that is done nowadays in places to keep the rolling stock looking in good shape, they are cleaning so much oftener and cleaning so much harder. I might say, more particularly, that it is immaterial what you use, that abrasion and continuous rubbing, if it were nothing but clean water and a sponge, with the amount of dirt that is on the car will wear off the varnish, and when the varnish is worn off there is no protection to the colors, that is, generally speaking, the color which he uses being an exception, as he maintains, but if he had to use such colors as they use on the Pennsylvania Road, which is nothing more than a turpentine stain, with a sort of light basis for coloring matter, why, just as soon as his varnish is removed his color is gone; there is nothing to save it, and the more it is cleaned after the varnish is rubbed off in spots, which he cannot avoid doing, the more that color will fade and become discolored, and as a result, if you go to touch up that color, no matter how well it is matched, you will have the car looking like a patchwork quilt, and nobody wants that. It is the result, gentlemen, not of emulsion cleaners especially, but it is the result of the greater care in trying to keep the equipment clean. Mr. Gohen knows as well as I do, and everybody else in the room, that a continuous rubbing and abrasion of the varnished surface will remove the varnish, and when the varnish is removed there is nothing that will protect the color from discoloration, consequently, without regard to the kind of decoration that is used on the car, the cutting in is an actual necessity, and touching up has become obsolete, I maintain. (Applause.)

Mr. Gohen: Excuse me; there is one more point I would like Mr. Ball to elucidate, and I believe I brought it out. I want to ask Mr. Ball how he can explain to this convention that this great system of terminal cleaning which the railroads are undergoing at the present time, how it is possible for them to clean all the varnish and paint off the car without taking the ornamentation and letters off? That is what I would like to have him explain.

Mr. Ball: As a rule, and it is the rule where gold is used as the material for decoration, that the gold itself is a protection to what is underneath it; it is a metallic protection and you can remove the varnish from the gold and the gold will not discolor.

Mr. Gohen: Look out, you will get into trouble.

President Cook: The chair cannot permit the general discussion of emulsion cleaners only as it applies to this subject.

Mr. Butts: My idea and Mr. Ball's are not as much at variance as I imagined they would be when this discussion was opened, because he does not take the ground that emulsion cleaners are responsible directly for cutting in, only that process of cleaning. I do not suppose any man in the room would really dispute the fact that the car can be over cleaned, and that the varnish can be worn thin by constant cleaning, especially if anything like pumice stone or anything of that material was used in the cleaner, but nevertheless both of those papers convey the idea that the frequent cutting in of cars is attributable to emulsion cleaners. I cannot see how we can discuss this subject and separate them entirely; we must refer to the emulsion cleaners.

Mr. Ball: There is no reference made to emulsion cleaners.

Mr. Butts: What is the language of the paper?

Mr. Gohen: Will the secretary read it in Mr. Gearhart's paper? It is in the early part of the paper.

The secretary read the following: "In answer to the above question it would depend on the condition of your job, also on the kind of material which is used for the body colors. Some years ago it was common practice to touch up a car at least two or three years in succession after the car had received class 1 repairs or turned it out new, but since the advent of so much cleaning at terminal points it has become almost obsolete.

Mr. Ball: That is it.

Mr. Butts: There is nothing said about emulsion cleaners, but the inference in speaking about so much cleaning is that it is due to emulsion cleaners; it is evident to me that that was in the writer's mind.

Mr. Ball: He does not say so.

Mr. Butts: I wish to discuss the subject a little in regard to why we cut in cars as frequently as we do. I had charge of a shop where we had the Pullman color for nearly seven years, and there was no excess of cleaning; there was nothing of the modern idea—we won't say anything about emulsion cleaners—there was nothing of the modern cleaning of cars at the terminal, simply sponging off with water; there was no special cleaner at the terminals that we have to contend with these days, and we adopted the process of cutting in those cars, because of the fading of the body color. The varnish was worn thin from natural causes that usually destroy varnish, the elements and the weather, and we found it to be more economical, more satisfactory in every respect to cut in those cars. We adopted it as a standard; did not pretend to touch up a car at all. Facts and figures proved that it was cheaper, or it would not have been adopted, I assure you, in the shop I was in.

Since that time I have had to contend with modern conditions and have had to become acquainted with this frequent cleaning that we are talking about at the terminals. Our cars are frequently cleaned now, much more frequently than they were at that time, very much more. We have quite an extensive system for cleaning our cars at the terminals, but I want to say that if it were not for the one fact that our body color fades as it does we could touch up every car that we put through the shop. Our varnish is not decayed; it is not worn thin as it used to be; it has very much more body than it ever had, and we would not need to put any color on the body of the car if it were not for the faded condition and the spots broken through by the cinders and other things that the car has to meet. Those are the absolute conditions on the road which I represent. Therefore, to be honest with myself and with the whole subject, I must say that the necessity for cutting in cars now is less on our road than it ever was before, therefore I cannot say that cutting in cars can be attributed to frequent cleaning we are doing at the terminals at the present time.

Mr. McMasters: One of the principal causes of cutting in a car is the getting uniformity of color. I think we will all agree on that point, regardless of what causes it or where the trouble is, but I want to take issue with our friend, Bro. Ball, when he says that the constant rubbing of cleaners, whatever they may be, destroys the varnish of the car. Now, that is true if you use pumice stone in rubbing the car down, but with the ordinary emulsion cleaner that is on the market today you do not have to use pumice stone.

I want to say, and I think all will agree with me, that if Mr. Ball or any one else will take a newly painted car, a newly varnished car, and set it out on the track where it is exposed to the elements, and take half of that car and we will say once every month take an emulsion cleaner and rub one-half of it—just one-half of it—and let the other stand, I will venture to say that at the end of twelve months, or at the end of sixteen months, the half that is rubbed every month will be in far better condition than the half that has not been touched.

Mr. Brown: The question that is under discussion, which is the best method to pursue, touching up or cutting in, depends entirely on the body color. I was in the service of a railroad company twenty-seven years, where the body color was composed of golden ochre and white lead only. We handled those cars all the way from five to seven years without painting; we could touch up that color in a very acceptable manner. Today the color we are using on the line that I am connected with, which absorbed the old one, the color that is used is such that it is next to an impossibility to touch it up with any degree of satisfaction. The striping and ornamenting are put on in such a way that it is an easy matter to cut in, and we do frequently save the gold two, three, four and five years, and cut those cars in every time they come into the shop. We are allowed to take them in after eight months' service; they would rather they would run a year, but if anything happens to them that they bring them into the shop, we are allowed to cut them in once in eight months, but the gold, whatever way it can be explained, looks remarkably well even after cutting them in, I might say three or four times. But with old standard color of golden ochre and white lead—thirty pounds of golden ochre and one hundred pounds of white lead—we put that body color together year after year, and for twenty-seven years, while I was in that employ, we ran them all the way, as I say, from eight to twelve years without repainting, so it depends entirely on your body color as to which is the most profitable to do, touch up or cut in.

Mr. F. W. Wright: This is a very important matter, this cutting in or touching up cars. I personally agree with both; I myself adopt both methods. It seems to me when cars are in good condition after a year or so of use it is far more economical and better results are obtained by touching up those cars (where there are only a few small bruises and slight wear) than would be obtained by cutting in the car. I for my part, where a car needs it, cut it in, if it is in bad shape and had been cut in for several years. I can't say I altogether agree with Mr. Gohen in the matter of touching up the car in the original color. I would sooner have a match when the car goes out, as near as possible, than to have it three or four months afterward. It gets dirty anyhow, and I would like to have the car somewhere near the proper shape at the time of leaving the shop. I think this is a matter that cannot be decided by a convention, but must be left to the individual members as the case may require. Some cars can be economically touched up and look quite satisfactory with certain colors, while others can be cut in to better advantage.

Mr. Pitard: I think that in general practice cutting in is the proper method for many reasons. A cut in job always looks the best; it does not looked patched, and besides it gives a foundation upon which to apply the succeeding coats of varnish, causes them to stand out better, present a better appearance, and for another reason, it enables one to classify the work. If a car goes into the shop to be touched up you do not know how long it is going to take a man to match the color. I have seen men spend hours and then not get the color. If you are going to cut in you know exactly how long it is going to take to cut in and you can make the calculations accordingly. I believe there are some exceptions to that, because there are some cars that do not require cutting in. In a case where a car has been only out a short time and the varnish is in good condition, if it happens to receive an injury it will be cheaper in that case to wash it off and varnish it, but in general practice, cutting in is the proper method.

Mr. Lanfersiek: I move that it is the sense of this convention that cutting in is preferable to touching up.

Carried.

THIRD DAY'S SESSION.

September 10, 1903.

The meeting was called to order at 9:30 a. m.

President Cook: Before we take up our regular routine business I will again speak of the matter of dues. I hope you will all see Mr. McKeon or his assistant.

President Cook: We are now ready to take up No. 4, "Harmony in Color in Finishing and Furnishing the Modern Railway Passenger Car."

Now I have in my hand a paper sent in by an outside party: is from the American Society for Testing Materials, and I understand it is very interesting, and if the convention is willing that the paper should be read we may glean something very important from it. I will entertain a motion that the paper be read.

It was moved by Mr. Bailey, and carried, that the paper be read.

ESSAY BY CHRIS. CLARK.

Harmony of Color in Finishing and Furnishing the Modern Passenger Coach.

Mr. President and Gentlemen:

So many and varied articles necessarily compose the equipment of a modern passenger coach that it presents a somewhat crowded appearance and to secure harmony of the whole requires artistic ability of no mean order. The color of the wood, style of carvings and trimmings with which it is embellished, the color and pattern of the carpet and the material with which chairs or seats are upholstered, must all be considered as they form the key note as it were to which the painter must attune his work. This requires on his part a keen sense of the perception of the harmony of colors, which, like a correct ear for music, is a natural talent to a large degree, but also like it, may be cultivated and improved by study. We must remember that this perceptive faculty is also possessed by the people that travel in the coaches, who, although not painters, have a knowledge of the same definite facts as to colors that suit each other, that we have.

Harmony does not necessarily demand that similar colors, or only those of a like nature be used, as harmony may be assisted by contrast produced by the employment of colors that are opposed to each other; as for instance a warm and a cold color—red and blue in suitable quantities and locations form a harmonious contrast. To secure a desirable effect, due regard must be given to the quantity of each color as well as to their relative positions in order to maintain what is known as the balance of color, which is also essential to harmony. The correct juxtaposition of colors is also important and is exemplified when a red and blue stripe are next to each other, which then have the appearance, especially at a distance, of their secondary color, or purple, and if this be on a green ground, purple and green being a discord, the effect is inharmonious; but by placing yellow or gold between the red and blue, quite a different and harmonious effect is produced.

Thus we see two primary colors in juxtaposition change the effect of each, although yellow—which is also a primary —and blue, do not assume their secondary hue—green—when placed next to each other. Yellow next to red, however, lightens the red, giving to it an orange cast. This harmonizes with blue. It is well known that some colors have a direct effect on others, adding to their strength and power, or softening their influence as the case may be; for instance, black near white appears blacker, and white whiter near black. Blue, red and yellow not only harmonize perfectly, but mutually heighten their appearance.

"Each gives each a double charm
As pearls upon an Ethiop's arm."

Red loses much of its power in the presence of green, while black and green neutralize each other, and black between red and green looks dull. Green, as a rule, lends brightness to other colors and in addition is restful to the eye. It is now very generally used for ground work on ceilings and side linings, and is undoubtedly a most suitable color in that capacity. In addition to green, nearly all light colors brighten those of a deeper kind, as white with blue or yellow with red. Green and gold look well with red for a border, but where different tones or shades of the same kind of green are used in striping or ornamenting, the ground should always be of the darker tone; i. e., a dark green should not be placed upon a light green ground. Gold is useful on a green ground for the purpose of harmonizing purple, or other color that would not harmonize with green, without the aid of gold or yellow.

The proper selection and arrangement of color is of importance, as for instance, when blue, which has a very unpleasant and forlorn apearance as a border or at the edge of an ornament, if carried in to the center of a panel or pattern, is heightened in effect and looks much better. Selection and arrangement may also be employed to give additional height to a ceiling as some colors appear distant, while others in the same location appear nearer. Blue for instance, recedes while red appears to approach the eye. The correct arrangement of colors is also necessary to display each with distinctness and to avoid confusion. Bearing in mind the afore-mentioned general conditions governing the requisites for harmony in color, let us apply them to the finishing and furnishing of a modern coach.

Somewhat bright colors in furnishing are pleasing and do not appear gaudy or glaring if employed in moderate quantities and with due regard to their suitability to each other. The pattern and color of the carpet or aisle-strip is an important factor and both in color and character of pattern it should correspond with, or at least bear a harmonious relation to every other color in the coach—to the ceiling and side lining in particular—and must not contain anything that either overwhelms, dwarfs or suggests incompatibility with its surroundings. The same rule applies in regard to the plush or other material with which the chairs or seats are upholstered. This should be of a bright color forming a pleasing contrast with the wood of which the coach is built; while the window curtains should be of a lighter and subdued tone of the same color.

The ceiling and side-lining have a very potent influence on the aspect of a coach and as a rule the same general colors should be used in its decoration that are contained in the carpet, taking care, however, that the groundwork is sufficiently light and soft to add as much as possible to the apparent height of the ceiling, while avoiding heavy and dark shading, also the use of bright red which seldom looks well on a ceiling for the reason before stated, that red always appears nearer to the eye than other colors. Let the composition of all colors in the ceiling be of a subdued tone selected and arranged both as to quantities and location of each, so as to lend distance to the whole. The design of the ornament on the ceiling should agree with the carvings and other woodwork in general style and character in order to preserve harmony of design, which is of equal importance with harmony of color. With this end in view, we should avoid all incongruities, duly considering the suitability of our subject, or in other words, display a sense of the fitness of things.

It may be well in this connection, to call to mind the "Artist" that, having painted a picture of Adam and Eve in the Garden of Eden, to enhance the effect, painted the figure of a man in the background carrying a double barreled, breach-loading, shot gun over his shoulder.

As to second-class coaches, there is no more reason for lack of harmony in a second class coach than for a woman to disregard its principles in a dress because made of inexpensive material. The same fundamental rules as to color prevail as with a first class coach, and a like care should be taken in the selection of color for painting floor, seat ends, ceiling, etc., because harmony, like civility, costs nothing but positively adds value where its principles are applied.

Flowers and foliage are not so extensively used as ornaments in decoration of coaches as formerly, but for a second-class ceiling they are both inexpensive and effective. If used, however, it is necessary to be true to nature, giving to each its correct form and color, but which of course must be of such a tone as to convey the impression of proper distance.

To illustrate the necessity of being true to nature, I will mention the "Artist." I guess he was of the same school, if not a relative, of the man that painted the Garden or Eden picture. This man had painted a view of the seashore, and on returning to Chicago, Pittsburg, or some other inland city, a bright idea struck him—to paint some crabs and lobsters in the foreground. So he forthwith sent to the fish dealer for models and innocently painted these red in his picture, as indeed were his models, which of course had been boiled.

Let me urge the necessity of harmony in every detail. For harmony is the equilibrium of nature; our senses are attuned to it; the keenest susceptibilities of mind demand it; completeness and proportion are contained in it; perfect composure and repose are impossible without it. It is definite, positive and indivisible in its nature; incapable of sustaining violence in any one part of its minute organism without a sympathetic protest being excited in every other part.

An appreciation of harmony is possessed in a greater or less degree by all, though perhaps unconciously by some. Therefore, none can escape its benign influence or fail to be affected by its absence. It is far from my intention that any remarks or rules contained herein shall be considered as of a dictatorial nature; but on the other hand, I hope there are those present whose longer and wider range of experience will enable them in pointing out the errors, to stimulate discussion that will be of benefit to all concerned, and thus fulfil the intent of this paper, which is to learn, rather than to teach, the principles of harmony in color as applicable to the finishing and furnishing of a modern coach.

In closing, I would invite attention to the very marked improvement that has taken place during the last two or three decades in the decoration of coaches. Each succeeding effort in this direction has outstripped the former, until in place of the erstwhile circus-band-wagon exterior and heavy and squatty appearing interior with small Gothic windows, and landscape painted panels, we now have the cheerful, light, artistically decorated and richly furnished modern coach. While we as an association do not by any means constitute a mutual admiration society assembled for the purpose of throwing bouquets at each other, or anything of that kind, I trust I may be allowed to suggest that some credit is due to such men as Mr. Warner Bailey, with whose elegant and symmetrical designs we are all familiar; and to other old-time members of this organization for the transformation that has made it possible for a cultured people to journey from one shore of this continent to the other while enjoying the ease and luxury of a stately, modern home.

CHRIS. CLARK,
N. Y. C. & St. L.

President Cook: Gentlemen, No. 5 is next on the program, "The Proper Method of Painting and Maintaining a Locomotive Engine." The first paper is by Mr. Kahler.

MR. KAHLER'S PAPER.

The Proper Method of Painting and Maintaining a Locomotive Engine.

Mr. President and Gentlemen:

A locomotive should be painted for durability and finish, rather than decorative effects to help out the surface appearance. To my mind the striping or decorating of locomotives, aside from passenger engines, is a useless expense, considering the present day practice of the majority of railways in usage and round house care of engines. What is really wanted is a smooth, durable surface that can be wiped, and a suitable varnish that will stand the wiping. Enough surfacing material should be applied to all prominent parts to fill up and create a smooth surface. This applies more especially to new work. In this condition engines require less material and labor when shopped to again place them in good condition; this as a rule and general practice.

The painting of locomotive tenders when new is one of vital importance. If the scale, flash and rust is not removed before the priming takes place, trouble may be looked for afterward; it will show up before the engine is ready to shop. Rust has been playing havoc underneath the paint, and by the time the engine is ready for shopping, pinhole rust, the worst of all, has made its appearance and you have a worse condition to contend with than before. In this condition nothing short of the sand-blast will reach and fully eradicate this evil; therefore, it is my belief that this process should be followed in preparing a new tank for painting. The same should be done on metal cabs; metal cleaned in this way is in perfect condition to receive the priming coat, which should be well brushed into all parts and left to dry for two days at least before applying coat of second coating material, which should follow next day with one (or two coats, if necessary) of knifing-putty, or plaster. This should, and can be done nicely to avoid much scouring. This can be cut down to a level surface with block and emery cloth next day, and one coat of rough stuff applied, avoiding brush marks as much as possible; this forms a keystone coat by stopping all suction and further sealing up to receive color coats and varnish. This coat is smoothed down with emery cloth next day and two coats flat color applied, which can be lettered and varnished the following day; but if gilded, a day later. No less than two coats of varnish should finish the tank and cab. In case the cab is built of wood the process is practically the same with new work; entire cab should be knifed in on the second coating. The open grain wood, if any, should receive two coats knifing. The lower edge of cab that rests on the run-away should receive plenty of paint, as this is very important in the beginning to insure longer life to this part which is exposed to a great deal of moisture accumulating around run-ways. The sand-box, dome and cylinders should be followed up closely so they may receive their proper amount of material to produce good surface. The driver wheels, when new, should be started as soon as possible to get material enough on and color-varnished before placed under engine to avoid oil and grease getting into surfacing material. This part of the engine should recive an extra allowance of color and varnish to withstand repeated cleaning, as here is where the wiper displays his skill. (?) All other parts should receive coat of varnish black, and where it is practicable, clean up and apply second coat of color-varnish after engine returns from trial trip.

In regard to maintaining, much could be said from the painter's standpoint. The use of crude, fuel, or any other gaseous acid laden oils for cleaning painted and varnished surfaces should be avoided, as these oils penetrate and in time rot the varnish, leaving the surface lifeless. In this state the repeated wiping oil is retained to further attack the surface material underneath; at this stage it becomes necessary when engines are shopped, to remove all material to the metal, as paint will not dry properly or give good results on this oily surface. Most of this wiping is done by cheap inexperienced labor, whereas, if it were done by competent men, by the use of a suitable oil cleaner, and done by the piece-price, much better results would exist in the appearance, and longer life to the painting—meaning by this, a saving in the paint-shop, as engines properly wiped can be cleaned, touched up and varnished in two and three days' time and are again good for six months or more.

The practice of cleaning shopped engines with potash or lye is unsatisfactory. Potash belongs in the lye vats where all material that can be handled is taken to be cleaned. Benzine is the best agent for cleaning frames, trucks and wheels, but as this has been eliminated from most shops, on account of its inflammable nature, it remains with the chemist to furnish us the solvent to take its place, but minus the bad features.

In maintaining front ends the proper construction of same is necessary to a great extent for good results; the thin pressed steel front is a failure in every way. There is too much expansion and contraction, due to enormous heat, and no paint material can withstand its power to consume or be thrown off. The failure of these front end plates has resulted in bringing back the heavy cast iron front of long ago when we had no such trouble as at the present time to keep them looking well. It is my belief that too much oil is being applied in the shape of thin washes which have a tendency to soften up and penetrate the metal, thereby unclinching the coating and causing the material to crack and scale off. My idea of treating front ends of locomotive engines is to apply the very best varnish color, or enamel, that will stand the heat. This coating to be applied when front is quite warm and the metal previously cleaned and smoothed up as well as possible. This surface should be kept clean by dry rubbing, and when necessary to coat over again, use only enough coloring matter to give solid color. A good rubbing pad for this purpose is made by soaking burlap in linseed oil, wringing it out and hanging up to dry for several days before using. The rubbing carried on day after day produces a nice polish on properly fitted up front ends, but where leaky joints exist you can expect them to be burnt off in most cases.

Respectfully submitted,
JOHN H. KAHLER,
Erie R. R., Meadville, Pa.

President Cook: There is a paper on the same subject by Mr. A. P. Dane.

MR. DANE'S PAPER.

All who are in any way connected with the mechanical department of a railroad hear, at least once a year, sometimes oftener, the "battle cry," "expenses must be reduced," and its waves, like those of the wireless telegraphy, reach every departmnet of the road sooner or later. As a general thing it seems as if the very first wave strikes the paint shop, why it is, I know not, unless painting seems to be regarded by many people, and I fear by some railroad people, as being somewhat of a secondary importance, and therefore can be curtailed perhaps easier and with less trouble than some other departments. It is at such times, the foreman painter is subjected to a questioning, if such and such operations in the prevailing method cannot be omitted or substituted by a cheaper material or can we get along with less help, and while it is the duty of every foreman at such times, in fact at all times, to be on the alert and ready to do what is possible to assist in economizing in his work, it is also his duty, if he conscientiously believes that the limit of true economy has been reached in his department to be able to demonstrate by good, sound, sensible argument, with a few practical illustrations, if possible, that his method is on a rock-bottom basis, and in his honest opinion cannot be reduced without detriment, at least, especially to preservation.

It is an old story, oft repeated, how beautifully locomotives were once painted and embellished, and how by the constant increasing demand for the curtailment of expenses, this beautifying has gradually disappeared, until it has reached a point, of plainess personified so that as far as appearance is concerned, I should judge the limit had been reached. But in reaching this limit of apearance, we have always contended, that it is of vital importance that he operations which pertain to the durability and the proper protection, should certainly be maintained, and nothing but the very best material known should be used, and the very best method known, employed, two qualifications which have been studied, practically by some of the best known practical railroad painters in the country, theoretically and chemically by learned theorists and chemists, to determine as near as possible the proper material to be used and the best and proper methods to be employed in the application for the protection of iron and steel, from the common and most destructive enemy encountered, viz.: RUST, and with all the studying, theorizing and chemical tests, there is not, today, a paint, pigment or vehicle that will permanently stop corrosion. There are some which retard it to a greater extent than others, and for this reason it is of the utmost importance that a primer should be selected which will check it for the greatest length of time.

Painting may appear to the majority of those, who are uninitiated in the art, as a very simple thing; and it may be in the covering of the outside of a house or barn with some fancy ready mixed compound, which has been duly advertised as the "Only Pebble," but when it comes to the painting of locomotives with all the vicissitudes of service, in extremes of heat and cold, sunshine and storm, atmospheric and other gases, from corrosive liquide and solids, grease, cinders, sand, and worse than all, if possible, sweating, it is quite a different proposition, and requires skill and ingenuity, and some chemical knowledge would not be amiss, for the master painter to determine the correct thing, in the right place, in the right manner and in the right amount. Not having the chemical knowledge (it was not included in the general routine of my duties as an apprentice) I have obtained what knowledge I do possess in regard to what ought to be used and how it should be applied, especially to locomotives, by carefully watching the results of experimental tests of different methods and materials, in which, I must add, with a great deal of pleasure as well as pride, I have been greatly assisted during the past eight years by the many very able papers which have been presented, and the very instructive discussions which have taken place at the conventions of this honorable and leading railroad association. And as a result of my attendance at these conventions, I now take pleasure in presenting to you a method, without egotism or any feeling on my part, that it is the only method, but simply one of the best, one which has been in operation on our system for the past six years with marked success, both in durability and economy.

Before presenting this method in detail, I wish to call your attention to the fact which we all know or should know, that it is impossible to make an iron-clad rule or system for the painting of a locomotive that can be adhered to at all times and under all circumstances in a repair shop owing of course to the different conditions which are bound to prevail when an engine reaches the shop. Right here is where the good judgment of the foreman painter is needed, and expected. It is for him to judge and say what operations, if any, shall be omitted; one of the conditions is generally the time allotted, and in the majority of cases it has come to be the principal condition for the reason that when an engine in its progress of repairs reaches the paint shop it would seem by some master mechanics as if it was time thrown away every minute it remains there, and they are as uneasy as a fish out of water to get it away from you.

In describing this method, I have written it for a locomotive which, in my judgment, needs the tank cleaned to the metal itself.

First day—In preparing the tank, we wash it with a strong solution of potash, followed by scraping with broad 3-in. knives and thoroughly rinsing with plenty of water. We then apply a primer composed of Prince's Mineral Brown, mixed to a paste with two-thirds rubbing varnish, and one-third boiled oil, thinned with turpentine.

DETAILED EXPLANATION OF ABOVE.

We make this potash to the degree of strength needed; if it is only to take the dirt and grease, it will not require full strength; but if we conclude it necessary to remove to the metal, full strength. For quite a number of years we used a mixture of potash and lime, plastering it on, but that method has been abandoned by us as too slow and inconvenient; in fact, very few tanks are cleaned to the metal at present, believing that unless a tank is in a very bad state of corrosion, that portion which is almost impossible to remove by any process should be allowed to remain and build up to that, the places or abrasions that occur on other portions.

As to the primer, I have experienced less trouble from peeling, cracking, or from rust, since using this compound. I have, as you all know, been a strong advocate of Prince's Mineral Brown as a proper pigment for metal, and I have found no reason for changing my views. Certainly we are and have been so free from the ravages of rust since its adoption that to return to a lead primer would seem foolish in the extreme; this, together with the great difference in the cost, makes it to my mind an ideal primer for iron or steel, when mixed properly. You will notice that we use two-thirds varnish to one-third oil. Varnish has a peculiar tenacity, clinging to the metal itself, and being of an elastic nature, is not apt to pull and crack as a pigment mixed ordinarily as a flat color.

I think, however, if a proper proportion of ground lamp-black be mixed with the above, it would perhaps be an improvement, but mixing this primer from the dry material we have not the time, nor could we mix it as thoroughly as it should be, or would be, if run through a mill.

Second day—Puttied, and a coat of glazing lead knifed on. We take a portion of the glazing lead and add enough dry white lead to make a stiff putty that will work well under knife, and putty up all the deep indents, pits, etc., and sandpaper this down smooth, and in an hour or two we apply a coat of special glazing lead knifed on with 3-in. knife. Generally this is sufficient, but occasionally we have a tank that needs a second coat. When this occurs, a brush-coat is applied and knifed off, leaving only what is actually needed to obtain a surface.

Third day—We sandpaper what edges the knife has made or left, which takes a man about 1 1-2 to 2 hours to prepare for the color coat. If the tank work is in advance of the engine, that is, in point of completion, we extend the time, and give the tank coats of engine finish in place of one coat of flat black, but ordinarily we have not the time, and a coat of black and one coat of engine finish is in order.

Fourth day—Lettered and varnished. We do not varnish the same day we letter, if we can possibly avoid it, but there are times when we are obliged to.

Fifth day—Finishing varnish. In the meantime cab, top-work, cylinders and drivers, have had same operations, with the exception of the potash cleaning, using instead a soap called Abbot's Renovating Compound, for washing the cab inside and out. Prior to wheeling the engine, the drivers have been brought up with mineral, glazing, and one coat of engine finish. The frame and fire-box have been thoroughly cleaned and one coat of engine finish applied. The jacket has received one coat of enamel, and when the machinists have finished, the engine receives its final coat of engine finish and the cab its second coat of varnish. Main and side rods and all bright work, together with the tires and ends of axles of all spoked wheels, are painted with a "finished steel" color, arches and stacks having had a suitable preparation, and she is ready for service the following day.

Perhaps it is worthy of mention that the classification of labor goes far towards simplifying and economizing the work. Having certain operations performed by the same men they become accustomed and expert in their work, which facilitates its expedition and gives an opportunity to hold the right one reponsible for improper operations should they occur. It also obviates the necessity, which, with some men, amounts to a fond oportunity of running around the shop for his foreman for a new job, thereby wasting time.

In the maintenance, we strike a subject well worthy of a paper by itself. We, as an association, have been unable, so far, it would seem, to impress upon the minds of some of the officials of the motive department, the vital importance of properly caring for the paint and varnish, after its application to locomotives. Be that as it may, it behooves us to keep this subject continually before them in the proper manner and well focussed. It is acknowledged that cleanliness is not only next to godliness, but it is a vital necessity to the longevity of most any body, or thing, and to say nothing of appearance, most especially does this apply to the painted or varnished surface. Apparently either the proper cleaner or the proper management of this branch or duty has not been found or reached. If it has it is not enforced on many of the railroads of the country and the condition of our work on locomotives after a short time in service are glaring evidences of the fact. I have always advocated and am still of the opinion that this branch of our trade, for such it should be classed on railroads, should be placed either in charge of the foreman painter, or with one who understands the nature of varnish, its needs, one who knows what is destructive to it, and what is a benefit to it, who knows enough to use a cleaner that is a feeder to varnish, and not a feeder of it. One who can instruct the operator that the cleaner, emulsion, or whatever is used, is applied for the purpose of loosening up the dirt and grease, so that it can be wiped off, and not to be left on the surface until it practically becomes a varnish remover. He should be given authority enough to say that the work shall be done so and so, and see that it is done, and be held responsible, and until some such person is placed in charge, with authority enough to have the work done properly, just so long will it continue to be a failure, the expense in the meantime becoming a useless, extravagant outlay. I mean by this, that by using an improper cleaner or the improper application of a proper cleaner, is not only an extravagance, but a detriment, for we know, under the present system of cleaning engines, that nine-tenths, yes, nineteen-twentieths of the locomotives when brought to the shop for general repairs, after twenty-four mouths of service, are in a condition fit for the sand-blast, partly the fault of improper application of cleaners, or too much of it. Occasionally an engine will be received, which by its appearance and the excellent condition of the painted parts, show at a glance it has had in addition to the regular wiper and cleaner, the united efforts and care of a driver and fireman, men whose inborn pride for neatness and cleanliness overshadows any rules that may be promulgated by unions or brotherhoods. I say occasionally such an engine is received, which, for the above reasons is in a condition to be "touched up" and varnished, but they are scarce instances, and how needless for me to state what the results would be if all were properly cared for in like manner.

We are very well aware, to preserve what has been done, in painting and varnishing an engine, it should receive at least, in twelve months time, a coat of varnish. No reputable varnish manufacturer will guarantee that his best goods, the best varnish that ever was manufactured, will hold its gloss, or retain its surface intact, longer than a year. Now if this is true, and for this reason a car receives attention every year, how much more necessary is it, for a locomotive, with its terrible conditions of service, so destructive to such material at all times, should receive like attention? But if you suggest such a thing, you are confronted with the statement, "Oh! we can't spare her; an engine is worth so much every day, and every day she is in the shop, we are losing that much." Well, supposing that is true, and I have no doubt that it is, would not the saving by this very act, in the paint-shop account at the end of the year, more than balance that expense, besides have better looking engines, easier kept clean, less expense all around? The varnish is gone: it is a hard job and a discouraging one to keep the engine looking respectable. The men give it a lick and a promise, disgusted in trying to clean it, and so it continues to deteriorate, growing worse every day, until the engine is booked for the shop. Now the chances are the shop is full and she is stored for a week (nothing said about what she is worth per day at this time), or possibly she may continue in service, until there is a vacant pit in the shop, but the paint is continuing to disappear, quite rapidly now, for there is nothing to hold it, and the rust is increasing and pushing it off, and by the time she reaches the paint shop, as I have before stated, she is a patient for the sand-blast. Whereas, if it had had two days even in the shop a year before, renovated and varnished, one-half the time one-half the expense, would have been saved at this time.

In conclusion, I wish to say that I am inclined to believe, unless preservation is entirely obliterated from the question, we have reached the limit of curtailing the expense of locomotive painting. The method which I have endeavored to explain to you in its detail is one which has given entire satisfaction on our system during its constant use the past six years with the excellent result of reducing the cost over one-third, simple in its operations, economical both in labor and material, and retaining with durability, a good general appearance, should, I think, be recorded as one of the best and proper methods.

I thank you gentlemen, for your kind attention.

A. P. DANE.

President Cook: Gentlemen, before taking up the reading of the other paper I think it would be well for the convention to consider the announcement of the chairman of the entertainment committee. We have a great deal of interest to attend to, and in my judgment it will require either an extended session at the present time or a short session this afternoon. It is a matter for the convention to determine; it will not do to let the committee go ahead and make their arrangements if we cannot adjourn in time.

Mr. Brunning: I move that we have a short session this afternoon.

Seconded.

Mr. Gohen: I think we ought to get through our business first, and so far as the automobile ride is concerned I suggest that we let the entertainment committee take out the ladies who are here and let them enjoy the ride, and we will stay here and finish the business; it may take us all the afternoon and tomorrow forenoon. I do not think it is a good idea to mix up too much entertainment with the business.

Motion to hold afternoon session was put to a vote and carried.

President Cook: The next paper is by Mr. J. A. Jackson, Wisconsin Central Railroad.

MR. JACKSON'S PAPER.

To the President and Members of the Master Car and Locomotive Painters' Association:

Gentlemen:—When I was informed by the Secretary that I had been selected by the Advisory Board to write a paper on subject No. 5, viz.: "The Proper Method of Painting and Maintaining a Locomotive Engine." I was surprised to be requested to undertake this difficult task as I am one of the very recent members of the Association, and as I am a stranger I think it would be well for me to first introduce myself. I was born in 1844 in the Old World. At eight years of age I was put into a paint shop where I served my time as an apprentice. I came to the United States in 1872, found employment in New York City, where I worked for four years as a carriage painter. At the end of that time I was advised to go west, which I did and landed in Brainerd, Minn., where the Northern Pacific shops were located. I worked there eighteen years under Mr. J. C. Congdon who was then foreman painter. Later I was transferred to the Wisconsin Central Railway which was then operated by the Northern Pacific and where I am still employed.

As before indicated, I think my attempt at handling so important a subject as the one assigned me bears about the same relation that a dull buck saw does to a pile of wood, which is very poor indeed. I do not think I can have very much to say as I consider it unnecessary to go into the discussion of every detail of locomotive painting as we are all acquainted with the general plan of this work and I shall only attempt to express a few ideas as the subject was pretty well covered by the gentlemen at our last convention.

However, I observe that the locomotives are growing larger and larger from year to year and the painter smaller and smaller; that is, he seems to be recognized less and less. He stands in the way of everybody and he must have his work completed before the machinists; if not the engine will go out without being painted.

At Fond du Lac, Wis., we have new and modern shops. in the paint shop there is room for ten coaches, which does very well for that work; but the engine work we do wherever we can. My method would be to provide a place for tanks equipped with a compressed air sand-blast in order to properly remove the old paint, rust and mill scale. This, I consider would be a great saving in labor; but shops not equipped with this useful apparatus, of course, have to resort to the old system of applying lime and lye.

Our method of removing this scale is by giving it a good thorough scouring with a piece of broken emery wheel and water, or a mixture of boiled oil and turpentine in place of water, and plenty of elbow grease. But, gentlemen, you can't follow this system of doing work if you expect to paint your engines at a cost of about —— to —— each, including labor and material as I am informed some roads are doing. I figure the average cost about ——, including the removing of old paint and applying two coats of varnish and doing a good job.

After the engines are painted and put into service, are they properly taken care of? I beg to say they are not. If the company would furnish sufficient help to keep them clean (and that help to work under the direction of the Foreman Painter), I am satisfied we would have better looking engines. My idea for doing this cleaning is to use an oil cleaner and a bunch of curled hair with pulverized pumice stone to loosen the dirt and wipe off with waste. I have found this method of cleaning a very good one. It will not only restore the paint and varnish, but will retard the rust to a great extent.

In my opinion one of the most serious errors and extravagant methods of painting engine equipment is the hurrying of its completion to the extent of injuring the durability of the job which deteriorates there all value of the material used, when, if properly applied and given sufficient time to dry would be satisfactory. For example, we have an engine coming into the shop for light repairs, all to be completed in six days. It is needed very badly on the road—possibly it is one of the large passenger engines. The tank is all rusted, cab must be burned off, etc. This means repainting throughout. It must be done and that is all there is to it, and in six days, too, and just as likely as not no overtime is to be allowed. This is only one job; many more on hand and to follow. There is no use for the painter to say, "I can't do it in that time," if he does he will terminate the same as the man who is watching the boss all the time; he will soon be looking for another job. Now what would you do? In fact what can you do? The only thing he can do is to swear—enough of it may help the paint to dry; and by the way, the engine painter is a poor member of the church; I know that by experience, sorry to say. But the system we follow after the surfacing is completed is the application of flat color and two coats of engine finishing varnish. The black varnish system may do very well but there is no time saved by it on account of the lettering having to be varnished. I have found that where black varnish is used it should never be varnished over; its nature is not to receive clear varnish as the flat color does, but for a round-house job where the numbers are cut in it will do very well.

There are also the front ends we have to contend with, and I think the least paint put on them the better. If they are painted once a week I think it is sufficient; the balance of the time to be wiped off with a piece of waste saturated with boiled oil and sprinkled with a little lamp-black, but the great trouble is the man who is assigned to do the work is almost sure to get too much on and then it will form a scale and peal off in places and become rough.

We have nearly 300 engines on the road and about 200 passenger cars, besides the freight equipment and all to be cared for at one point, as we have no division shop, and my experience has been that this is as great a mistake as the hurrying of engine painting to completion.

Now, gentlemen, I think I have said too much already and, as before intimated, I think most any one else would have handled this subject in a much more satisfactory manner than I, as I am a new recruit in this army. However, I am proud to be one and I have only to regret that I did not become a member of the Association long ago, for if I had I feel I would have profited a great deal and been better acquainted with the trade, for I realize we are not here for pleasure only but that we may discuss and try to develop up-to-date methods. I think every foreman painter who is employed by a railroad company should be a member of this Association, and I think the railways should not only urge this, but materially assist in the work of the Association, for they are to receive the benefit through the members thereof. And lastly, owing to the fact that my experience and ability as a writer are exceedingly limited, I will ask the president to let this land in the waste basket.

Respectfully submitted,

J. A. JACKSON.

President Cook: Gentlemen, it seems to me that the new recruit stood up to the firing line with considerable courage and did well. The subject is now open for discussion.

Mr. Brunning: There is only one objection to the paper and that is to the figures he gave out. I think he is doing a great injustice to a great many members of the Association and that he ought to eliminate those figures, and then the paper will be all right.

Mr. Little: I think we could not for a moment consider the painting of an engine at his figures. We paint our engines; we do not throw a brush at them while they are passing by, but paint them in a first-class manner. To talk about painting an engine for that price is ridiculous.

Mr. Quest: I feel like the gentleman who has just spoken on the subject. I think that all prices should be eliminated, that is, prices of finished work. I mean no disrespect to the gentleman that has given prices, but I believe the price of finished work should be eliminated.

Mr. Gohen: While in the abstract that might be a good idea, I believe in letting the prices stand. If I recollect, the gentleman said that he was not in favor of painting engines for $16, which some roads were painting them for. Now, I do not suppose there is any railroad company in this country that wants its engines painted rightly that would expect a man to paint an engine for $16, because they do not believe it can be done. They will not say, "I will make you paint your engines for $16," I know you cannot do it. This man states this as a comparison between the ideas of different people. I do not know that it is very objectionable, still in the abstract it is not always good policy. But now, why I am making this objection is, I have got a paper to read before this association and in a measure it was actually necessary for me to quote some figures. Now, if you are going to rule that out I will have to revise my paper, and if we are going to make comparisons some day simply because one man is doing a cheap grade of work and states his price on that, we are not necessarily going on to say how much we are going to paint our engines for. I do not think it is exactly right.

Mr. Brunning: This paper leads us to believe that he paints his engine in a first-class manner, removes all the paint, sandpapers it and everything else, and I say it cannot be done at that price.

Mr. Gohen: A man may perhaps paint an engine in a first-class manner according to his ideas what a first-class manner is. Suppose they do not surface it, do not put any ornamentation on it at all, thinking that in painting engines ornamentation is unnecessary. I know of a road that some years ago made a great boast about painting their engines for $15. I made a trip of several hundred miles to see it, and I found they were doing it for $15, that is all. I know of another road where the superintendent of motive power was going to make an excellent record by overhauling the paint for about $3.50. I think there are some in this room who know what that road was.

A Member: Seven dollars.

Mr. Gohen: Was it? Well, it was after he left your road, and he cut it in; it was cut-in work. Now, those are facts, and that engine was painted on paper, on paper, mind you, it was painted for $3.50, and that road is not a thousand miles away from where I am.

Mr. Butts: I want to agree with Mr. Quest. I think that we should eliminate prices as much as possible in our discussions here, and for this reason: On the road that I represent we have quite a number of different points where we are painting locomotives, and we have tried faithfully to find out what the cost is at each point to paint a locomotive, and we have come to the conclusion that it is an absolute impossibility to compare any one point with another, for the reason that you have got to have not only the same conditions before you can say it is a fair comparison, you have got to have a description of style and every little detail in regard to painting an engine before you can say one engine is painted exactly like another. I think we ought to pay more attention to statements as to how engines should be painted, what is durable paint and what is a good system, and before we give prices, to find out what the conditions are under which the work is done.

There was a point in the paper by Mr. Dane on which I want to say a few words. Whenever the question of cleaning comes up I generally bob up, for the reason that I am so frequently confronted by that problem that it is foremost in my mind all the time. Our people were dissatisfied with the looks of our locomotives as well as with the looks of our cars, and desired an improvement in that matter. It was turned over to my supervision to make an improvement while in service of the paint on the locomotives. I have done the best I could for the last year and a half along those lines, and for the last eight months at least I have been more than gratified with the results, and I think it is a subject that you have all got to meet. On our best lines, those that have a large passenger service running out of important terminals, it is beginning to be recognized that the engine ought to look as well as the cars that they are pulling.

On our road prior to a year and a half ago you would see an engine coming out of the roundhouse, the upper portion and cab looking very well. While the roundhouse forces are required to wipe the upper work, they are not required to do anything with the tank, consequently the tank looks very dim and yellow and bad in a short time, so you can scarcely read the name of the road oftentimes, while the cab and upper works are looking fine. I have adopted the same plan of cleaning paint on locomotives that I pursue on passenger car equipment, using the same material exactly. We have not increased the force; it is not costing a dollar more for wiping the engines than it did before, but where we gained in looks of our work is by having a systematic way of doing it. Under the supervision of the foreman in the roundhouse and by doing this work systematically now, the tank and the upper works, cab, dome, sandbox, etc., receive the same amount of rubbing and cleaning and there is a very marked improvement. The paint is being preserved, the appearance of the engine is improved in every way and I have received—I almost wish I had brought along a number of letters congratulating me on the good appearance of the paint on our locomotives. I think it would pay any Master Mechanic or Superintendent of Motive Power to adopt the same system. It is costing very nearly as much per square foot to paint a locomotive as it does a coach. Why do we put on good varnish and good surface on an engine and turn it loose and never do anything to it to improve its appearance in the way of wiping? I told our people that if we were not going to care for the paint itself, what is the use of paint—I would prefer to put one coat of black on an engine and let it go at that, than to paint it up in good shape and not give any care whatever. I think it is fully as essential. There is as great a chance for improvement there as there is on any other part of the railroad equipment.

Mr. Pitard: As a general thing the management of railroads do not know whether you are painting your engines right, trying to do a first-class job on them, or whether you are just painting them with a whitewash brush. A coat is a coat with them, so to speak, regardless of material, and for any man to get up here and give out figures on the painting of an engine I think is all wrong, because if you say such a thing is done some management will take those figures up and use them again at you. While you are trying to paint your engines right and perhaps they cost fifty or sixty or seventy-five dollars, they will grind you down to some figures given out by somebody who is painting his engine with a whitewash brush, or who throws a brush at it from the platform while the engine is going by.

Mr. Gohen: I think we ought to look at both sides of the question. This is not a new question with us at all. At a time this question came up that a certain party was painting an engine for $16, there was a false impression got out in regard to the matter. My Superintendent of Motive Power got the idea which was conveyed to him by the man who is the mechanical engineer; he is now Superintendent of Motive Power; his Master Painter is here to-day; he understood this man to make the statement in the Chicago Railway Club meeting that he painted an engine and tank for $1.00, and it was just as good as any tank in the country. Mr. Garstang came to me in the office and he said, "What do you think, this man painted an engine tank for $1.00.". I said, "That is not so." He said, "How do you know?" I said, "I know." He said "How do you know?" I said "You might as well convince me that you have a set of machine tools that can turn out an engine in twenty minutes. It cannot be done. What was it, an old tank or a new one?" He said, "I do not know." I said, "I don't know and I don't care. It will cost him more than a dollar to clean it. It is an impossibility." He said it was then costing him $16 to paint his engine. I said, "I don't believe that either. I would like to go down and see what they are." He said, "All right, go on, and find out what there is in it." I went down and investigated it thoroughly, and while they were painting those engines for $16 on paper, they were not doing it in the shop, and any of you would be ashamed of the engines when they were turned out. I said to Mr. Garstang, "If you want your engines painted like that I can do it as well as the other man." He said, "I do not know, perhaps some man might say conditions differ with them." I said, "For every engine you have spent $15 on, it will cost you twice as much to keep it in shape as any engine you spend thirty or forty or fifty dollars on." He said, "That looks like a good proposition." They have got some common sense, these officials, and whenever a proposition like this comes up, the conditions are entirely different. As Mr. Butts says, he cannot paint engines at different points for the same price, the conditions surrounding the painting of these engines are not similar. Something else comes in, so that it is almost impossible to paint two engines at the same price. Once in awhile you have got to explain those things to your officers. There are plenty of roads in this country to-day that are painting their engines for thirty dollars, but they are not painting them like the Pennsylvania Road, they do not surface them, but the Pennsylvania Road has a nice respectable engine and they have a right to feel proud of it. I do not think there is anything that looks nicer in front of a passenger train than an engine that is judiciously striped and painted. The Pennsylvania Railroad has that class of engine and they are willing to pay for it. Here is another road that does not care, so long as the engine is black, has the number and perhaps the initials of the road on it, perhaps they can get it done for that. I do not think we ought to eliminate the cost, there are times when it may become necessary to have it, and, gentlemen, before you get through with this convention you will find out why I am taking such a decided stand on it. I am compelled in a paper to quote figures and I do not want to be ruled out.

Mr. Miller: I am a firm believer in the old adage, that an ounce of prevention is worth a pound of cure, and I know that while those figures are not going to hurt me, there are a great many painters over this entire land who will have to do a whole lot of explaining, and it is not always a very easy thing to do. I really believe that we should eliminate those figures.

Mr. Pitard: Replying in a measure to some of the remarks made by Mr. Gohen in his talk some minutes ago, I do not wish to be understood that I am attempting to underrate the intelligence of the management of our railroads, but the point I wish to make is this, that now the figure is given by that man in that paper, it will go out from this convention, published in our proceedings, the management have a right to take those figures and use them on any of their foreman painters and they can say to you, "Why, here are the figures now, given by a member of your Association," and that is fair reasoning, too. Therefore, I think that if any figures are allowed to go out from this Association on the cost of painting anything, that they ought to be approved by the Association, not to be given out by an individual, that is, if they are to be used as a criterion.

Mr. Bishop: As I understood the paper that is written and read by Mr. Jackson, I did not understand that he endeavored to establish a price by which any member of this Association should be governed, or any other railroad probably. He speaks of the work that he cannot do, he speaks of the work that he is doing, but you cannot find in his whole paper one thing in which he recommends the work that he is doing, as being first class. He does not do it, for that reason I believe the figures should stay. And the remarks made by Mr. Gohen in reference to certain figures given on a line in this country, I was so proud of a circular that was issued at one time on the road I was working on that I carried the circular away and I have it at home now.—figures given by the Superintendent of Motive Power at that time for the painting of an engine were surprising; I was asked to do the work for those figures and said I could not do it. I was told if I could not do it they would have to get a man that could. He did not get a man that could do it, but they got another man in the place of that superintendent of motive power, because they wanted a man that did not want cheap work. The fact of the matter was that this superintendent of motive power got it into his head that the work should be so cheap that there was no wiping done on the road and the accumulation of dirt and grease on the moving parts of the engine was so destructive that when the new superintendent took hold, he had to have quite a number of new links and special moving power for the engines, everything was cut up so by the dust and accumulation. So I do not believe any figure given here at a low price will govern any other member of the Association, because I do not believe the management of the present day wants cheap work done, what they are after is good work and good results, and they are looking to this Association to establish such methods as to produce the results they are looking for: the best results I believe is what they are after. Let the figurs stay.

Mr. Congdon: Being a new member of this Association, I feel that I ought to keep still, but I am certainly very much interested in this subject, as I have charge of the painting of engines as well as coaches, and as painters we are well aware that the painting of engines today is very much different from what it was fifteen years ago and that the management of the eastern roads, or the management of the western roads demands different work.

While on Mr. Little's road they perhaps allow him to paint their engines up in fine shape, on our western roads perhaps we could not do that at all. This seems to be an age when the management seems to be looking to the tonnage, and they are not looking to the good looks of the engine and road; they are looking to what an engine will do.

Now, some years ago you all know that an engineer had his engine, but nowadays an engine goes to the roundhouse and Tom, Dick or Harry takes it out the next time, and the next time some one else takes it out, and so they do not care anything about the engine, how it looks; the fireman does not care about his engine, because he does not know who is going to take it out next, in fact, the engine has no care whatever.

It seems to me that we, as painters, ought to turn our attention to making the job as durable as we possibly can, because, on the western roads, when an engine leaves the paint shop our care ceases and the roundhouse man has charge of the engine, and when it comes back into the shop sometimes in three or six months, you cannot see the number on the engine, so I do not see what difference it makes about the surface in painting engines. On our road I do not try to get any surace, I try to put the material on so it will stay and have a general good appearance. It seems to me our painting of engines today and twenty years ago is very different, and we have got to go according to the circumstances that we are placed in.

In the maintaining of engines, I would like to have Mr. Butts explain his system of cleaning an engine with emulsion. I have heard a great deal about emulsion and all that sort of thing, and have used it somewhat, but I am a learner; I want to learn more about how he cleans that engine with emulsion and how others clean their engines. In speaking about a process, I think it is a good idea first to know something about the process and what we are doing. Now if we can clean an engine cheaper with emulsion and it is better, that is what we want to know, and if we can clean a coach cheaper with that emulsion we want to know bout it, but so far as I have seen and read, and I have paid pretty close attention to the proceedings of this master painters' convention, and I cannot see where they can clean a coach with this emulsion as cheap as they can clean it with water. I mean, take a coach that is dirty, or take a coach that has been out of the shop, say for six months, and comes into the shops, how are you going to clean that coach with an emulsion without costing a pretty good round figure?

Mr. Bruning: I think the time is ripe for this Association to take some action in the way of recommendation for preparing the steel on locomotives before they are painted. We on the L. & N. had a bitter experience the last year with over seventy-five new locomotives, from which in less than three months the paint nearly dropped off. And if it is in order, I would move that we recommend to our officers that the steel be prepared for the tanks in the proper manner for the reception of paint.

Carried.

Mr. Pitard: Before the subject is closed I will say that I have been informed by the secretary that this gentleman, the author of the paper who gives these figures in regard to the cost of painting, does not state whether that covers the labor and material or simply the labor, therefore it is misleading; and I move that the figures given by the gentleman be eliminated from the publication and be not allowed to go on the record.

President Cook: Mr. Pitard moves that the quotation of figures in Mr. Jackson's paper be eliminated from the general report. All in favor manifest by saying aye; contrary, no. It is so ordered.

Mr. McMasters: Have you disposed of the spbject entirely? If you will pardon me I would like to call your attention to the fact that there was a committee appointed to make a report on the painting of locomotives at the Master Mechanics' Association.

President Cook: Yes, that came up yesterday, and this subject is supposed to cover it.

Mr. McMasters: This subject ought to be discussed on that line, it seems to me, and some action taken on the matter.

The President read from the proceedings the letter from Mr. Taylor pertaining to this subject.

Mr. Gohen: I do not see where this association has placed itself then when we have to tell the cost of painting an engine and we have put ourselves on record that we should not do anything of the kind; and if I had voted in favor of it I certainly would move for a reconsideration. Now my friend Ball suggests a way out of it. He thinks a better way for this association would be to allow those figures to go on the record, and also allow the protests of the members as to the advisability of painting an engine for thirty dollars to be a matter of public record, and it would call the attention of the officers of this road to the fact that perhaps they were not painting their engines well enough, and that man may be allowed ten or fifteen dollars more and he would not kick. I think we ought to reconsider that and let this go on the record also, that we do not believe that an engine can be painted rightly for thirty dollars—that it is our honest opinion that we do not believe a railroad company can afford to paint an engine for as low an amount as thirty dollars.

President Cook: It seems to me that Mr. Gohen's remarks are logical; I do not think we need to take any alarm at the publication of these prices. The fundamental basis of price is quality of work, and if our superior officers demand a certain quality it costs so much to do it, according to circumstances. It seems to me those remarks are logical and in accordance with Mr. Taylor's letter we would have to take some such action as he suggests.

Mr. Brown: In answering that letter of the Railway Master Mechanics I understand that a special statement will be made and sent to them—not our proceedings on the whole, but a special answer to that communication.

President Cook: That is the purport of that request as I understand it.

Mr. Brown: Then, Mr. President, we cannot take these arguments or these papers that have been written and copy them verbatim and send to the party that has requested that.

Mr. Gohen: Surely not.

Mr. Brown: Therefore I move that a special committee be appointed to answer that communication.

Mr. McMasters: I object. How is that committee going to get the sense of this meeting?

Mr. Brown: If anybody is not getting the sense of this meeting through this talk, I don't know how under the sun they ever will get it.

Mr. McMasters: The report goes in as an official letter from this association.

Mr. Brown: That is another question which certainly can be arranged.

President Cook: It seems to me that the suggestion to appoint a committee on this subject is the only logical way out of it, but that committee report should be submitted to the convention before it is submitted to the Master Mechanics' Association. (A voice: That is right.) Now, I think it is asking too much of that committee to make a report at this convention, and the chair will appoint that committee at his leisure and ask the convention to determine when that report shall be sent in; it is not for me to say.

Mr. Brown made a motion that a committee of three be appointed to submit to the Master Mechanics' Association a report from this association on the subject under discussion.

Mr. Copp: I amend that motion to the effect that the committee be instructed to report at the next annual convention.

President Cook: We can incorporate that in the motion to save a little time if the mover of the motion accepts that.

Mr. Little: I would like to amend that further.

Mr. Gohen: I do not want to bother you, but we are going to get into trouble, I think; this thing was asked last year; we should have had that in before now. While Mr. McMasters' proposition is good in one way we are going to ask the Master Mechanics to wait until the year after next before we submit any proposition; we cannot get it to them next year because it must be submitted to this association and then to them. Now I think that when this association appoints a committee that we certainly ought to have enough confidence in the probity and ability of that committee to accept their report as they would send it to the Master Mechanics' Association; let it be sent to them next June at their convention, and let the committee report direct to the Master Mechanics instead of to the Master Painters' Association; then send their report to the Painters' Association of what they have done.

Mr. McMasters: I want to be understood in this matter. I do not want to cast any reflection on any committee, but I do not think that we have discussed this question today as the secretary of the Master Mechanics desires. Now, what we should do is to discuss the painting of a locomotive, commencing from the ground up, in all methods, in all ways, and in everything that would pertain to the painting of an engine, both new and old, and then appoint this committee here today and let them take all of this discussion and formulate a report and forward it, but do not let us put this thing off a year. I tell you the Painters' Association is getting a reputation for procrastination that is simply awful. We are putting these things off from year to year. I do not think it ought to go over, but let us discuss more thoroughly before it goes there.

Mr. Brown: I very respectfully beg leave to criticize our advisory committee. Why did not they put that question in our proceedings in its proper form according to that letter? Then we would have been talking on the very thing we have been after.

President Cook: Mr. Brown, if I understand it rightly, I think the matter was overlooked — was entirely forgotten. I may be wrong, but it struck me so in reading the proceedings of the last convention prior to coming to this session, and I made a note in my record to bring it up; and Mr. Little, I think it was, said that these papers on this subject would cover the ground. Now it does not seem to me that they do; but I just want to say that I think the matter was overlooked; but perhaps the advisory committee are not so much to blame as we think they are for not putting it in different shape.

Mr. Brown: I very respectfully ask them why they did not put it in; that is all.

Mr. Gohen: I was of the advisory committee——no, I beg pardon; I know I was there just as a visitor, and this thing was canvassed, but there was a part of that that was overlooked, and I think that it was the intention of the advisory committee to have these papers read here at this meeting on that line to cover that subject; but for some cause or other I suppose the parties who were asked to write these papers did not receive sufficient information in order to convey to this association what they should have put in their papers, so I think there was a little oversight; but then this discussion here will bring out a great many material points, and I think that the committee can get up a paper that will be satisfactory to the Master Mechanics and to ourselves.

Mr. J. D. Wright: There is no doubt the chair will appoint a committee that has had a great deal of experience, and they will have the benefit of this discussion before this convention. The Master Mechanics' Association certainly will think we are slow if we do not take action at this session. I am in favor of appointing this committee and giving them power to report at the next meeting of the Master Mechanics' Association.

Mr. Warlick: I move to amend that motion, that a committee of five be appointed instead of three.

Mr. Brown: I beg leave to suggest that the advisory committee be the parties to handle that; it certainly is in their line. It is a pleasant duty which they will enjoy, and it is a part of the duty which we expect them to perform.

Mr. Butts: I would like to have another word. I think perhaps my remarks may be somewhat misleading as to the point that I wish to make when I spoke of the care and maintenance of paint; that seemed to bring out the thought that I wanted more to say about oil emulsions. Now, I do not want to be understood as advertising any particular material, or the use of any particular material or process of gilding or painting locomotives. I have a great deal more interest in the system of carrying out the work of cleaning cars than I have in any one man's material. You can find plenty of good material; there are a number of manufacturers in the market that are all right; and of course every manufacturer thinks his is the best; but I care very little about the material question, I assure you; but I want to emphasize the fact that great improvement can be made in the appearance of the paint work on locomotives if there is a proper system applied in the roundhouse to take care of this paint. That is all I care to say on the subject.

Mr. Ball: I do not want to say anything about locomotive painting, but this discussion has brought to my mind something that I accidentally overheard in the hotel since I have been here. Several persons—I do not know who they were, but I think they must have been Master Mechanics—remarked in my hearing that "these people claim to be an association of master car and locomotive painters; we hear a great deal about car painting, but it is very seldom we hear anything about locomotive painting." And when I came to think it over I recollected that only about every three years we hear something about painting locomotives. I think the objection was well taken.

It also occurs to me that the advisory committee in making up their list of subjects might also provide for something on the subject of house painting, bridge painting and all other painting. I do not see why we do not discuss all those matters, because we are all, or a large number of us, are just as much interested in the roadway and bridge work and house work as we are in cars and locomotives, and in many cases there are master painters among us who have all those things under their charge—locomotives, cars and buildings. Why should we not discuss matters pertaining to those as well as cars and confining ourselves to cars all the time?

President Cook: Gentlemen, before leaving this subject is it the wish of the convention that this advisory committee of three be appointed, or that the advisory committee take up the matter, as suggested by Mr. Brown?

Mr. Gohen: I suggest that the association have a voice in the appointing of that committee. Let a number of members of the association be selected by ballot right away, and I move that this association ballot for a committee of five to prepare this paper on painting locomotives, of which the president shall be one.

Seconded.

President Cook: It has been moved and seconded that the convention by ballot select a committee of five to present this subject to the Master Mechanics' Association.

Mr. Pitard: I made a motion a few minutes ago, amending Mr. Brown's motion, to appoint a committee on this subject to report at the next annual convention of the Master Mechanics' convention, but as it seems to be the wish of the convention to report earlier on that subject I will withdraw my motion.

President Cook: That is all right; that can be withdrawn. I would like myself to get that report before the Master Mechanics as early as possible. Are you ready for the question?

Motion was put to vote and carried unanimously.

President Cook: We will take that up right away. Nominations are now in order.

The following nominations were made: President Cook, Messrs. Houser, Dane, Butts, Gohen and Little.

Mr. Gohen: I want to make an objection here; we are getting into the same rut that we did before. We have Mr. Cook, a Pennsylvania man, Mr. Little and Mr. Houser are Pennsylvania men. The supposition is when these men come to get this paper up they will get it from information and practice that they have at home. Let us diversify a little bit; do not let us have so many from one road.

Mr. Little: I withdraw; I would prefer that someone else be appointed.

President Cook: I think, gentlemen, the committee should be composed of members of the association who are in constant touch with this particular subject—that is, the painting of locomotives—and we will get better results from those men than we will from those who paint cars alone. Now I do not handle locomotives at all, while I have done it in the past, and as president of the association I would like to be free to attend to other matters that come to me without being loaded up with this.

The following nominations were then made: Messrs. Dane, Lynch, J. D. Wright, B. E. Miller, Quest, Congdon, Truman, Ginther, Clark and Kahler.

The president appointed as tellers Messrs. Little and Pitard, and the convention proceeded to ballot.

Mr. Brown: I would suggest in order to facilitate business that the five candidates receiving the highest number of votes be declared elected, so as not to have a second ballot.

PresidentCook: That is a good point. Do you make that as a suggestion or a motion?

Mr. Brown: I make that as a suggestion.

President Cook: While the tellers are counting the ballots I will put another question to the convention, one that is very vital and requires some plain, cold talk, and that is the arrearage in dues. Gentlemen, there are some members of the association—I do not know who they are, so I can speak freely—who are in arrears to the amount of eight or ten dollars. Now, every time we come in session at the annual convention we are faced with a deficiency, and the members who are here and have to pay their dues are requested to make still further payment in the form of an assessment. Now, perhaps it has not struck those members that others are paying for their privileges at the convention. The deficiency I do not believe would exist, at least very little of it, if all members would promptly pay their dues, and I want to call this matter to your attention. The article in the bylaws says that after a failure to pay dues for two years that members are dropped from the list of active members. I do not believe any man wants to be dropped from this association, and yet the chair will be compelled to instruct the secretary to strike off the names of a number of the members unless they make a prompt settlement. Now this is a matter of great importance. I speak kindly, but it is a business matter which should come to your attention, and I trust the matter will be looked into and the chair will not be compelled to drop from the list of membership any member of this association. (Applause.)

Mr. Miller: I think this is an opportune moment to call attention to the fact that we have present with us at the present time the master car builder of one of the trunk lines leading into this great city; I refer to Mr. La Rue, of the Chicago, Rock Island & Pacific railroad, who might be called upon to address us a moment, if he sees fit.

President Cook: I am more than pleased to extend to Mr. La Rue, master car builder of the Rock Island system, a cordial and hearty welcome to our convention, and we will be pleased indeed if he will find it possible to make a few remarks to us at the present time.

Mr. La Rue: Mr. Chairman and Members of the Master Car and Locomotive Painters' Association: I feel very much flattered to have extended to me an invitation at this time, and in reply will say that I feel very friendly towards this association. I think they are interested in a good work, and I read your proceedings with a great deal of pleasure, and I am vitally interested, because on the mechanical side we always look for the painter to cover up all the defects made by the previous workman, and also to retrieve all lost time made by the previous workman. (Applause.) Gentlemen, I thank you for your attention.

Mr. Brown: Mr. President, on behalf of the association, I would respectfully ask the gentleman if he would allow us to place his name on our honorary list.

Mr. La Rue: I shall be glad to do that, Mr. President and Mr. Brown.

Motion was made by Mr. Brown, and carried, that Mr. H. La Rue be elected as an honorary member of the Association.

It was moved by Mr. Lanfersiek that Mr. J. H. Tinker, master mechanic of the B. & O. Railroad, be made honorary member of the association.

President Cook: I would say that Mr. Tinker was present yesterday and made a very pleasant address. I do not know how it came about that we did not propose him for membership at that time.

Motion was put to vote and carried, and the president instructed the secretary to notify Mr. Tinker of his election.

On motion of Mr. Copp, Mr. White, master mechanic of the Lake Erie & Western railroad, was elected to honorary membership.

The ballot resulted as follows: The five candidates receiving the highest number of votes being Messrs. Dane, Wright, Quest, Congdon and Miller. These gentlemen were declared duly elected.

Mr. Miller: In order that there may be no confusion I will ask who will be chairman of that committee—the man getting the highest number of votes?

Mr. Dane: I move that the committee get together and choose their chairman.

President Cook: The committee will do so then. It is just exactly twelve o'clock, and we will now adjourn to meet again at two.

AFTERNOON SESSION.

September 10, 1903.

Meeting was called to order by the President at 2 P. M.

President Cook: Subject No. 6 now comes up for consideration, "Best Method and Material for Painting and Maintaining Steel Cars." We have no paper from Mr. Lafferty; next is a paper by Mr. W. O. Quest.

MR QUEST'S PAPER.

The Best Method of Painting and Maintaining Steel Cars.

Mr. President and Gentlemen:

We have had occasion to question our mental equilibrium several times since accepting the assignment of writing a paper on the paint end of the steel car subject. The man who can and will, under the present known conditions, come before a body of representative railway master car and locomotive painters and tell them the best method to paint and maintain the painted surface of a steel car, would in our estimation have the courage of a Daniel. We are also of the opinion that were such a man to appear, there would be a strong tendency on the part of his fellows to raise him a monument during life, thus eulogizing either the greatness of his skill and knowledge, or the size of his bump of egotism. But after having for several years shared with our official superiors the many trials accruing out of our shop experience in the daily task of watching scale and paint fall off the modern steel car, we have about come to the conclusion that the matter of protecting the surface of the steel car from its many specified enemies to the extent of meeting the up-to-date officials' expectation and approval, is one of the knottiest problems we know of, which also invites the suggestion that you generally do not know how much you know about anything until you are called upon to tell what you know. We, however, through our steel car painting experience, think we are qualified to suggest several essentials that should lead up to first-class results where put into practice.

The following are suggested methods and materials which we practically judge would produce good results at but small additional cost over present methods in practice:

First, the scale and rust should all be removed before the first painting—removed regardless as to whether or not the scale be of the lose or close adhering kind—removed, notwithstanding the fact of the many interested people who hold the opinion that there are no dangers in painting over a new, close-adhering scale. This same class of people will also put the question as to whether it is not a fact that the true under-metal of iron and steel plate will corrode where coming in contact with the elements. To all such queries we assuredly say "yes," that where protective coating becomes abrased or knocked off, rust and corrosion is sure to follow—but we do claim that the abrasion into the true metal will not do within 50 per cent the amount of damage that will be done by the abrasion made into an existing film of slag scale, from the fact of the scale being made up of a dross matter (a ferric oxide of iron) which perishes much more rapidly than will the true metal where coming in contact with destroying elements; this fact, we also think, unerringly accounts for the spotty appearance of the steel car, the paint remaining intact in service wear on true metal, and quickly falling off where applied upon the unremoved scale.

How the scale and rust can be economically removed from the steel car, we judge would be a suggestion of interest. All kinds of methods and materials are used, but the expense and grind is too great for muscular force alone, the task calling for machinery manipulation. The small pneumatic-chisel rigged hammer tool is especially recommended as a thorough scale remover, as is also the compressed air operated sand-blast. Our trial of the pneumatic hammer being anything but satisfactory, particularly on account of slowness, we turned our full attention to the sand-blast, the most practical effective method of removing mill scale, rust, dirt and grease from structural iron and steel. The requirements of the sand-blast are: First, a dry place to do the work; second, a sufficient force of generated air to eject the sand, which is used as a projectile to break up and hammer away any substance to be removed against which it may be directed.

The result after the use of the sand-blast is a bright, clean metallic surface, a perfect condition for paint adhesion, which can not possibly be secured where even the best of protective paint is applied upon a slag-enameled, or a pitted, rust-eaten surface. Properly handled, the sand-blast will reach and effectually clean every portion of the steel car's surface, otherwise inaccessible to hand cleaning where using the wire brush, steel scraper, chunks of emery, sandstone, etc., usually employed for such purpose, at great outlay of time and labor, many difficulties and little effect. The efficiency of the well appointed sand-blast is an assured fact, and as an economy, the method is past the experimental stage. There is really nothing remaining for the interested steel car manufacturer, also railway company to do, but to provide efficient and permanent plants to remove all scale from the new structural steel before assembling, also from the steel car to be repainted in repairs.

After considerable experience, also observation with the sand-blast problem, we have arrived at the conclusion that there is scarcely any limit to its possibilities for the future. We have had and are still having very good results with home-planned and constructed machines in the McKees Rocks Shops of the P. & L. E. R. R. Company, which we are pleased to say, are equipped with a modern air compressing plant. Although getting into line as fast as possible, our experience so far in cleaning old paint, rust and scale from steel cars with the sand-blast has been limited to some three 100,000 pounds capacity hopper bottom cars. We use a 30-gallon sand capacity portable machine on the work, which is operated with a 100-pound air pressure, having a free delivery of about 18 cubic feet per minute. With one nozzle, we developed an average speed of 50 feet per hour. The weather being dry when tests were made, the sand was gathered up and sifted back into the machine and repeatedly used. The company's powerful stationary and sand-blast, rigged with an air sand lifting device, with the same generated air force and delivery as mentioned above, will scale off a surface of new plate steel, 100 square feet in an hour, if properly handled. By increasing such resources as these, we believe any reasonable required quality and speed can be attained, this conclusively proving that the great modern steel car can both be originally cleaned at first painting, and can be maintained in service by the sand-blast method. The good honest paint applied on the cleaned surface will protect, and the protected car in its continued good state of preservation will become the voucher for the probable future millions of steel cars to come.

Our up-to-date experience, in looking after the paint interests of the company's steel cars, has convinced us that an ideal protective paint for the structural steel is still a matter of debate, especially where gauged by the requirements of the day. The paint problem, as viewed from the service requirements of the steel car, has gotten along to that point where wild theoretical calculation and haphazard combinations of paint will not do. Our practical experience in painting steel cars has been so varied in our endeavor to get something that would stick to the surface, that we almost hesitate to pass an opinion on resluts of the experience. We have painted cars with iron oxides, carbon blacks, graphites, red leads, asphaltums, coal tars and other paints of a similar character. We have both tested and used a number of highly recommended and endorsed paints on steel cars, which proved utterly worthless for the purpose. We will not go into details of the failures, but will mention only the paints giving the best general service results where applied on steel cars.

The standard makes of iron oxide paint, where mixed to counteract the strong oxidizing properties of the pigment, are, in our estimation, good all-around paints, and where made honest and up to requirements, have given us good averaged results as a steel car paint in the past, and we think will give better in the future, where applied as an elastic mix on the promised all-cleaned stel surface.

Carbon black as a protective coating, was applied on the first one hundred and fifty 80,000 pounds capacity steel hopper bottom coal cars received by the P. & L. E. Company early in the year 1897. The last of this lot of cars are now being re-painted as they pass through the repair yard. This carbon coating failed to prevent scaling off where applied on slag-covered parts of the surface, but we have found that surface parts free, or but slightly slag-coated, still retains an intact almost perfect protective coating. The retained adhesive and elastic wearing life of carbon black, applied upon these mentioned cars, being so remarkable, we have taken the liberty to present a cut out sample plate, also scrapings from same for your inspection, which we can assure you were removed from the extreme exposed side sheets of cars in question. Upon examination you will observe that the scrapings, after six years' service, still retain a gum-like elasticity, proving conclusively that two or more coats of a carbon paint of this description forms a non-porous protective coating and that it will stay where applied for a reasonable number of years, if applied on a perfectly cleaned off surface.

Our experience with a number of steel cars experimentally painted with graphite has convinced us that graphite, as a natural carbon pigment where mixed with a first class binding and wearing vehicle, is almost equal to the manufactured carbon black as far as regards an elastic protection for a metallic surface. After a number of practical tests we have never observed a single instance where a finely ground, properly mixed graphite paint has failed to show up well as an elastic drying, protective coating. Graphite, as a paint pigment, properly mixed, appears to have the power of repelling oxidation to the limit of producing a long wearing elastic coat. We have also particularly noted that the service broken graphite coating offers a very strong resistance against further under corrosion, showing conclusively that if continued elasticity is the life of paint, a good honest graphite paint should be classed as a protector in the painting and maintenance of the steel car.

In presenting the question as to what is the best method of painting and maintaining steel cars, we think it but fair to the manufacturer of paint, also painter, to call the attention of the railway officials who demand better paint service conditions for steel cars, to the fact that they too share in the responsibility. Do they always furnish a dry shop to paint the steel car in? The conservative railway official of this steel age surely knows that a steel car painted out in a rain and moisture ladened atmosphere can not be expected to give the best of results, from the fact that a penned-up moisture inevitably works out to the surface in the shape of corrosion, regardless of coats of paint applied. Perfect shop facilities, methods and paint materials would undoubtedly help prolong the life of the steel car. On account of the rapid corrosion of the steel car, the average life has been placed at ten years by several of the official experts who have evidently been keeping tab on the seemingly rapid deterioration, especially as the trouble of corrosion applies to the steel-made under structure. We are not in position to generally dispute these figures other than to say that we fail to observe any indications of steel cars that are going to fall down in ten years on the P. & L. U. E. R. R.

THE SERVICE ABUSE OF THE STEEL CAR.

The railway officials are also conversant with the fact, we think, that with the best methods of painting and maintaining, the practice could not be made beneficial if the present abuse of the steel car continues to prevail. To be a metallic structure seemingly invites the quick destruction of the steel car. Being of steel, the car is loaded with heavy hot and cold billets, which are dropped a distance of several feet, in quantities, from a loading bucket operated by a crane,, also with red-hot, mill-slang and cinders, and owing to the fact that the car is of steel, the fire of the hot molten load is rarely, if ever, quenched with water, and as a result will leave a badly warped car side, with the paint thereon totally destroyed. The load of coal, iron ore, slag, cinder, broken stone, gravel, etc., becomes water bound and frozen up in the winter. When this condition prevails in the Pittsburg district, the following quick, twentieth-century inventions are used: Lines of burning gas jets are placed in the centre of tracks, trained on under car bodies, steam, rigged up in huge box like buildings, the crow-bar, pick, powder, and dynamite are used; and last, but not least, the large hopper wrench which is used to strike heavy vibratory blows on the side sheets, making deep cut abrasions at every blow in the main muscular efforts of starting the loads into the discharging hoppers of the steel car.

In conclusion we wish to say that we are of the opinion that the steel car is here to stay, and that it can and must be painted and maintained to the extent of being a credit to the painter's craft instead of an eyesore. With perfect preparatory cleaning with the sand-blast when newly built, followed up with a coat of paint on some day if cleaned out of doors, this can be accomplished. The work also suggests that all applied paint be a first-class special steel car paint; also that it be skillfully applied at the rate of one coat every twenty-four hours only; also that where the steel car continues to receive its present harsh service treatment, that it be re-painted every two years on the outside; also spray-coated with crude petroleum oil on the inside every six months, it being possible that the crude oil applications would reduce the inside accumulations of flaked-up rust down to a safer minimum. The crude oil being inexpensive could be freely used in order that it might penetrate the strained under joints of assembled parts, and there arrest some of the claimed disintegration of the steel caused from a moisture sulphureted contact.

As members of a railway organization, we should take up the steel car painting problem to a finish. Our superiors expect us to practically demonstrate that there are best methods and materials for painting and maintaining the great modern steel car. We should unite on the task and do it, and thereby prove that the best way is the most thorough way, and the most thorough way is the cheapest way in the end.

Respectfully submitted,
W. O. QUEST,
P. & S. E. R. R.

President Cook: Next paper is by Mr. J. D. Wright.

MR. WRIGHT'S PAPER.

Best Method and Material for Painting and Maintaining Steel Cars.

Mr. President and Gentlemen:

Steel cars are painted, first, to preserve the metal used in their construction; second, to improve their general appearance; third, to provide a background for the marking which that all bear for the purpose of identification. Of these reasons for painting, the preservation of the metal is the most important.

Many agencies are instrumetal in the destruction of steel cars, chief among which are corrosion, abuse and accident. Suitable paint coatings properly applied will, in a measure, protect the metal from corrosion, but they afford little protection from abuse, and none whatever from accident. Therefore, in considering the best method and material for painting and maintaining steel cars, we have to deal particularly with the methods and materials which will best protect the metal from corrosion.

Before proceeding, shall we stop a moment to consider what is meant by corrosion? It may be either a combination of iron and oxygen, called oxide of iron, which is formed by the action of oxygen and carbonic acid gas with moisture, on the metal; or the sulphate of iron formed by the action of dilute sulphuric acid on the metal. The first form is commonly called rust. The second form is usually found on cars used in the transportation of coal, the dilute acid being formed by a combination of the sulphur in the coal with rain water. After corrosion has once formed on the surface it does not act as a protection to the metal, but being porous, it holds the moisture and dilute acid and allows these liquids to pass to the metal and continue their destructive action.

To prevent the formation of corrosion, the steel, as it is now manufactured, needs some kind of a protective covering or coating which will effectually keep the oxygen and carbonic acid gas in moisture and the dilute acids from reaching the metal. The protective coating may be in the form of a cement, enamel, paint, or a varnish—it matters not; the coating will be effective as long as it adheres to the surface and remains impermeable.

A description of the essentials of a protective coating was printed recently in the Railway Age, in a report of a meeting of The American Society for Testing Materials. A subcommitte of this body, on the requirements of a preservative metal coating recommended "that the material should have a maximum impermeability to moisture, air and carbonic acid. Iron and steel will not rust in dry air, or in water free from air and carbonic acid. The coating hould be efficient under ordinary conditions for at least five years. It should adhere to the metal under all ranges of expansion and contraction without cracking or peeling. Neither the pigment nor the vehicle, nor the compounds resulting from the reaction of the two, should cause a disintegration of the coating." This, it seems to me, is a good definition of a suitable protective coating for steel cars. I think we should strive, however, to secure a coating that will be efficient as long as the cars are fit for service.

The condition of the metal surface when the coating is applied is, perhaps, more important than the mixture used for its preservation. In the treatment of new steel cars we have to contend with more or less scale, rust, grease, oil, and miscellaneous kinds of dirt, which are found on the surface of the metal when it is turned over to the painter for coating. The best material is likely to prove a failure, if applied over steel in this condition. It is very necessary, then, that these be removed before the first coating is applied. How to get this done is an interesting problem. The grease, oil and dirt can be taken off easily with benzine by ordinary methods, but the removal of the scale and rust is a different matter. A metal surface which has been cleaned by a sand blast is, no doubt, in the best possible condition for a prime coating, but can we get new steel cars cleaned in this manner? Is it reasonable to expect the cleaning done by this method, even if it is feasible? Nearly all of the steel cars that are built are now constructed at manufacturing plants where a large number of cars are completed daily. From my observations of the methods in vogue in contract shops I am afraid the question of cleaning steel cars with a sand blast will have to be answered in the negative, until the time arrives when protective coatings receive more consideration than they do at the present time, and improvements are made in the methods of sand blasting. However, if a perfect surface cannot be obtained, there is no excuse whatever for applying good material over grease, oil, loose scale, loose rust and dirt which can be easily removed with benzine, scrapers and wire brushes by ordinary methods in a comparatively short time.

The question now arises as to the parts that should be coated. All parts which are not accessible after the construction is completed should be coated before being assembled. While the cars are being erected, all joints, laps and seams, wherever metal is placed upon metal, should be filled with a suitable heavy mixture of the consistency of soft putty to make these parts acid and water proof. When the construction is completed, all accessible parts of the underframing, body (both inside and outside) and trucks, should be cleaned properly and entirely covered with a suitable protective coating. Care should be taken to cover all parts evenly. One section should not be loaded at the expense of another, for the amount of protection afforded is measured by the weakest place in the coating. The number of coats required depends largely upon the consistency of the mixture. Taking the coatings now in general use as a basis, the underframing and all parts of the body should receive at least three coats, except the parts of the inside which come in contact with the coal. These parts and the trucks, should receive at least two coats.

There are three ways of applying protective coatings: First, spreading the material on with a brush; second, blowing it on with a pneumatic painting machine; third, the dipping rocess. The brush is a well known and reliable tool and in the hands of a good workman it will spread on an even and satisfactory coating. The pneumatci machine is objectionable from the fact that there is more or less moisture in compressed air, which is not a good thing for the steel, and it does not apply the coatings as evenly as the brush. The dipping process is not. to my knowledge, in use for painting steel cars, but it would seem that this method might be used to advantage, and it would carry the material to parts which are inaccessible by the other methods.

The best material for protective coatings is an open question. Cement, red lead, tar, iron oxide, asphalt, graphite and carbon mixtures have their advocates. Some prefer varnish-like coatings, claiming that hey are impervious to moisture, while others believe that very elastic oil mixtures will give the best results. Much depends upon the properties of the pigment and vehicle and the combination formed by their mixture. For instance, a good iron oxide paint might give better results than a poor carbon mixture, and a graphite carrying a percentage of inert material better results than a pure graphite paint. Carbon seems to be the most popular pigment at the present time, suspended in a vehicle composed largely of linseed oil which has been treated in order to assist the pigment in making the coating impermeable. Our tests show these mixtures to have considerable merit.

It is an advantage to have a different color for each coating, when more than one is applied, for it enables the workman to see that all parts are covered properly, and facilitates inspection.

After testing all the ordinary mixtures, and a great many preparations offered by manufacturers, we have failed to find a preservative coating which is entirely satisfactory for steel cars. Some improvements, however, have been made in the mixtures designed for this work during the past few years, and, as this subject is now receiving considerable attention, we may look for further advancement in the near future.

In this connection, it is interesting to look over some of the advertising which has been sent out recently. I find there are many "best" paints and protective coatings on the market. Some of the circulars show beautiful pictures of buildings and bridges which have been painted with the goods they offer as a solution of this knotty problem. Perhaps it is fortunate for some of the firms, sometimes, that more people look at the pictures and read the circulars than have an opportunity of inspecting the structures which their coatings are supposed to protect.

Before leaving this part of the subject it might be well to mention the art the railroad companies will, necessarily, have to take in the solution of this question. As very few corporations find it economical to grind the paint they use, it is necessary for them to test the material offered by manufacturers, in order to decide which is best adapted to their needs. These tests should be as thorough as possible. It is not wise to place too much weight on the performance of a sample of material on a small piece of tin, a small test panel, or even on one car. It is much better to take the average results from an extensive comparative and practical test on a number of cars in actual service. Take, for instance, a lot of twenty-five cars and coat one-half of each car with sample No. 1 and the other half with sample No. 2, allowing the two samples to meet in the centre of each side This will benefit both manufacturer and consumer, by showing the former any weakness which may exist in his coating, and the latter by furnishing reliable information as to the material which will best protect the Company's property.

We now come to the maintenance of steel cars. After they have been coated properly with the best protective coating that can be found, they are placed in service (most of them in the coal trade), and it is interesting to follow their movements for a short time and see the treatment they receive, with a view to finding out why the best coatings do not protect. The hopper cars are run to the mines where most of the coating is soon knocked off the inside parts by the coal, as it falls into the cars . While in transit, the rain on the coal forms a dilute acid which gets in its work on the metal wherever the coating has been knocked off. When they reach the coal piers to be unloaded they are pounded on the outside with bars and mauls in order to make the coal run; and sometimes, in cold weather a natural gas, or oil flame is turned on the cars to thaw out the ice. If this is not enough they are run to the steel mills and loaded with red hot material and the coating is burned off. In short, the treatment they receive makes one ask what is the use of applying a protective coating. At the end of a few months' service the inside parts show few signs of protection and the outsides are covered by rust spots, which have been started by the coating being knocked off in various ways.

By the foregoing it is very evident that stel cars cannot be protected perfectly, at all times, by paint coatings which may be knocked off by abrasion. Nevertheless, they seem to be best protection against corrosion, known at the present time. To give the metal a reasonable amount of protection by the use of paints, as they are now designed, it will be necessary to repaint the outside parts and underframing about every three years, and the inside parts every year. The best coating that can be found should be used on the underframing and outside parts, the loose scale and corrosion being removed by the use of scrapers and steel wire brushes before it is applied. It will, no doubt, pay to coat the inside parts occasionally, but, in my opinion, it will not pay to spend much time on the cleaning, or apply an extensive material. From the results of several tests which we made recently I am inclined to think tar paints, when free from acids, suitable for the interiors of coal hopper cars.

As steel cars have been in general use but a comparatively short time their construction has not ben perfected; for the same reason the best methods and materials for protecting the metal have not been developed. We have no cause to feel satisfied that we have the best that can be produced at the present time and, for this reason, I have endeavored to point out some of the short-comings of present methods and materials, and make a few suggestions regarding their improvement, rather than give a personal opinion of what I consider the best.

The principal suggestions offered as a means of securing improvements in the efficiency of protective coatings are as follows:

1. Secure a well cleaned surface at the contract shops before the first coating is applied.
2. Coat all inaccessible parts before they are assembled and fill all seams, laps and joints while the cars are being erected.
3. Make extensive comparative tests on cars in actual service in order to determine the merits of mixtures offered by manufacturers.
4. Secure an even and careful application of the most suitable coating that can be found.
5. Reduce the abuse of the cars in service as much as possible.

Respectfully submitted,
J. D. WRIGHT.

President Cook: Gentlemen, you will remember that I said this morning that I had in my possession a paper that touched on this subject from an outside concern, and it was the sense of this convention that that paper should be read. It is from the chairman of the committee on tests connected with the American Society for Testing Materials. Mr. W. A. Polk has secured the paper for us, and as he is perfectly familiar with it, I will ask him to read it.

Mr. Polk: This report was given to me by Mr. Edgar Marburg, who is the Secretary of the American Society for Testing Materials, which is affiliated with the International Society for Testing Materials, an English institution. Dr. Dudley, of the Pennsylvania Railroad, is president of the American branch. This is the report:

REPORT OF COMMITTEE ON PROTECTIVE COATINGS FOR IRON AND STEEL.

Since the fifth annual meeting of the Society, your committee has held two general meetings and one special meeting. The membership of the committee has been increased from the original six to seventeen members, and the committee has aimed to include representatives of every class engaged in the commercial production of protective coatings. The meetings so far have been confined to discussing the best methods of obtaining the desired data for a comprehensive report on this subject, and now, after a year's work, the committee can only report progress and outline a general scheme of action.

Before beginning this work it was considered necessary to put in concrete form several working headings:

(11 Requirements for a satisfactory protective metal coating.

(2) Methods used and suggested to determine if the protective coating is efficient.

(3) An index, with abstract, if possible, of general and current literature bearing on this subject, which has appeared in English, French, German and American publications.

(4) A classified list of all coatings used or suggested for the protection of iron and steel.

The committees on the first two subjects have submitted reports. The committees on the last two subjects report progress, and request further time for final report.

The report of the committee on requirements for a satisfactory protective metal coating called out a general discussion and resulted in the following recommendation:

In the preparation of surface for painting, it is considered necessary that the surface be free from grease and dirt, and that all detachable material, scale and rust, be removed. Material which cannot be removed by the hammer or chisel or wire brush it is thought will not affect the durability of the coating. The use of the sand blast is recommended, provided it is the opinion of the engineer that the cost is warranted, but it is not considered necessary in all cases.

Application of the paint.—It is recommended that the successive paint coatings should be as thick as possible, compatible with satisfactory spreading with the brush or machine. The brush marks should flow out. Paint should not contain any large amount of volatile matter, so as to chill the surface by evaporation. It is also considered objectionable if the paint cakes or solidifies in the bucket.

Drying.—It does not seem possible, without further experimentation, to reach a final conclusion on this point. Whether the paint coats shall dry in six or twenty-four hours is a matter to be determined by the contingenies of the case. In general it is recommended that as much time as possible be allowed between coats. It is, however, considered practicable to have an efficient metal coating dry in eight hours.

Successive Coatings.—The undercoatings must not be softened or acted upon by the subsequent coats of paint.

Protective Power.—This is the keystone of the whole subject. The coating must protect, to accomplish its purpose. It is recommended a coating must have the maximum impermeability to moist air or carbon dioxide. Iron and steel will not rust in dry air or in water free from carbon dioxide. The best protection will be obtained, therefore, from the most impervious coating. To this end the pigment should be as finely ground as possible.

It is further considered that in general there should be no chemical action between the pigment and vehicle, and therefore it is recommended that the vehicle or pigment, or both, be combined with some other color. Whether this last is to be done by the use of the lampblack or by the use of some non-drying oil will be the subject of further investigation.

Durability.—It is the opinion of the committee that the coating should be efficient under ordinary conditions for at least five years. The durability measures the life of the coating; it should therefore adhere to the metal through all ranges of contraction and expansion without peeling or cracking. Neither the pigment nor vehicle, nor compound resulting from a reaction of the two, should cause the disintegration of the coating.

It is further recommended that the coating should not be affected by the protection necessary for the equipment, maintenance or use of the structure protected. This applies especially to the siphoning of paint on bridges or tenders resulting from passing trains.

It is further recommended that there should be successful resistance to mechanical injury due to sand, cinders or other material carried by the wind.

Feasibility of re-coating.—There can be no question that a satisfactory coating must permit a re-coat where needed, without additional labor for cleaning or removing old paint.

Cost.—Upon this point it is only necessary to say that if the other valuable requirements be obtained, that coating is the best which can be furnished and applied at the minimum cost.

What is to determine the efficiency of coating.—It is the opinion of your committee that it is useless to prescribe the same tests for all classes of protective covering. An efficient coating in the dry atmosphere of the western states may fail to withstand the moist, saline air of the coast. A coating which is perfect for structural steel under a static load may fail entirely when exposed to vibratory shock on bridges and tenders. In short, tests must be in harmony with conditions imposed in service.

General Cause of Failures of Coatings to Protect—Is the same corrosion of the metal itself, that is, moist air and carbon dioxide.

Diluted acids as a rule have more action on paint films than alkaline solutions. A paint combined with linseed oil will show no signs of disintegration when merged in an acid which will rapidly dissovle the metal if unprotected, and the same paint would go to pieces in a few hours when exposed to the action of a correspondingly strong solution of ammonia, or carbonate, or caustic alkalis. Strong acid solutions rapidly destroy the coating, but it is rare that such conditions exist, and, if necessary, can be met by special requirements.

It is recommended that tests be conducted to meet the demands of service conditions, and divided into three broad classes.

First, Actual service tests under normal conditions applied to the structure to be protected.

Second, Accelerated tests, applied to especially prepared surfaces and subjected to abnormal, severe conditions.

Third, Chemical tests to determine constituents and adulterations of the pigment and vehicle as far as the knowledge of the subject will admit. It is undoubtedly true that the first set of tests gives the desired information in a most conclusive manner, but unfortunately the truth comes too late to remedy the evil, if the protection is insufficient to prevent corrosion.

It is further considered that the function of this committee is not to specify any covering or covers as protective, but to specify tests which coatings must sustain to assure maximum efficiency. It will, therefore, be necessary to work along the lines of accelerated and chemical tests, selecting those which harmonize with the results of long time service, experiments and ultimately formulating laboratory tests which can be relied upon to give the desired information. It should, however, be realized, that in this work chemical analysis must be used to supplement experience, not to provide any general rule. It is thought by previous experiments that certain pigments and oils give durability and protection, while others fail in these essentials, but it will not do to condemn the unknown without the aid of experience.

A review of the accelerated tests shows a variety of methods to impose abnormal, severe conditions. These tests have in some cases little connection to service requirements, but it is believed that the results obtained by the methods selected will be in harmony with long time service tests.

It is expected that the following series of experiments can be conducted through co-operation of railroads and consumers on one hand, and the manufacturers of standard coatings on the other, the former providing the structure and labor, and the latter the material to be applied. It is recommended that two coats of protective coating be applied to possibly full-sized structures. Not less than one span of a bridge, one steel freight car, or, in general, one unit of dimensions. The surface to be prepared and coating to be applied as recommended under those headings. At the same time, panels of tank steel, 20 inches by 24 inches by one-quarter inch are prepared and coatings coated in the same manner as the structure and with the same body of coatings. The panels are coated on both sides and on the edges of sheet, the work to be done indoors under favorable conditions for drying. The panels ought to have a one-quarter inch hole bored in the middle upper end, to facilitate hanging and are to be stamped with steel abrasion on both sides at the upper left-hand corner. Panels to be prepared in pairs, one pair to be green and dry panels are exposed under the roofs of train sheds, in roundhouses, directly over the smokestacks of engines, on trusses of bridges, and on roofs of adjoining power houses, stacks, etc., in tunnels, on docks, in salt water and tidal rivers, where they will be immersed twice every twenty-four hours in salt and fresh water, in the ebb and flow of the tides.

In addition to the above series of panels, several panels on glass and textile steel are prepared in the same manner as the foregoing; the steel panels are exposed to the action of exhaust steam at a temperature not to exceed 150 degrees Fahrenheit for twelve hours each day, and ordinary atmospheric air for the remaining twelve hours; tests to be continued for thirty days. The porosity is determined by noting the absorption of a drop of oil on the coating. If the film is impervious, the drop of oil will run down the panel in a narrow band the width of the original drop, but if the life of the coating has been destroyed, the drop of oil will spread out to a more or less broad furrow. Glass panels are tested for water repellant properties by treating the dry coating with a few drops of water. Rapid evaporation is prevented by means of a covered glass, and examined after the water has been in contact for twelve hours.

The capacity of the coating to withstand destructive agencies necessary to equipment and maintenance of structure will require special tests. For steel cars and bridges the coating is tested with lubricating and burning oils to determine if it is disintegrated. For refrigerator cars it is tested in the same manner, with a common salt solution.

A further set of laboratory tests by coating the cisterns of iron (?) one inch deep with two coats of paint. These are filled with ordinary tap water, and allowed to evaporate under cover to dryness, the water renewed until definite conclusions can be deduced. Chemical analyses of the coatings will also be made to determine percentage of pigment oil and volatile matter, with composition and quality of each.

The above service and laboratory tests ought to be conducted at as widely distant points and under as different conditions as possible. The service tests are to be carefully examined at stated intervals, and the entire series of experiments accurately tabulated for comparison with long-time service tests.

From these data it is expected that laboratory tests can be formulated which, when made, will insure a satisfactory protective metal coating.

S. S. Voorhees,

Chairman of the Committee on Protective Metal Coating.

I am indebted to Dr. Dudley for his help in getting this paper for me, and also Mr. Edgar Marburg, Secretary of the Committee, and I thank you, gentlemen.

President Cook: Gentlemen, this constitutes all the papers on this very interesting subject, and I think I may say, three more interesting papers it has seldom been our good fortune to listen to.

The matter of dues was again called attention to by the President and Mr. Bishop, urging all delinquent members to pay their dues to the Secretary.

The subject of the papers was then declared open for discussion.

Mr. Ball: I was very much interested and edified by hearing those papers read, and I agree with Bro. Quest, particularly, in one suggestion that he makes in his paper; it has been in my mind for quite a long time, and I have made the suggestion myself. A chain, as you all know, is no stronger than the weakest link, and the weakest link in a steel car to my mind is the interior. It will make not a particle of difference what material we use for the painting of the interior, what you use as a protector, if you cannot manage to protect the protector. In other words, if in loading and unloading a coal car an abrasion takes place, removing the protector, exposing the steel to the elements, it does not matter how well the outside is protected, that deterioration is going to go on from the inside. Now, it seems to me that that is the problem to be solved, how are you going to protect the interior. I believe that any good protective paint is all right for the outside, but that is not the weakest point. The interior is the weakest point, as was shown in the second paper that was read. There are other things to which these cars are subjected, such as hot slag, cinders and one thing and another, which burn off the interior.

Now, no matter how good a material or how superior a paint you may put on there, it is going to be burned off or scraped off, you have no protection. I said that I agreed with Mr. Quest in the suggestion that he makes there, and it is one I made several times, and I think it is the only solution to the problem. My idea was that at terminal points where the cars are unloaded, to have a gang of laborers, and any unskilled labor will do, to sweep out those cars and then give them a thorough swabbing out with crude oil, mineral oil or whale oil. Now, that oil will penetrate the pores of the steel and it will also form a sticky substance on the surface, and when the cars are unloaded in the usual way, a certain amount of dust that will stick to them will form some coating over it, which will be impervious to the acids that are generated by the coal and the rain water, and if that is done as frequently as the car is emptied, I do not see why that should not prevent corrosion from the interior. That swabbing out too with the oil will find its way down into the joints and crevices and remain there, and I do not know of any acid that will be generated from it.

I had another thing that suggested itself to me, that where a railroad company had the compressed air convenient to a terminal of that kind, some kind of a spraying machine such as farmers use—you have seen them with a knapsack that they carry on their backs, which they use to spray trees to kill the insects—something of that kind filled with that oil and with the use of compressed air, a laborer can take one of those on his shoulders and go around and spray quite a number of cars through the yard without any difficulty. But where they have not that convenience, of course, a swab would be the most convenient thing to use. I merely give you that for a suggestion, somebody else may have something better.

Mr. Gohen: I do not know that I would hardly be an authority to speak on the compressed steel car question, as we have none of them on our road, but my friend Ball speaks about swabbing or spraying the inside of them and that the dust that would accumulate on them would be a protective to the paint. Previous to that he said something about it not being so difficult to protect the outside. Well, I have noticed a number of pressed steel cars going over our road, and over other roads, while I have not had the opportunity to examine the inside, as a general proposition, the outsides were very rusty, and while Mr. Ball was talking, it occurred to me that if the oil was a good thing on the inside, and I believe it is, and the adhesion of this dust also, why would it not be a good thing to put that on the outside? "It does not look nice," Mr. Ball says. That is true, but that is not the object in our freight cars, and there a question arises, what would you do about your stencils? I suppose you could do on your pressed steel cars just as you do on your copper sheathed cars, put metal letters on both.

This question of pressed steel cars and other steel cars is going to be of vital importance to the railroad companies, and I believe there are some of them that are beginning to think that the pressed steel car is not a good thing, and if I am not mistaken, we had a master mechanic here yesterday who said that they had quit painting them; they just brushed them off and let them go. Now, I think it will be a very hard matter to get a protective paint for a pressed steel car. We have not arrived at perfection in that line yet, nor do I think we ever will for the inside of cars, especially where we generate these acids from the water and the gas in the coal, and in addition to that, what is still worse on the cars, the great attrition of the coal. Now, in dumping, say, if it is a hopper bottom, dump bottom, or anything of that kind, when the lump of coal passes out of the car, it takes every bit of paint out of the car that you have inside, and even if it is not dumped, if it is shoveled out, in going over the road, the load, in a train running twenty-five to forty miles an hour is constantly grinding that paint off the car, and I think it would not be very far from the truth if I were to say that you might take a newly painted car, painted on the inside, at one of your terminals and run it four or five hundred miles with a load, and when that car is unloaded, you will possibly find that on the greater part of the inside of that car there was no paint whatever.

Now, as Mr. Ball said, we want to get a protector for the protector. How are you going to do it? I do not believe you are going to get a protective paint for the steel car that will be satisfactory to the company, and I think we would better hunt along another line for something else.

Mr. Miller: The subject of protecting steel cars by painting is one in which we are all greatly interested, in fact, our superiors are after us, I know our Superintendent of Motive Power if after me, he wants to know which is the best way to protect these steel cars and perpetuate the life of them, and I am glad to see that such interest is being taken in this subject, as previous to leaving for this convention I was reminded by our Superintendent of Motive Power of the importance of this subject.

I think that we are all of us greatly overrating the danger of deterioration from the inside. I do not think the danger is as great as many of us believe. A car kept constantly in use is kept comparatively free from rust by the continual dragging over the surface of the coal, it gives you a sort of polished surface which prevents the rust from taking hold very readily, and I do not think that it would even pay to paint the inside of these steel cars except perhaps for the first time after they had been assigned. Keep the cars in continual service, do not let them stand idle on the tracks, especially in a loaded condition, where continued rains would help to form acid which would be very destructive not only to the paint, but to the steel.

Now, I do not anticipate that rapid deterioration is going to take place on the insides of these cars, at least not as rapidly as a great many of us have been led to believe. We have on our road a number of steel cars, most of them are new, some of them we have had in service for about three years. We have calipered some of the metal and have found that the loss through corrosion was not so great after all. We see a large amount of rust gathered up on the side of a piece of steel, the accumulation may caliper up, perhaps one sixteenth of an inch, that does not go to show, of course, that one sixteenth of an inch of metal has been rusted away. I am of the opinion, however, that we should look after the exterior and the under-framing of these cars very rigidly. All of our cars have been painted with carbon paints and graphites with very good results. We have, however, been using on our bridges with great deal better results for first coat, red lead, and I am of the opinion that the priming coat on a sand-blasted surface of a steel car should be red lead, afterwards coated with a good slow-drying carbon or graphite paint. I think that by adopting a method of touching up the bodies especially of these steel cars where they show rust spots caused by abrasion and misuse, I say, I believe that that will be a good thing. It will be inexpensive and could be done wherever cars of this kind can be caught in repair yards and terminals and at the mines.

We have given the subject of spraying the interiors of these cars some thought, but have never put it in practical use. I really do not believe that it would be of much effect, and I do not think that it would really be necessary if a car were kept in constant use.

Mr. Nicoll: I do not exactly agree with that in reference to the inside of the cars. I was sent by our superintendent of motive power to take a ten days' trip last winter just on this one thing, and I find, in going over the different roads that we visited, that there is a great deal of trouble that they are having from the inside as well as outside. I know that we are painting the inside and taking care of them as best we can. What we are after is to find something that will actually protect from the rust inside as well as out, because we can take care of the outside very easily, but it is the rust on the inside that has to be looked after, because I know our men took it off with hammers, chisels and brushes and it actually comes up to a couple of hundred pounds that comes off the inside of the car, sometimes one sixteenth to one eighth of an inch across, and I have sometimes seen openings in the cars that come through from the inside.

We were sent out to find the best methods, and I visited a great many of these men, some of the men in this room, and took their ideas and embodied them in a report to our Superintendent of Motive Power, and I know we are up against it right from the inside as much as from the outside, more so. We want to know what will protect the car from the inside while we are getting at it from the outside. Is oil the best thing? If not, is there something somebody can suggest that is better than the oil?

Now, the suggestion was made that at the mines, before loading, those cars be sprayed, swabbed, or something, with crude oil, so as to protect them. We thought by that means they would be protected from the jostling and jarring of the load. Otherwise, I know the abrasions occur at the coal piers by striking with a loaded sledge or maul to loosen the loads. Then again, I have seen some chalk marks on the cars, so that you could hardly see any paint where the chalk marks were; but coming down to it, I would like to find out some good method for the inside, that is the main point I want to arrive at, the outside we could care for very easily.

Mr. Miller: I just want to state for the gentleman's information that on our road we haul nothing but anthracite coal, and the danger from sulphurous acid is probably not so great as where the bituminous coal is hauled.

Mr. Bruning: It seems from the discussion that there will be no trouble to protect this steel in a proper manner—to get the paint to stay on, provided we can keep the coal off from the inside. Why would it not be a good suggestion to put in a false side of rough lumber? It would be cheaper than hammering away at it. This is simply an idea; it would not cost much to put up boards inside to keep the coal off the sides. The great trouble with the outsides of these cars is that the steel is not properly prepared when they are painted. If you take a piece of steel and put it under a magnifying glass you will find it is nothing but a mass of blisters, and if those blisters are not well removed you are going to have trouble, I do not care what kind of paint you put on. If you take the sand blast it will remove that trouble. Each of those blisters contain some moisture. If we can prepare a locomotive to keep it from rusting, why cannot a coal car be prepared in the same way? We simply want to take a little more pains with it. The other suggestion is a good one that was made, but I think that the coal could be kept off the inside by putting in false sides of lumber.

President Cook: Has any one anything to say in regard to Mr. Bruning's suggestion?

Mr. Butts: I think that all speakers have agreed on one point in this discussion, and that is that a paint coating does not protect the interior of a coal car. I think Bro. Bell sounded the keynote when he said that we ought to look for a method of protecting the protector. To my mind there is not a coating that will protect or ever will be found that will protect.

The thought has come to me just as I was sitting here, and I throw it out as a suggestion. There is only a certain part of the interior of any car on which the paint is abrased or broken or scraped off, so to speak. Would it not be a more practical thing to suggest to the manufacturers of steel cars to put a protection in there that is like a false hopper, or something of that kind to receive the blows and scrapings, etc., of whatever is thrown into the car? That can be easily repaired and renewed whenever it fails. The main body of the car so constructed would not be subjected to this trouble. We have all agreed that it is comparatively easy to protect the surface up to the point where the paint is knocked off or scraped off. I think we will never have a perfect car until they change the construction; that is my opinion. I have never had very much experience in painting steel cars. Bro.

McMasters here has been wrestling with that subject, and as he is a little backward about talking, I will now publicly call him out, and while he is on his feet I would like to have him express himself on the coating of red lead.

Mr. McMasters: As long as this is an experience meeting, I will say that in 1901 I was connected with a railroad in the east which, about fourteen months, I think, previous to that purchased one thousand steel cars, and inside of fourteen months they were the worst looking subjects that any one could imagine, both inside and out. Well, it fell to my lot to paint them, and we experimented a little along in the early spring to see what we could do. We got into several cars, rigged up a sand blast business ourselves to see if that method of removing rust, scale and old paint was practicable, which I found it was. The result was that we went onto a field where we could get space adjoining a main line track and prepared for it first by putting in tracks. We put in three tracks holding twenty cars each, if I remember rightly. Anyhow, on the first track, ten car lengths down from the switch, we built a platfrom on either side of the track, and arranged a sand blast on it and set off an old box car on either side to hold the sand. We had the sand hauled in by the carload; we had a compressor, a locomotive boiler, which was set at the head of the tracks to furnish the power and air, and we were ready for business. We made arrangements to get all the steel cars in that were necessary to carry us for a week or two ahead; we stored our siding with them to have plenty on hand, and it was the duty of the switchman each night to set ten cars in on this first track. The first car was set in directly opposite this platform. Well, at seven o'clock in the morning, two men came on and each one took sand blast, took the hose and sanded this car, completely cleaning off everything in very nice shape. The tracks were built as gravity tracks, so that immediately when this car was sanded it was dropped down to the far end of the track.

President Cook: Sanded inside and out?

Mr. McMasters: No, they were only sanded on the outside. Well, that car was dropped down on the far end of the track and was immediately sprayed, painted and another car pushed on and sanded, so that at the end of the day the tenth car stood at the sand blast, or just beyond it, completed and sprayed before quitting time.

The next day these cars were moved around, another ten set in, sanded and sprayed, and the next day the first ten that had been sanded and sprayed were loaded, so that our output was ten cars a day. It kept going right along and the result was before the end of the season we completed that thousand cars. I have since left there and have not been able to watch the cars to see how they are wearing, but I have the word of Mr. Wise, who is there now, and who tells me he has examined those cars and that they are all wearing very well indeed.

Now, the inside of those cars; we went in there with steel wire brushes, hammers and one thing and another, cleaning off the worst of the rust. I rather thought there was not much use to waste a great deal of time on the inside of the car, because it is immaterial what you put on, it will be knocked off by the coal coming in contact with it, but I also noticed that there was rust in great big sheets, which, when pounded and scraped, would come off, but I am inclined to think that after that was clean and after that first sheet of rust came off that that would not be so apt to happen again. I think that is more the original flash, and I do not believe those conditions would exist so much thereafter, although I have not been able to see the cars. Perhaps Mr. Wise will tell us as to that.

Now, we used on those cars, if I recollect rightly, three different kinds of paint, two manufactured paints and one that we made up from lampblack and oil, and I believe all of them at the present time are wearing very well.

In answer to Mr. Butts' question about red lead, I am afraid I will have to pass. There seems to be a divided opinion on that, and my experience with red lead is that the less we have to do with it the better off we are. In the first place, it is a very hard material to work; you have got to mix it yourself, or rely upon some other one to mix it, and he does not like to mix it any better than you do. The result is, you have to take long chances in attempting to mix red lead.

Mr. Miller: I would like to ask if anybody has ever found anything better than red lead next to iron, if the red lead had been properly applied? I am speaking now only of red lead as a protective coating next to the iron, the subsequent coating to be what you like.

Mr. Dane: I will state for Mr. Miller's information that red lead creates corrosion. This opinion is based partly upon the experiences of others, also from results which I have witnessed, not only on engine tenders but structural iron work—notably the Boston Elevated structure, which is, I am told, being sand blasted.

Mr. Gohen: I understand that Mr. Quest has with him some samples that he has taken from cars on his road on which he has made some experiments. I would like to have Mr. Quest tell us about it; he has had some experience in steel cars.

Mr. Quest: I have here some scrapings that were taken off a car that has been on our road over six years. This piece of metal was taken out of the side of one of them. If you will take that and take your knife you will find that that is still very elastic, that scraping. That is another illustration. I will take some of this out of the envelope which is taken from the same thing, that is, the paint that was taken off one of those cars of one hundred and fifty, that is the Northern Pittsburg & Lake Erie Railroad. This I believe is one of the first lots of cars that was turned out by the original pressed steel car company. That is what I call elasticity. As long as you have that much elasticity, you have a protective coating.

Now, those cars, as I stated in my paper, were not free from corrosion, from the simple fact of the bruises. Of course, wherever abrased we had trouble, we had rust, especially where the abrasion was in the slag or in what you might call the flash, and I think the deterioration would be equal to 25 per cent more than it would have been if it had been in the true metal. Of course, where bruised in the true metal it would rust, but not so fast as it would where the abrasion is in the slag.

While we are speaking of it, I presume we have the only red lead cars in the country to-day. We had some three years ago; one of the old oil trust companies sent their own people to our place and we furnished them with cars to clean up the iron and paint with red lead. In order to get fair play in the matter, they brought their own people to apply the paint, and their own red lead, oil and everything pertaining to the painting of those red lead cars, in order to see whether there would be any difference in having the car that would be painted all red lead and one dark, that is, a certain amount of lampblack added to it to make it a chocolate color. We furnished, I think, some four cars, but if my memory serves me right three of them were bright red lead; they looked pretty bright when they were turned out of the shop. Our superintendent said there was nothing in the color, that he did not care how red they were as long as we got results. Those cars have not been repainted, but they need it badly, but those that were painted with red lead and also that car painted with the red lead and lampblack combination.

I will state further that during that test my observation amounted to this: that I think that the commercial red lead that we are using to-day has too much weight. If you could have a division of the parts, say, that you could produce a red lead something after the order of a Prince's metal brown (we use that as a parallel) I think we could get better results. If we get, say for instance, a red lead that will weigh 25 drams or more to the cubic inch, if that could be reduced down to about 15, or something of that order, you will get a gread deal better result.

Mr. Bruning: These cars that were painted with red lead, were they sand blasted before it was applied?

Mr. Quest: They were not sand blasted. The cars that were painted with red lead were all neutralized with kerosene and benzined off before they were painted.

Mr. Bruning: I think they would have gotten better results if all that rust had been removed. You know that if there is a particle of rust on a surface and you apply red lead it will help to produce more rust.

Mr. Quest: Well, I am not able to answer that question, because I never had the experience of having a sand-blasted car painted with red lead. But this I do know, red lead is an oxidizing agent, one of the strongest we have, and I do not see how you can consistently use a red lead and have it dry as hard as it will dry if you figure to get any elasticity, and more especially when the particle is so heavy that it will oxidize, all but burn it up, as it were. It can be used in another shape, so that you can have it suspended in good oil. I have an idea you could get better results with a lighter pigment.

Mr. Bruning: I am not an advocate of using red lead, but I understand better results could be obtained if the rust were all removed.

Mr. Quest: I am giving my experience. We have red lead cars, and so far as having a car primed with red lead is concerned, as our friend Mr. Miller suggests, and then covered over with something else, I have not had any experience with that. It may be a good idea and I think would bear investigation.

Mr. Gohen: You said you had some cars painted with pure red lead and others painted with red lead and lampblack. Which one of those gave the best results?

Mr. Quest: There was not a great deal of difference, but the better results were with the chocolate colored car.

Mr. Gohen: With the red lead and lampblack?

Mr. Quest: With the red lead and lampblack, yes. I will state further that they had the greatest trouble they ever met with to get that stuff to stay on, and that while their own people put it on, men that were supposed to be skilled in putting on red lead, they were not going to trust it to our men, and they finally asked this one man who had a squirt and sprayer if he would not spray it on next, it had to be atomized out of a machine.

Mr. Butts: I see that we have in the room here a manufacturer of paint, who is also a chemist, Mr. Lowe. I would like to hear from him on the manufacture of red lead and paints. It would be of interest to hear from him.

President Cook: If Mr. Lowe is in the room, we will be glad to accord him the privilege of speaking.

Mr. Lowe: Mr. President, I consider it a privilege to meet this assembly of master painters.

The chemistry of red lead is simple, but to understand the physical changes that may occur in the process of making it is not so simple a matter. Red lead is simply litharge, the monoxide of lead, plus oxygen. The burning, both preliminary and final, is done in a reverberatory furnace. The quality of the finished product depends upon three things: (1) the quality of the material from which it is made, i. e, whether "casting house dross," metallic lead or white lead; (2) the skill of the workman who sprays it, with a sort of hose, until the metal is more or less thoroughly oxidized, and (3) its mechanical pulverization, washing and drying. The impurities to be looked for in red lead are metallic lead, free monoxide or litharge and vitrified particles. If your red lead is right for paint making, when properly mixed in proper proportions with raw linseed oil and applied to a smooth, vertical surface it will neither run, separate nor sag.

Our experience has been that dry red lead that is practically pure will vary in weight per gallon, U. S. standard measure, from 17 to 35 pounds, due to its physical condition, i. e., its particles being more or less finely divided. The lighter the weight per given volume, the better the red lead is for painting purposes.

We do not make red lead, but we use much of it, and I have been and am an advocate of its use in paint for priming naked steel. I do not agree with your secretary pro tem, who said that red lead promotes the corrosion of steel. We do not find it so.

This does not seem an occasion for me to discuss materials and methods of painting. In facing men who have been in close contact with paint all their lives, it gives me a sense of humility; you know more about paint and painting than I do, although I have studied probably all the reputable books that have been written on the subject and have been testing and making paint for thirty-four years.

One thought occurs to me that should have some influence upon this association. Painters have done so much to make me what I am that I would like to see the Master Car and Locomotive Painters' Association of the United States and Canada as high and representative an organization as there is in the United States. In order to accomplish that end it seems to me wise that you should appoint a permanent salaried secretary, have permanent headquarters in some central location, and have a well-established technical library that would be at the service of every member of the association. It would be my great pleasure to contribute towards such an institution, and if you have it, I am sure that you will understand better the nature of paint materials and the close relation that paint bears to things which it covers, such as steel, wood, etc. You should be familiar not only with paint, but with the nature of every substance to which paint is applied.

Few of us know much about steel. You should all have access to the works of such metallurgists as William Metcalf, Harry Hughes Campbell and Henry M. Howe in order better to understand the nature and structure of steel. Prof. Howe tells us that steel is a composite or granitic substance, its main constituents being "ferrite and cementite." From these it is formed as the rock granite is formed, from mica, feldspar and quartz. It would do the members of this association good to study the articles which the government has published on the subject of preservation of timber and of the seasoning of timber. All books on all special subjects kindred to paint and painting should be in a library to which you all would have access.

I believe there is an earnest purpose here to gain knowledge, and if I can promote your welfare by contributing towards a library, or towards the establishment of permanent headquarters, it would be a pleasure to me to do it.

President Cook: Mr. Lowe, allow me to thank you on behalf of the Association for the very practical and interesting remarks made to the convention. Is there any further discussion on the subject?

Mr. Lanfersiek: I want to say in regard to steel cars that during the summer just past, I visited several shops in the East, that is, as far as Pittsburg and even as far as Altoona. I went to McKee's Rocks, and saw Mr. Quest and he and I looked at several cars. He had cars that were on the stocks to be repaired that had been in service for six years. Well, some of them looked very rough and bad inside and the scales were probably nearly one-eighth of an inch thick on the inside. There was not much of the actual material gone, as Mr. McMasters has said. We calipered the metal and I do not believe that there was one hundredth part of an inch of the material missing after six years' service, and I actually believe that this hue and cry about steel cars falling to pieces is all a mistake. I think almost any of them, with some repairs, will last for twenty-five years, and if they will last that long, I think they will have rendered service fully worth their cost. After my return I sand-blasted three G. L. gondola cars, both inside and outside, including the underneath, took every particle of rust off and painted them with two coats of carbon paint, with one coat of our standard colors on top of the two coats, making three coats inside and outside. I have not seen any of the cars since they were painted, but of course the time is too short for us to be able to determine anything yet as to their deterioration, but I expect and believe that the outsides of those cars will be in fair condition for the next five or six years. Of course, I believe it was a useless piece of business to paint the cars inside at all; I think after two or three loadings, most of the paint, or a great proportion of it at least, will be scraped off by being loaded and unloaded, and I have come to the conclusion that by taking off only such portions as are necessary, taking the rusted portions off and touching them up and coating the whole with a coat or two outside is all that is necessary to do with steel cars.

Mr. Putz: I am not interested in steel cars at all, but I am somewhat interested in the graphite question. As you all know, in 1894, when we met in New York, I submitted some specimens of steel tank to the association, which I had coated. There were pieces from the flange of the tank and they were badly rusted. All I had done to them was just to scrape them off with the putty knife as well as I could, then coat them with graphite. In the first place I coated them with oil and graphite, and afterwards I gave them the regular coating of the tank, as we usually do, and I exposed them to very severe tests, and after a long time I found that the graphite had actually arrested the rusting underneath, and those parts had been entirely clean from rust, there was not a particle of rust underneath them any more. That is my experience with graphite, and I think that the graphite coating on steel cars would be a very valuable coating. I left one of the specimens, I think, with Mr. Quest. I do not know what became of it, I suppose he can tell us more about that after some time. Did not you get one of those pieces which I left with you?

Mr. Quest: You refer to the pieces of metal?

Mr. Putz: Yes, and pieces of flange iron.

Mr. Quest: It was handed to me when I was chairman of the test committee. I recollect, yes, that was very lasting.

Mr. Bishop: I have not yet had the pleasure of painting steel cars, but I expect to be up against it sooner or later, as the company which I represent are purchasing a number of steel cars, but almost all the remarks that have been made here have had reference to coal cars, the inside of coal cars and the sidebars. It is a question in my mind whether a railroad corporation, in figuring on the protection of the steel car, will figure on the protection of the side-bar or the bottom construction. It seems to me the frame work, that part that makes the car hold together, is more essential that the side bar. A large number of cars that we have of steel construction have a wooden body with steel stringers or sills, steel cuts, steel transoms and so on. In these cars they carry freight of all kinds, and naturally the brine that comes from packed fish has a bad effect on the under construction. What I want to get at is something that protects the steel from what flows down on it from the freight above, because we are hauling a great amount of that kind of stock, and if I could get a protection for the under construction, that would be the principal object.

President Cook: What shall we do with this question? Does the Association understand that we are to come to a decision, or has the advisory committee put this before us for a general discussion?

Mr. McMasters: I would like to get a consensus of opinion as to the relative preference for paint of the members present. Some say that red lead is better than anything else, others say the Prince's mineral is better; others that carbon paints are better. If possible, I would like to get the consensus of opinion here.

Mr. Pitard: It is rather a peculiar condition that confronts the association in this subject that we have under discussion. It is the primary object of paint to protect that upon which it is placed until worn away by the elements, but if there are other destructive agencies over which we have no control, then it cannot be expected that paint will be of any avail; therefore I am inclined to the opinion expressed by some of the members here that the manufacturers of steel cars should go a little further by the aid of their painters, in the matter of protecting steel cars by providing something on the interior that protects the paint. The Master Car Painters Association have met and overcome almost everything else that required their attention in the matter of protecting surfaces, the flat bodies of paint, and they can do so in this instance if the condition is such that the paint will be permitted to stay where they place it, therefore I think it is the duty of the manufacturers to make these cars in such a way so that the painters' paint will be allowed to remain where they put it for protection.

Now, to take the sense of this association regarding the best paint for this purpose, I think would be somewhat out of the regular proceedings, for the reason that, no matter whether the paint cost fifty cents or fifty dollars a pound, it would not stay on the inside of the car where there was that continual grinding motion of the coal inside the car. And so I think it would be unjust to any kind of paint to say that this paint or that paint was best for the purpose.

Mr. La Rue: I would like to say a word in regard to the protection proposed to be put inside of the car to protect the paint. When cars are being ordered, the question of weight very materially comes into consideration. A protection to be put onto the inside of the car to protect the paint would add so materially to the weight that I think it would be discarded on first thought almost. The question arises that the material would naturally be of wood construction and in order to eliminate the weight as much as possible, it would be very thin, consequently this thin material would be operated upon by the elements and would soon warp and twist until I think the protection on the inside, the remedy, would be worse than the disease. I think that the steel car is here to stay, and we will have to do the very best that we can to protect it. But the gist of the speaking this afternoon has been in regard to the inside of the car; the question in my mind is in regard to the underframe and the bottom of the car. I would like to ask for information. The road that I am with has no steel cars, but I would like the information, is it the bottom of the car or the sides of the car that rust through first? Is there any difference between the rusting of the commercial sheets and the compressed steel sheets?

Mr. McMasters: On all the steel cars I have examined, I have found the sides to be in very much worse condition than the under-framing; in fact, the under-framing has in all cases been in very good condition. Why it is I am not prepared to say, but the fact is as I have stated.

Mr. Gohen: I have looked around to see if Mr. Ball could answer, but Mr. Ball has left the room, but in a personal conversation some time ago Mr. Ball said that it was his experience, before this question was brought up, that the sides invariably rusted away and the under-framing and other parts of the bottom were in good condition, while the sides were invariably bad.

Mr. Laufersiek: I can corroborate what Mr. McMasters has said in regard to the bottom of the steel cars. Those cars that I had sand-blasted, the paint I put on them was as good as any I could put on, I would say that they were as good before I sand-blasted them as they were afterwards. I had orders to sand-blast them, I called attention to the fact that the paint was good, but that was of no avail, I had to take the paint off. I will say that on every one of them that I examined the paint was good underneath, and it did not necessitate any painting. The sides, of course, were the worst.

Mr. Gohen: Perhaps Mr. Lowe could tell us something of that in a chemical way. It may be just possible that the water that remains on the inside has something to do with the rusting; that the water which trickles through goods down to the bottom of the car and down to the framing, that runs off and the air soon dries it, perhaps that is the reason, would you think so, Mr. Lowe?

Mr. Lowe: I do not know, I could not answer that question. You speak of the bottom of the car, do you refer to underneath the bottom?

Mr. Gohen: The framing underneath, outside, underneath.

Mr. Lowe: I am not prepared to answer that.

Mr. McMasters: If you will permit me, I do not know whether I can express myself or not on this matter, but the way I figure it out is, the under parts of those cars are protected from the sun—he is "the boy" that does the business—and the sides are not. Now, to get a protection on the steel, you must keep the moisture from going from the outside through that paint, and the paint under that car the sun has not, as we say, deteriorated it, while on the outside it has. The result is that it has taken the life out of the paint from the outside, the moisture goes straight through the paint.

Now, to try to prove that, take our locomotive tanks. We do not have the rusting of the locomotive tanks that we do on the steel cars, and why? Because, we have anywhere from five to six or eight coats of paint on there, at least five or six coats and one or two coats of varnish, and the result is that the moisture does not get through that coating and the tanks stand, but the minute your tanks wear and run down and become pervious to the water, away they go.

Mr. Bruning: I do not agree on that subject. I think it is all caused, as I said before, through these large sheets of steel passing under the roller. They will be more or less chilled in passing over that roller and that produces this slag and the small size holes—it is full of millions of fine blisters and they have all more or less moisture in them and until that is removed you are going to have trouble, it does not make any difference what you put on there. The true pressed steel does not have any blisters. We have the same trouble with locomotive tanks, they have just the same thing, and until you remove those clots, and you cannot do it without the sand-blast, you will have that rust. It is all due to the rolling, that is it in a nutshell.

President Cook: What will you do with the subject? Are there any further remarks? If not, we will take up No. 7, "Is the Authority and Responsibility of the Master Painter Co-Equal?" by Mr. John H. Pitard.

Mr. Pitard: Mr. President, I feel that I ought to beg the indulgence of the convention before I proceed with this subject, for the reason that owing to an unusual run of work this year, I deferred this paper until it was almost too late to do any more than touch upon the subject superficially. I did not go into it as deeply or as extensively as I should like to have done, but I hope to redeem myself on a future occasion.

ESSAY BY J. H. PITARD.

Is the Authority and Responsibility of the Master Painter Co-Equal?

Mr. President and Gentlemen of the Master Car and Locomotive Painters' Association:—The term Master Painter is a significant term. It applies not to the painter, but to the man who has mastered an art that is indispensable to the creative genius of man and to the pleasure of humanity. The Painter is made and his name should be legion, but the Master Painter is born and there are but few. He is master not only of his art but of himself and of those under his charge. He has striven to reach the pinnacle of his vocation; he has met and mastered the obstacles which are within his path. Shall he be denied the fruits of his victory and be burdened with the entire responsibility of his department and clothed with only a limited authority to meet it? To place one in such a position, is to check the development of the possibilities of his greater usefulness; to crush his spirit; to blight his hopes and destroy his usefulness.

This is a question which concerns not only the Master Painter, but in fact the head of every department of railways work. Neither is it a new born question, for history contains instances where the failure to effect a proper balance between authority and responsibility have ultimately resulted in failure and disappointment. History also contains instances of abused authority that have resulted in disaster, not only to the abuser, but to the subordinate and the superior, and in some instances, to an entire nation. It was on account of lack of support at a critical moment that caused Napoleon to lose the battle of Waterloo, but the latent cause of his downfall was his abuse of power. Thus it is possible, as it may frequently happen, that the Master Painter's superiors, or superior officers, who may disregard the courtesies that should obtain between men in every relation of life, may so far overstep the bounds of reason as to permit themselves to be actuated by selfish and arbitrary motives and refuse to invest the position of Master Car Painter with the rights that properly belong to it, and may even go so far as to curtail much of the rights that it formerly enjoyed, while he generously permits the responsibilities incident to the position to remain a heritage to the Master Painter's heroic efforts. The results of the efforts of the Master Painter thus hampered and struggling under such disparaging circumstances, can well be imagined. This is like packing a man in ice and then cursing him because he won't sweat; for someone to electrocute him and end his miserable existence would be almost a charitable act.

Where such condition unfortunately exist they must be ascribed to various causes. It may be on account of personal feeling or that the Master Painter's superior has not gained sufficient control of himself to deal with his subordinates from the standpoint of their value to the company instead of from the standpoint of his personal regard or rather disregard for them. On the other hand, the cause may rest with you, your superior may have failed to discern in you all those elements which constitute the successful manager, or the interest shown by you in making your department a success, does not impress him as being sufficient, in which case the old adage is most applicable, that man is the architect of his own destiny; he can make it what he wills.

It must not be inferred from this, however, that the Master Painter can fix the limitations of his authority and responsibility to suit himself, but his efficiency largely determines the degree of his responsibility and is also the standard by which is fixed the limitation of the sphere of his authority. The fountain cannot rise above its source. It is indeed difficult to conceive of any shop or business being successfully conducted where the manager is burdened with entire responsibility on the one hand, and clothed only with a limited authority on the other. The one over-balances the other and makes success impossible. Such a condition strikes at one of the cardinal principles upon which success is based, and that is shop discipline to which it is fatal. No set of men can be held to a strict line of duty by a foreman whose authority is limited; their respect for the foreman and for the shop discipline will be in proportion to the Master Painter's authority. It were far better, when creating the position of Master Painter, to invest the position with every right and privilege necessary to its successful conduct and then select a man to fit the position rather than curtail any of the rights of the position in order to make the position fit the man.

In the matter of selecting paint materials, the Master Painter's judgment should be supreme. He may not be a chemist, but his long and intimate acquaintance with paint materials enables him to readily detect adulteration. Has he not a right to expect that this consideration be shown him and is not his reputation for efficiency at stake, to say nothing of the company's interests, which is the first consideration? Not coercion but personal pride should prompt every Master Painter to make his department a success, and as the success of the whole depends upon the success of each integral part, the Master Painter's superior should be quick to realize that his co-operation and support of the Master Painter is necessary to his own success.

There should exist between them no gulf, no differences, personal or otherwise, that might prevent or mar their mutual relations. They should enjoy each other's business confidence and friendship. They should work shoulder to shoulder. They should realize that although they occupy positions of different degree, they are both employes of the same employer, and that it is his interest and not their personal considerations that should prompt them in their business dealings. They should be ever ready to consult, to advise, to encourage each other, both animated by the same desire, and that desire the successful discharge of the trust reposed in them by their employer. Then and not until then will the authority and responsibility of the Master Painter be co-equal.

J. H. PITARD,
Mobile & Ohio Railroad.

Mr. Quest: I would just like to say that I am very glad that Mr. Pitard did not have an opportunity to rewrite that, because it is such a fine paper as it is.

President Cook: It is the sense of the convention that it is a very able paper. The next number is No. 8, Essay—The Copper Sheathed Car," by Mr. J. A. Gohen.

ESSAY BY MR. J. A. GOHEN.

The Copper Sheathed Car.

To the President and Members of the Master Car and Locomotive Painters' Association.

Gentlemen:—The question of economy in maintenance of passenger cars is one of vital import to the railways of the present day, especially is this a fact in the matter of painting in which the ornamental enters to a large degree, and any system or method which will reduce the annual expense of such maintenance, must, of necessity, be no minor factor with such systems as the Pennsylvania Railroad with about 4,000 cars; the N. Y. C. & H. R. R. with over 2,200 cars; the N. Y. N. H. & H. R. R. with over 1,800 cars and the Boston & Maine with over 1,500 cars.

The question of cost of maintenance is not the only factor, as th earning power of these coaches while in shop undergoing repairs and repainting is entirely lost to the company, and any method reducing this shopping period adds to the coffers of our company. So it is not at all to be wondered at that the ingenuity of our people is exerted to minimize this expense.

Time was, and not generations ago either, in the days of high tariff rates, slow trains and small competition, when the question of painting was hardly given a passing thought except by the Master Car Builder and Foreman Painter, and then, the question of uniformity and expense was entirely ignored. It was nothing unusual thirty years ago to have four or five different styles of ornamentation on the coaches and as for headlinings, the more elaborate, varied and costly they were the more valued was the Foreman Painter in the estimation of his superior.

The same condition existed in the engine paint shop. Special representation to suit the fancy of the Master Mechanic, and often, too, the whim of the engineer was indulged in ad infinitum. Ask Warner Bailey, W. L. Marsh, or some of the other foremen of other days, if they do not, even yet, have fond memories of the landscapes, scrolls and hunting or marine scenes they painted on cars and engines in "Auld Lang Sine."

Sixty to ninety days was not an extravagant allowance of time for painting cars and engines in those days, and the single item of ornamenting a headlining on a tank was far in excess of the total cost of painting and varnishing a car or engine of today. We have made considerable progress in our individual line and the coaches and engines are as pleasing to the eye as of yore, for the times change and styles change with them, and that they do change brings to my mind a thought that we are sometimes prone to take too much credit on ourselves and our association for the improvement made in car and engine painting. We are only abreast of the times; not in advance.

Look about and see the development made in other departments and lines and you won't probably swell up so much over your own. Just to illustrate this idea; I happened to be in St. Louis August 24 and heard the train caller sing out: "The Burlington-Northern Pacific Express for Kansas City, St. Joe, Northwest Nebraska, Black Hills, Wyoming, Montana, Idaho, Washington, Puget Sound, Portland and Seattle." I had heard this call before but it had never impressed me as on this occasion. I had been thinking of the Development in the Paint Shop in connection with the paper I was expected to furnish on the "Copper Sheathed Car" when this call awoke me from my reverie, and I began to think the Master Painters were not the only progressive people on this mundane sphere, especially so, if the manifesto of the Metal Plated Car & Lumber Co. is true. Here is what they have put forth in a publication, a copy of which, no doubt, has found its way to the desk of everyone interested in the Maintenance of Railway Cars:

"This improvement consists in covering each piece of wood sheathing, paneling, belt rails, letter boards, etc., with sheet copper, before such parts are assembled, and in such a manner that the metal fits skin tight to the wood, the exterior of the car thereby presenting a smooth and finished surface, making all joints absolutely water-tight, the several members being so secured together that the exposed surfaces of the metal are not punctured by nails or other fasteners.

"The metal is oxidized in a variety of shades, thereby imparting to it a permanent and uniform color, unaffected by the action of the elements, and rendering the use of paint or varnish on the exterior of the car body wholly unnecessary.

"In the past, paint and varnish only have been used to protect and finish the exterior of Railway Passenger Coaches which have been an item of great expense, especially as it is necessary to re-varnish at least once a year, and to repaint and re-varnish every four and one-half years.

"While many improvements have been made during the last decade, both in the construction and appearance of cars, yet up to the present time nothing has been accomplished in the way of improving the exterior.

"Realizing that this item of painting and varnishing was a constant source of expense, and with the end in view of providing some imperishable protecting surface for the cars, experiments were begun sometime ago which have resulted in what has become known and referred to as the Metal Plated or Copper Covered car, the distinguishing feature of which is the external covering of copper, which, once applied, needs no further care during the life-time of the car and which is at all times worth 75 per cent of its original cost."

Gentlemen, if this be true, I will say to you in the language of Sergeant Tilman Joy, written by Secretary Hay, "Now my gentle Gazelles, you may resolute till the cows come home," but you won't convince the railway companies that you are in any degree progressive, or that it is to their interests to indulge longer in the foolish practice of paint, putty and varnish on the exterior of their cars.

There is a lurking suspicion, however, in my mind that Brother Copp was right when he said in his article on this subject in the May number of the Master Mechanic, "It has been a good many years since cars were painted and varnished and no doubt they will continue to be so finished many years more," so if there are any of you contemplating a change of vocation for fear the copper sheathed car will prevail, don't do it, because it has yet to be proven that the copper sheathed car is less expensive to maintain for a given number of years than is the painted and vanished car.

Again, if it ever comes to the point that railways will

sacrifice all pretensions of respectability or appearance of their equipment because of the expense of such maintenance they will not discard paint and varnish and have recourse to copper. When that day comes, if it ever does come, they will discard japan colors and varnish and resort to the cheaper method of oil paint as they are now doing on freight cars.

"The apparel doth oft proclaim the man." This is also true of railways and they are usually judged in this day by the appareling their coaches bear.

It is but a few years ago that a certain railway in this country gave all the painters a scare by discarding surfacing, ornamenting and varnishing, and proclaimed as loudly, perhaps, as do now the Metal Plated Car Co., the advantages and economy of the famous four-coat method, or enamel process. It didn't last very long and now that same railway has gone to the other extreme in surfacing, ornamenting and finishing, fully convinced that it is better and cheaper than the cheapest painting ever done on their system. If the enamel process or four-coat method were animated and gifted with speech, well might it exclaim, "If so soon I were done for, what was I begun for?" It will not be at all surprising if the copper sheathed car meets with the same results.

As Brother Copp truly said in his article, "It is a case of the survival of the fittest in all things and this will doubtless prove no exception." Sufficient time has not elapsed since its introduction to judge its fitness or superiority over paint, except in one instance and that is appearance, and if it proves such a lamentable failure in economy and durability, then, indeed, will paint and varnish survive. For the reason that the copper sheathed car has not found lodgement in our section of the country it is unfortunate that I were selected to dilate on it. I have seen but one copper sheathed car in this section; it is on the P. C. C. & St. L., or as commonly known, the Pan Handle, and although I have watched carefully I have not seen it for perhaps eight months, but if this car is identical with the rest of them their appearance is anything but pleasing. The copper sheathing on the letter board was badly buckled and bulged and the whole outside presented a dingy, uninviting appearance. I don't think the car had been in serive more than a year when I last saw it, yet the parts below the belt rail were interspersed with small indentations, which cannot be eradicated, except by re-sheathing. A painted and varnished car could be remedied by a little good old putty and touched up and varnished at infinitely less cost than re-sheathing.

Now, having noticed this car and having no access to others I made inquiry of some parties who were conversant with the condition of similar equipment and found the same conditions existing in other cars of same class. I understand it is almost impossible to clean them, and after making a few trips they look worse than a painted car running a year without cleaning.

It is also so difficult to sheath the letter boards properly that some of them use sheathing all the way up, dispensing with the letter board, and unless the greatest care is used in coppering the sheathing it looks bad. After going in service it is but a short time until the car is full of indentations such as I noticed on the Pan Handle car, and it does not take much of a blow to indent the copper, it being very thin; neither does it reqnire much of a rake to cut through the copper, and once cut, there is no recourse but to remove and re-sheath. Unless the rake is a bad one, all that is necessary where paint is used is puttying, touching up and varnish, at much less expense. I understand where sheathing is removed on account of such rake and new sheathing applied you get a fairly good match at first, but after car has been placed in service you can see the patch very plainly.

A friend of mine who lives on the line of one of the copper sheathed car roads told me sometime ago, that he noticed from his home a car passing one day that looked like it had been painted lead color. He after noted a number so painted; happening at the station one day he examined one of these cars and it proved to be one of the copper sheathed cars that had taken on a lead color deposit, so, my dear friends, it seems as if the copper sheathed car is not proving the howling success its friends anticipate, and you may as well make up your minds to do business with paint and varnish until you retire with the millions you are making out of it, or you have joined the silent majority.

So much for the appearance of the car. How about the cost? In the book put forth by the Metal Plated Car & Lumber Co. they say under the caption of "Valuable Features": "In addition to the fact that the beauty and finished appearance of the oxidized copper is permanent (which, by the way, is not), time and experience have proved that it is the most economical covering yet devised." Time and experience have proven no such a thing, else the Metal Plated Car & Lumber Co. would undoubtedly and justly present a comparison of the cost of maintaining, for a given number of years, a passenger car painted and varnished as against one metal plated, and until they do show some such comparison favorable to them we will dispute their assertion of economy, just as we do their assertion that the beauty and finished appearance of the copper is permanent.

Item 1 says, "A less expensive grade of lumber may be used;" and Item No. 2 says, "The time and labor of surfacing the body is wholly saved, as the lumber to be plated only needs to be smooth planed." I have with me some samples of copper plated sheathing, one of which is new and the others old. If less expensive lumber may be used, why is it not used? Here on this old piece is just the same kind of lumber that is on the new piece and both are the same kind of lumber that we use under paint and varnish. There must be some reason for its use or a cheaper grade would be used; and again, an examination will disclose the fact that this sheathing is finished about the same as ordinary sheathing. So the saving in this line amounts to little or nothing.

Item 3. "No painting or varnishing is ever necessary." Listen, a voice as of a little bird has whispered to me that they are now debating the advisability of enameling the copper sheathed cars on account of their unsightly appearance and difficulty in cleaning them, and it is just possible that the 700 cars for the subway may be enameled. Here is a solace and a comfort to our dear friend, the varnish man, who has been like ourselves, under the terrible nightmare of copper sheathed cars.

Item 4. "The copper can be reclaimed at any time as scrap and has a market value of 75 per cent of its original cost, while nothing can ever be reclaimed from paint and varnish." Sheet copper, such as used for sheathing, is worth about 22 cents per pound; thin coper scrap 10 cents. Will the Metal Plated Car & Lumber Co. please say how much money is saved by this reclamation over and above the original cost of all the paint material applied and of which nothing is reclaimed, and then tell us how much more copper sheathing costs than painting and varnishing.

Item 5. "In case of accident the metal, if not torn, can be used again." A self-evident truth. So, also, is it true in case of accident, the paint and varnish, if not marred, need not be renewed, but what kind of an accident could possibly happen to the body of a car that would not tear the one or mar the other?

Item 6. "The metal covering may be applied to the car while in erecting shop, and the expense of shifting same as required in the case of painting entirely saved." How about the inside? Copper that, I presume.

Item 7. "As the copper covering lasts the life-time of the car without additional expense, the loss of car service incident to the repainting and varnishing thereof is also saved." Now in the very next paragraph they say "That such are facts, having been fully demonstrated by companies which have had the copper covered cars in service for the past three and one-half years." Suppose we give them the benefit of a doubt and make the period four years, can we not reasonably ask, Is four years the lifetime of a car, and is it true that there has been no additional expense on any of these cars so copper covered, and has the excess cost of copper sheathing over paint and varnish been offset in the meantime, or in other words, if two cars were put in the same train four years ago and continued therein, one of them copper sheathed, the other painted and varnished; the copper-covered car in the meantime having no additional expense; the painted one being cleaned and varnished as the exigence might require, which will have cost the most in the four years, and what is of vital import, which one of these cars at the expiration of the four years would be the most pleasing and agreeable to the patrons, and most acceptable to the managers of the company?

How about the cost of maintaining these cars for four years. To sheath and paint the body of an ordinary 60 foot coach is less than $230, equally divided between carpenters and painters. This, of course, does not include the sash, deck, trucks and platforms, but such parts only of the car as would be coppered.

Now, at the end of the first year, the painted car would be shopped for ordinary repairs and repainting. If no damage is sustained by the wood work, which by the way is least expensive in the painted car, it will cost about $35 or $40 to clean, touch-up and varnish. The same expense would be entailed at the end of the second, third and fourth years for either cleaning, touching up and varnishing or cutting in and varnishing, so that we begin the fifth year of the painted and varnished car with an apparently new car, pleasant and agreeable to all, with a nominal cost of $400 for the provision and maintenance of the exterior of a car body for four years. Now, how has the copper sheathed car fared meanwhile. I am unable to say just how much it costs to copper-sheath a car, but I have heard it estimated at $600. Am I wrong? Now contrast the appearance of the apparently new painted car with the other one, and then let us ask, How can we reconcile the statement of the Metal Plated Car &

Lumber Company in their book where they say, "At a conservative estimate from $100 to $200 per car per year may be saved by the use of copper." As the aggregate for four years has not exceeded $400, how can they save $400 or $800 unless the copper people do their work for nothing?

As to the claim that "The loss of car service incident to the repainting and varnishing thereof is also saved," I have only this to say: On our road we do not shop cars for painting alone, but we think in these progressive days that cars running 50 to 60 miles per hour need, at the end of one year, an overhauling of trucks and platforms and a renovating of the upholstery, if not painting and varnishing, and right here I will venture the assertion, that in few shops today is any passenger car held many days longer than is necessary to repair the trucks, platforms, etc., and to renovate the upholstery. The paint shop, in the meantime, has not been lagging, and in many cases are waiting for some other department, so that the claim of the loss of service incident to the repainting and varnishing of cars is a myth, a mistake or a mis-statement.

Now, my friends, it is a serious matter to the Master Painter to controvert the assertions of this company. They have asserted that it has been a constant and inferentially, an inexcusable expense to paint and varnish coaches, and as a surcease from such useless and inexcusable expense they offer something that many of us verily believe will prove disastrous to those who have had, at least, an excusable degree of confidence in our probity, our honesty and our judgment, and we would indeed be recreant to the trust imposed in us, if we did not at least ask that they "Rather bear the ills they have than fly to others that they know not of." Let them rather abide themselves awhile until peradventure there is no question of the "Survival of the fittest" and when that day comes the Master Painter will have no regrets.

If, in some future day, it becomes necessary for our companies to sacrifice, on account of rigid economy, the ornamentation, the beauty and the brilliancy of the present day passenger car, let us hope they will not be persuaded to go to copper, which will, no doubt, prove ruinous to them, but rather should they go to common oil paint, which is protective and preservative, if not prepossessing.

J. A. GOHEN.

President Cook: Gentlemen, it is now five minutes to adjourning time, shall we continue any longer in session?

A motion was made to adjourn.

Mr. Lanfersiek: I want to state to the members present that the car that Mr. Gohen referred to in his paper was covered in the Columbus shop on the Pennsylvania Railroad, and the statements he makes in regard to it are true. I want to say that the only portion of the car that is covered is merely the outside of the body below the roof, the brackets, platform and sash, roof and everything is painted on that car the same as on any other car, and the inside is painted identically the same as any other car and thus, although all the cars were covered with copper, the painter would still have the majority of the painting on any car that he had, for that reason I do not believe the painters need have any fear, so far as copper cars are concerned, of knocking their work to smithereens.

Mr. Copp: I would like to say in explanation of Mr. Gohen's paper that I understand that the New York and New Haven Road have had this season one hundred and twenty-six coaches made copper covered, fifty or fifty-one at Springfield (Wason Mfg. Co.) and fifty or fifty-one by the Osgood Bradley Car Co., at Worcester, and twenty-six by the American Car and Foundry Company, Wilmington, Del., and they are all being enameled to match the New Haven equipment color. I understand Vice-President Merrill wished it to match the rest of the equipment in color. I do not know that I am giving away any state secret. I have orders from my superior, Mr. Chamberlain, of the Boston & Maine, that as soon as the summer traveling season is over to take in one of the twenty coaches which were acquired by the lease of the Fitchburg road and have it enameled. We already have the enamel on hand and I shall probably do it in the course of a month, so I guess there is something yet for us to do.

Mr. Gohen: I hope that the members, if any of them know anything about this, if we are not going to adjourn, will talk this matter over. It is of some importance to us, and I would like to say to the members from the East, if you would like to have a car running over your road that was imperishable and never needed any repairs for years in the way of additional lacquer, would not that be a beautiful thing to hold up. Gentlemen, do not be afraid of the copper covered car.

Mr. Lanfersiek: I want to say in addition to what I said of the copper covered car on our road, that it was originally intended when that car was first covered to have it enameled, and then the president of the Pennsylvania Railroad came through the shops during the time it was being covered, and he asked what it was, and he was informed that the car was being covered with copper, but it looked so unsightly that they proposed to enamel it. He asked why they were covering it with copper, and they told him it was for the protection of the car. He said, "If it is for the protection of the car that is all the protection it needs, we won't do anything more to it." That car has had nothing put on; has never been oxidized, nor anything else. That car has been in the shop since it has been covered about three times, it is nearly four years since that car was covered, and it has been in the shop about three times, and the only thing we did to it while it was in the shop was to take waste and moisten it with "Modoc" and wipe it off. You could not do that with an oxidized car.

Mr. Forbes: We have about fifty of them now on the Erie, and I have had quite a little experience with them. Our people have found it necessary to relacquer all the cars twice within the last year. You cannot get a lacquer that will stay there. We simply cannot keep them in any kind of shape. There is another feature: I found where they removed the copper sheathing, that in several cases the wood sheathing had been all used up with dry rot.

President Cook: Before any one leaves the room, let me make this announcement, that the first thing we will do in the convention tomorrow morning will be to ballot for the next place of meeting. Do not forget it, and circulate it around so that we may get as many in tomorrow morning as possible.

Adjournment.

FOURTH DAY'S PROCEEDINGS.

September 11, 1903.

The meeting was called to order by the president at 9 a. m.

President Cook: The idea, when we adjourned yesterday was that first thing this morning we would ballot for the next place of meeting, but I think we would better wait until we have more members present.

Subject No. 9 we will take up next, "What is the best material for the shop cleaning of passenger cars preparatory to painting or varnishing?"

MR. BAILEY'S PAPER.

What is the Best Material for the Shop-Cleaning of Passenger Cars Preparatory to Painting or Varnishing?

I beg to say that I am fully appreciative of the compliment conveyed in your request to discuss or to express my views upon any subjects that may be selected for consideration, and while I realize that perhaps the opinions of others in the matter of "car cleaning preparatory to varnishing" may be as good or better than my own, still I feel that an experience of over half a century has not been without results which enables me to speak advisedly upon subjects with which I have been obliged to deal in a practical way. I mention my long experience reluctantly and in no spirit of egotism, but only to suggest that in the fifty years of service much of greater or less value must necessarily have been learned by observation and experience.

Like almost everything else of the details of our business, cleaning cars preparatory to varnishing is a qeustion of judgment based upon experience and should not be governed by a mere personal prejudice, or opinions not warranted by actual work and practical experiment.

The first material used for cleaning cars, or at least the first known to the writer was what is known to everybody as soft soap, which is made from a caustic alkali by leaching wood ashes and combining it with grease. This, sufficiently reduced with water to suit the case (stronger for the outside) answered the purpose very well—perhaps as well as anything that has since been tried.

Various hard soaps have been used by reducing them to liquid form. These have seemed to give satisfaction for a time; but that everlasting longing for something different brought out potash, caustic soda and sal soda. Potash, I consider unsuitable because of the fact that you cannot control it in the hands of the cleaners. The same objections will apply to caustic soda, although good results can be obtained by proper management.

What I consider the best, and what I am using at the present time is sal soda, with ground pumice stone, or some of the substitutes for the latter. The following is what I am using at present, and I should be very reluctant to change for anything I know about: To about 15 pounds sal soda add 50 gallons of water, and when thoroughly dissolved and well mixed together, this will be about suitable for the outside body of car. For trucks and steps add more soda when necessary. For inside of car, dilute the same with water sufficient to meet the conditions of the job. While sal soda answers very well for cleaning the inside of cars, I much prefer some of the soaps, especially when the interior is not to be revarnished. The tendency to injure the gloss is not so great with a linseed oil, or palm oil soap, as with soda.

In any event, I believe in thorough work in cleaning cars

for revarnishing, especially on the inside where the beauty of the natural wood is so much at stake to maintain. With the exception of the gold leaf and other lettering and decoration, it does not so much matter whether all trace of smoke-grime is scrubbed from the exterior or not, so long as it is to be cut in, or repainted; but I cannot emphasize too much the importance of thoroughly scrubbing the inside to be revarnished, being particular to get into all the corners and less noticed portions of car, using pumice stone and elbow grease unsparingly. Also plenty of water, even if the floor of car gets drenched. Some seem to be as afraid to use water as though they came from Kentucky. As I am from the Granite State where prohibition has only very recently been set aside this may account for my disposition, but I believe in its use still—for some purposes. At any rate I do not believe in slack methods of interior cleaning from year to year until the car has become so begrimed that nothing but a varnish remover will bring it back to first principles. If more thorough cleaning was done there would be less need of varnish removers, their use being confined chiefly to the removal of varnish when it has become badly cracked or otherwise defaced. I think I can in all modesty claim that when only the cars of the C. & M. road were under my care I was able to maintain their interiors in a clean manner, corners, crevices and all; but since the lease of this road and a general mix-up of all the cars of the great system has taken place as regards shopping, so that the car you take pride in this year you may never see again and the one you get next you never saw before, I am often at my wits' end to know what to do to put some old cars in shape that have had such a prehistoric condition and treatment, having come down from one road to another that it would be hard to trace the cause of the condition they are in. But the main trouble is in making no different work of cleaning a car for varnishing than one without, and thus grime is being constantly buried beyond recovery, except with a varnish remover. Of course the inside of cars not to be varnished, and in good condition, can be cleaned more lightly—given a milder treatment; but they should be made clean nevertheless, for whether varnished or not if dirt is left from year to year to accumulate in the corners it will not be long before it is beyond the reach of ordinary cleaning methods. It is easier to keep a train moving than to start it, and it is easier to keep a car clean than to resurrect it after having been once buried by wrong cleaning methods, which is too often the case of many first-class cars. This is especially the case with the mahogany finish which is in vogue today on car interiors. It shows the accumulation of smoke very plainly, which was no the case with the black walnut of former years. Too much stress, therefore, cannot be put upon interior cleaning of passenger equipment in the paint shop, and I counsel all our young foremen painters to look well to this and not beguiled into the use of things advertised to renovate car interiors that too often bury them in dirt if constantly used. Do not forsake the old-time soap, water, pumice stone and elbow grease, for they will bring the sure reward of clean cars.

Respectfully submitted,
WARNER BAILEY,
B. & M. R. R., Concord, N. H.

MR. SHORE'S PAPER.

To the Master Car and Locomotive Painters on the United States and Canada.

Gentlemen:—I will not occupy much of your time, nor will I detain you long in giving my views and opinion on Subject No. 9: "What is the Best Material for the Shop Cleaning of Passenger Cars Preparatory to Painting or Varnishing?"

During my experience for the last twenty-nine years in connection with the painting of cars, I have used all kinds of bar soap and soap powders and have had very good results from same. I have also used acid cleaners and have had very bad results from same. For the last eighteen months I have been using a soap called "Columbia Oil Soap," and I would say that I have had very good results from this soap, together with ground pumice stone; it cleans quick and takes off the dirt, and cars that have been out a year look very good after being cleaned with this soap; it has not damaged the varnish on the cars on which I have used it and I think it is a good material for cleaning passenger cars preparatory to pinting or varnishing, but precaution must be taken to rinse same off with plenty of water.

Respectfully submitted,
ROBERT SHORE,
Foreman Painter, L. S. & M. S.

MR. BISHOP'S PAPER.

President and Members, Master Car and Locomotive Painters' Association.

Gentlemen:—Having been selected by the Advisory Board as one to present a paper on "The Best Material for the Shop Cleaning of Passenger Cars preparatory to Painting or Varnishing," I wish to state that I am self-conceited enough to claim that the method I use is the best. I am so assured of this that nothing but a thorough discussion with convincing argument will shake me from the stand I take. It must be proven to me otherwise and a method shown that is better than my own. The subject for this paper is not a new one. In looking over my files I find that it has been presented at the conventions of the Master Car and Locomotive Painters in one form or another numerous times since the Association was first organized. I do not consider preparing for touching up and revarnishing, or for recoloring and revarnishing, sufficiently different to divide it into two subjects. I find in 1871, afternoon session, Sept. 6th, Subject No. 3, "What is the most economical way to prepare coaches for revarnishing?" Record says, "Discussion by all the members present." There is, however, no record of what was said. Sept., 1878, one of the subjects presented for discussion at the convention to be held at Detroit, Mich., Sept., 1879, of which convention I have, however, no record, was, "Cleaning of Cars Inside and Outside Preparatory to Revarnishing—What is the Most Economical Method?" In report of convention held Sept., 1884, I note paper read by Mr. Davis, Canadan Southern Ry., St. Thomas, Ont., "On the best method to pursue and the material used for cleaning a passenger coach preparatory to touching up and revarnishing, with formula for matching the principal car body colors now in general use." Upon this occasion there was quite a discussion, especially upon that portion of the paper pertaining to cleaning. Various materials and modes of handling were mentioned, but I note little improvement by the majority at the present day. There was no decision, vote or resolution showing which the Association considered best. I note these several mixtures, i. e., Equal portions of good bar soap and washing soda. Soap and water and a little alkali, not too much, it is just enough. Dissolve one pound caustic soda in a gallon of water, no soap needed. Muriatic acid, one quart to three gallons water. Soap, water and steam. Yellow bar soap mixed with pumice stone. Twenty pounds washing soda and one box lye. Concentrated lye, 3 lbs. to 50 gallons water. Babbitt's bar soap. Pearline. White Castile soap, etc. Each having their own peculiar value, and while two or more use the same ingredients no two just alike. At Cincinnati, Sept., 1895, the subject was "What is the best material and method for the exterior cleaning of passenger equipment preparatory to varnishing." Papers were read by J. H. Stout and J. H. Hartley. The former says he is advised that soaps, alkalis or acids in some form have been the principal basis of material employed. He uses a specially prepared soap for the purpose and was then testing what was called "Detergene Powder." Mr. Hartley believes the best material to be soap and water and therefore uses a solution of 25 bars soap, 13 lbs. sal soda, 6 lbs. borax, 50 gallons water. There was no discussion upon these papers, but on motion the papers were accepted. In report of proceedings of convention held at Philadelphia, Sept., 1899, Subject No. 3, "Practical Cleaning and Varnishing Passenger Equipment Cars, giving method and materials used." Paper by F. J. Kelly and W. C. Fitch were read. The former gives as method and materials the following: "The first operation is to thoroughly clean the car; to do this well I know of but one good way. There are other methods, but the following is the only good one: Good soft soap, ground pumice stone, about No. 2, and water, necessary tools, bucket, good stiff scrubbing brush, a bunch of curled hair, a soft piece of wood to clean out corners, chamois skin, and a good, strong, willing man to use them." Mr. Fitch says: The one from which he has had best results is an oil soap, a combination of linseed oil, and alkali, in a semi-paste form, practically a neutral soap, and the practice in using an oil soap is to dissolve 15 lbs. in warm water and then add cold water enough for 50 gallons, and for the purpose of destroying the alkali he uses a solution of about a 10 per cent dilute oxalic acid. These papers were well written and should have brought forth some discussion; but I find that it is recorded "that it would seem that there is not much to be said on the subject." Motion that the next subject be taken up, there being no objection it was so ordered. In report of proceeding of our convention at Buffalo, 1901, I find this subject: "Is there a method of successfully treating passenger cars, going through the shops for revarnishing which are more or less cracked and which have recently been cleaned at terminals, with emulsion or other cleaners containing mineral or non-drying oil?" Paper by W. J. Russell says, "Yes, not with the time-honored process of soap and water and pumice stone, but with a strong liquid soap, one that does away with many of the small and varnish cracks." In a paper by Mr. C. B. Harwood, he says, "Our practice is the old method of soap and water with pumice stone." Another paper by Mr. J. C. Martin states that after

the car has been benzined to remove all traces of grease, then follow up with the Modoc powdered soap and scrub the same as on any other car. At this convention there was considerable discussion after the reading of the very able papers presented. In the record of this discussion all appear to be using soap, pumice stone and water, excepting in one instance and in this a dilution of muriatic acid is used, about one of acid to twelve of water, but in no other instance mentioned is soap, pumice stone and water abandoned, so that at this writing it seems to me that soap, pumice stone and water is considered the best to use in preparing a surface for recoloring and varnishing. But, how? True, many say they use in connection with soap and water, pumice stone; but are these with the tools mention enough? The best method says not. You must either agree or disagree with me in my method and if the latter, then do not hesitate to correct me, but give me a method that is a better one; one that answers the purpose for the requirements as set forth in the topic for this paper; one that will, as well, cover all the requirements set forth in the more recent topic as presented in subject of 1901, heretofore referred to, especially that portion referring to the revarnishing of exteriors upon which emulsion has been used. The method I use does all this and more, showing an increased cost of labor probably in the renovating process, but also showing a decreased cost of labor in the higher class of work, the recoloring or necessary sandpapering previous thereto. I shall hope to be able to make my method sufficiently clear that you may proceed immediately to the discussion of the same without the numerous inquiries. How long does it take? How much does it cost? Does the color or varnish creep or crawl? etc. I shall state the facts as they are, have been and will be if properly handled.

Now for the best method: The first proceeding after a car has been taken into the shop and while car is being stripped of sash, curtains and other equipment is that the body of car be thoroughly repaired by carpenters and followed quickly as possible by painters, scraping away all loose paint and putty, cleaning out all bruised spots in lumber and then use a strong primer upon all new battens, patched siding, bruises, nail holes or other scraped or bare worn places, in fact the surface of car thoroughly touched up, this priming allowed twenty-four hours or more to dry and then time permitting a second coat applied, using a strong bodied paint, such a one as would ordinarily be used for second-coat work, then puttied with a good, hard-drying putty, puttying the same as one would for surface that is to be rough-stuff coated for rubbing. If time does not permit for the second priming, putty on the first. After putty has had say fourteen to sixteen hours to dry you may begin the cleaning of the surface, having as one has said good strong willing men, the latter preferable if capable. A very important item before the cleaning is began, is where compressed air can be used, to blow out all the dust that has accumulated back of letter board, or rather between it and the interior finish of the car. For the washing give each man two water buckets, sponges, a one-gallon tin or galvanized iron pail for the soap, pumice stone box or pail with No. 1-2 or No. 1 pulverized pumice stone, a fibre, flat hand-scrub brush, 2 1-4x5-inch face, a 5-0 round, fibre soap brush and a block of Eureka rubbing stone and then proceed with the work, beginning at the crown moulding and working their way downward, each man in his own section and lord of all he surveys, applying soap and scrubbing with soap and pumice stone, loosening and removing the dirt, smoke and grease, washing off the soap, etc., with water and then rubbing the surface with the rubbing stone and rinse with clean water. The amount of rubbing necessary being determined by the condition of the color and varnish upon the surface. It has been my experience that this manner of rubbing with the stone does at least three things, probably more that are not accomplished by any other method. First, the rubbing with the stone removes the last or perished coat of varnish, perhaps more; second, in removing this varnish it reduces in depth at least the large cracks, if any, and surely does remove the smaller ones; third, it places the putty that is always necessary, to a level with the old surface and prevents the unsightly humps and bumps many times seen upon cars after the varnish has been applied. Why should I stop here with only these three reasons as to why my method is the best, when I see another and a more important one. Great is the amount of time consumed by high-priced labor, sand-papering and cutting down putty and old varnish preparatory to recoloring in the old, old way and at the best preparing only a fairly passable surface, while with the rubbing stone process this is done by the washer, known in our country as the painters' helper, at a low wage rate and the time consumed is but little greater than that usually taken in the ordinary method of shop cleaning. Who is it that does not know that a man cannot level putty with sandpaper so that it will not show after gloss coats have been applied, provided putty is right. Who is it that does not know that as much or more is removed by sandpapering around the putty than of the putty itself? We have heard much for years past regarding the necessity of burning off cars because they were badly cracked. We have heard much also of the inability to obliterate cracks upon badly cracked surfaces, but try my method a year or two and see the results, I kow you may not place much credit to what I write upon this matter for you are aware that I am so far away in the Northwest country, not quite but nearly among the Indians, and that you are not likely to be enabled to pass examination upon these results, but ask my friends what they have seen when visiting these wilds. I have had cars in shop so badly cracked from years of service and the frequent application of color and varnish, that it did seem a waste of material to endeavor to recolor and varnish them; but having been asked to fix them up for another year of service I could only try my best, resorting to my method of treatment, applying color and two coats of varnish, and thus turning out some quite fair looking cars, yet while the cracks were not entirely obliterated at this shopping, they did look passable, in fact much better than some cars that I have seen that were not so treated, but what may astonish my hearers most is the fact that while these cars were only to give one year more of service they after having served the allotted time were again taken in shop and again treated with my method, recolored and varnished and once more placed in service, some having been shopped twice are now running in the third year, a few of them I have seen upon which the cracks have become filled level with the old surface. This I attribute wholly to the varnish having entered the cracks and not having worn out with the year of the varnish upon the surface, so that at the next shopping surface being again treated by my method, rubbing with the stone, removing the outer surface and reducing it thereby leaving a less depth of crack to be filled with varnish or perhaps obliterating it altogether after color has been applied.

This little story may sound "fishy" but then you know that Minnesota is noted for its numerous lakes, and their finny tribe. Having cleaned and rubbed the surface, reprime all thin or bare rubbed surfaces with second coating paint, reputty and knife surface where necessary, sandpaper lightly over the entire surface to loosen any grit that may be left by the washing, dust off and proceed to apply the color, or cut in with color, it will be found that the necessary work upon the ornamentation is not any greater on account of the stone rubbing than is customary after any other method of cleaning. After ornamenting apply two or more coats of varnish, then let her go. The time preparing by the painter's helper is from forty to ninety hours according to the size of the car, class and condition. You will bear in mind that the size of equipment has increased fully one-third in recent years. Usual rate paid the painter's helper is 15 cents per hour. Formula for soap used: Salsoda, 13 pounds; bar soap, 16 bars; each dissolved and sufficient water added to make 50 gallons. This, after standing twelve to fourteen hours, becomes a medium weight, clear and clean soft soap, strong enough for exterior washing, not injurious to the hands but strong enough to remove dirt; and if allowed to remain long enough upon the surface will remove varnish. It can be made sufficiently weak with water to answer for interior cleaning also. This soap is as good as any in the market and there is none better or cheaper, nor to me as satisfactory.

That I may be understood I suppose that I shall have to explain why I prime and putty so thoroughly before I do any washing, the reason for this you can readily guess, for I believe it is best to do all repairs, prime and putty before cleaning so that all water may be prevented from entering the wood, thus avoiding the necessity of waiting for the water to dry out, preventing delay. It prevents the swelling of the joints and bruised places and the putty being dry and having been rubbed with the stone gives that level surface which is at all times so desirable.

Regarding the emulsion cleaners, I have had some experience but no trouble, excepting in one instance, trying to apply varnish upon a car three days after having applied emulsion and not having previously destroyed the grease with gasoline, "I use gasoline for all these purposes and no benzine." I have no trouble upon service cars, cleaned by my method that is the best for preparing a surface for recoloring the revarnishing, a method that is equally good for cleaning surfaces that otherwise are in good condition, requiring only touching up and revarnishing, probably not necessary to use the rubbing stone. No harm done, however, if light rubbing be done, unless upon a surface where the varnish is badly perished and which might become grey, but might also again become revived by the application of varnish. I give you this best method as the one which I am using daily and from which excellent results are at all times accomplished, knowing however, that it cannot be adopted by all owing to circumstances, and yet while I consider it

the best I believe we must in the accomplishment of results be governed by circumstances. Much as we should prefer to use and have the best in all things, we are subject sometimes to conditions and taking all things into consideration we become satisfied with that which we have. Claiming that my method is the best and believing I am right and perhaps a little conceited in this matter, I have written much more than required, but perhaps only sufficient to bring forth the needed discussion and action of my fellow craftsmen and be the result of showing a method which shall prove to be an improved one over all other methods. It is now "up to you."

Yours truly,

A. J. BISHOP,

Master Painter, Northern Pacific Ry.

President Cook: Gentlemen, those are all the papers on this subject; it is open now for discussion. Is there anything further to be said?

Mr. Copp: Mr. President, this is an important subject, but it has been pretty well covered, I think, and in view of the shortness of time and the amount of work we have to do today, I move that we pass to choice of the next place of meeting without any discussion.

- onded by Mr. Little and carried.

President Cook: The committee appointed by the chair to select the names of cities for our next meeting will now make their report.

Mr. Dane read the report of the committee as follows:

Your committee on next place of meeting would respectfully submit the following names of cities as being the most prominently suggested: Atlantic City, Indianapolis, St. Louis, Saratoga.

Respectfully,

J. W. Houser, Chairman.

President Cook: Gentlemen, you have heard the report of the committee, you will proceed at once to ballot. You will realize how short the time is, let us be as prompt as possible. I will appoint Mr. Brown and Mr. Little as tellers.

Mr. Copp: Mr. President, I suppose it is in order to make remarks?

President Cook: Remarks are in order, Mr. Copp.

Mr. Copp: I hope the matter of St. Louis will be dropped. I think we have had enough exposition towns for conventions. Of course, if the majority want to go to St. Louis, that is their privilege, and I would not want to put my personal preference in the way, but it is pretty safe to state that if St. Louis is made the choice of the convention, that the East will be out of it. I think I will take my fishing rod and go up among the mountains and lakes of New Hampshire. I will not go to St. Louis myself, but if the rest of you want to go, of course that is your own matter.

Mr. Little: We have had experience before in this same line during the World's Fair; we went to Milwaukee; we took a third rate hotel and everything was being crowded in Milwaukee, we could get nothing in Chicago. And at Buffalo the same way, we took a third rate hotel and only had half accommodations, and now we will have the same thing to contend with in St. Louis. There is no doubt in my mind but what we will get only half accommodated there. I am opposed to going to St. Louis.

Mr. Dane: I will state in the case of the Boston and Maine men that it would be utterly impossible for us to procure passes west of New York. Now, I believe in choosing a city that most of the members can reach. I think that our Western roads are still giving their men passes, procuring them transportation; this trouble all lies in the New England members.

Mr. Glass: I will say the South has had the same trouble; we simply had to pay our fare. I think it would be only fair for the Eastern men to do likewise.

Mr. Whittington: I think that is a wise suggestion. I think they should meet us half way.

President Cook: Gentlemen, the Chair is tempted to say something on this question before we distribute the ballots, but Mr. Copp and others have spoken about it. There is one feature, however, that comes to my mind, that perhaps you have not touched upon, and perhaps it would be well for us to consider. Of course, this is merely the Chair's personal view of the matter, and is not forced upon the convention and that is that it is not well for us as an association to always seek to attend these fairs, that is, to give out the impression that that is our primary object. Now, I do not think that is far fetched, because the matter has been spoken of in that connection, and it is just as well that we should bear all those points in mind if we make our selection. If we want to go to the fair, it seems to me it would be wise to go at another time and not take the two in at once.

Gentlemen, have you all voted? I am going to close the ballot.

Mr. Pitard: I would like to make a motion that the place receiving the lowest number of votes be dropped from the list, so as to expedite this matter.

Seconded.

A Member: I would like to make an amendment to that, and that is, that you drop the two lowest.

Mr. Pitard: I accept the amendment.

President Cook: It has been moved and seconded that the two cities receiving the lowest number of votes on the first ballot be dropped. All in favor say aye, contrary no. It is so ordered.

First of all I will make an amendment which I have been requested to make. There are a number of copies of the Railway Age on a chair next to the door for the use of the members, and I understand that the proceedings of this convention are in it as far as possible, so each member will avail himself of the privilege of taking one as he goes out.

We will take up the queries, while the tellers are at work.

(1) "Does any member advocate the use of steel wool in the paint shop?"

Mr. Butts: We have with us this morning Mr. W. O. Thompson, Division Superintendent of Motive Power of the New York Central, a staunch friend of this Association. He is the secretary of the Traveling Engineers' Association also, and a very busy man, and cannot stay with us but a short time. I should like to have him say a word to the convention.

President Cook: We are always pleased to welcome visitors and accord to Mr. Thompson this morning, with a great deal of pleasure, a hearty welcome to our convention and we would like to hear from him.

Mr. W. O. Thompson: Mr. Chairman and Gentlemen, Mr. Butts has gotten me into quite a predicament this morning. I can work eighteen or twenty hours a day and I can get the other boys to hustle all right, but when it comes to get up and say something before as intelligent looking crowd as this, I begin to get stage fright. I am in somewhat the same predicament that a couple of engineers were in on a road that I represented at one time, and whom I had charge of. They were a couple of Irishmen by the way, one of them the yard engineer and the other a freight man. One day the freight man was coming down, going out through the town where the switch engine is located, went through the town very slowly—you know how slowly the boys always go when they have to travel six miles an hours, or something like that—the switch engine came down and went into the other one. Well, after the smoke cleared up, of course the next thing was to fix up a story for "the old man," you know, so that neither one of them would be to blame. The one running the switch engine, who, by the way, is quite a character, came around to the other one and he said, "Billy, you was running faster than the law allows through the town, wasn't you?" "No, Mike, no, I was right down to the limit." "You were, were you, Billy?" "I was." "Well, Billy, you did not whistle for me to stop, did you?" "Yes, I whistled for you twicet, Mike." Mike says, "I guess you did, Billy, I guess I remember you did. Well, Billy, what in h——l, will I tell him?" (Laughter.)

That is the same predicament I am in this morning, gentlemen, trying to say something to you. We received your greeting that you sent to the Traveling Engineers' Convention on the 9th, it was acted on by the convention as a whole, and the secretary, instead of writing to you our greetings in return, the secretary was ordered to extend them to you in person.

It was moved by the convention that the Traveling Engineers' Association extend their heartiest greetings to the Master Painters and wish them the best kind of a convention and that they would have the good time, which the Traveling Engineers are having.

Every one in the railway service, particularly in the locomotive and car end of it, ought to be a good friend of the painters. They will go around and do their poor jobs and make the misfits anywhere from the apprentice boy to the boss, then go around to the painter, "Now, John, put in a little extra filler there and smooth her up so the old man won't catch on." And they usually do it.

I see, Mr. Chairman and gentlemen, that you have a long list of subjects and a very interesting list of subjects. We had such a long list before the convention which I represent that I was afraid we would never get through with them, and I know that if you have gotten through with these, that you have done a whole lot of work, if you have also had a good time, and if you have not, it has been your own fault.

Mr. Quayle, in making an address to us the other day, among other associations that he thought were a good thing for the railroad world, mentioned the Master Painters, and you know, boys, when Mr. Quayle says that the Master Painters' Association is a good thing, you can make up your mind that it is, because all of us that know him know that he is a pretty good talker, and on the other hand, we know that he means what he says. I agree with Mr. Quayle exactly, not only the Mas-

ter Painters, but all the kindred associations are a wonderful help to the railroad fraternity from the lowest to the highest. You get together and it is not half of that that you talk over in your conventions that does the good, but when you are sitting down below, "chewing the rag." You know railroad men cannot get along without talking "shop," in fact, they would not be any good if they did not. If a railroad man can meet another and not get to talking about railroads, he is not a railroad man. As I said before, they are of great value to the railroad world, they are beginning to be recognized now more than they ever were in the world. At the convention, which is now in session up at the Stratford Hotel, there have been, I think I can safely say, six general officers this year, where there was not one in former years. They come in and not only make a nice little speech and go out, so that the members of the convention think they are good fellows, but they come in and get off into a far corner, and listen to what is going on, and some of them will attend more than one session.

I presume that to-day you are recognized by the officers in the way of encouragement to go and attend these conventions, and if you are, the man that does encourage you to come is getting big interest on his money. Mr. President, I will not take up any more of your time this morning, again wishing you the best kind of a convention, gentlemen, I thank you. (Applause.)

President Cook: Thank you, Mr. Thompson, I hope we will have the pleasure of seeing you again.

Mr. Little: Mr. President, your tellers beg leave to report as follows: Total number of votes cast, 89; of which Indianapolis receives 25; Atlantic City 24; St. Louis 22; Saratoga 14; Louisville, Ky., 2; Kansas City, 1; New York, 1. No choice. That will leave Indianapolis and Atlantic City. Louisville, Kansas City and New York were not in it at all; only four cities, that drops St. Louis and Saratoga, as I figure it.

Presdent Cook: As the convention is aware, the committee was appointed to select cities to be balloted for. The names of those cities were presented, and you have balloted for them, and the two cities remaining to be balloted for are the two cities of Atlantic City and Indianapolis.

Mr. Brown: I would like to speak a word. Every gentleman is entitled to express his opinion and select his choice, but, gentlemen, think twice before you select. Let us endeavor to think for the best place to suit the largest number. My legs are short, I cannot walk as far as my Bro. Little can.

President Cook: Now, while the tellers are collecting the ballots, we will try to discuss some of the queries. I announce the question to be taken up again "Does any member advocate the use of steel wool in the paint shop?" Now, gentlemen, get to work right on the question.

Mr. Whittington: I will state that I would not advocate the use of it.

A Member: I am not in favor of steel wool at all.

Mr. Lord: I have had experience with it; I have no use for it.

Mr. Pitard: I consider that for some purposes the steel wool is much more preferable than sandpaper, for the cleaning of mouldings, for instance, and uneven surfaces, the use of steel wool is indispensable in the paint shop.

Mr. Quest: There are places in the car repair shops where steel wool can be used to advantage on a number of jobs.

President Cook: There are two in favor of it and three against.

Mr. Baker: I want to tie that vote by stating that I am in favor of it; in a great many things I find it indispensable, I should hate to get along without it.

A Member: I want to cast my vote with Bro. Pitard, that I favor steel wool for certain kinds of work.

Mr. Houser: I am in favor of steel wool.

A Member: We carry it in stock and are using it successfully.

A member: It is hard on the fingers.

Mr. Nicoll: I am in favor of the use of it for certain work.

Mr. Rattenbury: I am in favor of steel wool. I find it can be used to advantage in a great many parts of the car. I find it is much superior to sandpaper for a great many purposes.

Mr. Coleman: I cannot get enough of it.

On motion, Mr. W. O. Thompson was made honorary member of the association.

President Cook: We will now take up the next subject, "Do we pay enough attention to the front end of our locomotive engines?"

Mr. Butts: Is there any paper on this subject, or is it only a query?

President Cook: These are all queries I am announcing.

Mr. Butts: I have been doing a great deal along that line, trying to educate our motive power men, foremen of roundhouses and master mechanics to pay more attention. We are making headway along that line. As a rule, I think that the front end of a locomotive, from the painter's standpoint, is abused more than any other part of the locomotive. It has generally been considered that anything almost is good enough to paint the front end of a locomotive. It seems to have been in the past the prevailing idea that it was necessary to put a heavy, durable coat of paint on the front end of a locomotive, giving more consideration to the time it would wear, so to speak, than the general appearance of it. All kinds of mixtures have been offered for this purpose. We took up the subject over two years ago of trying to devise the best coating, trying to find the best coating, and I have been following up the subject thoroughly and have arrived at the conclusion myself that we have been going in the past entirely wrong. It does not make any difference, in my estimation, what you put on the front end of a locomotive, it will not have a nice, tidy appearance very long. On a passenger locomotive, the coating will not look well enough to remain without recoating more than two or three trips, and if you paint it over with a heavy material, it will only be a short time before it will be ready to peel off. I take it that we paint a front end more for beautifying its appearance than for anything else. If we put on a coating there to preserve the front end, it would not be necessary to do anything more than oil over with an ordinary black car oil; it would keep it from rusting. We paint the front end to make it look well, consequently, if we are to succeed in what we are trying to do, we must paint it often, and in order to prevent its peeling, I think the thinner the coating, the better. We have got down to putting on a coating that is almost as thin as turpentine and we place no restriction upon the man that has the engine in charge as to how often it shall be coated, so I think they have it coated three times a week, perhaps oftener, every trip, and by putting on a very thin coating, we get to the point where it does not peel rapidly, as if we used a heavier paint. But it has been a difficult job to impress upon those that have it in charge that they need to pay any special attention to the front end. Anything is good enough, let it go and that is where the great trouble comes. There does not seem to be enough interest in the matter to devise a proper way, and in sending out material on the line, send out in two parts, one mixed ready for use, send thick paint and thin paint together. Invariably, when we first began this way of treating them we found they would not pay enough attention, would not thin it out, put it on just as it was. I think there is quite a field here. I think that we ought to try to interest those in charge of this work in this matter, care for the front end.

In my estimation, the front end as it comes out of the roundhouse on the locomotive that goes out to take its train, if that front end is all peeling off and scaling off, it looks a great deal like a man with a good suit of clothes with a hat that is all spattered and battered up. I would rather see nothing at all on it than the front end in that condition, but the remedy lies in a little more care and attention, the material to be scraped off, the scales more frequently cut down to a firm foundation, and use some paint.

Mr. Dane: What do you use on the front ends?

Mr. Butts: Well, we have tried quite a number of things, and we are still experimenting, Mr. Dane. We have been using of late an ordinary asphalt, thinned down with one of the rapid drying oils that is in the market, such as Japan oil or Japanol, or something of that kind, but I have advocated putting as little as possible of the asphaltum in, it is so very cheap, it appealed to our officials as a good thing to use, and by putting it in and watching it, we have had very good success. I believe myself that a more elastic coating would be preferable, if prepared properly.

Mr. Dane: We have had a great deal of trouble on our road in regard to this subject, the care of front ends. It is an important subject and you will remember at the last convention in Boston, Mr. Bartlett, our Superintendent of Motive Power, said "that if there was any one in this association that could formulate a front end paint that would be durable he would be doing a good thing for the railroad companies."

I have tried almost everything. Asphaltum, I think, is the poorest article you can put on a front end. There is nothing, in my opinion, manufactured that will last any great length of time, especially if the front end is not perfectly air tight, for if there is a particle of leakage it will cause the cinders to catch fire and you have a red-hot iron, which no paint will stand; and in stormy weather, snow and rain, most anything applied will be destroyed. For these reasons, whatever is applied must be very thin, and applied often. I have experimented with many kinds of mixtures and have concluded that Sipe's Japan Oil as a basis is the best and cheapest of anything so far. I take about five gallons from a full barrel of Sipe's Japan Oil, mix with it thoroughly about twenty-five pounds of ground lampblack, return it to

the barrel, mix this thoroughly, and I have found that this mixture does better work, dries quickly, can be put on a hot or cold arch, is easy to apply with sponge or waste, avoiding the use of brushes by inexperienced men, an expensive item and is cheaper than anything so far that we have tried.

That has been my experience, I would like very much to know if anyone has anything that is superior. That is what we are hunting for every day.

Mr. Clark: I would like to ask if any one here has tried what is known as rubber enamel? We have recently tried it, but sufficient time has not yet elapsed to form an opinion of it.

President Cook: Can any one answer Mr. Clark's question?

Mr. Butts: I cannot speak from experience, but we are experimenting with it now. The Assistant Superintendent of the Lake Shore Road, Mr. Vaughn, wrote me a letter some time ago and inquired what we were using, and said that they have had quite a little experience with this rubber enamel, with good success. We have ordered some of it, and in fact have it in use at the present time, but have not gone far enough for me to make my report.

Mr. Little: We would like a little information. Kansas City, Saratoga and St. Louis received seven votes, shall they be counted in on this vote?

President Cook: On this ballot?

Mr. Little: Yes.

President Cook: I do not see how we can. We announced the cities to be balloted for, the only two cities under consideration were Atlantic City and Indianapolis.

Mr. Little: Is it the pleasure of the association that those votes be cut out?

Mr. Orr: It has been customary at every convention I have attended, that we have always counted those scattering votes on every ballot.

Mr. Little: We did, on the first ballot, then you agreed by vote to drop everything but the two.

Mr. Orr: We did not say a man had no right to vote for some city, we have always counted those ballots.

President Cook: My recollection is that heretofore it has been as Mr. Orr says, the votes have always been counted that have been cast.

Mr. Bishop: A motion was made that all except the two be dropped, that motion cannot be violated unless reconsidered.

President Cook: Those cities that were voted on at the first time and received a low number of votes, cannot be counted at this time.

Mr. Little: I will announce the vote: Total number, 95; Atlantic City, 45; Indianapolis, 43; Saratoga, 2; Kansas City, 2, and St. Louis, 3. In that case your choice is Atlantic City. (Applause.)

President Cook: Gentlemen, Atlantic City, in the Chair's judgment, has received the majority of the votes of the convention, and has been selected as the next place of meeting. That is my understanding.

Mr. Dane: I move you that in order to close this query regarding front end that we instruct the advisory committee to take that as one of the subjects for our next convention. Carried.

President Cook: "Can you successfully paint galvanized iron without degalvanizing?"

Mr. Gohen: I say yes. For a number of years we have been under the impression that we cannot paint galvanized iron without first degalvanizing it, or using some chemical or acid on it to remove this galvanization. I have here a couple of samples which I had not the remotest idea in the world would amount to anything when the party who gave them to me presented them for a test, and I left them hanging out on my fence at home, put them on the inside of the north fence, where they would get the sun nearly all day long, and I made no note of the time I placed them out, but this stain that you see there is in the only data by which I can tell you how long they were out, they were out considerably longer than that stain on there. A year ago last April my house repainted and these were hanging on the fence, the fence was painted the same color as the house, consequently these samples were stained by the house painters in going over the fence. They were out some time in the winter previous to that, so these pieces were out nearly two years, and when I hung them out, I expected inside of thirty days or sixty days to see them almost to pieces. I will pass them around to you, those of you who wish to see them. Mr. Copp has examined them; he may tell you about how they seem to him. I cannot tell you anything at all about it, it is not on the market, nothing of that kind, but after seeing this it occurred to me that probably it would be a good thing to put that subject among the queries and see if anybody else had something that they could paint their galvanized iron with without degalvanizing it. This is the first time I have ever seen galvenized iron painted that way.

Mr. Koons: I would like to ask Mr. Gohen how large a surface he painted; if it was simply the little sample?

Mr. Gohen: I did not paint them, they were painted by a man who worked for Mr. Baker in the Delaware shop, he made this preparation himself, and by the way, he is the engine painter there, and he painted some of the tanks with the same preparation. There is something he puts in, and I want to say to you they are about the best tanks that are on the road. What it is we do not know.

Mr. Butts: Three years ago last fall we had a great many roofs on the passenger cars as they came into the shop galvanized, iron roofs I should say, that were very badly peeled, so much so that we thought the only way to do a proper job for them was to take the old paint off completely, as fast as those cars came into the shop, to strip the old paint off every one of them, there was none of them but what was very badly peeled. We coated them over first with a primer, the same we are using on all passenger equipment, and as far as I have been able to note there has been no sign of peeling or giving way since. Some have been out over three years and some only for two years, but they are wearing splendidly—no sign of chipping or peeling off. Those roofs have been painted over since, however, when the car was passing through the shop, but I take it that the galvanized iron throws off the coating before the coating is worn away, so that I do not consider the subsequent coat that has been placed upon that roof has any protection whatever to defend that roof from peeling; in fact, if there is any indication of peeling, or the paint loosening or cleaving, that on the galvanized iron a coat of paint placed on there a year from that time would cause it to peel any more than if it had not been placed on. That is my experience with a tin roof or galvanized iron roof, that after it has gone a certain length of time and we put a fresh coat of paint on it, it will oftentimes peel before it goes out of the shop, because the drying process of the paint in contracting peels the paint off and helps to make it cleave and peel off more rapidly than if it were not painted at all. I watched those roofs during the last two shopping seasons, and so far there are no signs whatever of their peeling.

Mr. McMasters: Linseed oil paint will not stand with galvanized iron, in my experience. The best results I have ever had have been with the Flood & Conklin primer.

A Member: I have had very good results from using "slop" varnish on galvanized iron. It has been in service for two years and a half, or thereabouts, and it is just as solid as the day I coated it.

Mr. Rattenbury: My experience with galvanized iron is in water-proofing some tanks. For a number of years it has been quite a deep study to me how to put paint on galvanized iron. The success I have had in the past has been through the washing with muriatic acid. I invariably wash it off and sandpaper it and finish it off with varnish as a primer. I have had good success.

Mr. Pitard: I am very glad the association brought up this subject, because it is a very important one. There is a great deal of galvanized iron used in various places, and while the degalvanizing process no doubt makes a very durable job, yet it is hardly practical, and in my own experience I find two things that stand very well on galvanized iron—that is, finishing varnish with a primer for work that you are going to varnish over afterwards. Go over it, prime it with finishing varnish to which is added a small proportion of corn starch; that corn starch is put in for the purpose of giving the other paint something to hold to, and for outside work, where there are loops and things of that kind, I found nothing that will equal graphite or lampblack. That was rather a discovery with me. We had a blast pipe connecting two of the shops, and we painted it frequently with various kinds of paints, and they all seemed to peel off, and so it occurred to me one day to put lampblack on it; so we painted it with lampblack about three or four years ago, and it is good yet.

Mr. Copp: What do you mix the lampblack with?

Mr. Pitard: Just common linseed oil. I have not tried it since. I do not think anything will stick better than lampblack or graphite.

Mr. James: We only use galvanized iron on headlights. I find by taking the sand blast for the sanding of the tank, sanding it off slightly, that it works very good; I find that it does not peel, and I use a primer to prime it, the same as I would the tank, and I do not find any trouble.

Mr. Clark: In painting galvanized iron from time to time, I have never found anything much more reliable than the Murphy "A," if it is put on very thinly, that is to say, not reduced at all, but spread thinly on the galvanized iron. I made a business of finding out something like that about twenty years ago, finding out what appeared to be the best material for coating galvanized iron, and I met an old foreman painter at the Illinois Central Shops that had been there

about forty years, and he said he had a standing offer in his shop to any man who would invent a reliable, durable paint for galvanized iron. After trying quite a number of things, the nearest he ever came to getting a suitable article was in a mixture of coach japan and neat's foot oil in about equal proportion, which could be mixed with any desired color. It was so thoroughly elastic; it was a long while drying, but at the same time, it would pretty nearly stay there.

Mr. McMasters: That it a pretty good subject; ought it not to be referred to the Committee on Tests to be worked out?

President Cook: That is a good suggestion.

Mr. McMaster: I have something like a dozen or more box cars with galvanized roofs, so it is a pretty live subject with me.

(4) What glass, if any, should be bedded?

Mr. Brown: If you will excuse me, I may wander just a little away from the question, but I simply want to tell you that after the convention last year, when I went back to my shop last December, I mixed up two little lumps of putty, one with some linseed oil and whiting only, the other with hard oil and whiting; I put them onto a piece of glass and set them on the window alongside my desk, where the sun would not strike them. Sometime before I left, the linseed oil putty had a skin over the top and had formed quite a coating, and when I broke it open it was all dry and crumbled, while the piece with the hard oil straightened out, was quite pliable—very much so.

(5) Does any member still use a paint sprayer? If so, why?

The secretary read the following communication from Mr. F. S. Ball:

QUERY NO. 5.

In answer to Querie No. 5: I am using a paint sprayer for a shop of limited capacity or no capacity at all, where, as is commonly the case, the freight cars are repaired and painted out of doors, a spraying-machine is indispensable and especially during a scarcity of skilled labor, such as we have experienced during the past year or more as it enables the foreman painter to meet any or all emergencies, while without it he would often be seriously handicapped aside from the actual saving in labor and materials. The objections commonly advanced to the use of the paint sprayer are: First, is not more paint wasted than is put on the car from an experience of about four years? I say decidedly not, if proper care is exercised in the management of the machine and the amount of air pressure and flow of paint is regulated rightly, and even if answered in the affirmative I would also contend that the labor and time saved is of more value than the paint wasted; second, the quantity or thickness of the paint film to each coat is so much less by machine painting than with the brush, that to obtain equal protection more coats are required when sprayed than by hand, this objection would seem to have more foundation than the first, but when we consider the general practice of a thin coat of priming well brushed out, and the brushing out of each succeeding coat no matter what consistency the paint may be, the difference in the thickness of the paint film on the surface when dry is nil; a third objection is injury to health, on this head I can only refer to men who have been using the spraying machine day after day for nearly four years without experiencing any ill results, nor do they lose any time that can be attributed to that work, nor do they take any extra precautions to protect themselves. The following is a comparative statement of the cost of repainting a pressed steel hopper gondola car, 80,000 pounds capacity, inside and outside, by hand and with paint sprayer:

F. S. BALL,

Carried.

Mr. Congdon: The question is, does any member still use the paint sprayer, and if so, why? I would state that I use the paint sprayer, and the reason is because I think it is more economical, and a great advantage to the company, and not a disadvantage to the workman. I think, of course, that there is certain work that the paint sprayer is adapted for, and that is all. I use the paint sprayer on all trucks, on our passenger car trucks and on our engine tender trucks, and all classes of box cars, and I have a little nozzle here that I invented myself, if anybody wishes to see it. It is very simple and I find that it works very well, it never clogs up. you can use it all day long, and the opening is large enough so that it does not trouble you at all in clogging, and it is so simple that any one can use it, and I would like very much to have you look it over. We find in our shops at South Tacoma that we have made a great saving to the company by using the paint sprayer.

Mr. Bradley: I find we have very good results from them.

Mr. Quest: I do not know that you want to hear from me on this subject.

A Member: Go ahead.

Mr. Quest: I use a spraying machine because it is economy to do so, decided economy.

Mr. McMasters: I am a good deal like Mr. Quest; I believe in it to the last, I would not want to do without it.

Mr. Miller: I use the paint sprayer in the same manner that Mr. Congdon does. I use it under the locomotives, on the sides and frames; I do not use it on freight cars, because I do not think it is economical to use it on freight cars; I think there is too much water injected into the paint, and I would not think for one minute of using it on a steel car, especially next to the iron. Who wants to put water next to iron? Is there a man here who will deny that he can compress air without getting a whole lot of moisture in his paint? Who wants to get that next to iron and give the opportunity for rust then and there? The idea is ridiculous.

Mr. Quest: I would state I have been using spraying machines for five years, and I do not know as our air supply is any more dry than elsewhere, we pass it right through and we never have the trouble that Mr. Miller speaks of. We have painted the cars by hand and by machine, and I am in position to say we have never seen any deterioration of paint owing to the fact that we have applied that paint by machine, and we are using the machine every day, we paint our cars by machine. We do not use a brush on them, we use the machine, and we find it economy to do so, and it is not possible my officials would allow me to go along using the paint sprayer if there were anything of that kind.

Mr. Butts: We are not using the paint sprayer, and the question is, why? Simply because we have no facilities for it, not but what we would like to do it. There has been so much rebuilding done on our plant, that we did not have sufficient air pressure at our end to use the paint sprayer. I believe it is a good thing. I just want to refer to one reason why I think that a person can apply the conditions that they will find that the paint sprayer is a good thing to use. Mr. Ball, a few years ago, I think it was at the Philadelphia convention, got up in the convention and opposed the paint sprayer pretty vigorously; since that time he has become an ardent advocate of it. Now, I think there must be some merit in the paint sprayer, or you could not have converted Mr. Ball to the idea of using one. I visited his shop a short time ago and was greatly interested in seeing this machine. He was doing the work very successfully indeed, making certainly a great success of it. I saw a whole car done in the time I was there, and I could vouch for the figures he has given us there as far as the sprayer is concerned.

Mr. Congdon: This gentleman over here was speaking in regard to the water entering into the paint in using a sprayer. As perhaps some of you know, I am from a country where they have lots of water, over in Washington, they claim it rains there all the time, and you can wring water out of the air any time, and I say we have been using the paint sprayer there for eight or nine years and using it most successfully. we have never had any trouble about water in our pipes. We use it, as Mr. Gohen says, right from the pipes that are attached and occasionally we spray a little water out of the pipe when we first start using it, otherwise never bother about it at all, but we have never seen any ill effects from its use. We have steel cars there, too. Our road is quite a coal road, and over on the west end they are buying lots of steel cars and so far we have seen no trouble with them from that cause.

Mr. Gohen: I am pretty nearly like my friend Ball, I am almost persuaded, I am one of the fellows that bucked that spraying machine, bucked it hard, too, and I think I was the one that suggested this query. Now, we are probably in like condition with Mr. Butts, we are not in position to use that machine or any machine, or I think that we would have one, and I want to say, while I have not been using the spraying machine I perhaps am in a position to answer Mr. Miller about the water in the paint. I have perhaps to-day on an old ice house up at the Brightwood shops as good as a set of samples showing the comparative merits of the brush and spray as perhaps any man in the country. At the time I was so violently opposed to this paint spraying machine, I did not use one myself, had not any there, but I got Mr. Harwood of the Chesapeake & Ohio, who is present and will endorse every word I say; I asked him to paint me a set of samples for my own personal benefit. I told him what I wanted, I told him I wanted some samples painted in warm, dry weather with the brush and with the spray at the same time; I wanted one coat, two coats and three coats, specifying on the panels the number of the coats: I also asked him to paint during wet cold weather a like set of samples with one, two and three coats, with the spray and brush. He sent them to me and I put them on this old ice house back of the paint shop, at Brightwood. They have been there now about three years. Gentlemen, I want to say to you that those sprayed boards are the best boards to-day, they are better than the boards painted with the brush, and the weather did not seem to have any effect. Those that were painted in the cold, damp weather, were just as good as

BOOK DEPARTMENT

As the RAILWAY MASTER MECHANIC has, from time to time, received requests for books with reference to the locomotive, its parts and the auxiliaries necessary to the operation of the same, we have compiled the following list of books and their authors, of interest to those concerned with the maintenance and operation of the locomotive.

LOCOMOTIVE ENGINEERING.

Locomotives, Simple, Compound and Electric. Reagan.................................$ 2.50
Locomotive Engine Running and Management. Sinclair................................ 2.00
Modern Locomotive Construction. Meyer....... 10.00
The Catechism of the Locomotive. Forney...... 3.50
Locomotive Catechism. Grimshaw............. 2.00
Locomotive Engine Driving. Reynolds......... 1.40
The Model Locomotive Engineer.............. 1.80
Compound Locomotives. Woods............... 3.00
Modern American Locomotive Engines. Edwards 2.00
Pocket Companion for Locomotive Engineers. Hoxsie.................................. 1.50
Construction of Modern Locomotives. Hughes.. 3.50
The Locomotive Engine and its Development. Stretton................................ 1.00
The Locomotive Up-To-Date. McShane........ 2.50
Modern Locomotives 7.00
Hand Book of the Locomotive. Roper........ 2.50
The Compound Locomotive. Colvin......... 1.00
The Locomotive of To-day. Compiled from the Locomotive Magazine 1.00

AIR BRAKES.

Air Brake Practice. Phelan...................$ 1.00
Continuous Railway Brakes.................. 3.60
Pocket Primer of Air Brake Construction. Rogers .50
Diseases of the Air Brake System. Synnestvedt.. 1.00
Air Brake Catechism. Blackall.............. 1.50
The 1903 Air Brake Catechism. Conger..75c and 1.00
Evolution of the Air Brake.................. 1.00

CAR BUILDING.

Car Lubrication. Hall.......................$ 1.00
Modern Freight Car Estimating. Stimson...... 5.00
The Car Builders' Dictionary............... 5.00

INJECTORS.

Practice and Theory of the Injector. Kneass....$ 1.50
Practical Treatise on Injectors. Nissenson...... .50
Steam Injectors. Pochet..................... .50
Injectors; Their Theory, Construction and Working. Pullen 1.40

INDICATORS.

Practical Application of the Indicator. Ellison..$ 2.00
Indicator Practice and Steam Engine Economy. Hemenway............................ 2.00
The Steam Engine Indicator and its Use. Le Van .50
The Steam Engine and Indicator. Le Van...... 4.00
Twenty Years with the Indicator. Pray........ 2.50
Manual of the Steam Engine Indicator. Peabody 1.50
The Steam Engine Indicator. Compiled from regular isues of Power................... 1.50
Practical Application of the Indicator. Ellison 2.00

VALVE GEARING.

Locomotive Link Motion. Halsey.............. 1.00
Treatise on the Slide Valve and Locomotive Valve Setting. Loetzen........................
Link and Valve Motion. Auchincloss........... 2.00
Treatise of the Movement of the Eccentric upon the Slide Valve. McCord................. 2.00
Slide Valve Practically Explained. Rose....... 1.00
Treatise on Valve Gears. Zeuner............... 5.00
The Slide Valve. Begtrup.................... 2.00
Valve Gears. Spangler....................... 2.50
Slide Valve Gears. Halsey................... 1.50

FUEL AND COMBUSTION.

Locomotive Sparks. Goss.....................$ 2.00
Combustion of Coal. Barr 1.50
Practical Smoke Preventions. Nicholson....... 1.50
Soft Coal Burning. Higginson................ .25
Firing Locomotives. Sinclair................ .50

EXPERIMENTAL ENGINEERING.

Experimental Engineering. Carpenter..........$ 6.00
Hand Book on Engineering Laboratory Practice. Smart 2.50

BOILERS.

Steam Boiler Explosions in Theory and Practice. Thurston.................................$ 1.50
Boiler Making for Boiler Makers. Ford........ 1.00
On Boiler Incrustation. Rowan. Revised by Idell .50
Care and Management of Locomotive Boilers. .50
Boiler Maker's Assistant. Courtney.......... 1.00
Steam Boiler Construction. Hutton.......... 6.00

MISCELLANEOUS.

Mechanical Engineer's Pocket Book. Kent ...$ 5.00
Engineering and Electric Traction (Pocket Book) Dawson.............................. 4.00
Safety Valves. Le Van...................... 2.00
History of the Growth of the Steam Engine. Thurston 2.50
Locomotive Appliances. Kirkman............. 5.00

The above mentioned books will be promptly supplied at the prices indicated. Remittance should accompany order. Address Book Department, Railway Master Mechanic, 305 Dearborn Street, Chicago.

those painted in dry weather, so that I do not think the water in the air cuts much figure.

Mr. Miller: I would like to state that I have painted hundreds of box cars, and other cars of all kinds, with the spraying machine. My great trouble consisted in flattening down and picking out the blisters which the sun would draw on account of the moisture in the paint. That is the great objection to the use of the spraying machine with us, we cannot keep the water out of the paint.

Mr. McMasters: I have had considerable experience with the painting machine and have given it a good deal of study the past six or seven years, and I want to say, as Mr. Gohen has said, that from my observation I am satisfied that paint applied with the painting machine wears better than brush-applied paint in nine cases out of ten. I do not know that it does every time, but I have watched it very closely and I am satisfied that there are no ill results coming from moisture that comes from the air in the paint applied by machine.

Now, in the Painters' Magazine, I saw quite a pertinent question. It said, if the painting machine is a success why is it that none of the large car building companies have them in use? Now, that is easily explained. In most of the car building shops of this country, the shops are low, as we all know, particularly in box car shops, they turn out anywhere from thirty to seventy-five, or possibly one hundred cars a day, and there are hundreds or thousands of men working there. The result is, if they attempted to paint fifty or seventy cars in there, which they have to do in the very shortest time, in a few hours' time, they simply could not live under those conditions. On the railroad a great many of them are painted out of doors, so I think that explains that question.

Mr. Skinner: I am with the Western Steel Car & Foundry Company. We put a plant in several years ago that we experimented with quite a little while, and we found that we could paint a car cheaper by hand, all things considered, than we could with the machine, so we gave it up.

Mr. Pitard: There seems to have been somewhat of a lull in the use of the paint sprayer from what it was when it first came into existence, but owing to the rapid increase in the freight car equipment of the railroads of the country, there seems to be a growing demand for quicker methods for painting freight cars than by the brush method, and while I am not much of a prophet, I predict a great future for the paint sprayer on that account.

Now, the greatest trouble that we experience in the use of the paint sprayer is getting somebody to use it. Workmen all complain that it gets into their faces and it gets into their lungs and on that account it is difficult sometimes to get them to consent to use it. Now, if some one will invent a sprayer that will keep the paint out of the faces and lungs of the users, I thing the sprayer will move forward with a jump compared to what it has done in the past.

President Cook: We will pass to the next and last inquiry: "Is there anything better than white lead for stenciling freight cars?

Cries of "No, no."

Mr. Miller: Yes.

A Member: What is it?

Mr. Miller: A twenty-five per cent addition of zinc will prevent calking.

President Cook: We will hear the committee on resolutions.

REPORT OF COMMITTEE ON RESOLUTIONS.

Chicago, September 11, 1903.

To the President and Members of the M. C. & L. P. Association:

Gentlemen:—Your Committee on Resolutions offer the following for your consideration:

Resolved, That we are not in any degree unmindful of the kindness of our officials in permitting us to again assemble as of yore. The granting of transportation over the several lines of railway for ourselves and our wives and children is highly appreciated and cannot be fully expressed in simple words. May we be able to demonstrate after our return to our several homes, that the relaxation from duty and consequent recreation will be beneficial to them as it has been to ourselves.

To the officers and members who have in any way contributed toward making this convention a success, we return our thanks. Also to the supply men without whose attention, care and thought this meeting would have been as dreary as some of the weather. On the contrary our wives, our children and ourselves have had a pleasing and pleasurable time.

To the proprietor of the Victoria Hotel for his endeavors to cater to our comfort and welfare when a busy season made it a difficult matter to do so.

To Armour & Co., Swift & Co., Libby, McNiel & Libby for their invitation to visit their immense plants. It is something to be remembered in the future.

We thank our visitors of the Mechanical Department of several railways who have honored us with their presence during our session, notably so the honored son of our worthy member, Mr. F. S. Ball, Mr. H. F. Ball, Superintendent Motive Power of the Lake Shore & Michigan Southern Railway; Mr. F. W. Brazier, Asst. Supt. Rolling Stock, New York Central & Hudson River R. R.; Mr. W. O. Thompson, Div. Supt. M. P., New York Central & Hudson River R. R..; Mr. W. White, Master Mechanic of the Lake Erie & Western, Lima, O.; Mr. F. La Rue, M. C. B. of the C., R. I. & P., Chicago, Ill.; Mr. J. H. Tinker, M. M. of the B. & O,, Garret, Ind.; L. G. Parish, M. C. B. L. S. & M. S., Englewood, Ill.; and Houston Lowe of Lowe Bros., Dayton, O.

In the languege of Rip Van Winkle, may they and their families live long and prosper.

To the wives and daughters of the members who have favored us with their presence. Without them our meeting would indeed have been a dreary one.

We extend our sympathy to Mr. John H. Long of the Chicago, Burlington & Quincy, who is now lying sick in our convention city. We regret his illness at this time more than at any other and trust an all-wise Providence will grant him a speedy return to health.

To Mr. D. J. Gilliland of the Flood & Conklin Company who is now in the west with his invalid wife, who regrets his inability to be with us, feeling that his greater love and duty calls him elsewhere.

We greatly deplore the death of our ex-President, Mr. Leopold who was an honor as well as an aid to our Association; also the death of the wife of our worthy Secretary, Mrs. Robt. McKeon.

Lastly, but not in any degree the least, to the loyal members of the Association who have helped to maintain our Association. May their tribes increase.

Whereas, God has seen fit in his all-wise Providence to remove from our midst, A. S. Baner, Alex. Campbell, A. A. Nicoll, W. R. McMasters, we bow submissively to his will and know that all is for the best.

Resolved, That these resolutions be spread on our minutes and a copy of the same be conveyed to the families of the deceased in this hour of their affliction.

C. E. MANCE,
A. J. BRUNING,
H. M. BUTTS.
Committee.

President Cook: If there are no objections, the report of the committee will take the usual course, and be spread on the minutes.

Mr. Butts: There is one thing I would like to bring up, which is very important. I would like to have a resolution passed that the stenographer's notes of the remarks made here by the members of this convention should be submitted to each one before being printed in the proceedings. Every year we find a great many errors creep in. I know of no organization whatever where there is a rambling discussion where remarks are permitted to be printed and go on the record without each one having a chance to revise and correct any error that might be made. We are being criticised severely by other associations, and I think this is very important. Mr. Brazier came into our association and was quoted as making a remark that he never conceived of, it got mixed up in some way or other. It is very easy for errors to creep in, and there should be a chance for those corrections to be made before they are published.

Mr. Quest: What would you suggest?

Mr. Butts: Each person who is recorded as making any remarks, should be furnished with a typewritten copy by the secretary and allowed to make corrections.

Mr. Copp: That might be done in the bound volume, which of course would not come out for months, but it could not be done in the October number of the Railway Master Mechanic.

Mr. Butts: It should be corrected in our official publication.

Mr. Gohen: Yes, that is what ought to be done.

Mr. Copp: I think you will find that a very difficult thing to do. It is voted that this matter shall go into the October number of the Railway Master Mechanic, and it would be impossible to get these individual speeches back in time.

Mr. Butts: It is a difficult matter for you, but I am speaking about the official publication.

Mr. Copp: What you do for one, you ought to do for all, and it is a very difficult thing to do. You would have to have two or three copies, the original would be lost and perhaps two or three copies besides before you got it all back.

Mr. Gohen: I think I can settle this little difficulty. Let the record of this meeting go on as it is in the October number of the Master Mechanic, and if anybody is misquoted, to amount to anything, if it brings about a different construction of his idea, let him correct it through the Master Mechanic, or call it to the attention of the secretary, so that it would come out correctly in the official record. That would be the proper way.

President Cook: Mr. Gohen, while you are on the floor will you give the report of the uniform stenciling committee?

Mr. Gohen: The committee on uniform stencils are not quite ready to report. Yesterday it was said that "procrastination is the thief of time," I think that is what Mr. Brown quoted, and sometimes you know it is said that fools rush in where angels fear to tread. Now, whether we are proscrastinating, or whether we are afraid, or something, I do not know, but we are not quite ready. There were several things, after we got pretty well under way, that came up which prevented our making this report, and it is a good thing that we did not do so, for the Master Car Builders, at their last convention in Saratoga, appointed a committee to give attention to this, and that committee, I believe Mr. Brazier of the New York Central is chairman, of, is he not, Mr. Butts? And he is also the President of the Master Car Builders' Association. I was talking to Mr. Miller yesterday and he referred me to Mr. Butts, and I talked to Mr. Butts this morning, and Mr. Butts gave me this information as to Mr. Brazier being on this committee, and we are informed that that will be a better way to get Mr. Brazier to call his committee together and we together to meet at some mutual point and finish the thing up, and turn the report over to the president of the Master Car Builders' Convention, and then make the final report to ourselves here. If that meets the approval of the Association, why, we will act on those lines.

President Cook: If there are no objections, the committee on uniform stencils will pursue the course suggested by Mr. Gohen. I hear no objections.

Mr. McMasters: We do not want to slight anybody around here, and there is a railroad man, a master car builder, here, who takes a great deal of interest in painting and painters' work and has had considerable to do with it. He has just sneaked in under the canvas, and he is hiding now behind that post. We would like to hear from him.

Mr. Le Grand Parish: Mr. President, I said to Mr. McMasters that I did not intend to say anything to the convention at this time, and that is the reason he got up and sprung this on me. I am very glad to be with you, and I, as you all know, take great interest in work of this kind, and I think this committee report that you were just speaking of is a very important one, and I think the Master Car Builders' Convention will be pleased to have this question of uniform stencils followed up and brought before them. I know of one organization that is working on that at present, and Mr. Butts is also a member of that organization, and we find it a very important subject to follow up. I hope you will do all you possibly can to follow that report up. Again, I am very gald to be with you this morning.

President Cook: We are glad to hear from you.

On motion, Mr. Parish, of the Lake Shore, was made an honorary member of the association.

Mr. Gohen: Before we adjourn I wish to ask if there has been any action taken by this association in regard to the printing of the official record, and the subscription to the Master Mechanic, on which we should take some action, otherwise the secretary will not be empowered to do so.

President Cook: No, not only that, but your officers have not been installed and a lot of other things not done.

President Cook: This ends the duties of your presiding officer for this convention, and I believe the members of the convention will scarcely appreciate the efforts that I have made to preside to their satisfaction and to win their appreciation. However, I have done the very best I could, and that is all you can ask of me; and it is now in order for the officers for the ensuing year to be installed. I will ask Mr. Lanfersiek to take the chair and announce the president for the ensuing year.

Mr. Lanfersiek: Gentlemen of the Convention, I take pleasure in introducing Mr. C. A. Cook, who has been elected President for the ensuing year of this Association.

President Cook: Gentlemen, I agreed not to make any further remarks. I will assume the office for the ensuing year and consider the honor a great one indeed, and will endeavor to do the very best I can for the association. (Applause.)

Mr. Lanfersiek has been nominated and elected to the office of First Vice-President for the ensuing year.

Mr. Lanfersiek: I have nothing to say, because our time is valuable, and we do not want to lose any more than we can possibly help.

President Cook: Mr. Butts is Second Vice-President for the ensuing year.

Mr. Butts: I will not take your time, gentlemen. I thank you and will do the work to the best of my ability.

President Cook: There are two committees that the chair has yet to appoint. He will appoint those at his leisure if the convention has no objection, the committee on hotel and re-arranging the committee on tests. I am not prepared to do it. I regret exceedingly that we are closing this convention in this hurried and unsatisfactory manner. I had arranged a little program of entertainment, but it all has to be dispensed with and we will have to adjourn as we are.

I beg your pardon, Mr. McKeon, we have been so accustomed to installing you as secretary that there is no reason to fear that you were overlooked, but Mr. McKeon is, as usual, our secretary for the ensuing year, and I do not think Mr. McKeon has anything special to say to us this morning, the time is so short.

Mr. McKeon: I thank you very much for the honor you have again conferred on me, and I shall do my duty as far as I am able, as I have done in the past. It is unnecessary to say any more at present. (Applause.)

Mr. Gohen: I move that the secretary proceed as in former years in the matter of printing the official record and furnishing the Master Mechanic to the members of the Association, and I would like to impress upon the secretary the importance of not sending any copies of the Master Mechanic to those who have not paid their dues. It is an unforunate thing that we should have to say this, but it is a matter of fact that some men come here year after year and do not pay dues and they participate in all the benefits and all the entertainments and everything of that kind and, either through carelessness or for some other reason, do not pay their dues, consequently I say, our secretary should enforce that rule and those who have not paid their dues shall not have their name appear on the roll as being present, either should such remarks as they have made be printed in the proceedings.

President Cook: The secretary will so understand.

The following committees were announced:

Advisory Committee.

J. H. Kahler, chairman, Erie R. R., Meadville, Pa.
J. A. Gohen, C. C. C. & St. L. Ry., Indianapolis, Ind.
J. W. Houser, Cumberland Valley R. R., Chambersburg, Pa.
D. A. Little, Pennsylvania R. R., Altoona, Pa.
W. O. Quest, Pittsburg & Lake Erie R. R., McKees Rocks, Pa.

Committee on Information.

H. C. McMasters, chairman, Southern Pacific Ry., Sacramento.
Warner Bailey, Boston & Maine R. R., Concord, N. H.
F. W. Bowers, Erie R. R., Kent, Ohio.
Thos. R. Cowan, Canadian Pacific Ry., Montreal, P. Q.
Gus J. Ginther, Wabash Ry., Moberly, Mo.

Committee on Tests.

J. H. Pitard, chairman, Mobile & Ohio R. R., Whistler, Ala.
A. P. Dane, Boston & Maine R. R., Boston, Mass.
A. J. Bruning, Louisville & Nashville R. R., Evansville, Ind.
C. E. Mance, New York, Ontario & Western Ry., Middletown, N. Y.
W. H. Dutton, Lehigh Valley R. R., Sayre, Pa.

Committee of Arrangements for next place of Meeting.

H. J. Kuhn, chairman, Flood & Conklin Co., Newark, N. J.
Wm. Marshall, Anglo-American Varnish Co., Newark, N. J.
F. V. Archibald, Berry Bros., Detroit, Mich.
J. D. Wright, B. & O. R. R., Baltimore, Md.
D. A. Little, Pennsylvania R. R., Altoona, Pa.

THE ENTERTAINMENT.

The entertainment, without which all railway conventions would be very dull, was up to the usual standard in excellence, and in some points surpassed all others.

Tuesday evening, the 8th, there was a theater party to the Coliseum, with Brook's band.

Wednesday afternoon there was a trip to the Union Stock Yards by special train, leaving I. C. Van Buren street station at 1:30. This was a great sight to those who had never been there. The spectacle of 250 head of cattle being killed and dressed every hour is something appalling for the tender-hearted to behold. Yet all was done as mercifully as possible, and all was neatness throughout this great plant. If all this were to cease a large portion of the world would go meat hungry. Rain marred the trip somewhat.

Wednesday evening there was another theater party, this time to the Studebaker theater to see Geo. Ade's play, "The County Chairman," and all who attended were highly pleased.

Thursday afternoon there was to be an automobile ride, but on account of bad weather in the morning it was postponed until the next day. In the evening the event of the convention came off, which was the annual reception and ball of the association at Studebaker ball room. This, the first of its kind, we are told, was entered into with much doubt of its success by some of the entertainment committee. But before it had proceeded far all doubts were removed. It was most enjoyable whether one danced or not. All took part in the grand march and with clown's paper hats on the men and paper fezzes on the ladies they presented a gay appearance and unbent their stiff dignity and entered into its spirit very enjoyably until 12 o'clock, when the band union of

Chicago rings everything off. However, that's late enough. Delicious refreshments were served by Chicago's best caterer.

Friday, both forenoon and afternoon, there were general automobile rides. In the forenoon to Lincoln Park and in the afternoon to Jackson Park. Thus closed one of the most enjoyable conventions it has been our lot to attend in ten years.

CONVENTION NOTES.

By far the largest convention ever held by the M. C. & L. P. A. Many new men in attendance. Whether they enrolled themselves as members we do not know. If not, they should have done so. Chicago is a great railroad center and a capital place to get together. The weather was rather hot and the rain interfered some with the outdoor sports.

At a regular meeting of the Master Painters and Decorators Association of Chicago September 8, the following resolution was offered and unanimously concurred in: "Whereas, it has come to our notice that the Master Car and Locomotive Painters Association of the United States and Canada are now assembled in annual convention in our city; therefore be it resolved, That we extend to the officers and members thereof our most cordial and fraternal greetings and welcome, and that we bespeak for them a most enjoyable and profitable convention."

After all the large attendance one accustomed to being there each year could but help noting the absence of some old hands. Our old confrere, Mr. T. J. Rodabaugh was not present, for what reason we have not learned. Mr. W. T. Canan, who has enlivened many a like gathering with a song, sent a letter explaining his absence. He was only out of the Altoona Hospital August 27, after spending thirty days there, the result of an amputation of the great toe on the left foot. After words of greeting and encouragement he set the noble example of enclosing a check for his dues. "Go thou and do likewise." Frank Fish was confined at home by his scalded leg, but his son was there.

Mr. Houston Lowe, the chemist of Lowe Bros., paint manufacturers of Dayton, Ohio, and the fast friend of our association, was called upon for a speech and nobly responded. While on his feet he said that if we would establish a permanent meeting place and secretary, he would give us a library. A noble offer. How about Saratoga? It looks as though the M. C. B. Association was making it permanent for them, also the M. M. Association.

It was a great encouragement to have so many of our friends among the superior officers with us and taking part, viz.: F. W. Brazier, assistant superintendent rolling stock, N. Y. Central; H. F. Ball, S. M. P., Lake Shore; W. White, M. M., L. E. & W.; Henry La Rue, M. C. B., C., R. I. & P.; L. G. Parish, M. C. B., Lake Shore (Englewood); J H. Tinker, M. M., B. & O., and others. The secretary of the Traveling Engineers' Association, which was in session at the "Stratford," not a block away, greeted us in person for his association. Come again, all of you.

The next convention is appointed to be held at Atlantic City the second Tuesday in September, 1904. Just now the news is that seventy-five hotels have been wiped out by wind and storm. However, there'll be time to build new ones before that time. Don't worry.

There was the usual varied assortment of souvenirs, without which the conventions would lose their charms, especially to some. These are valued mostly for the associations they bring up as they are viewed at home afterward. The Sherwin-Williams Company gave tasty china cups, of their own design; the Wolf Brush Company, a nice ink stand; W. H. Coe & Co., stick pins of their own design; and away down to the Hotel Majestic, up in the top story, Walter B. Whitworth, of the Columbia Refining Company, was "treed," like an oppossum, where he had a pretty shell spoon and ash trays. J. B. Sipe & Co. gave pocket books and ash trays. The Glidden Varnish Company gave little brown jugs, said to contain their "Elixir Oil." N. Z. Graves & Co. gave their usual souvenir boxes of cigars, tape measures, etc. C. A. Willey gave a useful palette knife. Besides there were many other nick nacks too numerous to mention, or remember, as we made no notes.

For the first time in its history the convention had a lady stenographer, Miss E. Jacobson, 815 Chamber of Commerce building, Chicago. She does this work for the Western Railway Club, and many other organizations.

The paint manufacturers attending the conventions and their representatives are given in the following list. Their officers were Wm. C. Rennolds, president; J. C. Conway, secretary; Wm. Marshall, of the Anglo-American Varnish Co., treasurer, and H. B. Coffin, of Heath & Milligan, chairman of entertainment committee.

Aquart Varnish Remover Co., represented by A. D. Aquart.

Columbia Refining Co., represented by W. B. Wentworth.

Flood & Conklin Varnish Co,, represented by H. J. Kuhn.

The Hildreth Varnish Co., represented by J. E. McGee.

Kay & Ess Co., represented by D. O. Klinger

American Lucol Co., represented by L. A. Shadburn.

W. H. Coe Mfg. Co,, represented by C. H. Bowers.

Berry Brothers, varnishes, represented by H. W. Frost and Mr. Archibald.

Detroit White Lead Works, represented by John W. Marshall.

The Protectus Co., represented by J. H. Murray and Mr. Wheeler.

Chicago Varnish Co., represented by G. S. Bigelow and Capt. Ford.

Blake & Andross, represented by W. E. Blake.

DeVoe & Raynolds Co., represented by Wm. C. Rennolds, N. C. Conway, Mr. Phillips and Mr. Jetner.

D. B. Crockett Varnish Co., represented by John B. Hicks.

The Wolfe Brush Co., represented by W. B. Wolfe.

Glidden Varnish Co., represented by R. T. Walbank.

Toch Brothers, Paints, represented by Maxwell M. McGloin.

Pratt & Lambert, varnishes, represented by J. P. Gowing and Joseph Maycock.

Eureka Solvent Co., represented by J. T. Hartnagle.

Detroit Graphite Co., represented by T. R. Wyles, E. R. Smith and J. T. Dinkgrave.

The Acme White Lead & Color Co., represented by H. N. Turner, Benson Brown and Mr. Deming.

The Anglo-American Varnish Co., represented by Wm. Marshall.

Standard Oil & Soap Co., represented by Ph. Sussman.

Murphy Varnish Co., represented by Chas. D. Ettinger, Geo. Kissam and Mr. Brazier.

Wadsworth-Howland Co., represented by R. T. Bryden.

J. B. Sipe & Co., represented by H. G. Taylor, C. O. Taylor and Mr. Roberts.

Lowe Brothers, Paints, represented by Nat C. Dean, Mr. Shannon and Mr. Lowe.

Thresher Varnish Co., represented by H. C. Hopkins.

Edward Smith & Co., Varnishes, represented by J. H. Berrwell.

Patterson, Sargent & Co., represented by W. A. Polk.

The Cleanola Co., represented by G. L. Ball.

The Imperial Car Cleaner Co., represented by H. F. Morelock.

Heath & Milligan Co., Paints, represented by Mr. Coffin and Mr. Wheeler.

Sherwin, Williams & Co., represented by W. B. Albright, Jack Eames and Mr. Medill.

Johnson Magnetic Paint Co., represented by Jos. Bailey and O. C. Barrie.

N. Z. Graves & Co., represented by Ferdinand J. Graves, V. F. Graves and H. C. Carpenter.

The Joseph Dixon Co., represented by D. A. Johnson.

C. A. Willey, Colors, represented by C. A. Willey and John Willey.

Adams & Elting, represented by F. E. Campbell.

Lilly Enamel & Paint Co., represented by Wm. H. Jones.

Mound City Paint & Color Co., represented by Fred W. Bittman.

Valentine & Co., represented by A. Dowdell.

Beckwith & Chandler, represented by R. E. Mills.

The Akron Mining, Milling and Manufacturing Company, Aurora, Ill., with offices at 656 Rookery building, Chicago, were represented at the Painters' convention by Messrs. F. L. Harkness, of the company, and R. B. Kadish, sales agent of the Chicago office. Their quarters were at room 120 Victoria hotel, and during the convention they distributed handsome souvenirs in the shape of Gypsy fortune telling cards, compliments of the company. Mr. Kadish, who recently took charge of the Chicago office, is well known in the paint business.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EXPRESS

The Iron Clad Paint Company

In investigating the product of the Iron Clad Paint Company it is found to be one of the industries connected with business trade in which Cleveland may have particular pride. It is one of the largest paint manufacturing concerns located there, exploiting particularly a standard brand established now for thirty-three years, and has made its speciality standardized all over the country. The present plant, which has a capacity of about 2,000 gallons per day, has been occupied for over two years. The company was bought at that time by the present holders and the location moved to the Upper Flats, contiguous to the Big Four and Erie railroads. F. H. Chamberlin is president, J. D. Smith is secretary and treasurer, and R. H. Coleman manager, general offices being located at 28-40 South Water street, Cleveland, Ohio. There are branches in Chicago, New York, Cincinnati and Quebec, Canada.

The products are widely known as hard specular iron ore paints obtained from Lake Superior ore, and graphites paints obtained from the best graphite known to the trade, and is sold dry, and ground in linseed oil, and also ground stiff in linseed oil. It is designed for outside and inside work on metallic surfaces or wherever a protective is desirable. The advantages claimed for it is durability; it is absolutely waterproof quality, that is not affected by heat or cold, acids or alkalies, and it does not blister, crack or scale. It is sold with a five-year guarantee. An examination of it in the raw state shows a flaky ore in the first grinding, reduced to a flowery powder in the final grinding. A significant fact about its widespread use and regular demand is that twenty-one railroad corporations are using it in quantities from 2,000 to 10,000 gallons yearly. Mr. Coleman gives the information that the business of the company doubled during the past year, and that the prospects are that the ratio will be maintained. This company is now enlarging its scope and manufactures besides the nine varieties of Iron Clad paint, three grades of white lead paint and a line of floor paints; it also manufactures asphaltum paint.

Mr. Walter D. Crosman, who is well and favorably known in railway circles, has opened an office at 125 La Salle street, Chicago, for the handling of a general line of railway supplies. He is the sales agent for Wadsworth-Howland Company, of Chicago, paints, Midland Iron Works, of Racine, Wis., manufacturers of the Wilbur Door Hanger, and the Wachter Manufacturing Company, of Baltimore, manufacturers of army and navy glue.

A Car Painted with the Product of the Detroit Graphite Manufacturing Co.

Established 1878.

RAILWAY MASTER MECHANIC

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BRUCE V. CRANDALL, Editor. CHARLES S. MYERS, Manager. MAHAM H. HAIG, Associate Editor.

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THE tendency in the past has been to equip engine houses with cast off lathes, drill presses, shapers, etc. Is this economical? If it is a saving to a manufacturing concern to scrap a worn-out or out-of-date machine, why is it not economical for a railroad company to do the same, taking into consideration the fact that it is almost as dependent upon relative savings as upon traffic to produce dividends?

The demands upon a roundhouse are that the running repairs shall produce results by being as nearly permanent repairs as possible and that they shall be done as quickly as possible. Can work not be done more quickly on a good machine than on one which is out of date and ready to fall to pieces? In other words is it economical to put old machinery in an isolated engine-house?

ON some of the larger railway systems, divisions hitherto considered unimportant, have lately been called upon to handle double the business of three or four years ago. The result is that the shops and engine-houses of these divisions are called upon to do work for which they are not prepared. We find track facilities, cinder pits, coaling stations and turntables inadequate in facilities, size and strength to handle the greater number of larger locomotives. This means that larger engines cannot be handled economically at the small terminals even where their use would be desirable out on the division. The question then arises: Would it not be advisable to remedy these conditions at once and at the same time provide for even further growth?

THE location of cab appurtenances for the convenience of the engineer affects locomotive performance to a greater extent than is usually appreciated in the drafting room. The location of the position of a cab fixture upon a blue print where apparent space advises and where it seemingly will be in view from the engineer's seat, when arranged upon the boiler, does not always result favorably or conveniently for road conditions.

During the recent meeting of the Traveling Engineers' Association some very apt and pointed remarks were made relative to this subject. As a practical solution of the difficulty, the policy was suggested of detailing a representative of the road having new locomotives built, to visit the building shop, to inspect the location of cab fixtures while being placed. By first putting in the engineer's seat, the inspector can locate himself where the engineer will sit while running and from this point he can judge absolutely as to the proper location of each appliance.

An observation of this practical suggestion will often add to the comfort of the engineer by placing water glasses, lubricators, etc., where they may be seen readily, thereby minimizing the time during which his attention is distracted from the road ahead.

OTHER pages of this issue contain an outline of the proceedings of the second annual convention of the Master Steam Boiler Makers' Association held in Chicago during the past month. The results of the meeting appear very satisfactory and the association bids fair to continue on a firm footing.

In order to cover many points worthy of consideration by the association, a large number of questions were selected, lists of which were sent to all members for their attention before arriving at the convention. From this number fifteen of the more important were chosen and arranged for the program of the occasion, each question being assigned to a member for presentation before being opened for general discussion. After the conclusion of the programme such others of the list of subjects were taken up which included points upon which any member desired to obtain information derived from the experience of others.

The association will meet next year in St. Louis for its third annual convention.

THAT portion of his duties upon which the young master mechanic enters with least confidence, concerns the office works of his administration. His training heretofore has been concerned so particularly with the exclusive mechanical portion of railway operation that he frequently enters his new office somewhat in awe of the gentleman of figures of whom he is now placed in charge. Right here comes the crucial test of his administrative ability. Two courses are open to him. A very usual choice is to display a hopelessness of mastering this unfamiliar though really simple detail of his duties and to "leave it all to the clerk," thereby weakening himself all around, but particularly in the estimation of the man whose unswerving loyalty and admiration is so necessary. This man, the chief clerk of a master mechanic, is perforce his private secretary and hence is in a position to do more to make or unmake him than any other one employe under his jurisdiction. And that attachment to his interests which unhesitatingly accompanies acknowledgement of ability can be obtained in no better manner than by taking hold of the unfamiliar subject of office work and quickly mastering its essentials. No mechanical man feels any hesitancy in taking charge of carpenters or painters, notwithstanding his unfamiliarity with the details of their trade. The work of the clerical force is nothing more nor less than carpentering with report blanks and figures and one of the number who cannot arrange his figures to exhibit satisfactory reports is simply an unskilled workman. The master mechanic, by his very freedom from the maze of the details, is in a position to point out the proper lines of revision of an unsatisfactory statement. Take the matter of oil performance or repair costs. The requisitions of the bridge and building department, water service, depot and train crew supplies, wreck expenses, etc., present opportunities for revising an unsatisfactory cost sheet, to the clerk who is competent and loyal. Hence the necessity for the young master mechanic to display no hesitation in thoroughly familiarizing himself with this phase of his new duties.

MR. FRANK BARR,
GENERAL MANAGER OF THE BOSTON & MAINE RAILROAD.

Mr. Barr entered railroad service in March, 1869, and has since that time been connected with the Worcester & Nashua as freight and ticket clerk and later as general agent; with the Boston & Maine as superintendent and afterward assistant general manager, which position he held at the time of his appointment as general manager.

ANOTHER feature wherein a young master mechanic's administrative ability is newly called into test consists of calls upon him for a certain amount of paternalism. He is relied upon by those under him for a certain amount of protection, which he must exert if he is to obtain that loyalty from his men that is essential to his success. Engine crews desire his personal services as a sort of attorney for the accused when called upon the transportation carpet and his efficiency in procuring benefits of doubt in such cases will do more than any other thing to cap his prestige among the roadmen. He is further called upon by all to somewhat interest himself in the personal affairs of these men, to induce the company to protect one man from the legal entanglements attending an unjust debt, to encourage another who is developing a patent, to advise another as to whom best to consult about his little piece of real estate or other investment, etc., etc. The frequency with which his men request his judgment, assistance or protection in such matters is a new experience for the young master mechanic and he is inclined to shirk the responsibilities. Yet the very fact of such calls is an acknowledgment of the wisdom and prestige, and he is indeed foolish if he declines these opportunities to grapple his men to him "with hooks of steel." The ability to gain the real perconal esteem of men under him, while rigidly holding them to their duty, is one of the most conspicuous traits and in no way can such demarcation be better and more quickly established than by a display of intelligent interest in these matters which are really not specified in his duties.

MR. FRANK H. MASON, Consul-General at Berlin, writes of a practical experiment of the highest importance and interest in the development of electrical railway service in progress on a suburban line between Niederschonweide and Spindlersfelde, in the southern quarter of Berlin.

There has been in daily operation a car driven by a new motor, invented by a young Austrian electrician and built from his plans by the Union Electric Company, of Berlin. This motor achieves with apparently entire success what has not been accomplished hitherto, viz., it propels the full-sized service car at any desirable degree of speed without employing any cumbrous and expensive regulating devices, while deriving its energy from a single-phase alternating current of 6,000 volts, carried along the line on one small trolley wire and delivered directly to the motor without conversion to a lower voltage or a continuous current.

The experiment involves no question of extreme high speed, but rather the transmission of a single-phase alternating current at a voltage (6,000 volts in this case) sufficient to carry it over a long line on a small and relatively inexpensive wire, and the direct use of the current, without transformation, by a motor capable of running economically at any desirable speed and which fulfills all the other requirements of electric traction. No sparking or other technical difficulty appears thus far to shadow the success of the experiments. The system eliminates the expensive substations, with their heavy initial outlay and operating expenses, and appears simple and direct in its working.

Santa Fe Freight Locomotives, A. T. & S. F. Ry.

ANOTHER instance of the substitution of heavy locomotives for lighter motive power is presented by the heavy Santa Fe type, 2-10-2 freight engines now being built by the Baldwin Locomotive Works for the Atchison, Topeka & Santa Fe Railway. The locomotives in question weigh 234,580 pounds on drivers and are to replace consolidation locomotives weighing approximately 180,000 pounds on drivers, capable of exerting a tractive effort of a little over 40,000 pounds. Twenty-five of the engines are being built for burning coal and are to be used on the New Mexico division of the main line of the Santa Fe, and forty-five are to be built for burning oil, to be used on the Albuquerque and Arizona divisions. On the first named division there are some heavy mountain grades; in one case running as high as 185 feet per mile, on Raton mountain pass. There are also long stretches of varying

"Santa Fe" Type Freight Locomotive.

and broken grades over which the maximum are from 59 to 78 feet per mile. On the Albuquerque and Arizona divisions there are long stretches of grade 75 feet per mile, several sections of 10 to 20 miles long of 95 feet per mile, and about 10 miles having a maximum grade of 137 feet per mile.

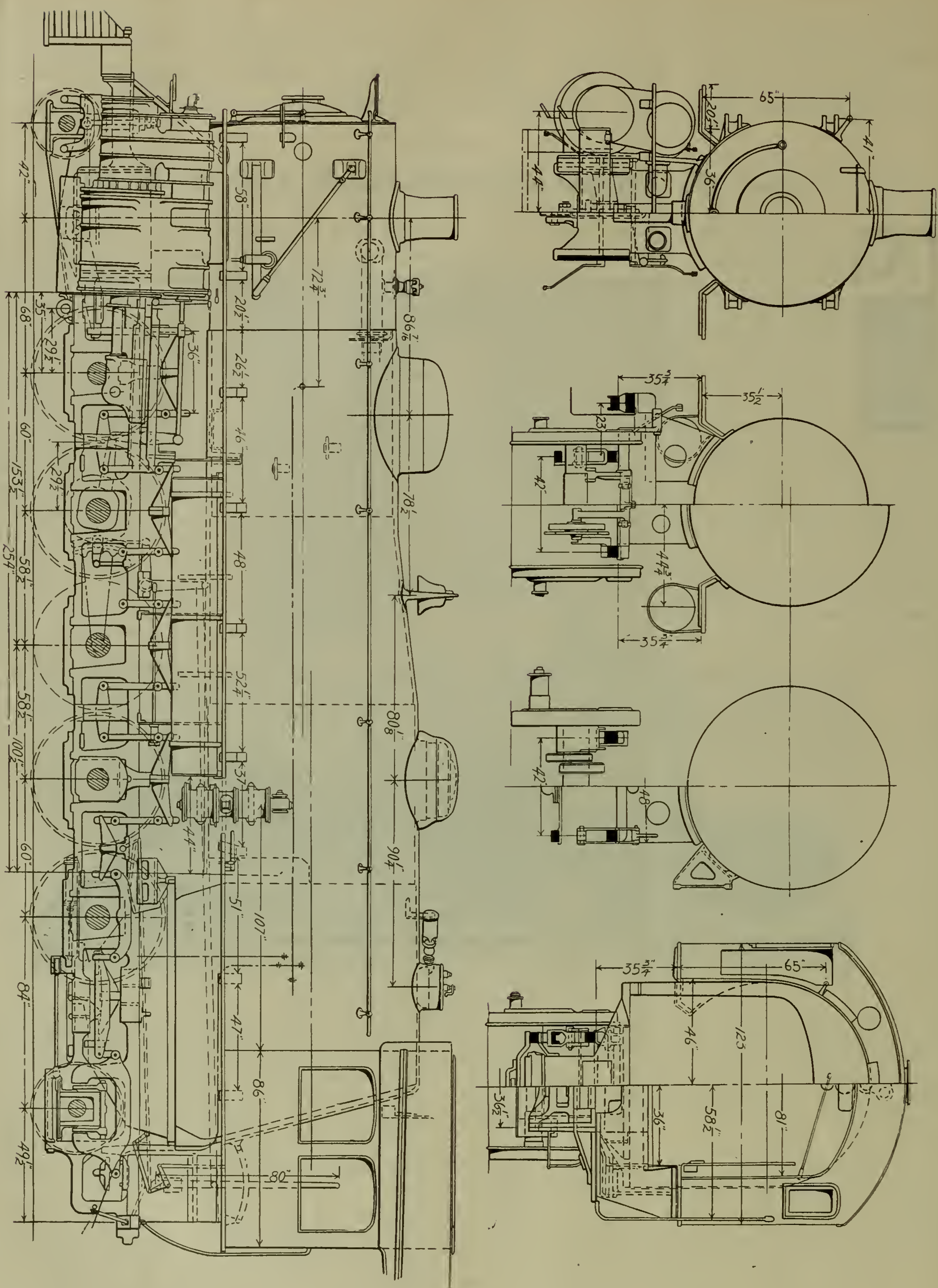
The tandem compound type of locomotive has been selected for this service, operating under 225 pounds of steam. A photograph of one of the coal burners is reproduced herewith, together with several line drawings showing the designs of the most important features.

The boiler is of the extended wagon top type, radial stayed, and having two rows of sling stays near the forward end. The front flue sheet and back head are braced with the usual form of tie rods, and additional braces are applied to the back head and wagon top sheet, as shown in the accompanying line drawings of the boiler, made necessary by the wide water leg. That portion of the shell in immediate proximity to the steam dome is reinforced by an additional sheet. There are 391 tubes in the boiler, 2¼ inches in diameter and 20 feet long, giving a tube heating surface of 4,586 square feet. The firebox heating surface is 210 square feet, making a total heating surface of 4,796 square feet, of which 95.5 per cent is in the flues and only 4.5 per cent in the firebox.

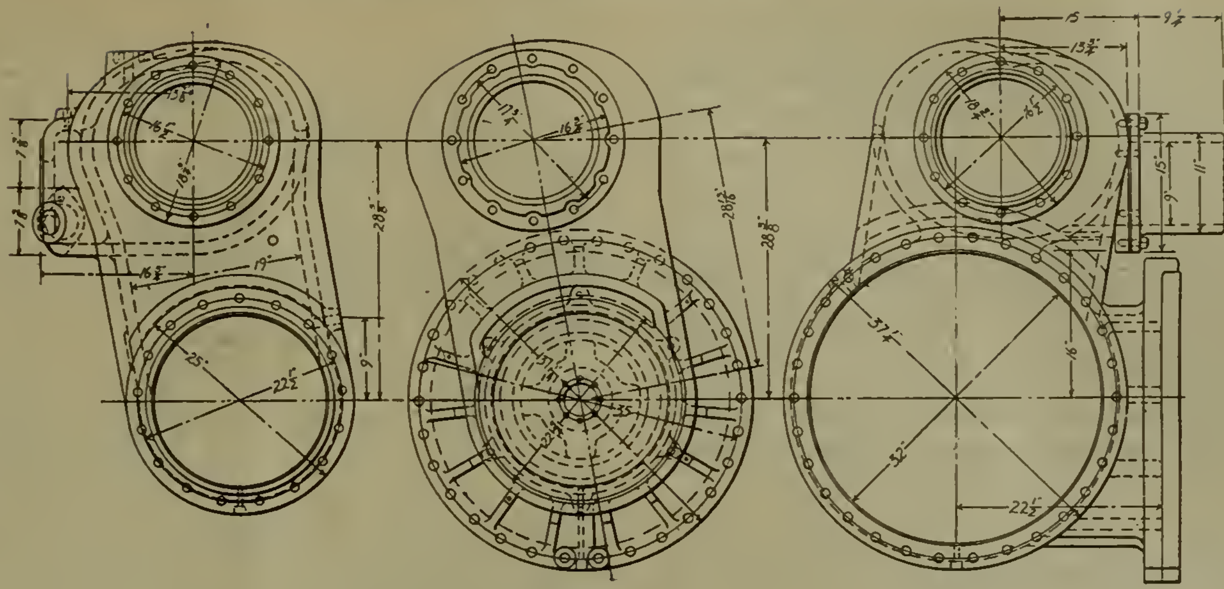
In view of the large diameter of the low pressure cylinders and the consequent height of the center line of the cylinders above the center line of driving axles, the cylinders and guides are inclined 1 inch in 24 inches in order to equalize the thrust upon the crank pins and reduce the force of the upward thrust against the guides.

Each cylinder, with its steam chest, forms a separate casting and is fastened to the slab frame passing between the cylinder casting and the separate saddle casting. The low and high pressure cylinder castings are bolted together, as shown in the accompanying line drawings of the cylinders. The high pressure cylinder front heads and the low pressure cylinder back heads are of cast steel, while the heads between the cylinders are of cast iron.

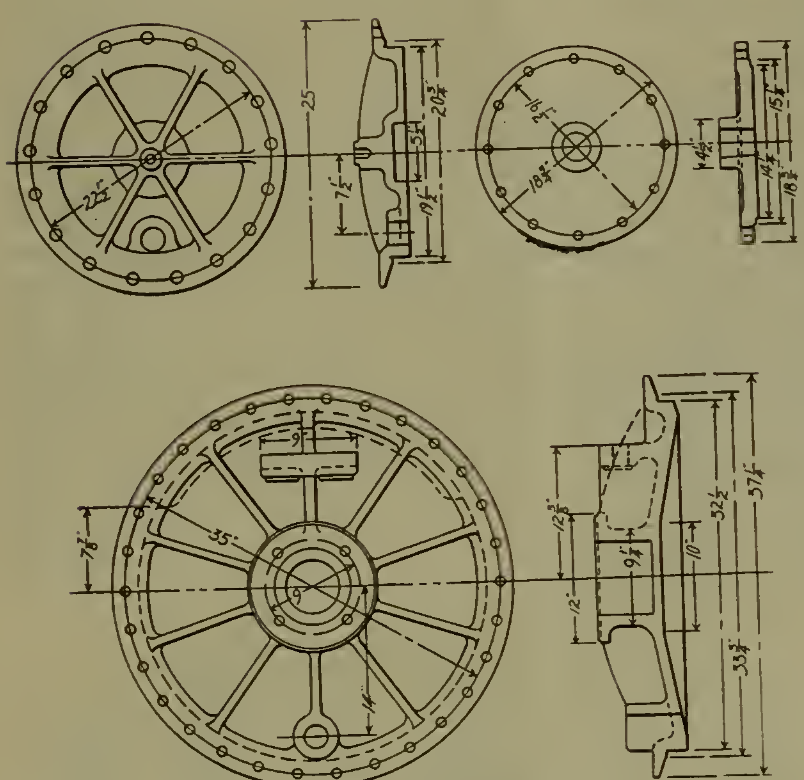
The whistle is applied to a supplementary dome located immediately ahead of the cab and in order to clear all obstructions along the right of way it is arranged in a horizontal position. It is located to the left of the centre line of the boiler, the outer end being supported by a small bracket bolted to the boiler shell.



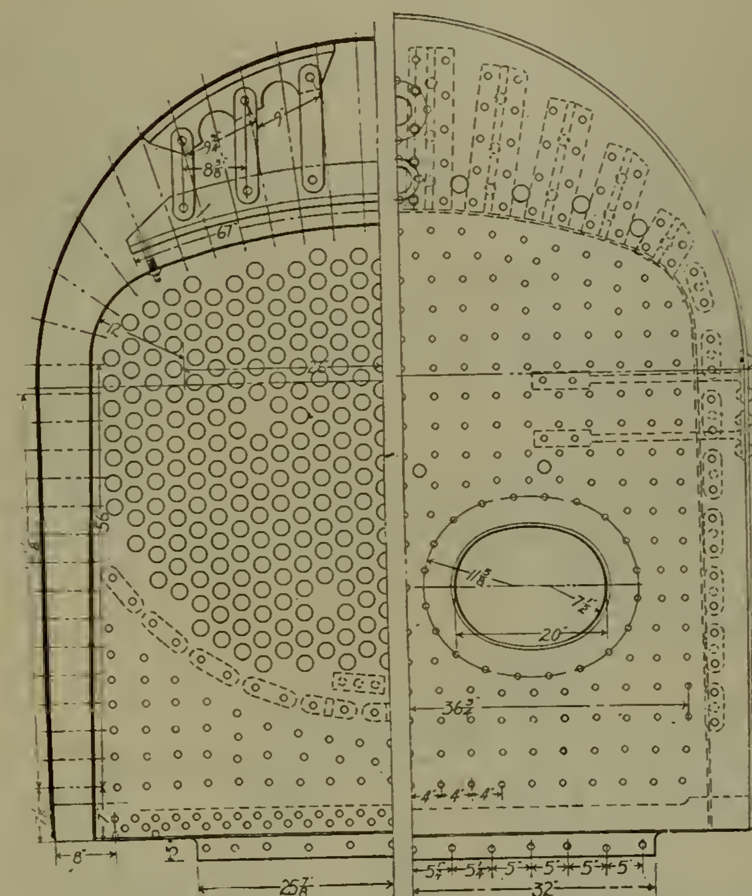
SANTA FE FREIGHT LOCOMOTIVE—ELEVATIONS AND SECTIONS.



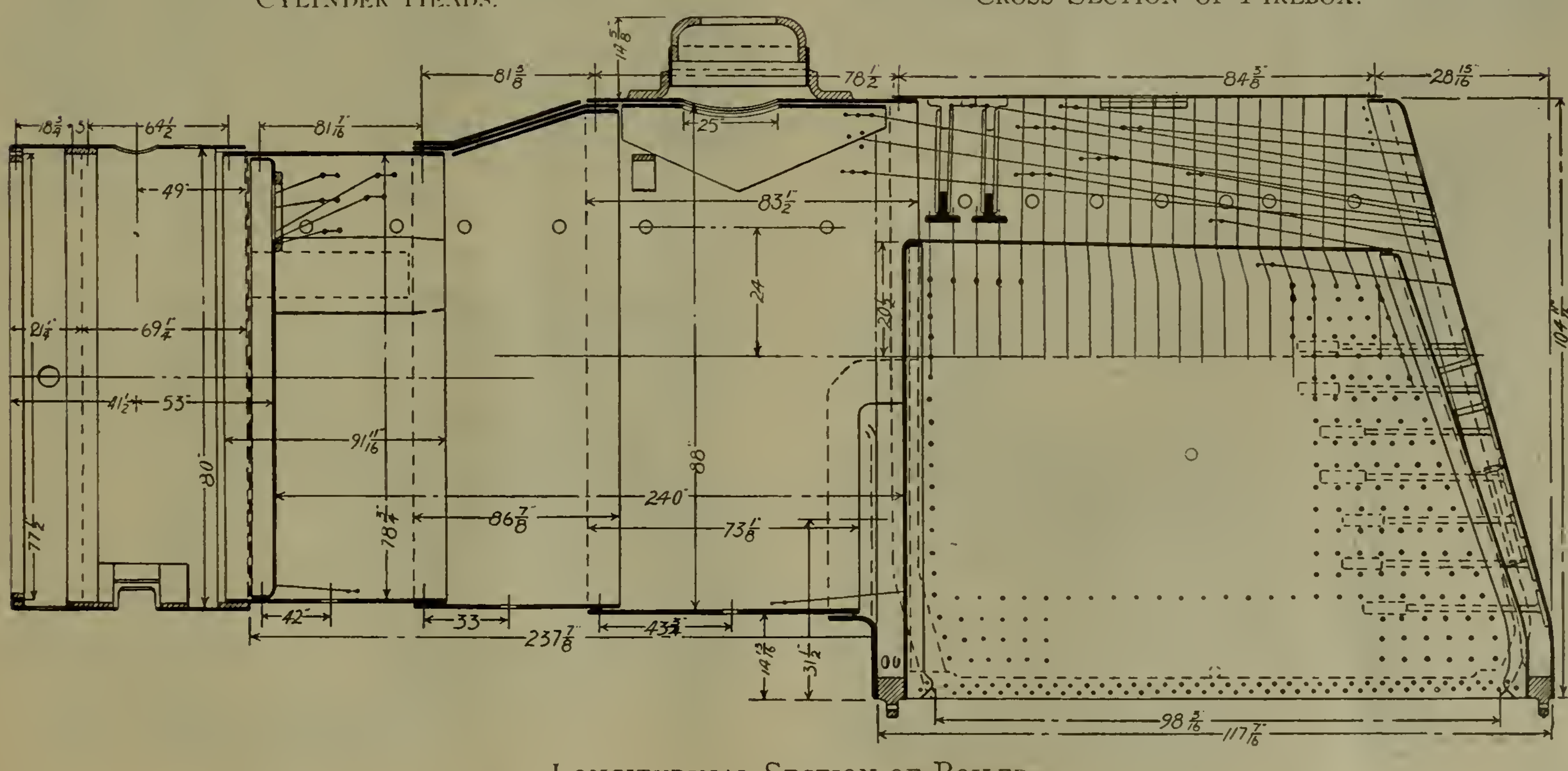
Cylinders.



Cylinder Heads.



Cross Section of Firebox.



Longitudinal Section of Boiler.

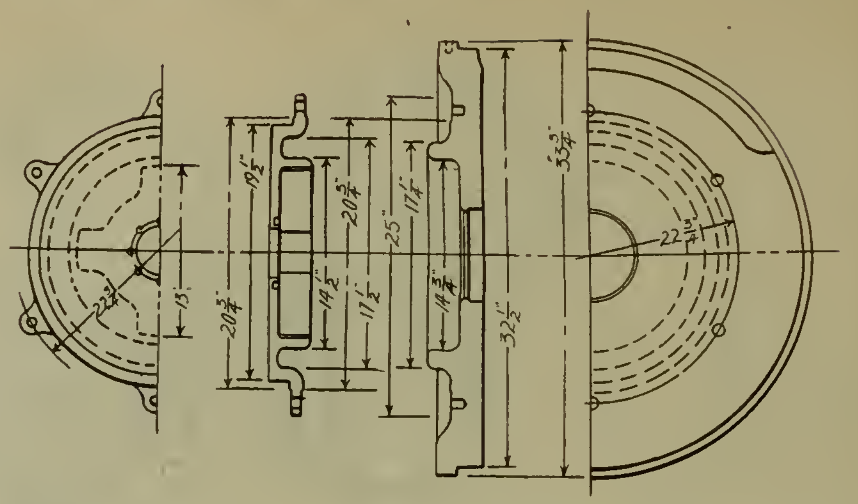
Santa Fe Freight Locomotive.

For convenience in repair work a small jib crane is attached to each side of the smoke box, to facilitate handling the high pressure cylinder when it is necessary to remove and replace the same. A small pulley travels on the horizontal bar of the crane, to which a block and tackle may be applied.

By the usual formula for four-cylinder compound locomotives, the tractive effort is 60,400 pounds. The ratio of adhesive weight to tractive effort is 3.88; the ratio of tractive effort to total heating surfaces is 12.6, and the ratio of total heating surface to grate area is 81.98.

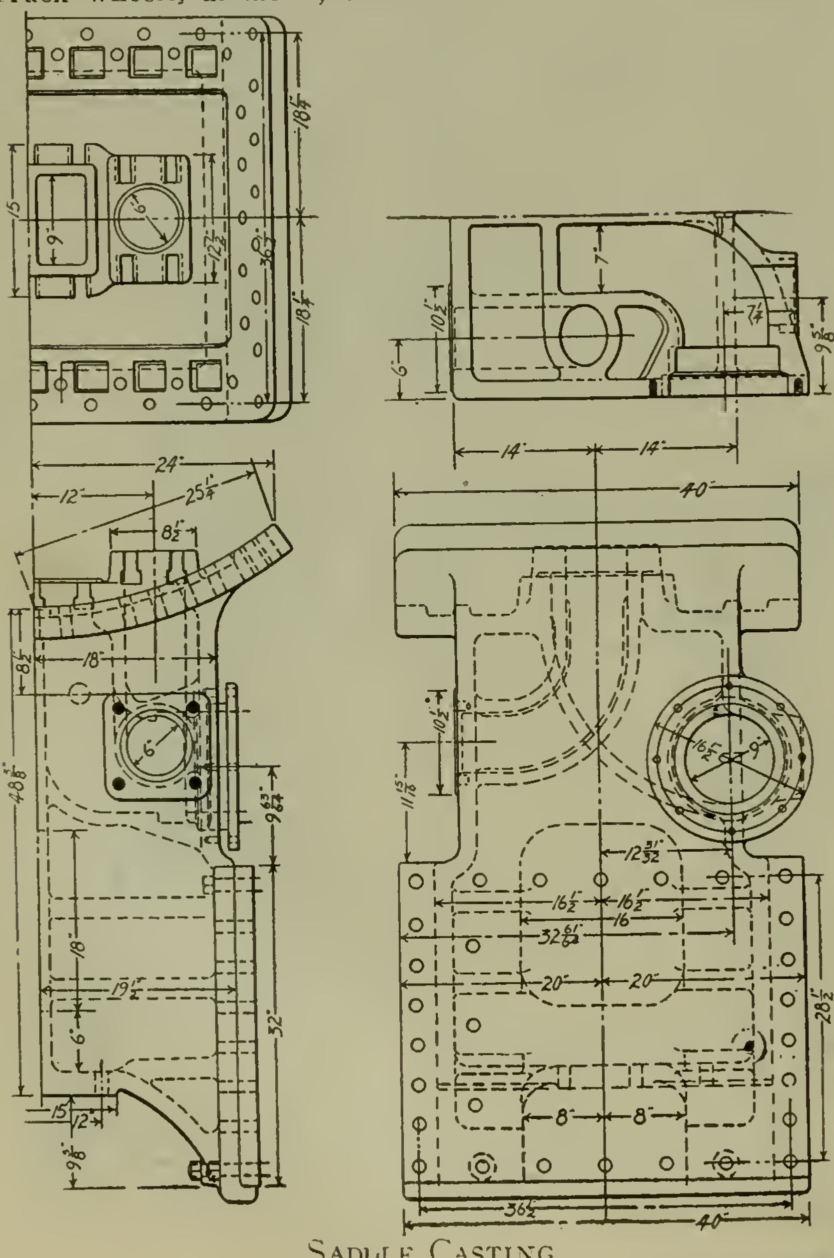
The following table presents further details of this locomotive which exceeds in total weight any others yet built.

Road	A. T. & S. F.
Builder	Baldwin
Gauge	4 ft. 8½ ins.
Fuel	Soft coal
Weight on drivers	234,580 lbs.
Weight on truck wheels	23,420 lbs.
Weight on trailing wheels	29,240 lbs.
Weight, total	287,240 lbs.
Weight, tender, loaded	162,760 lbs.
Wheel base, total, of engine	35 ft. 11 ins.
Wheel base, driving	19 ft. 9 ins.
Wheel base, total (engine and tender)	66 ft. 0 ins.
Heating surface, firebox	210 sq. ft.
Heating surface, tubes	4586 sq. ft.
Heating surface, total	4796 sq. ft.
Grate area	58.5 sq ft.
Drivers, diameter, outside	57 ins.
Drivers, diameter, center	50 ins.
Truck wheels, diameter, front	29½ ins.

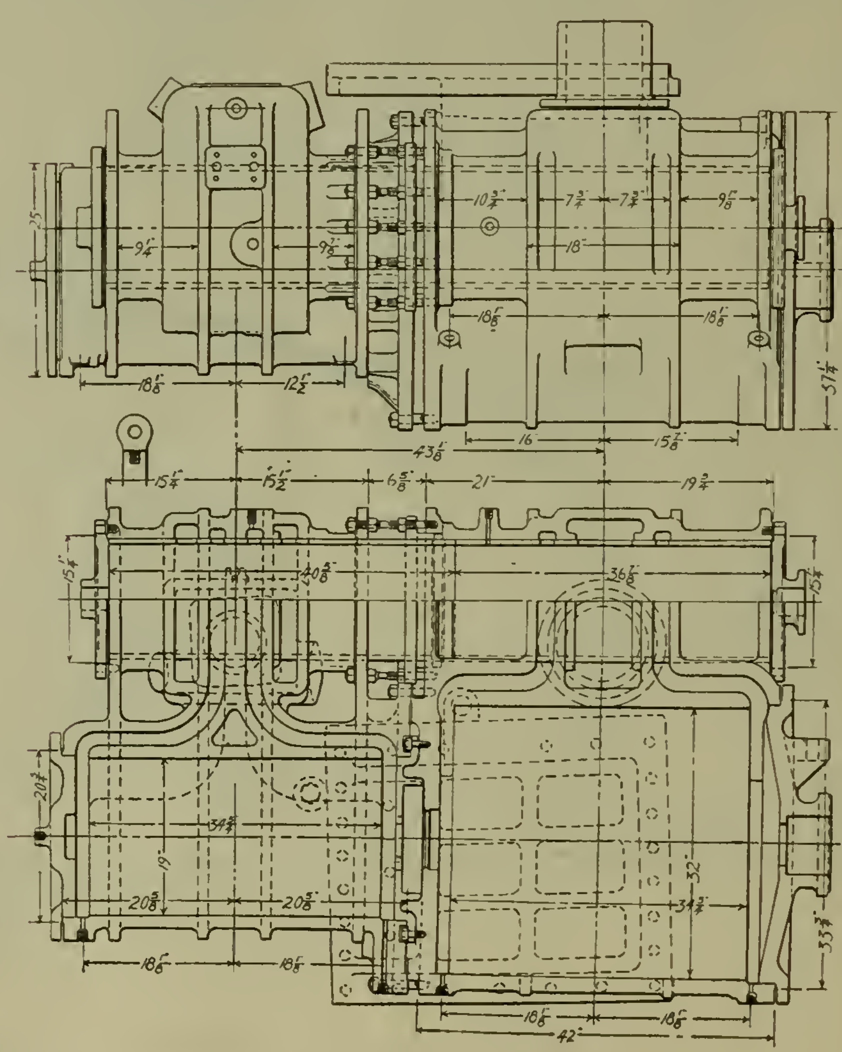


Heads between High and Low Pressure Cylinders.

Truck wheels, diameter, trailing	40 ins.
Journals, driving axle, size, main	11 ins. by 12 ins.
Journals, driving axle, size, others	10 ins. by 12 ins.
Journals, driving axle, size, first	6½ by 10½ ins.
Journals, truck axle, size, trailing	7½ by 12 ins.
Cylinders, diameter	19 ins. and 32 ins.
Piston stroke	32 ins.
Valves, kind of	Balanced piston
Boiler, type of	Extended wagon top
Boiler, working steam pressure	225 lbs.
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	⅞ and 15-16 ins.
Boiler, diameter of barrel	78¾ ins.
Thickness of tube sheet	9-16 in.
Crown sheet stayed with	Radial stays
Dome, diameter	31½ ins.
Firebox, length	108 ins.
Firebox, width	78 ins.
Firebox, depth, front	80¼ ins.
Firebox, depth, back	78¼ ins.
Firebox, material	Steel
Firebox, thickness of side and back sheets	⅜ in.
Firebox, water space	back 4 ins., front 4½ ins., sides 5 ins.
Tubes, number	391
Tubes, material	Iron
Tubes, outside diameter	2¼ ins.



Saddle Casting.



Cylinder Castings.

Santa Fe Freight Locomotive.

Tubes, length over sheets	20 ft.
Smokebox, diameter	80 ins.
Smokebox, length	94½ ins.
Tender.	
Type	Hopper water bottom
Tank capacity for water	8500 gallons
Coal capacity	10 tons
Type of underframe	Steel
Diameter of truck wheels	34¼ ins.
Diameter and length of axle journals	5½ by 10 ins.

Strength of Locomotive Steam Chests

By O. W. Bodler

IN looking over older engines it is found that a large number of plain rectangular section steam chests are in use. This fact shows that they were strong enough for the lower steam pressures, but as higher pressures were put into service stronger sections were found necessary. This was generally accomplished by the addition of ribs on the outside. When these failed under the higher pressures, theoretical calculations showed that the fiber stresses were too high.

In calculating the strength of steam chests there is one force that cannot be accurately figured. This is the amount held by the friction of the cover and cylinder casting. This can be omitted and a comparison made of chests that have been breaking and those that did not break. Omitting the friction of the cover and cylinder, the side of a steam chest can be taken as a beam uniformly loaded with both ends solid. This will bring the maximum bending moment at O, Fig. 1. This is borne out in practice by the chests usually breaking at the corners.

For this form of beam

$$M = \frac{W\,l}{12}$$

$$f = \frac{M\,e}{I}$$

M = max. bending moment.
l = length of side in inches.
W = total load.
= boiler pressure × area of side.
f = fiber stress per square inch.
e = distance of neutral axis from outer edge in inches.
I = moment of inertia.

Figure 2 is an example of a form of steam chest which has been in service for some time and which gave considerable trouble in breaking.

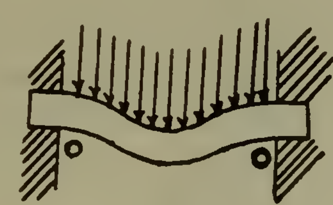


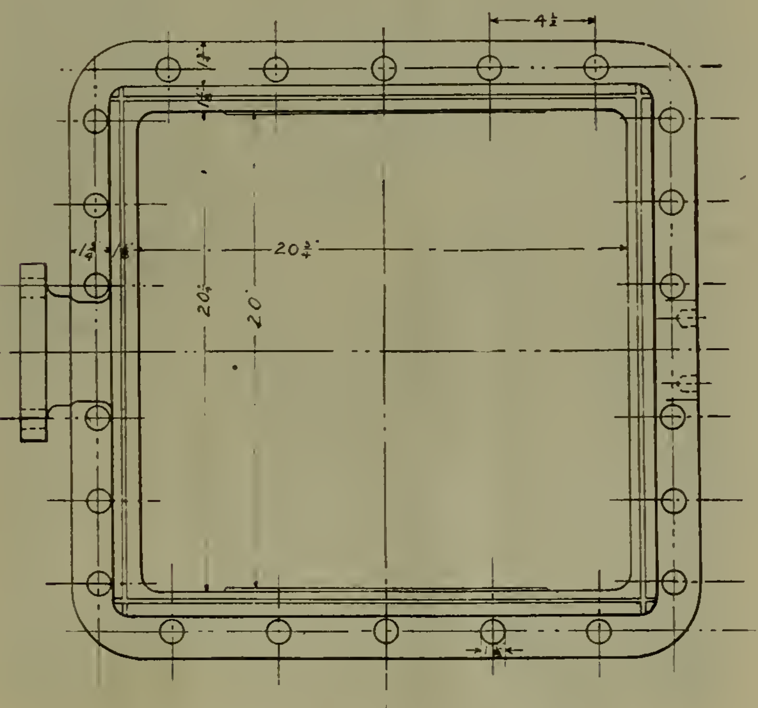
FIG. 1.

Steam pressure, 190 lbs.; length of side, 20¾ ins.; height, 7⅝ ins.; I = 5.735; e = 1.982.

$$W = 7\tfrac{5}{8} \times 20\tfrac{3}{4} \times 190 = 30067.$$

$$M = \frac{30067 \times 20\tfrac{3}{4}}{12} = 51991.$$

$$f = \frac{51991 \times 1.982}{5.735} = 17967.$$



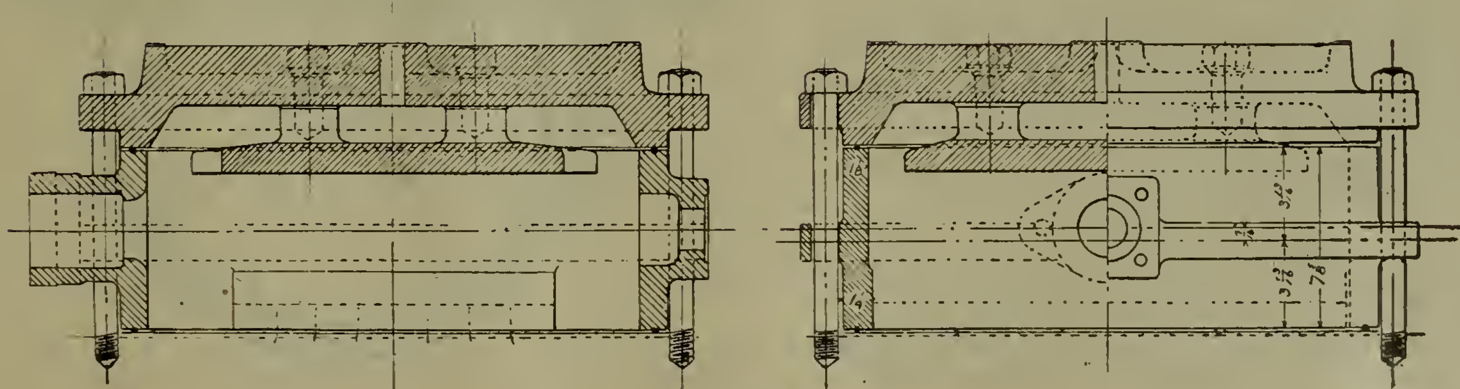


FIG. 2.

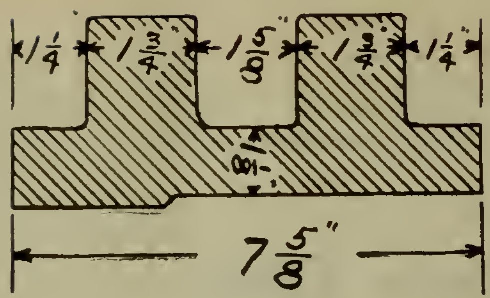


FIG. 3.

This could be strengthened by adding another rib as Fig. 3. I = 9.811; e = 1.715.

$$f = \frac{51991 \times 1.715}{9.811} = 9150.$$

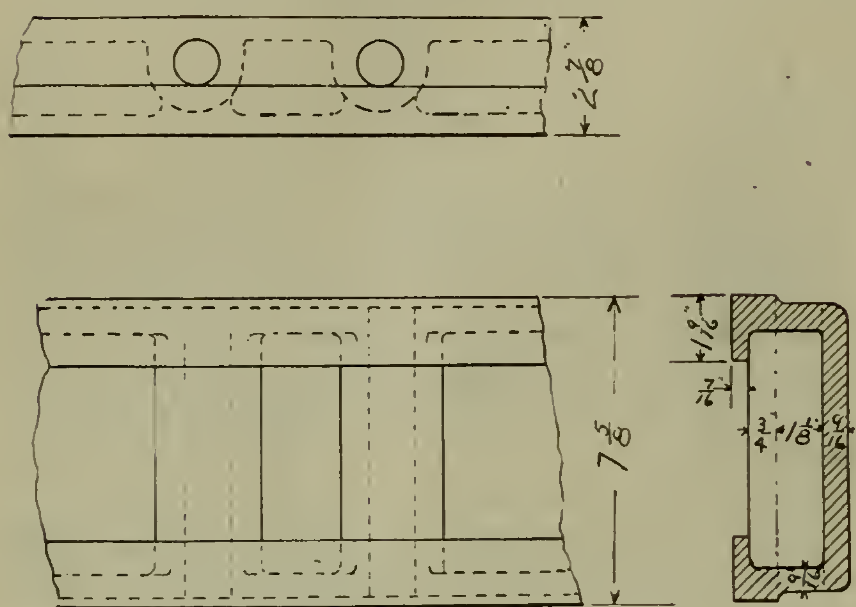


FIG. 4.

Or it could be made like Fig. 4 which puts the greatest amount of metal in tension and would therefore be the better chest.

I = 7.2; e = 1.03.

$$f = \frac{51991 \times 1.03}{7.2} = 7500.$$

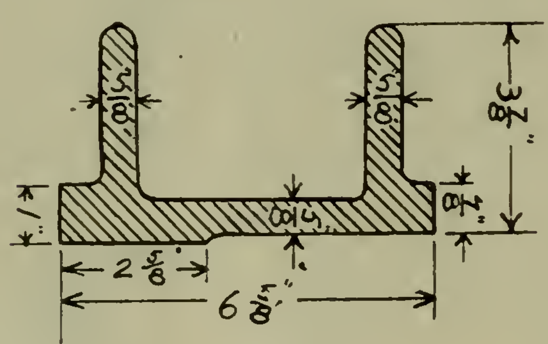


FIG. 5.

Fig. 5 is a section of a cast steel chest which has been in service for four years and none has broken. I = 7.656; e = 2.315; M = 47500.

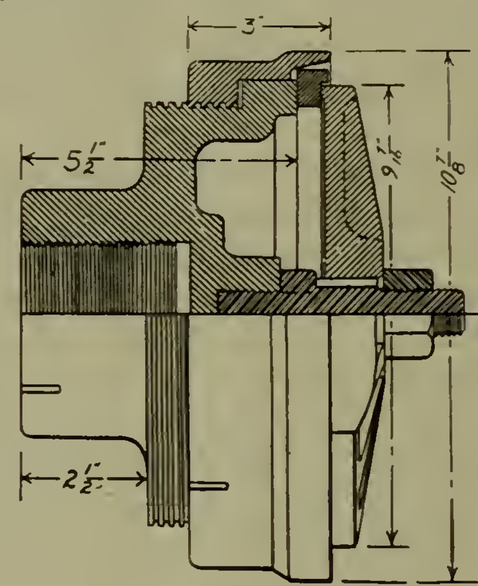
$$f = \frac{47500 \times 2.315}{7.656} = 14350.$$

The cast steel chest is evidently the best chest to use, weighing only a little more than half what Fig. 3 and Fig. 4 do. In replacing old chests with a form like Fig. 4 it does not allow any lagging to be used unless a new steam chest casing is used.

By checking a large number of different designs in service, a fiber stress of about 9,000 pounds per square inch for cast iron and 15,000 pounds per square inch for cast steel was found to be a safe limit.

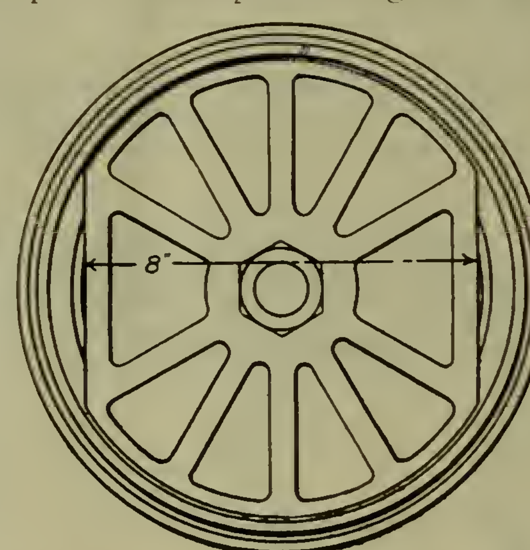
Chuck for Truing Piston Packing

THE accompanying line drawings illustrate a clever device for turning up a piston packing ring equally throughout its circumference, after the ring has been cut. The usual practice is to compress the ends on each side of the cut, clamping them together while the ring is being turned up. It is readily seen that compressing the ends does not affect the entire ring and after turning, the ring will appear in an eccentric form.



CHUCK FOR TRUING PISTON PACKING—PARTIAL SECTION.

The chuck herewith presented is placed on the spindle of the lathe. A ring which has been turned to a diameter ⅛ in. greater than that of the cylinder to which it is to be applied and from which a section 5-32 in. thick has been cut at an angle of 45 degrees, is placed in the chuck and held lightly between the outside plate and the body of the chuck, pressure being applied by the nut shown. The outside ring of the chuck, shown 3 inches wide, is screwed up with a spanner wrench, its inner beveled edge compressing the packing ring equally throughout so that its diameter is the same at any diagonal. The nut is then tightened up to exert a pressure against the plate suffi-



CHUCK FOR TRUING PISTON PACKING—ELEVATION.

cient to hold the packing ring in position. The outside ring is then run back out of the way and the packing is turned up to the desired final diameter.

To remove the packing, the nut is loosened and the ring lifted out.

This device is in successful operation at the Grand Crossing, Wisconsin, shop of the Chicago, Burlington and Quincy Railway, having been designed and patented by Mr. John Rusche, general foreman, to whom we are indebted for the illustrations presented.

The North-West Railway Club

By T. W. Flannagan, Secretary

DURING the early part of the year 1888 a number of gentlemen connected with the mechanical departments of northwestern railroads had occasional and informal talks in regard to organizing a railroad club, with headquarters in St. Paul, and under date of July 12, 1888, The Northwestern Railroader, a paper then published in the interest of railroads, having offices in St. Paul and Minneapolis and edited by Mr. Harry P. Robinson, issued a circular which they sent out to thirty gentlemen, who it was thought would be interested in

Mr. David Van Alstyne, President of the North-West Railway Club.

the organization of such a club. This circular asked the following questions:

First—"Whether you approve of the organization of the North-West Railroad Club," and

Second—"Whether the club can count upon your membership and support."

The answers to this circular were satisfactory with but very few exceptions.

There was considerable delay before sending out a second circular, which was dated "Minneapolis, Nov. 23, 1888," announcing that a meeting of the heads of mechanical departments of the northwestern roads would be held at the Ryan Hotel, in St. Paul, at 8 p. m., on Saturday, December 1, to organize the North-West Railroad Club. At that meeting the first step was taken towards the formation of the North-West Railroad Club. The meeting was called in room 119 of the Ryan Hotel. Mr. W. T. Small of the N. P. R. R. was made temporary chairman and Mr. H. P. Robinson of the Northwestern Railroader, temporary secretary.

On motion of Mr. Matt Ellis, of the C., St. P., M. & O. Ry., it was then voted that the gentlemen present should organize themselves into an association to be known as the North-West Railroad Club, and that all gentlemen then present, to the number of about fifteen. and such others as had expressed their intention of doing so but had been unavoidably prevented from being present, should be charter members.

On motion of Mr. J. O. Pattee, the chairman appointed a committee on constitution and by-laws, consisting of Mr. J. O. Pattee, Mr. C. F. Ward and Mr. Matt Ellis. A committee on finance and a selection of of rooms was then appointed as follows: Messrs. W. T. Reed, J. Taylor and G. F. Wilson.

These two committees were then instructed to report at the next meeting, which was to be held two weeks from that date. It was finally voted, on a motion made by Mr. Ward, that the regular date of meeting be the fifth day of each month, except when the fifth would fall on Sunday the meeting should be held on the fourth.

In accordance with the resolutions passed at this meeting, the committee on constitution and by-laws met at the Ryan Hotel, St. Paul, on Saturday, December 8, and drafted a constitution and by-laws to be recommended for adoption at the regular meeting, which was held on Saturday, December 15, on which date the North-West Railroad Club was permanently organized and adopted the constitution and by-laws which had been prepared by the committee.

The temporary president, Mr. W. T. Small, not being present, Mr. W. T. Reed was elected to preside over the meeting. After the adoption of the constitution and by-laws the meeting proceeded to elect officers for the ensuing year, which was done by ballot without nominations. The officers elected were as follows:

President—W. T. Small, superintendent M. P. & R. S., N. P. R. R.

First Vice President—W. T. Reed, superintendent M. P. & R. S., C. St. P. & K. C. Ry.

Second Vice President—G. F. Wilson, M. M., M. & St. L. Ry.

Secretary—H. P. Robinson, editor of the Northwestern Railroader.

Treasurer—H. L. Preston, M. C. B., St. P. M. & O. Ry.

Mr. W. T. Reed, of the committee on selection of rooms, reported that the club could have the use of the directors' room at the Union Depot, St. Paul, for their meetings free of charge.

The first subject for discussion at the next regular meeting was proposed by Mr. C. F. Ward, and was as follows: "Snow Plows and Flangers—The Best Form and Manner of Applying and Operating."

The meeting then adjourned to meet in the directors' room, Union Depot, St. Paul, at 7:30 p. m., January 5, 1889.

The following gentlemen were present at this meeting: W. T. Reed, C., St. P. & K. C. Ry.; C. F. Ward, St. P. & D. R. R.; Matt Ellis, C., St. P. M. & O. Ry.; T. A. Fraser, M. St. P. & S. Ste. M. Ry.; C. E. Brunson, Union Depot Company; G. F. Wilson, M. & St. L. Ry.; A. Bardsley, N. P. R. R.; A. F. Priest, Eastern Railway of Minnesota; Wm. McIntosh, C. & N. W. Ry.

Besides the gentlemen who were present at the first regular meeting, Messrs. J. C. Barber, E. A. Wescott, H. S. Bryan and J. O. Pattee were closely identified with the formation and early history of the club. The club was conducted for a number of years according to the original organization, the membership consisting solely of mechanical department officials. The constitution was amended in 1891, admitting to membership all railway officials and persons having charge of the design, construction or repair of railway rolling stock, or any department pertaining thereto; also editors and associate editors of the railway press. Persons connected with any house or company manufacturing or dealing in railroad supplies were at that time admitted to associate membership. In April, 1895, the constitution was changed, transferring all names at that time on the associate list to the active list of the club. Commencing with a few charter members, the club has now an active membership of 377. The meetings of the club are held each month during the year, except during the months of June, July and August, meeting alternately in Minneapolis and St. Paul.

Among the past presidents of the club may be mentioned the following names: J. C. Barber, E. A. Williams, superintendent of rolling stock, Canadian Pacific Railway; G. D. Brooke, superintendent motive power, Minneapolis, St. Louis & Iowa Central Railroad; Tracy Lyon, assistant general manager Chicago Great Western Railway; T. A. Foque, mechanical superintendent M., St. P. & S. Ste. M. Ry.; D. Van Alstyne, superintendent motive power Chicago & Great Western Railway.

Composite Gondola Cars of the Chicago, Burlington & Quincy Ry

THE Chicago, Burlington & Quincy Railway are now receiving the first of a lot of one thousand steel coal cars from the Cambria Steel Co., and the first of a lot of the same number of composite cars from the Standard Steel Car Co. The entire steel cars are the first of such construction received by the "Burlington." Due to lack of space, we are unable to include the details in this issue. The principal dimensions are as follows: Capacity, 100,000 lbs., with a light weight of 38,000 lbs.; inside length, 40 ft.; width, 9 ft. 6 ins.; height, 4 ft. 3¼ ins.

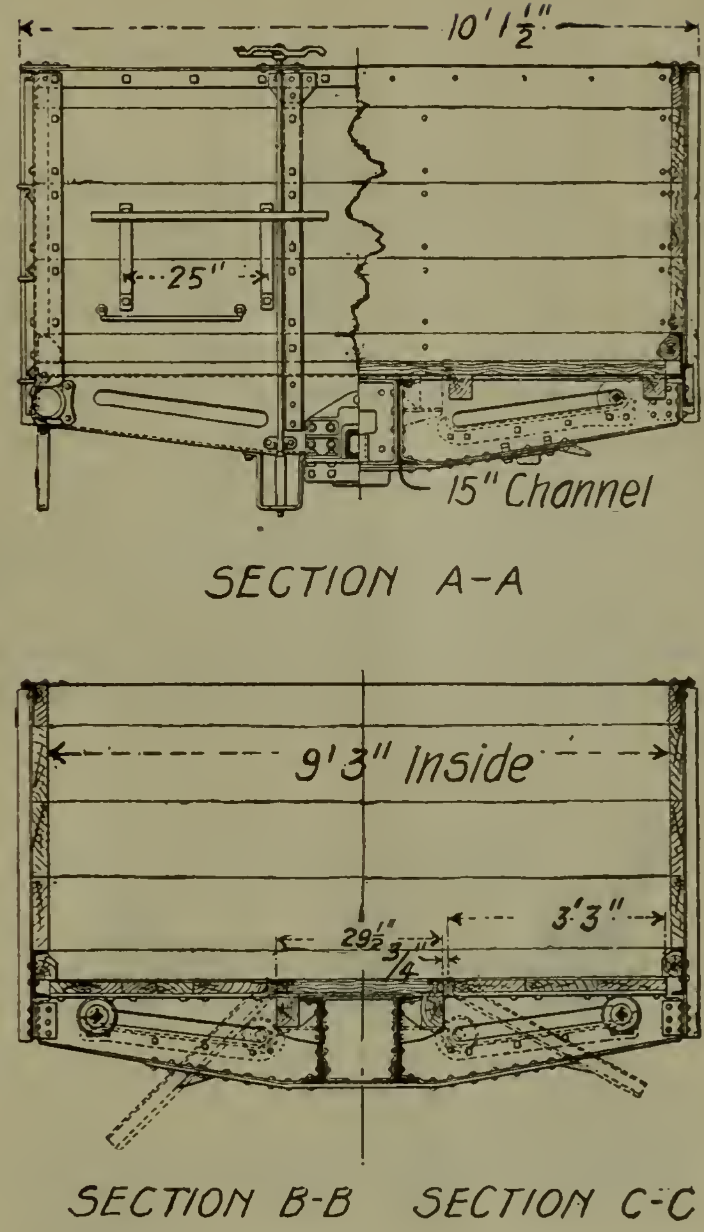
The details of construction of the composite cars are presented herewith: The underframes are made of structural and pressed steel shapes and the sides and ends of the cars are of wood bolted to the steel stakes, posts, braces and counter braces. When the doors are closed the floor is level and the cars can be used in the same manner as ordinary gondolas, there being no obstructions or irregularities in the floor to interfere with the use of of shovels. The cars have the following general dimensions: Length over end castings, 41 ft. 2¼ ins.; inside length, 40 ft.; width over side stakes, 10 ft. 1½ ins.; inside width, 9 ft. 3 ins.; height to top of brake wheel, 8 ft. 9ins.; inside height, 4 ft. 3⅞ ins.; height of floor above rail, 4 ft. ½ in.; height of center of drawbar above rail, 2 ft. 10½ ins.; center to center of trucks, 29 ft. 2¼ ins.

The side sills are 8-in. steel channels placed above the line of the floor with the flanges turned inward. The sills are riveted through the back to the stakes, which are in turn riveted to the transverse diaphragms by means of connection angles. The cross beam and side sill connection angles are 3½ ins. x 3 ins. x 5-16 in. and the bolster and side sill angles are 6 ins. x 3½ ins. x ⅜ in. at the corners. The backs of the side sills are riveted to the corner posts. The corner posts are also riveted to a short channel section, the upper flange of which is riveted to the lower flange of the sill. The end sills are connected to the side sills through the flange of the corner post which is riveted to the short channel, as mentioned above. The corner is also additionally strengthened by the push pole corner iron. The side sills are backed up by 4-in. x 4½-in. timbers held in place by bolts. The upper inside edges of these timbers are chamfered and the bottom side of the timbers serves as a stop for the drop bottom doors, as shown on the cross section of the car.

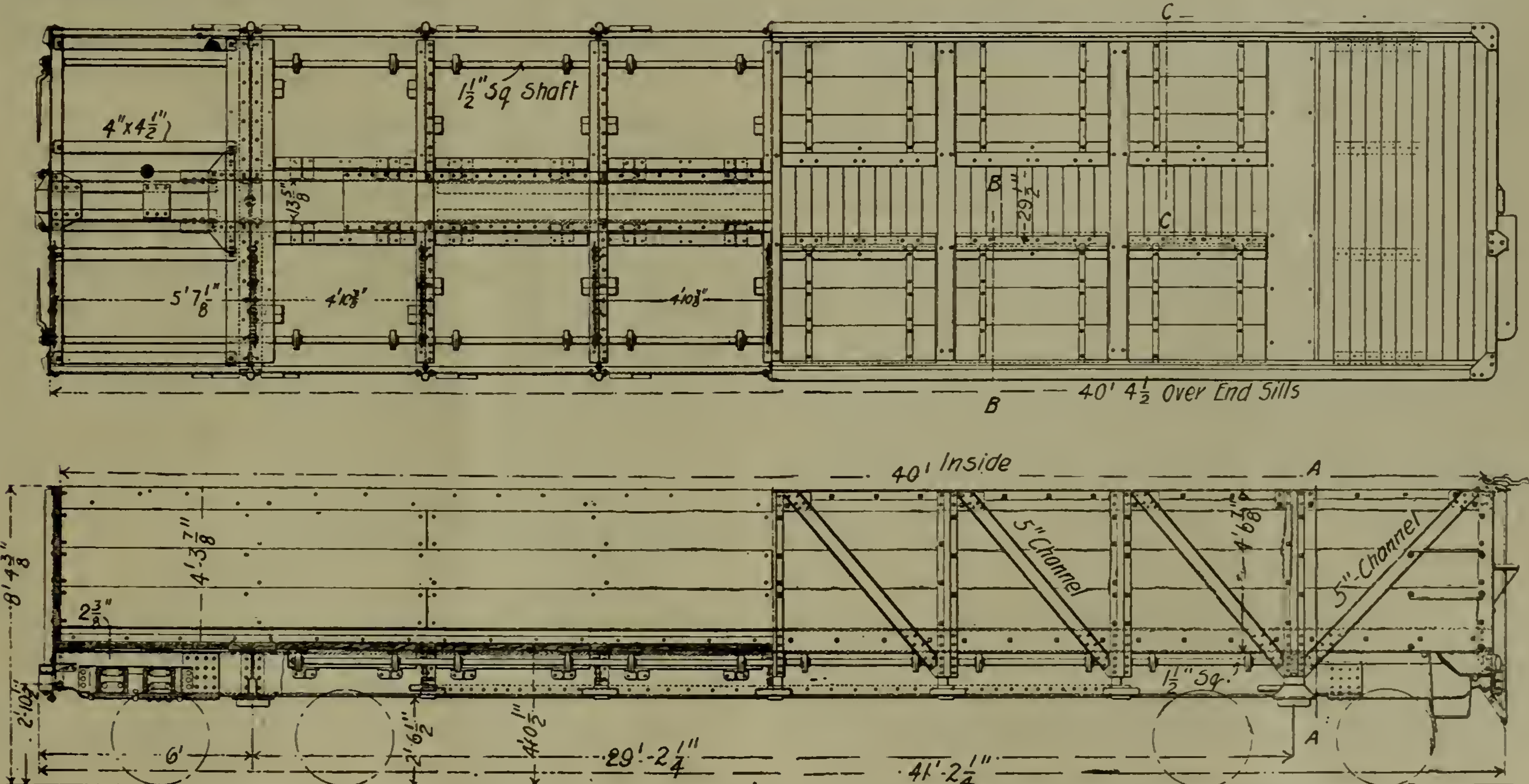
The center sills are two 15-in. channels, spaced 13⅝ ins. apart, with flanges turned outward. They are continuous only between body bolsters and have a top covering plate 24 ft. long at the central portion. The bottom flanges of the center channels are reinforced for a length of 18 ft. 10 ins. by angle irons 4 by 4 7-16 ins., riveted on the inside. The center sills are stiffened between backs of channels by pressed steel fillers at body bolsters, which are double and placed back to back. There are also single stiffening fillers ¼ in. thick placed 9 ft. 8¾ ins. from body bolsters. The pressed draft sills, ⅜ by 16 ins., are flanged with top flange out and bottom flange in and these form also the center sills between body bolster and end sill. Cross bearers are riveted between the side and center sills and these are spaced 4 ft. 10⅜-in. centers. These cross bearers as well as the end sills are slotted 2½ by 30 ins. for the travel of the dumping shafts which extends the whole length of the car on each side. The web fillers of the cross bearers are pressed steel ¼ in. thick and the top cover plate ⅜ by 6 ins. and bottom tieplate 7-16 by 5 ins. The body bolster is built up in a similar manner with double pressed steel web fillers 5-16 in. thick placed back to back, and on each side of the center sills. The top cover plate for body bolster is ⅝ by 16 ins., and the bottom tieplate is ⅝ by 14 for a length of 3 ft. at center and tapered from there to 7½ ins. wide at the ends.

The end sills are pressed steel channels 8 9-16 ins. deep at ends and 13 13-16 ins. deep at the center. The total length of each sill is 9 ft. 6½ ins. and the flanges are 4 ins. wide. The end sill flanges fit around the end of the draft sill and a rigid connection is made by means of vertical connecting angles and gusset plates.

The side and end construction of the car body is very

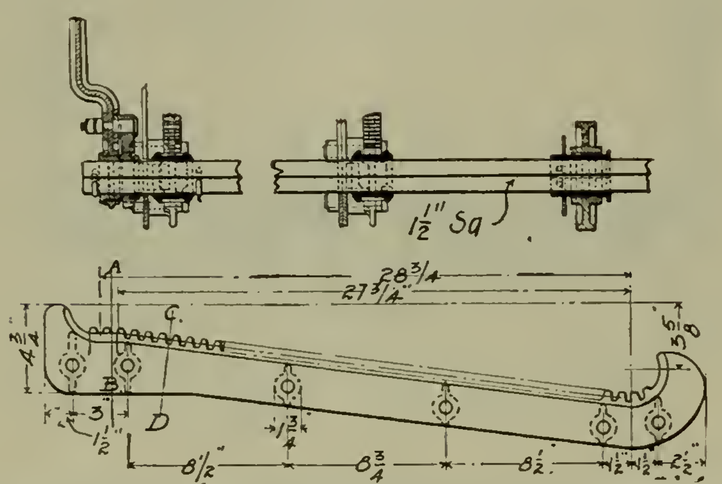


Composite Gondola Cars of the C., B. & Q. Ry.—End Elevation.



Composite Gondola Cars of the C., B. & Q. Ry.—Plan and Side Elevation.

strong. The stakes are semi-circular in section with flanges, through which pass bolts for holding the 2¼ ins. thick wooden sides. Each panel between the stakes is braced by a 5-in. channel and each end panel is similarly counterbraced. A 3-in. x 3½-in. angle forms the upper rail of the side. The rail, braces and stakes are joined together by gusset plates which, together wth the rigid connections between the stakes and cross beams, gives a strong trussed side construction. The end posts are 3-in. x 3-in. angles bolted to the wooden ends and riveted to the rail and end sill. The corner posts are 5-in. x. 5-in. pressed steel angles. The wooden floor of the car is 2⅜ ins. thick and between the body bolsters and end sills is supported by four 4½-in x 4-in. nailing strips. The portion of the floor over the center sill and between the body bolsters consists of short transverse strips held down by metal straps bolted through 4-in. x 6-in. timbers supported from the center sill by brackets. The hinges of the drop doors are also fastened to these timbers as shown.



Composite Gondola Cars of the C., B. & Q. Ry.—Details of Dump-Door Mechanism.

There is a series of six inside dump doors on each side of the car between the body bolsters, all of which operate simultaneously by the Caswell mechanism. The patents covering this arrangement are owned by the Caswell Car Co., of Chicago. To operate the mechanism two shafts, 1½ in. square, extend the entire length of the car, one on either side, the ends of each shaft being provided with a handle for revolving it. In order to lock the shaft in any position, a dog is attached to each handle. On the web of each cross bearer and at the lower edge of each oblong slot is riveted a malleable iron rack, and a small pinion on the square shaft gears into this rack. Under each door are two rollers which revolve on split bushings on the square shaft. These rollers are in a position furthest removed from the hinge center when the door is closed. When the square shaft is revolved the pinion on it travels along the rack toward the center of the car and the shaft with the supporting rollers is carried along in that direction, the door gradually opening in until the rollers reach the inner end of the slot and the limit of door opening is reached. The doors are closed by a reverse motion and the dog on end lever secures them in this position.

Legal Supervision of Passenger Car Construction

THE attention of railway men and car builders is directed to the following bill now before the New York state legislature:

Subdivision 1. That from and after July 1, 1904, every new sleeping car which is to be used in this state shall be constructed and equipped in accordance with the following requirements: The exterior shall be sheathed with metal, and the interior lined with metal or other non-combustible material. All woodwork, fabric or other material used in construction, decoration, fittings or otherwise, shall be subjected to such treatment or process as will make it non-combustible. The lighting shall be by a method or process other than kerosene or gas. No stove or furnace shall be kept inside or upon or shall be suspended from such cars. Upper berths shall not be hinged to the ceiling or sides of such cars. Trucks and wheels of such cars shall be of the Master Car Builders' type and standard. The brakes on all such cars shall be of the kind or description generally known as quick-action brakes. All steam valves shall be so located that they may be operated from the platforms of such cars. The platforms and ends of all such cars shall be constructed in the manner best calculated to render the cars non-telescopable.

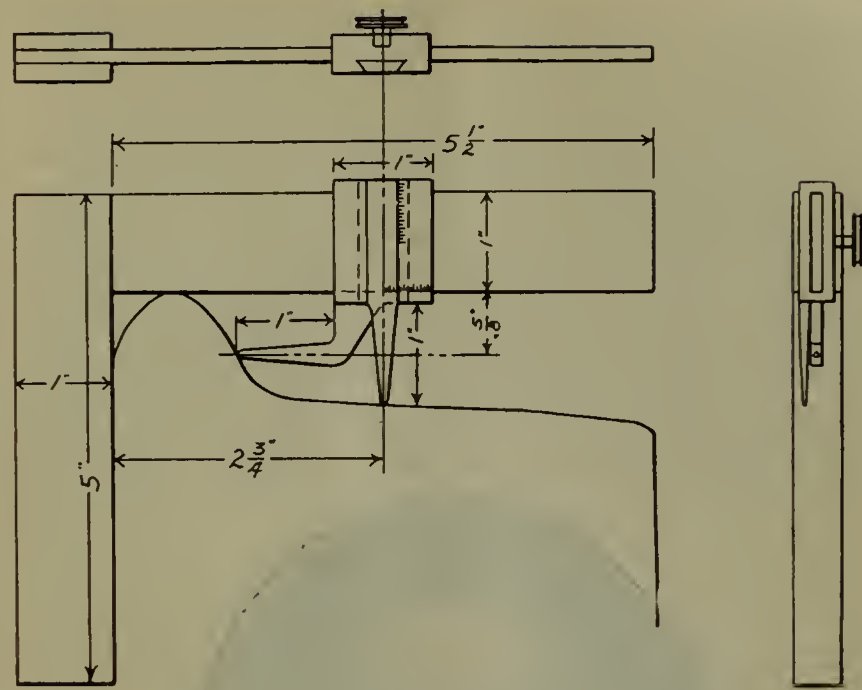
Subdivision 2. That from and after July 1, 1904, no new sleeping cars shall be used in this state until the Board of Railroad Commissioners shall have made and filed with its secretary a certificate that all of the requirements set forth in subdivision 1 hereof have been complied with in the construction of such cars.

Subdivision 3. That from and after July 1, 1904, there shall be constructed and equipped in accordance with the requirements of subdivision 1 hereof at least tewnty (20) per centum of all sleeping cars used by every company operating a line of railroad within the state,, and it shall be unlawful for any company operating a line of railroad within this state to use or haul in any year a greater percentage of sleeping cars unequipped and not constructed in accordance with all the requirements of subdivision 1 hereof than herein above specified—to wit: during the year ending July 1, 1905, eighty per centum thereof; during the year ending July 1, 1906, sixty per centum thereof; during the year ending July 1, 1907, forty per centum thereof; during the year ending July 1, 1908, twenty per centum thereof. On and after July 1, 1909, it shall be unlawful for any company operating a railroad line within the State to use or haul any sleeping car that is not constructed and equipped in accordance with the provisions of subdivision 1 hereof.

Subdivision 4. That on or before September 1, 1904, every company operating a line of railroad within this State shall file with the Board of Railroad Commissioners a verified statement of the number of sleeping cars used or hauled by it constructed and equipped in accordance with the requirements of subdivision 1 hereof, and shall thereafter annually in the month of September for the ensuing five years file with said board a verified report of the number of sleeping cars used or hauled by it during the preceding year constructed and equipped, and the number not constructed and equipped in accordance with the requirements of subdivision 1 hereof.

Subdivision 5. That any railroad or other company using, hauling or permitting to be used or hauled on its line or lines sleeping cars in violation of the provisions of this act shall be liable to a penalty of one thousand dollars for each car so used or hauled or permitted to be so used or hauled, to be recovered in an action to be brought by the attorney-general, in the name of the people, in any judicial district, and it shall be the duty of the Board of Railroad Commissioners of the State to notify the attorney-general of all such violations coming to its notice.

Tire Gauge



TIRE GAUGE.

The drawing reproduced herewith illustrates a gauge for measuring the depth of wear of tread and flange of locomotive driving wheel tires, designed by Mr. E. A. Averill.

The Master Steam Boiler Makers' Association

Second Annual Convention

THE second annual convention of the Master Steam Boiler Makers' Association was called to order by President T. C. Best, Wednesday, October 7, 1903, at the Palmer House, Chicago. The meeting was opened with a prayer, led by the Rev. William Colledge. In the course of opening events the visiting members were entertained several times by selections rendered by the Weber Quartet. The association was addressed by Mr. Howard S. Taylor, prosecuting attorney of the city of Chicago, who welcomed the gentlemen of the convention in behalf of Mayor Harrison and the city.

PRESIDENT'S ADDRESS.

In opening his address Mr. Best laid especial stress upon the necessity and importance of an association organized for the education of fellow craftsmen, and the official organ published by the association to aid in the uplifting of those interested in the construction of boilers, in order that they may apply scientific rules to their work. Continuing in the same strain he further advocated the assemblage of men to exchange opinions and thereby assist one another in the promotion of scientific boiler construction. As the boiler is the origin of power regardless of its being attached to a locomotive, steamship, power house or what not, the same rules govern the construction of all, and the scope of the association is therefore broad, general and sufficiently comprehensive to embrace all classes of boiler work and men interested therein, so that this organization should be alone sufficient to cover the entire existing field.

In view of the lives and property saved by the careful observation of rules governing boiler design, construction and operation no further argument need be offered to endorse the work of the association in the education of men who build boilers, as by this method alone can the number of disasters in the past be reduced in the future. In consideration of the necessity to observe defects in order to prevent explosions, Mr. Best, in the most straightforward manner, advised the members that where a man inspecting a boiler after an explosion is unable to give the true and reasonable cause for the explosion, he should not hesitate to call for a competent man who is capable of explaining the reason of the catastrophe. This suggestion was given, in view of the fact that by arriving at the true cause of an explosion future boilers may be designed against the weaknesses which have resulted disastrously in the past.

REPORT OF SECRETARY AND TREASURER.

The secretary's and treasurer's reports showed the membership of the association to have increased from a total number of 48 last year to a present number of 105 active members and 5 associate members, and a balance in the treasury of $677.90. In the secretary's report was included the advice that the executive committee shall consist of 9 members, who are to be elected at each convention.

REPORT OF COMMITTEES.

Deterioration of Material.

The committee appointed at last year's convention to ascertain the percentage of deterioration of material in steam boilers advised that in their opinion it is impossible to make an intelligent report at this time on account of the wide range of boilers and the large difference in their locations. The same rules cannot apply in all cases on account of the various solids and impurities appearing in the feed water of different localities. For these reasons it was suggested that a map be made, and certain localities indicated thereon from which samples of water should be selected and careful analyses made. Further than this, all information should be gathered giving other causes for the deterioration of material in boilers and such data arranged to appear in a report, together with the water analyses. In order that this matter should be thoroughly investigated the committee requested the time limit to be extended until the necessary data could be gathered and consistently arranged.

Mr. T. C. Best, President of the Master Steam Boiler Makers' Association.

DISCUSSION OF QUESTIONS.

Mr. John H. Smythe, foreman boiler maker of the Chicago and Alton Railroad, at Bloomington, Ill., was elected chairman of the meeting. In order to cover the many points worthy of consideration by members interested in the design, construction and operation of all types of boilers, 69 questions were selected, copies of which were forwarded to members for their consideration, before appearance at the convention. From this number 15 of the most important were selected and arranged for the programme of the occasion, each question being assigned to a member before opening the discussion. Upon the conclusion of these subjects such others were taken up which included points upon which any member desired information, derived from the experience of others.

Staybolt Holes.

The discussion of the question whether staybolt holes be drilled, punched or punched and reamed, was opened by Mr. T. A. Jameson, whose practice it is to punch a 9-16 inch hole in a sheet, which is then reamed out to fit the staybolt.

Bushing Staybolt Holes.

The consideration of the practice of bushing staybolt holes on the outside sheet and the most practical method of bushing them had been assigned to Mr. T. A. Jameson, whose remarks indicated that in his opinion it was not advisable to bush staybolt holes, believing that a large per cent of the holes could be bushed with safety; but it is more advisable to replace the old sheet with a new one. He directed attention to the fact that where care is used in removing the old staybolt without destroying the thread, the same size of bolt may be replaced in the original hole, thereby doing away with an enlargement of either the hole or staybolt. The practice of the Hicks Locomotive Works, explained by Mr. W. H. Drompp, is to use a brass bushing, tapping out the hole in the sheet from 1⅜ to 1½ inch, where 15-16 to 1 inch staybolt is to be used. Upon motion it was decided to be the sense of the convention that it is a safe practice to bush staybolt holes.

The Leakage of Tubes in the Bottom Center Rows of a Locomotive Boiler.

Mr. Stephen Christie, of St. Paul, Minn., presented a paper discussing a cause for tubes leaking in the bottom center rows more than in any other portion of the flue sheet in locomotive boilers, in which he attributes the cause to feed water and the opening of furnace doors; the feed water being the coolest, upon entering the boiler it falls to the bottom of the shell as it approaches the flue sheet. This comparatively cool water tends to cool and therefore contract the flue sheet, while the intense heat of the gases entering the flues tends to expand their ends, pushing the bead away from the flue sheet. As a remedy against the effect of the cool feed water, he offers the suggestion of placing a baffle plate within the shell, to distribute the feed water and divert its course away from the flue sheet, in order that entering feed water may attain the temperature of the boiler water before approaching the sheet. With regard to the opening of fire

Mr. George M. Clark, Secretary of the Master Steam Boiler Makers' Association.

doors, as the air rushing into the furnace is drawn quickly to the flue sheet the tendency is for this cooler air to contract the sheet. As the door is decidedly smaller than the area of the flue sheet and is located immediately opposite, it is natural to suppose that upon entering the furnace it will direct its course to the center of the sheet.

Crown Bar Braces.

A paper discussing the advisability of making crown bar braces tight or loose was prepared by Mr. F. A. Mayer of the Southern, at Atlanta, Ga. Mr. Mayer advocates applying such braces tight, with sufficient space in the hole of the brace to allow for the expansion of the firebox, believing that the firebox will expand upward from ⅛ to 3-16 of an inch, and if tight braces are applied without an oblong hole in the bottom of the braces, it will necessarily either bend the braces or break the brace bolts. The most satisfatcory method is to apply braces cold, which may be done very simply by getting the proper length of each brace and by making the brace 1-32 of an inch shorter, by which method a good driving fit may be had.In order to facilitate the removal of broken braces he advocates the addition of a lug at the lower end of the brace, the lug to be permanently attached to the crown bar and keyed to the lower end of the brace. Without such an arrangement it is a difficult and expensive matter to remove crown bar braces. Drawings illustrating this method were passed around among the members for their consideration, the two styles of braces being arranged side by side in order that they might be the more easily compared. After the discussion of crown bar braces, upon motion, the association put itself on record as recommending the best practice in arranging crown bar braces to locate an oblong hole on each end of the brace, including the lug as described by Mr. Mayer, further recommending a tight brace.

Back Head Brace.

The secretary read a paper by Mr. J. J. Fletcher of the Canadian Foundry Company, Toronto, Canada, relating to the question of applying flat ends of braces in order to place an equal shearing strain upon each rivet. After the consideration of formulæ for determining the stress applied to each rivet, he continued by advocating the application of braces in such a manner that they should be as direct as possible between the point supported and the side of the shell, reducing the angle formed between the brace and outside sheet to a minimum. The ideas advanced in Mr. Fletcher's paper and by the members entering the discussion were formed into a resolution adopted by the association to the effect that the shearing strain is equal on both rivets in such cases where one rivet is located back of the other, or where the rivets in the flat end are in line with the brace. The experience of those drawing up the resolution has been that in the majority of cases where braces have been known to fail, they have broken through the first rivet hole, due to the fact that the area of the section at this point is not sufficient to permit the tensile strength of the material to equal the shearing strength of the rivets. They further recommended the solid crow foot brace, when properly proportioned, to be the most satisfactory form.

The Bagging of Horizontal Tubular Boilers.

A short paper on this subject was read by Mr. J. H. Fahey, of J. I. Case & Co., in which he attributed the cause to the deposit of sediment contained in the feed water upon the fire sheet, causing an over heating of the plate at this point. Where no scale or other substance appears on the boiler to keep the water away from the sheet, he believes the cause to be due to some defect in the design. In order that sheets may be thoroughly covered by water at all times, he advocates drawing steam from more than one point, as drawing steam from one place tends to lift water from the bottom of the boiler. He further touched upon the subject of circulation and insufficient size of a boiler to perform definite work. The ensuing discussion centered largely upon the reasons for the bagging of clean boilers, and several experiences were exchanged mentioning reasons for the bagging of boilers at points thoroughly covered by water. Upon motion, the association passed a resolution attributing bagging of boilers to the formation of scale immediately over the grate bars, the hottest part of the boiler; the improper setting of the boiler furnace, causing it to be too low over the front ends of the grates, or the bridge wall and grates being too close to the bottom of the boiler; improper circulation and the over taxing of the capacity of the boiler.

The Grooving of Sheets.

A paper by Mr. Charles P. Patrick on the pitting of the shell of locomotive boilers is appropriate to the question relative to the grooving of sheets. The pitting and grooving of boilers is usually found in the bottom of the shell near the girth seams and just above the mud ring on the outside sheet. He attributes the cause to the chemical action of impurities within the water upon the material of the sheets. As a palliation he suggests the location of a blow-off cock in the belly of a locomotive boiler where it may be easily operated and often used. Continuing he states there are but two remedies, either purifying water before it enters the boiler, or so construct and manage the boiler as to prevent so far as practical the cause remaining.

Bulging of Front and Back Flue Sheets.

The discussion of this question was opened by Mr. Charles Miller, N. Y. C. & St. L. Railway, who attributes bulging to the constant strain on flues, an action which has a tendency to expand the sheet in the direction in which a slight bend might have occurred when the sheet was first placed in position. A similar cause was mentioned by others, who suggested the expansion of flues and the resetting of same from time to time, which tends to elongate the flue sheet by rolling flues, thus causing the flue sheet to bulge.

Strength of Rivets in Double Shear.

A motion was carried to appropriate a sufficient amount of money to test the strength of rivets in double shear, and a committee was appointed to make the necessary investigation and report to the association.

Water Space in Leg of Locomotive Boilers.

During the discussion consequent upon the introduction of the question to determine the proper amount of water space in the leg of a locomotive boiler, Mr. John H. Smythe related an interesting experience with some new wide firebox boilers, which were under his supervision. Trouble was experienced with these engines from the time that they were first placed in commission, due to leaky staybolts and cracking of sheets. Believing that the staybolts may have been improperly applied, he had a large number of them removed, examined and replaced, determining to his satisfaction that the cause was not due to the original application of the bolts. In order to obviate this difficulty he increased the water space three inches, by applying each side sheet in the form of a box patch. Since this change was made no trouble has been experienced with these boilers, and the arrangement herein described has proved entirely satisfactory in every way. This experience has led him to believe that what is more necessary than the large water space is sufficient space in which to permit the sheets to expand. While on this subject he displayed a board illustrating a firebox side sheet in reduced scale, in which he had indicated each staybolt by a small section punched from the side sheet. Each piece so obtained was taken from the immediate proximity of a staybolt and arranged on the board as in the sheet. By closely observing the appearance of the several specimens it was seen that the greatest occurrence of cracks appeared near the center of the sheets, showing that this location is the hottest.

Mr. F. A. Linderman of the Michigan Central Railway advocated a five-inch water space all around the firebox. It was finally decided to refer this subject to a committee, who should investigate the matter carefully, confer with others and decide upon a general size, which should be worked out in proportion to the other parts of the boiler.

Boiler Material.

Mr. H. L. Wratten of The S. Freeman & Sons Mfg. Co., Racine, Wis., presented an interesting paper upon the best material for the boiler, whether iron or steel, and the reocmmended tensile strength for the same. He opened his paper by advocating a careful consideration of the quality of material to be used, because of the variation in temperature to which it is subjected in boiler practice, and the strains which material must stand. That the material must be capable of bearing violent alterations of form without fracture is more vitally essential than strength, and lack of tenacity can be met by using more metal, but nothing can make amends for brittleness. Very great tenacity combined with ductility is the essential characteristic of all material used in the construction of steam boilers. Comparing the analyses of iron and steel, he showed that the best irons are more irregular and uncertain of composition than the best steels. For boiler plate the carbon should be kept below ¼ of .1 per cent and all other elements as low as possible. After comparison of the two materials, Mr. Wraten's paper advocated the use of steel as a better material for the construction of boilers. As ordinarily made steel is rarely as easily manipulated as iron, and when subjected to the ordinary operations of boiler making seldom exhibts as little loss of quality as the best irons. The tensile strength recommend by him is 50,000 lbs. to 60,000 per square inch.

Why Wagon Tops of Some Locomotives Crack.

In a paper from Mr. Charles P. Patrick, Newman, Ga., his experience described therein has been that with crown stayed boilers the wagon top sheets crack more than with radial stayed boilers, due to the strain on the wagon top sheet, caused by the movement of the firebox when heated and cooled. He accounts for this by the fact that radial stays not being so rigid as the crown staying give and bend more or less. As a remedy of this evil he suggests the use of a turn buckle in each sling stay, using four rows of such stays at the forward end of the crown sheet and advocating two longitudinal rows on each side of the center line of the boiler extending the full length of the firebox. The turn buckle is so designed that the upper end terminates in a hole ⅛ of an inch larger than the stay which passes through the same. The lower end of this stay terminates in a T head and the upper end is screwed into the wagon top sheet. The lower hole of the turn buckle is tapped with 12 threads per inch, into which the lower stay is screwed. The turn buckle is so located as to be above the water line, in order that impurities in the water may not form upon the buckle and so clog that it cannot be turned.

Why Staybolts Break.

A paper by Mr. D. G. Foley, Green Island, N. Y., was read by Mr. William Horsley, advancing a theory for broken staybolts, which caused a lively discussion. He advances the idea that expansion of inside firebox sheets is not as much as the outside sheets, and further believes the outside sheets to be much warmer than the sheets next to the fire. Upon the completion of the paper Mr. John Boyce, I. C. R. R., directed attention to the impracticability of such a statement, arguing that staybolts are usually found to break nearer the outside sheets, and as the staybolts have broken from continued vibration it is natural that they break nearer the end held rigid, which evidenced the fact that inside sheets expanded the greater amount, causing the inner ends of the bolts to vibrate through a greater distance than the outer ends. A number of other remarks along similar lines evinced the fact that the theory advanced by Mr. Foley was not favorably accepted by all of the members present. Continuing the staybolt question in a general manner, Mr. John H. Smythe advocated the use of flexible staybolts, expressing his opinion that such devices will finally make broken staybolts a thing of the past. His experience with these bolts has been very satisfactory, and in renewing staybolts he has put in a large number of the flexible type, applying them where the greatest strains occur, and not throughout the entire area of the sheets. Mr. William H. Drompp of the Hicks Locomotive Works mentioned an instance in which he placed 50 to 60 flexible staybolts in each corner of the side sheets of a firebox. It happened that three years later he had occasion to repair the same boiler and inspected the staybolts personally, finding that in that time but one of the flexible bolts had broken, attributing this failure to bad forging of the material.

Boiler Inspection.

Interesting papers were read by Mr. Joe Holloway, Los Angeles, Cal., and Mr. Stephen Christie, St. Paul, Minn., upon the training of a young boiler maker to become a boiler inspector, and upon the practice to be followed in making boiler inspections. In the main, both papers dealt with the selection of capable men careful to advance and educate themselves and whose experience has been large and varied, the advisability of the inspector being able to gain access to the most vital parts of boilers, his ability to so explain his work as to be understood by the average layman, the ability to judge by sound where it is impossible to view the parts, and a thorough understanding of boiler making and design.

ELECTION OF OFFICERS.

The following gentlemen were elected officers of the association: T. C. Best, president; W. M. Wilson, vice-president; George M. Clark, secretary; J. J. Boyce, treasurer. Executive Board: T. C. Best, W. M. Wilson, George M. Clark, J. J. Boyce.

NEXT PLACE OF MEETING.

St. Louis has been decided upon as the place of meeting for the 1904 convention.

AMONG THE SUPPLY MEN.

The Supply Men's Entertainment Committee providing the various theatrical and other entertainments consisted of:

Mr. Hogue, representing Shelby Steel Tube Co.
Mr. Kittoe, representing Jos. T. Ryerson & Son.
Mr. Finley, representing Scully Steel & Iron Co.
Mr. Chamberlain, representing A. M. Castle & Co.
Mr. Veitz, representing Crear-Adams & Co.

The following representatives were in attendance at the convention and contributed to the entertainment of the association:

Shelby Steel Tube Co., Robert Spencer, O. D. Hogue.
Handan-Buck Mfg. Co., W. G. Fergus.
Jos. T. Ryerson & Son, J. S. Kittoe, J. T. Corbett.
Scully Steel & Iron Co., H. C. Finley, W. A. Roome.
Chicago Pneumatic Tool Co., Chas. Walker.
C. A. Thompson & Co., I. B. Keggler.
A. M. Cassell Co., Mr. Chamberlain.
Falls Hollow Staybolt Co., M. H. Jordan.
Philadelphia Pneumatic Tool Co., H. G. Hollingshead.
Ingersoll-Sargent Drill Co., W. H. McCutchen, M. W. Prischer.
C. Murphy Co., R. J. O'Neil.
Reliable Mfg. Co., Addison Boren.
A. W. Cadman Mfg. Co., J. F. Robinson.
J. Faessler Mfg. Co., J. W. Faessler.
Crear-Adams & Co., W. A. Veitz.
Sligo Iron & Steel Co., D. S. Decker.
Ewald Iron Co., Stephen Sullivan.

Sibley College of Mechanical Engineering, Cornell University

APPRECIATION of the thorough technical courses offered by Sibley College in the several branches of mechanical engineering, is evinced by the following from the American Machinist, October 8, 1903:

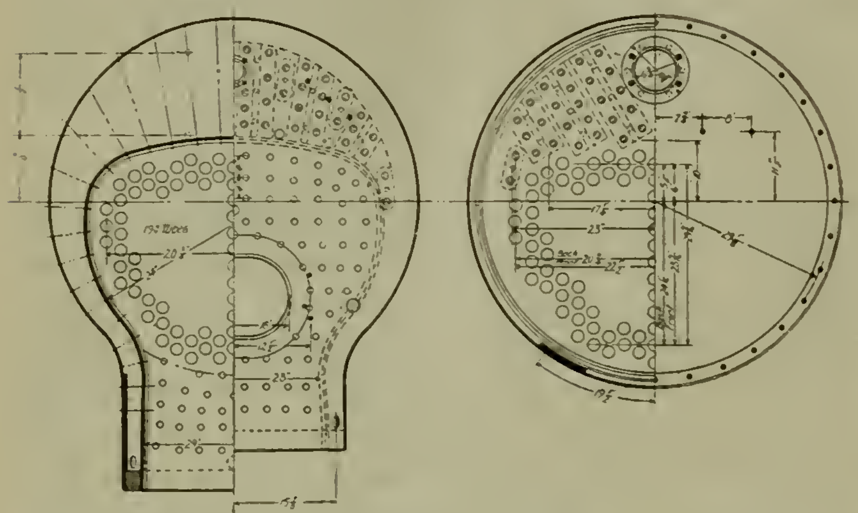
"In spite of the epidemic of typhoid at Cornell University last spring, the number of students entering the department of mechanical engineering is larger than ever and is in fact so large as to embarrass the authorities. The registration last year, the then largest in the history of the department, was, in the undergradute courses, 886 and about 900 all told. This year the total will probably exceed a thousand. Lecture and class rooms as well as laboratories, shops and teaching staff are inadequate, and the last is to be increased at once. Many of the classes are too large for the rooms provided and are compelled to make use of the recently completed auditorium. The embarrassment is not confined to the Sibley facility alone, as the instruction in science and mathematics is given in the general university provisions for those departments and they are correspondingly overcrowded with Sibley students. In physics the lectures are given in quadruplicate, and the plans for a new physical building which contemplated a lecture hall to seat 500 students must be revised. There is, however, a limit placed on such a lecture hall by the necessity for seeing the experiments clearly, and it is not thought practicable to provide a hall large enough to prevent the necessity for duplicating the lectures on physics.

"The situation illustrates the fact that institutions of learning are always poor. The Sibley department alone needs a quarter of a million dollars to provide needed facilities, while the university as a whole has plans matured which need a million for their realization. Unless funds can be found it is thought that the number of students must be definitely restricted another year."

Another pleasing testimonial is the gift of one thousand dollars toward the erection of a locomotive testing laboratory, from Mr. H. H. Vreeland, president of the Metropolitan Street Railway (New York City), and president of the New York Railroad Club.

Mogul Locomotives for Japan, Kiushiu Railway

SEVERAL 2-6-0 locomotives for the Kiushiu Railway of Japan, have recently been built by the Schenectady Works of the American Locomotive Company. A photograph of one of these engines is presented herewith together with several line drawings of the locomotive and boiler. Reference to these illustrations will show the machine to have been constructed along American lines, according to American design. The firebox and tubes, however, are contrary to American practice, the former being of copper plate, supported by copper staybolts, and the flues are of solid drawn brass. The fire brick arch is supported on angle irons. The engine and tender are supplied with both steam and hand brakes.



MOGUL LOCOMOTIVE FOR JAPAN—HORIZONTAL SECTIONS OF BOILER AND FIREBOX.

Determining the tractive effort by the usual formula in which the mean effective pressure is taken as 85 per cent of the boiler pressure, the engine is capable of exerting a tractive effort of 19700. The weight on drivers being 78,000 pounds, the ratio of adhesive weight to tractive effort is 3.96; the ratio of tractive effort to total heating surface is 16.45, and the ratio of total heating surface to grate area is 70.9.

The following table presents the general dimensions and details of construction:

General Dimensions.

Gauge	3 ft. 6 ins.
Fuel	Bituminous coal
Weight in working order	91,500 lbs.
Weight on drivers	78,000 lbs.
Weight engine and tender in working order	147,000 lbs.
Wheel base, driving	11 ft. 11 ins
Wheel base, rigid	11 ft. 11 ins.
Wheel base, total	19 ft. 5 ins.
Wheel base, total, engine and tender	39 ft. 11½ ins.

Cylinders.

Dameter of cylinders	17 ins.
Stroke of piston	24 ins.
Horizontal thickness of piston	5¼ ins.
Diameter of piston rod	3 ins.
Kind of piston packing	Plain rings.
Kind of piston rod packing	Jerome.
Size of steam ports	14 ins. x 1¼ ins.
Size of exhaust ports	14 ins. x 2½ ins.
Size of bridges	1 in.

Valves.

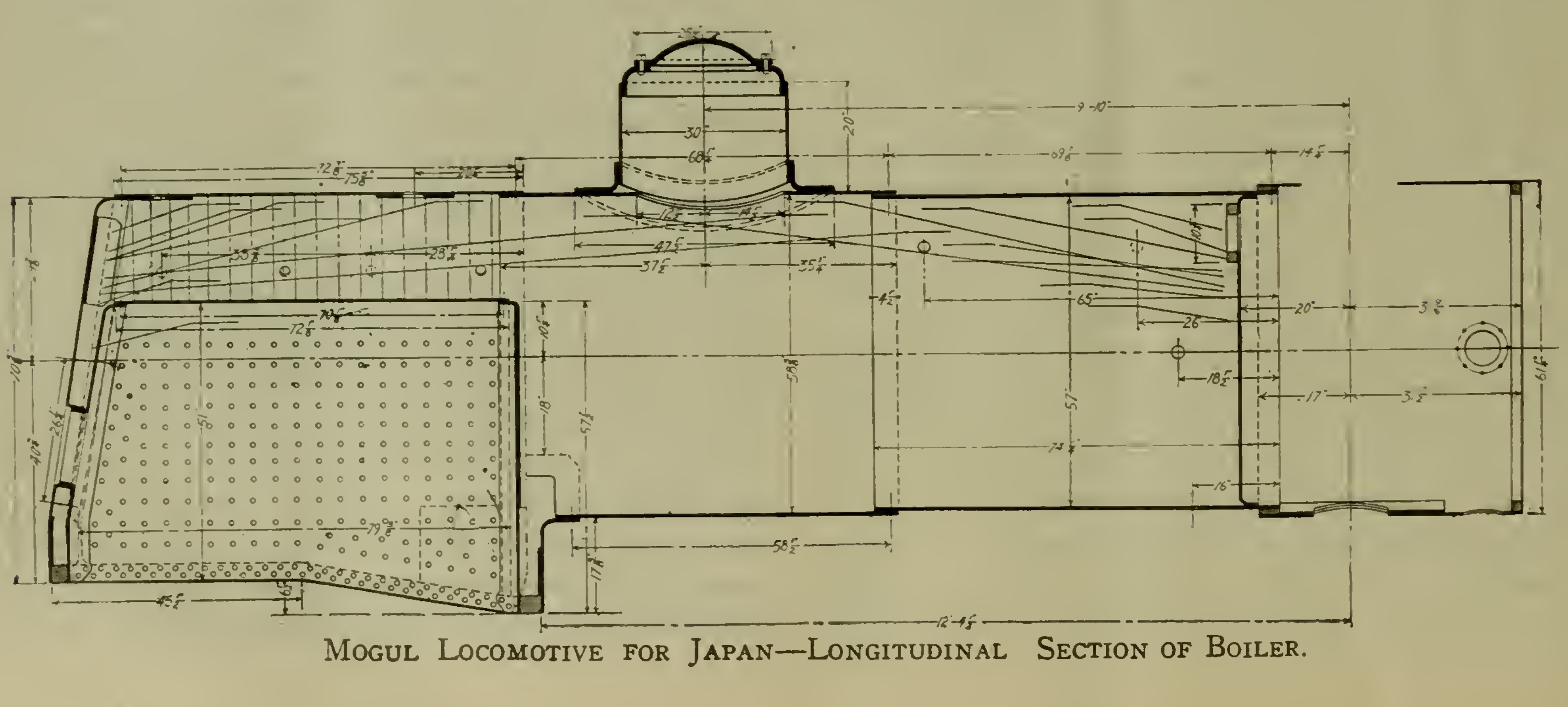
Kind of slide valves	American
Greatest travel of slide valves	5½ ins.
Outside lap of slide valves	⅞ in.
Inside lap of slide valves	Line and line.
Lead of valves in full gear	5-16-in. lead at 6-in. cutoff, line and line in full gear.
Kind of valve stem packing	Jerome.

Wheels, etc.

Number of driving wheels	6
Diameter of driving wheels outside of tire	54 ins.
Material of driving wheel centers	Cast steel.
Thickness of tire	3 ins.
Tire held by	Shrinkage.
Driving box material	Steeled cast iron.
Diameter and length of driving journals	7 ins. dia. x 8 ins.
Diameter and length of main crank pin journals	Main side, 5¾ ins. x 4¾ ins.; 5 ins. dia. x 5 ins.
Diameter and length of side rod crank pin journals	F. & B., 3¾ ins. dia. x 3½ ins.
Section of rods	Main, I; side, I.
Engine truck, kind	Two-wheel, swing bolster.
Engine truck journals	5 ins. dia. x 8 ins.
Diameter of engine truck wheels	28 ins.
Kind of engine truck wheels	Krupp steel tired, cast-steel spoke center with double-lip set rings, 3-in. tire.

Boiler.

Style	Straight.
Outside diameter of first ring	58 ins.
Working pressure	180 lbs.
Material of barrel and outside of firebox	Worth
Thickness of plates in barrel and outside of firebox	11-16 in., ½ in., 1 in., and 7-16 in.
Horizontal seams	Butt joint, sextuple riveted.



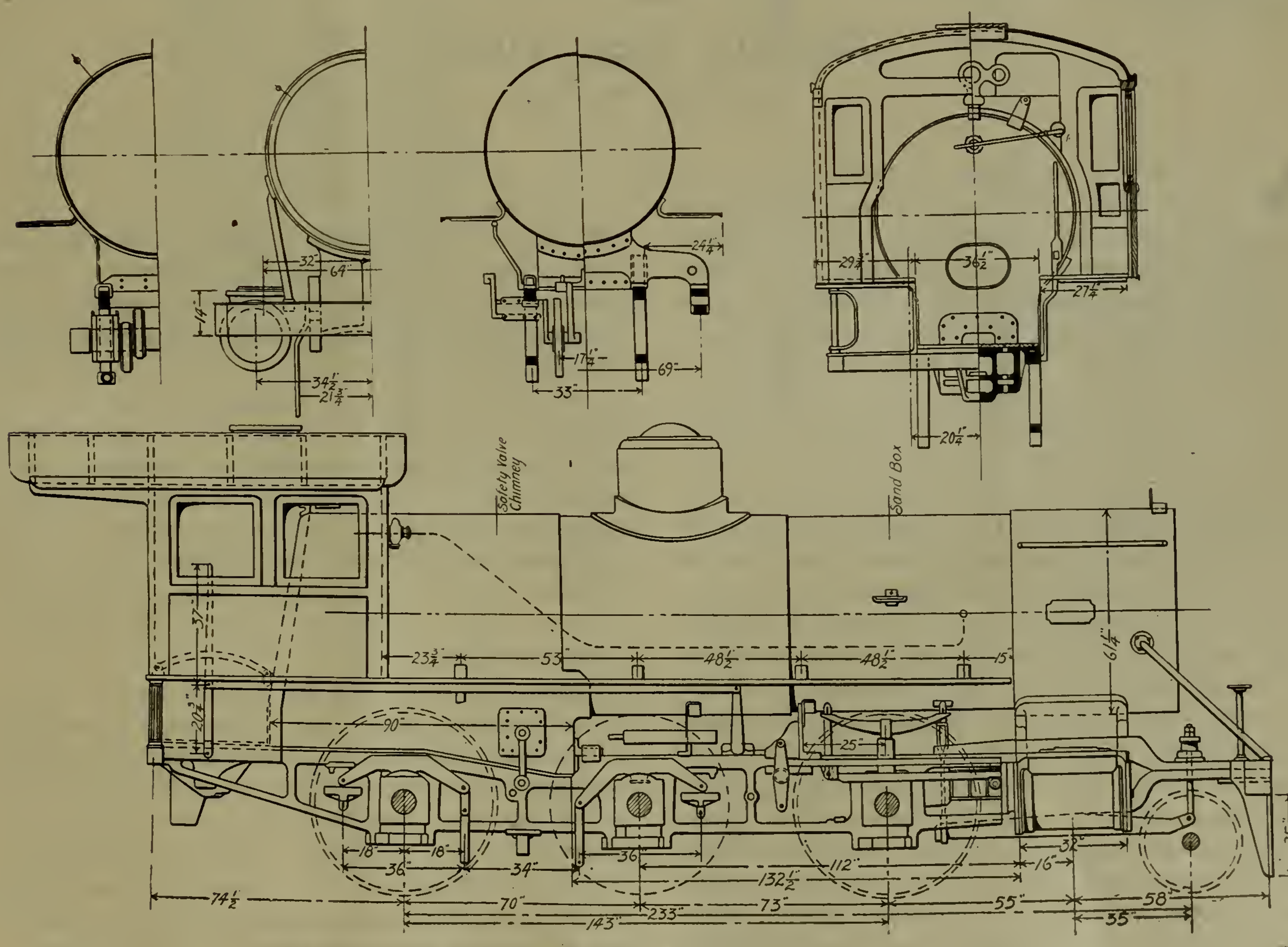
MOGUL LOCOMOTIVE FOR JAPAN—LONGITUDINAL SECTION OF BOILER.

MOGUL LOCOMOTIVE FOR JAPAN.

Circumferential seams ....Double riveted.
Firebox, length ....82 in.
Firebox, width ....29⅝ ins.
Firebox, depth ....Front, 57½ ins.; back, 51 ins.
Firebox material ....Hendricks copper plate.
Firebox plates, thickness ....Sides, ½ in.; back, ½ in.; crown, ½ in.; tube sheet, ½ in. and ⅞ in.
Firebox water space ....4 ins. front, 2½ ins. sides, 3 ins and 4 ins. back.
Firebox crown staying ....Radial, 1 in. dia.
Firebox stay bolts ....Copper, 1 in. dia., U. S.
Tubes, material and gauge..Solid drawn brass, No. 13 B. W. G.
Tubes, number 190
Tubes, diameter ....2 ins.
Tubes, length over tube sheets ....11 ft. 1 in.
Fire brick supported on ....Angle irons.
Heating surface, tubes ....1,091.22 sq. ft.
Heating surface, firebox ....105.67 sq. ft.
Heating surface, total ....1,196.89 sq. ft.
Grate surface ....16.86 sq. ft.
Grate, style ....Rocking with drop plate.
Ash pan, style ....Sectional.
Exhaust pipes ....Single.
Exhaust nozzles, diameter ....3¾ ins., 4 ins. and 4¼ ins.
Smokestack, inside diameter ....14 ins.
Smokestack, top above rail ....12 ft. 5 ins.
Boiler suplied by ....Sellers injector, class "N-1887," Improved No. 8½.

Tender.

Style ....U
Weight, empty ....24,900 lbs.
Wheels, number 6
Wheels, diameter ....30 ins.
Journals, diameter and length ....4½ ins. dia. x 8 ins.
Wheel base ....10 ft. 0 ins.



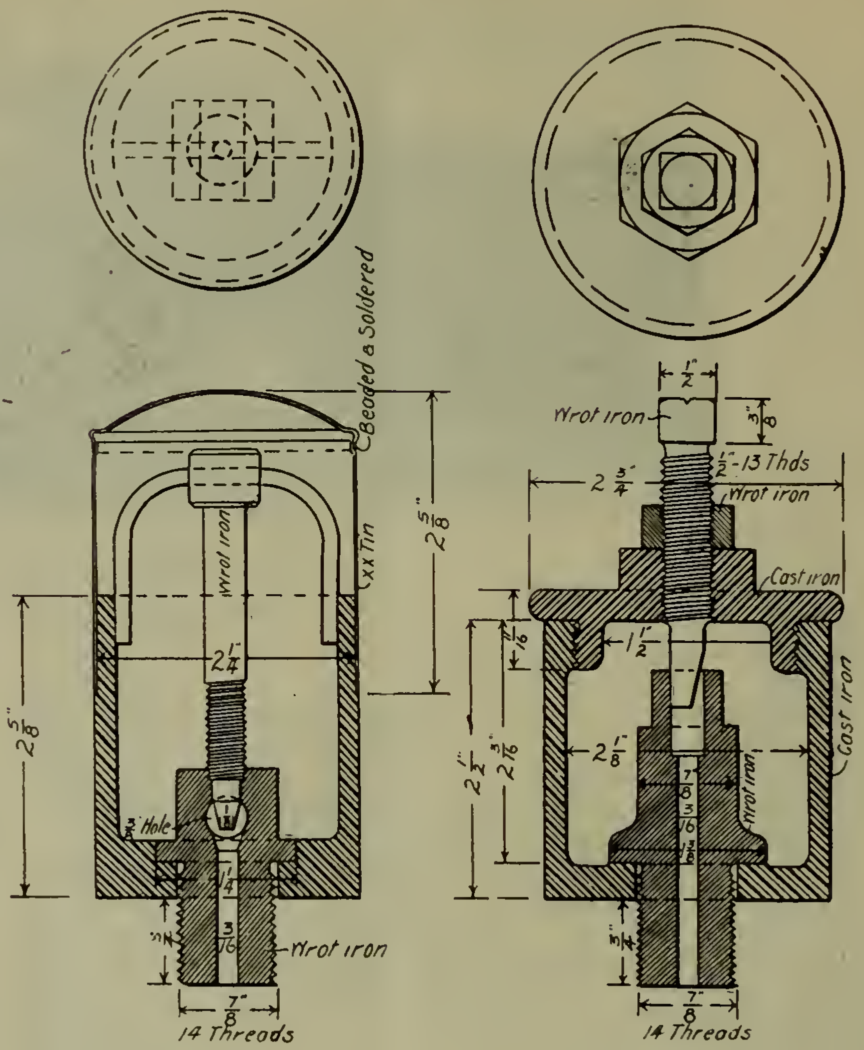
MOGUL LOCOMOTIVE FOR JAPAN—ELEVATIONS AND SECTIONS.

Tender frame ....Steel plates and channels
Tender trucks..4-wheel, center bearing, rear of tender, 1 pair wheels on axle in ped. support front end of tender.
Water capacity ....2,500 gallons, Imperial.
Coal capacity ....5,600 lbs.
Brake ....Steam and hand on drivers; also on tender.

Oil Cups

WHILE the solid forged oil cup is generally considered the most satisfactory for use on rods, there are yet many of the individual cups in such service which will be continued to some extent and for guides the individual cup is the more satisfactory. As removable brass parts are stolen from locomotives at a rate which makes the use of brass unprofitable, this material has largely been substituted for by cast iron and steel in this connection.

Mr. Ben Johnson, superintendent of machinery of the Mexican Central Railway, has kindly forwarded us blue prints of cast iron rod cups which he is using successfully in Mexico. The interesting feature of these cups is the wrought iron plug used with each cup by which it is secured to the rod or guide. By referring to the accompanying illustrations, this plug is seen to pass through a hole in the bottom of the cup and screw into the guide or rod, a shoulder of the plug securing the cup in position. A hole drilled through the plug permits the flow of oil to the bearing, the flow being regulated by a set screw as shown.



Railroad Shop Tools

By Chas. H. Fitch

VII.

A PROFESSOR in philosophy advised the students of his class in attempting any new enterprise to begin with the easier part of the work and go on gathering courage and experience for the more difficult problems. The introduction of hydraulic tools did not follow this course. It was begun with the jack, a wrecking tool subject to the most careless usage of unskilled men, a piece of mechanism singled out for abuse. Owing to the great efforts exerted a little imperfection of alignment will cause bending of parts, and the great fluid pressure finds any flaw in the hydraulic joints. The earlier jacks, therefore, while acknowledged as most valuable tools often developed defects difficult to remedy, which threw them out of use when most sorely needed, and caused them to be pronounced unreliable. Mr. Geo. L. Gillon, of the Watson & Stillman Co., in a paper published for circulation by that company, illustrates the type (Fig. 1) of base jack which is the result of long experience, eliminating the weak points of early jacks. The plunger is of solid drawn steel, and not built up from steel tubing, making more joints, as in less desirable forms of jack. Even with these improvements the jack requires intelligent care. If water used is dirty it will cut plungers, hence leather packing is preferred. Kerosene hardens leather packing, wood alcohol corrodes and water rusts steel surfaces. A filling recommended is oil of the quality of zero oil with grain alcohol.

We find some roads using hydraulic jacks with satisfaction where other roads will use only screw jacks, the difference in practice being no doubt due to getting properly constructed jacks and observing a few fundamental points in the care of them.

Some tools must have a considerable range of free movement, and in these to save time a second piston causing a rapid movement under low pressure is used, the larger piston being then used to produce the heavy pressure at low speed. Such is the transfer jack by which four pairs of drivers can be placed under a "consolidation" engine in thirty-eight minutes by a gang of five men. Figure 2 illustrates such a jack as used in a roundhouse pit.

Figure 3 shows a crank pin press as used in forcing on and removing crank pins. This press as made by the Watson & Stillman Co., is built so that the ram may be brought to the proper height and position by a socket wrench operating screw and chain gearing, after which hydraulic pressure is applied. This press is shown in Fig. 4. The pump valves are metal to metal and the cylinder is of solid steel, not lined, which is an expedient used in cheaper construction with cast iron cylinders.

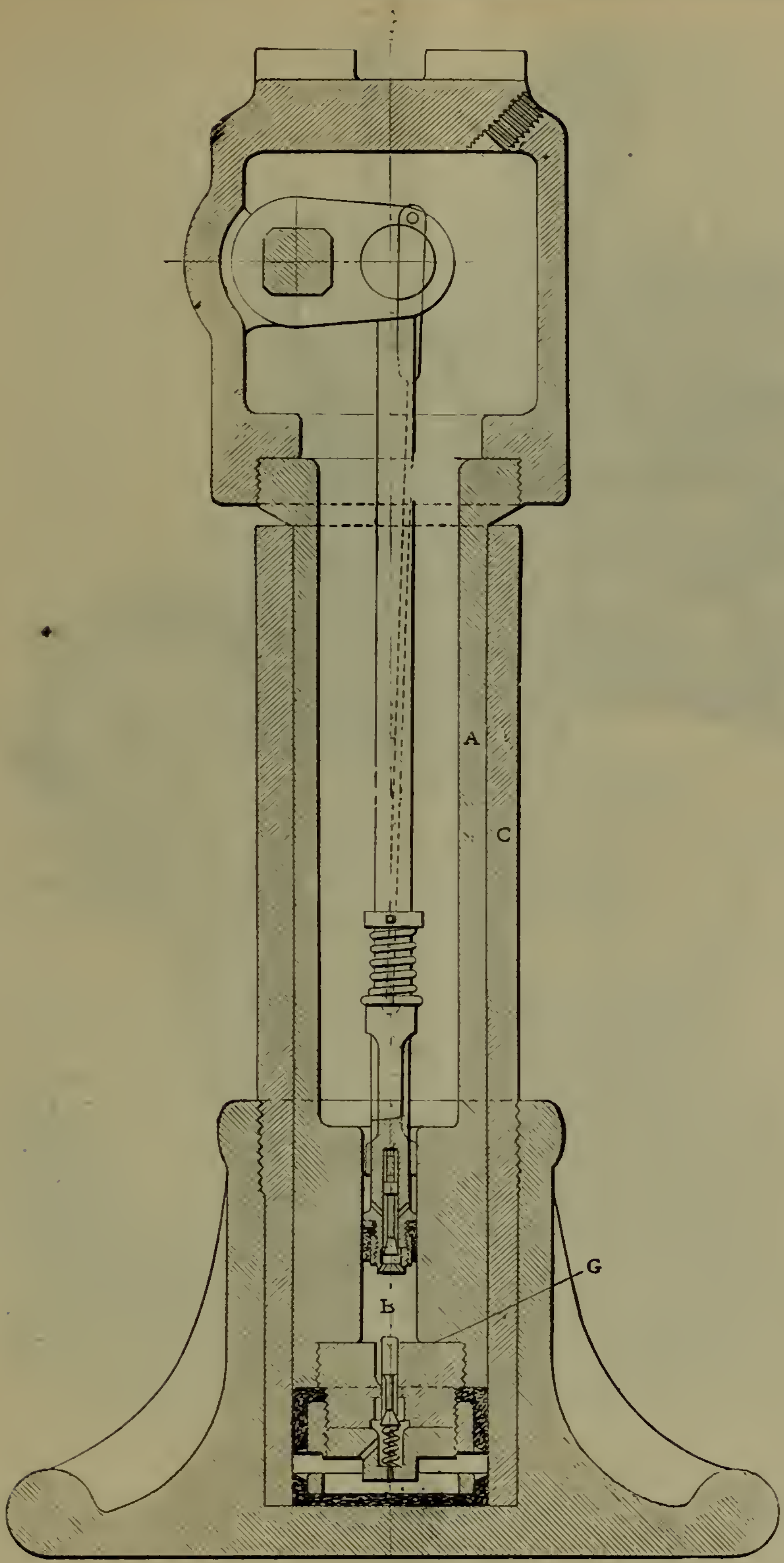


Fig. 1—Hydraulic Base Jack.

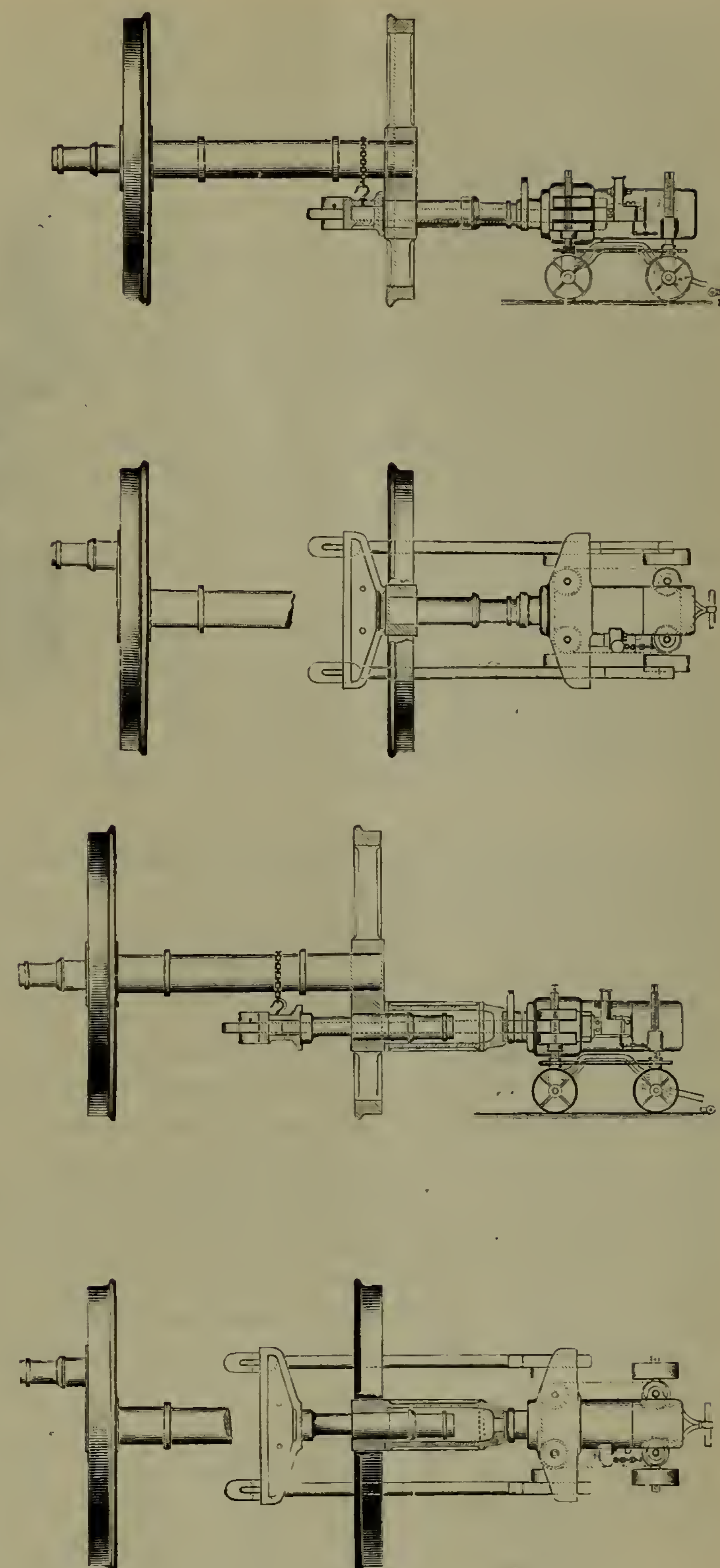


Fig. 3—Crank Pin Press.

The hydraulic car wheel press is and long has been a tool necessary to the equipment of every shop. It is shown in Fig. 5 and Fig. 6, with the posts, beams and hangers as commonly used in forcing axles on and off. These cuts show the Watson & Stillman construction with quick action, two pumps for varying speeds and pressures, and tight and loose pulleys.

Electric drive is now frequently applied, as shown in Fig. 7 from engraving loaned by the manufacturers, the Niles-Bement-Pond Co., N. Y. Delivery may be instantly stopped by trip valve without stopping the motor.

With the jack and the wheel press and riveting machinery the application of hydraulic power in railroad shops remained for some time stationary, but it is now becoming realized that this power can be utilized more extensively and in many special applications. The wheel press can be made double acting, so that with one operation axles may be forced on or removed from a pair of wheels at great saving of time. Wherever work is tightened by screw and lever action, a tedious process on large work, it can be done instantaneously by hydraulic power. We defer description of these applications at the request of inventors who have patents pending.

In fitting wheels and axles the pressure of fit is registered and must fall within certain limits or the fit is rejected. It was formerly the custom to turn axles to fit the bore of wheels, but at the Lake Shore shops at Chicago (Mr. LeGrand Parish, Englewood, Ill., M. C. B.) it is found better to bore to fit the axle, being a quicker operation, which also permits of a re-use of many axles which could not be used if turned down. These shops under the inspiring influence of Mr. Parish have developed many interesting improvements, so that the plant, although compact, will repay a visit better than some larger shops. Great numbers of couplers are sent to this point to be broken up, and a hydraulic press devised for shearing off the bolts of coupler has proved such a labor-saving machine that several have been built; applied also as vertical "bulldozers" and general blacksmithing presses for die forging and bending. The work of the press is very smooth and quick, requiring no special skill, owing to automatic details and government worked out by ingenuity of Mr. R. D. Fildes. The main point of significance in the design is the automatic operation of several valves by a single movement of one four-way valve, so that the operator has only this valve to look after instead of several valves.

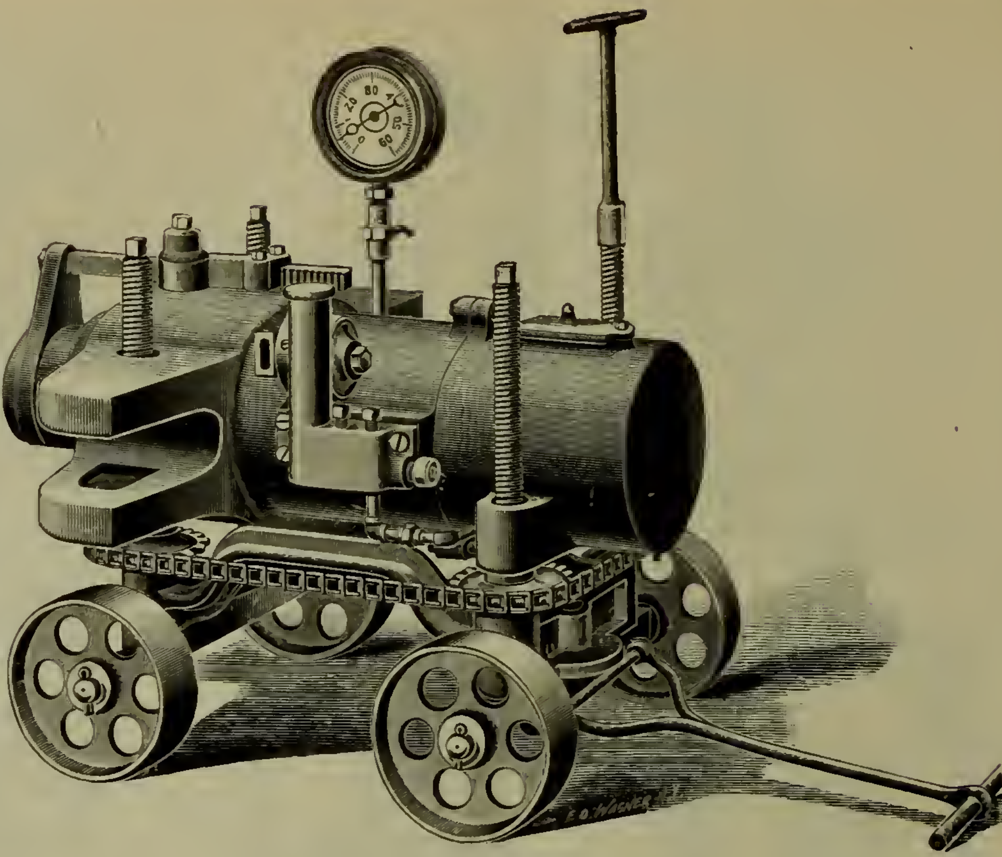


Fig. 4—Portable Hydraulic Crank Pin Press.

The four-way valve is turned to admit oil pressure of 100 pounds per square inch to a fluid-operated valve which has an auxiliary valve called the bleeder, both main and auxiliary valves being closed by the same pressure.

The fluid-operated valve admits 100 pounds pressure to an air and hydraulic (or oil) cylinder in which a piston separates the air in the lower from the hydraulic fluid in the upper part. This is called the supply cylinder, and might be called the pressure transmitting cylinder. The hydraulic end communicates with the plunger of the ram of the press, which is thus advanced to its work quickly under pressure of 100 pounds per square inch. Then a throttle valve is opened, admitting air to a pneumatic pump, which almost instantly brings the pressure up to 9,600 pounds per square inch on a 9-inch diameter plunger, or enough to cause the ram to shear off four 1⅛-inch coupler pocket bolts like cheese. The pressure actually needed to do this ranges from 75 to 125 tons. If the throttle should be left open the pump works until stalled by the pressure, and stops without damage.

The work being done the throttle is closed, and the four-way valve is turned to exhaust air pressure. The fluid-operated valve cannot reverse while the heaviest pressure is on the ram. This pressure must first be released. The exhaust by the four-way valve first opens the bleeder, which releases the pressure, when the fluid-operated valve reverses, acting through the supply or pressure-transmitting cylinder to lift the plunger of the ram. This whole operation is almost instantaneous, the pause while the bleeder acts being momentary, and the ram then rises to its highest point.

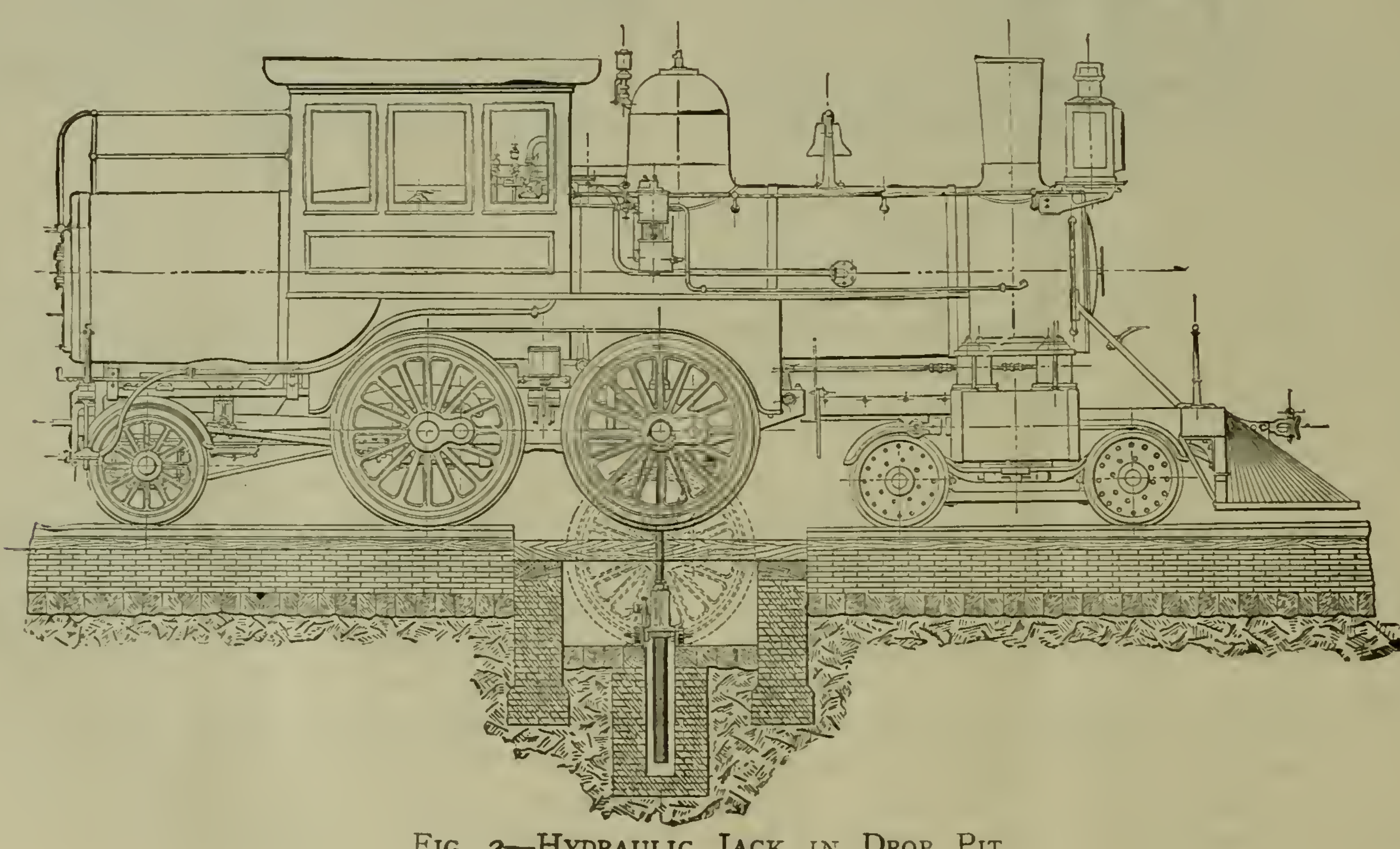


Fig. 2—Hydraulic Jack in Drop Pit.

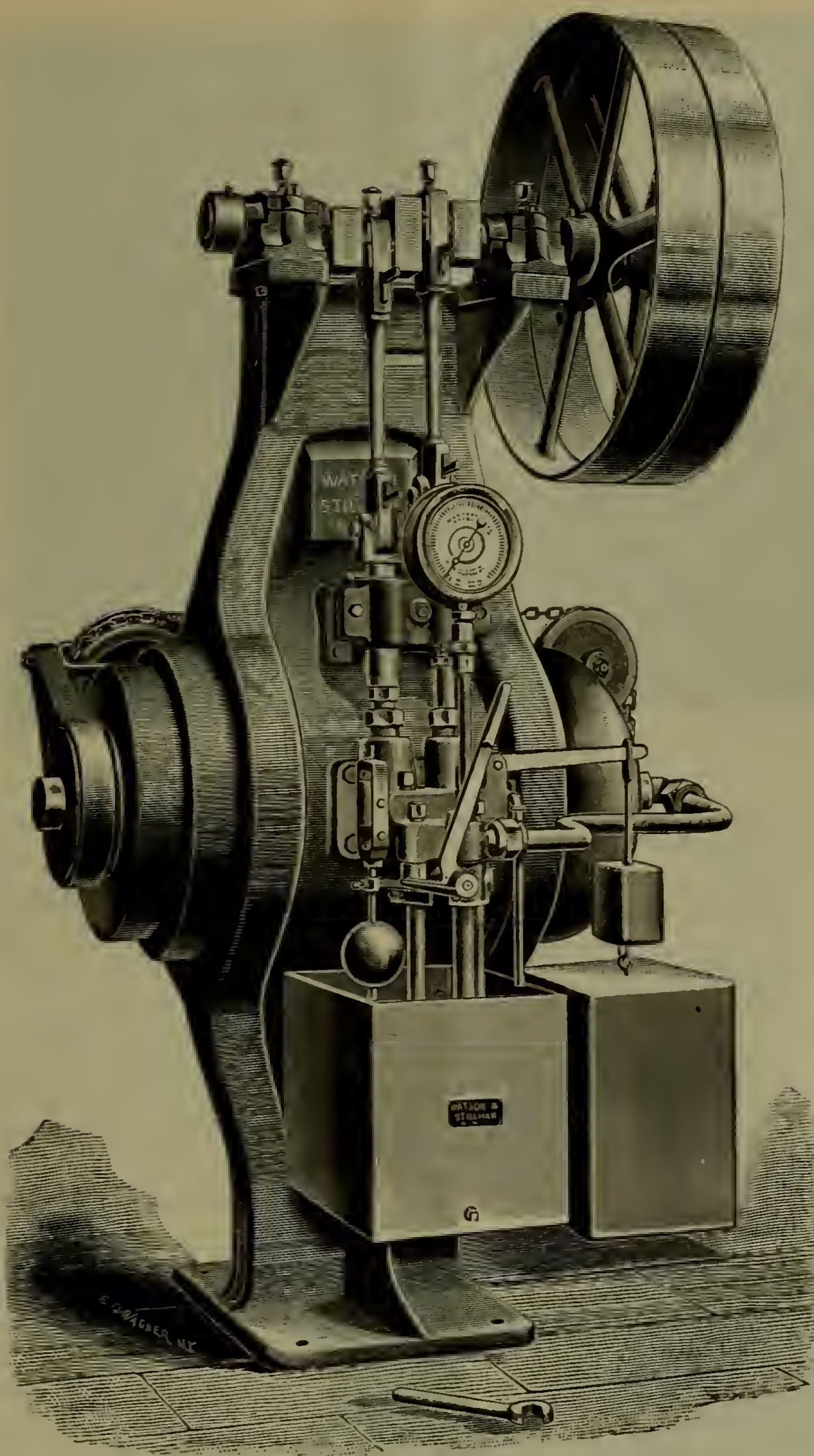


FIG. 5—HYDRAULIC CAR WHEEL PRESS.

The pneumatic pump has a large main valve with an internal admission through a perforated cylindrical tube. Tappets in the pump cylinder admit air pressure to a small piston moving an auxiliary slide valve, which reverses and so maintains the double-acting operation of the pump.

This press is a good example of the happy combination of pneumatic valve action with hydraulic machines, obtaining speed with power. The work for which it was first designed—shearing pockets from couplers—was a very tedious job done by men with chisels and sledges at great expense of labor. One unskilled man operates the press, which works rapidly, but on most work is not as rapid as a power "bulldozer" would be. It obtains a much greater pressure, however, and is very quick for heavy work.

At the C. & N. W. shops, Chicago, are several large hydraulic punches and shears thrown out of commission because they are too slow. This, however, is the fault of the design, as hydraulic machinery can be designed for rapid action.

Powerful hydraulic presses, such as shown in Fig. 8 (from a plate loaned by the Baldwin Locomotive Works), and by the halftone engraving of the hydraulic flange press, illustrated on page 418 of the October issue of the Railway Master Mechanic, are now generally used on locomotive boiler work. The hydraulic pressure cylinders are below the floor. The plates are heated in an oil furnace shown. The work done by them is flanging tube sheets, furnace door ways, back heads, smoke fronts, base rings and dome tops, and pressing on dome rings. This work was formerly done by hand-hammering with wood mallets while the plates were held with a screw clamp. This required a very skillful blacksmith with a gang of strikers and helpers directed with much shouting. It was a brilliant but very expensive picture. Now, the proper dies being in place, the sheet is formed with one mighty squeeze. The press shown can exert 365 tons pressure. Accumulators are used, by which this great power is stored, only small, slow-working pumps being required to produce it.

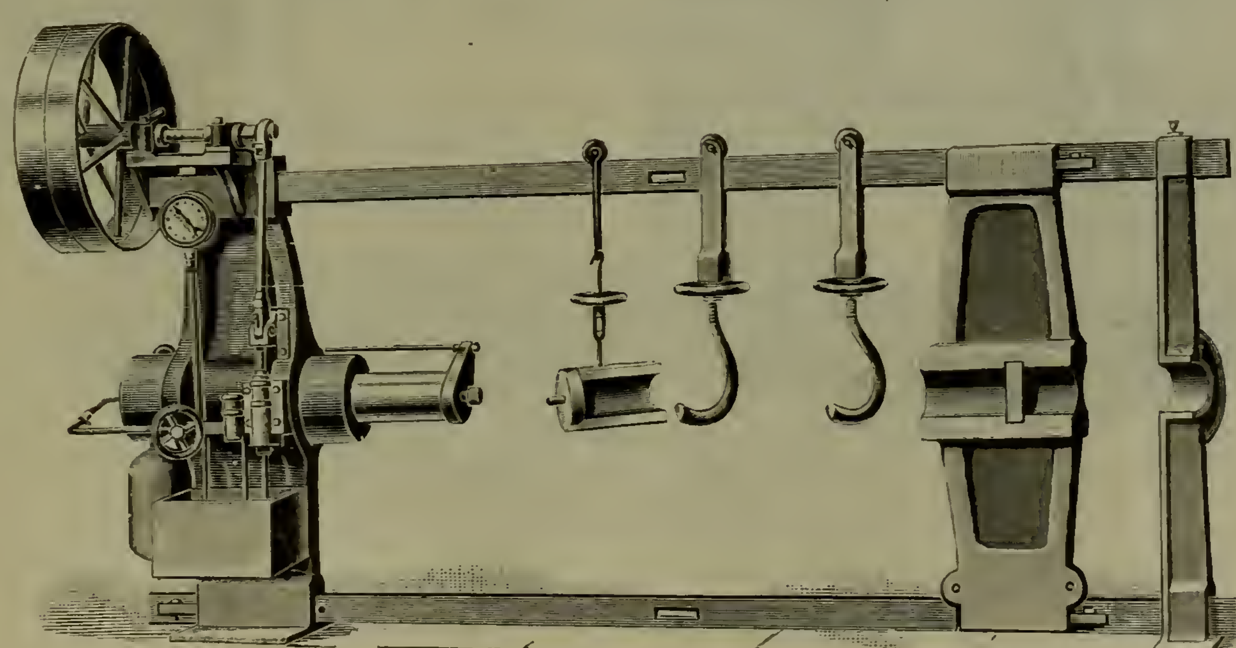


FIG. 6—HYDRAULIC CAR WHEEL PRESS.

Trucks for Electric and Steam Railway Cars

The following from Consul Raymond R. Frazier, at Copenhagen, Denmark, appears of interest to our manufacturers: "A well-known firm of agents in Copenhagen desire to correspond with a firm in the United States who are in position to furnish trucks for street cars and steam cars in a country foreign to both Denmark and the United States, where the government will undertake the construction of new lines of railway, electric and steam. Trucks for passenger cars will be required for the electric lines and trucks for passenger and freight cars for the steam railways. Letters forwarded to the consul's office in reply to the above request will be promptly delivered."

Personals

Mr. George Wick has been appointed traveling engineer of the Chicago, Burlington and Quincy and the Keokuk and Western railroads, with headquarters at Centerville, Ia.

Mr. Earl Kirk has been appointed general foreman of the Atchison, Topeka and Santa Fe shops at Winslow, Ariz.

Mr. John V. Brown has been appointed generai foreman of the roundhouse and shops of the Mobile and Ohio at Tuscaloosa, Ala.

Fig. 8—Hydraulic Flange Press.

Mr. Anthony King, heretofore general foreman of the Central of New Jersey at Port Oran, N. J., has been appointed assistant to General Foreman P. J. Herrigan of the Baltimore and Ohio at Connellsville, Pa. Mr. King will have supervision of the roundhouse and the assigning of the engines to service.

Mr. Owen Owen, who resigned as master mechanic of the Colorado Springs & Cripple Creek District Railway, has been appointed master mechanic of the Denver, Northwestern & Pacific, with headquarters at Denver, Colo.

Mr. Carl H. Metzer has been appointed master me-

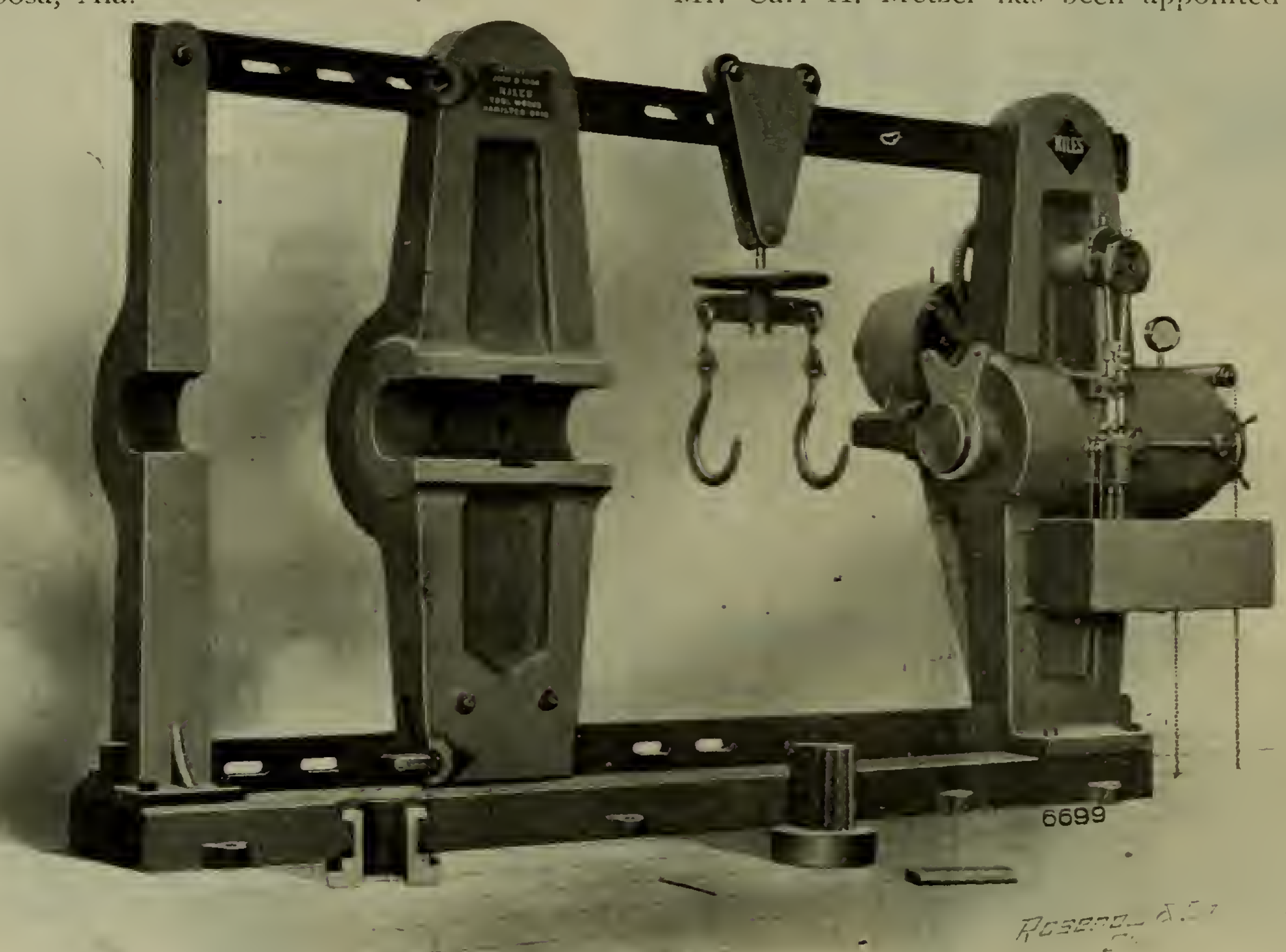


Fig. 7—Hydraulic Car Wheel Press Eectrically Driven.

chanic of the East Board Top Railroad, with headquarters at Orbisonia, Pa.

Mr. A. McCormick, heretofore master mechanic of the Chicago, Rock Island & Pacific at Fairbury, Neb., has been appointed master mechanic of the Colorado Springs & Cripple Creek District, with headquarters at Colorado Springs. Colo.

Mr. George C. Summers, general foreman of the Baltimore & Ohio Southwestern shops at Washington, Ind., stepped in front of a switch engine on Sept. 17 at that place and was instantly killed. He was at one time general foreman of the B. & O. S. W. shops at Chillicothe, O., going from there to Pana, Ill., and thence to Washington, Ind.

The new Collinwood (Ohio) shops of the Lake Shore & Michigan Southern having been completed a number of changes have been made in the mechanical department, among which are the following: Mr. W. F. Burton, formally general foreman of the cai department at Buffalo, has been transferred to Collinwood. Mr. J. R. Renniff has succeeded Mr. J. W. Senger as general foreman of the car department at Englewood, Ill., and Mr. I. S. Downing no wholds a similar position at Air Line Junction, O.

Mr. Frank C. Farquharson has resigned as general foreman of the Atchison, Topeka & Santa Fe at Raton, N. M.

Mr. Thomas Roope has been appointed assistant superintendent of motive power of the Chicago, Rock Island & Pacific, with jurisdiction over the western district, with headquarters at Topeka, Kan.

Mr. Leonard D. Tuft, road foreman of engines of the Delaware division of the Pennsylvania Railroad at Wilmington, Del., has resigned, having been in the service of the company for 49 years.

Mr. J. A. Carroll has been appointed road foreman of engines of the Albuquerque division of the Atchison, Topeka & Santa Fe.

Mr. J. H. McConnell, who was for a number of years superintendent of motive power of the Union Pacific, but recently manager of the Pittsburg works of the American Locomotive Co., has resigned the latter position.

Mr. J. B. Musgrove has resigned as master car builder of the Great Northern Ry. of Canada, and the position of master car builder has been abolished.

Mr. George D. Brooke, superintendent of motive power and equipment of the Minneapolis & St. Louis and the Iowa & St. Louis has resigned, and the office has been abolished.

Mr. Herbert F. Moore, mechanical engineer, has resigned as instructor in machine design at Cornell University, to accept a position as mechanical engineer of Riehle Bros. Testing Machine Co., Philadelphia, Pa.

Mr. H. S. Jones has been appointed master mechanic of the Durham & Charlotte, with headquarters at Gulf, N. C.

Mr. H. K. Mudd, formerly master mechanic of the Chicago, Cincinnati & Louisville, is now general foreman of the Cleveland, Cincinnati, Chicago & St. Louis at Wabash, Ind.

Mr. A. J. Friese has been appointed division master mechanic of the Boston & Albany at Alston, Mass., to succeed Mr. W. H. Taft, resigned.

Mr. R. M. Croom has been appointed superintendent of motive power of the Warren & Corsicana Pacific, with headquarters at Warren, Tex.

Technical Publications

MECHANICS OF MACHINERY, by Joseph Le Conte. The scope of this book is the application of the principles of mechanics to certain problems connected with machinery, with special reference to the mechanics of the steam-engine, this machine, in the author's opinion, being the most important from the standpoint of the designer. The work is divided into three parts, the first two embodying the principles of kinematics, or that branch of mechanics which deals with motion without reference to the cause producing it, and the third part applying the theory of kinematics and dynamics to the steam engine, involving a consideration of the relation existing among the several parts, the forces due to steam pressure in the cylinder, inertia effects of the reciprocating parts, etc. This work is the outcome of a series of lectures prepared for the instruction of students in the department of mechanical engineering, University of Cailfornia, by the author, an instructor in the university. Published by the Macmillan Company, New York City. Price, $2.25.

THE PRACTICAL PHYSICS OF THE MODERN STEAM BOILER, by Frederick J. Rowan. The work appearing under this title embodies a consideration of the fundamental principles which affect the form and action of steam boilers, endeavoring to reach a fuller understanding of the generation of steam and the requirements of efficient boilers. It therefore treats of the lines along which the steam boiler may be improved rather than a consideration of the mechanics of boiler construction or the strength of materials of which boilers are made.

We quote the following from an introductory note by Dr. R. H. Thurston, director of Sibley College, Cornell University: "The book is not a systematic treatise covering the whole field of design, construction and operation of every class of ooiler. nor is it intended as such. It is a discusion of a defined and limited part of that great department of engineering, and its illustrations of fact and principle are very largely devoted to the modern types of "water-tube" boilers, while the purpose of its writer is declared to be quite as much as the indication of the trend of improvement as the exhibition of their present status as apparatus for the evolution and storage of thermal energy.

"The point of view of the author of this novel and valuable contribution to the literature of the subject is well expressed, and the purpose held before himself during its preparation is clearly defined by the form given by him to the topics discussed. He would not seek to learn the ratio of fuel consumption to the grate area, but rather the philosophical datum of real importance, the ratio of area of heating surface to fuel consumed. He would ascertain the conditions of maximum efficiency both of heat development and heat transfer. He studies the effect of varying rates of flow of furnace gases along the heating surfaces with which they are in contact, with the purpose of ascertaining the laws of heat exchange as affecting the efficiency of the boiler as a whole. He investigates the effects of chemical and structural changes, as well as of mechanically applied stresses. upon the safety and endurance of the boiler." Published by D. Van Nostrand Co., New York City. Price, $7.50.

Boiler Design

The committee of the Master Mechanics' Association on "Boiler Design" has issued the following circular of inquiry:

1. What minimum depth of water over highest point of crown sheet do you use or recommend (a) for curved crown sheets, (b) for flat crown sheets?

2. The distance from vertical line of boiler to water glass (a) for curved crown sheets, (b) for flat crown sheets?

3. What exposed length of water glass do you use or recommend?

4. How are gauge cocks located with reference to water glass?

5. If crown sheets are sloped, how much per foot, and why?

6. Is an automatic low-water detector a desirable attachment for general use on locomotives? By an "automatic low-water detector" is meant a device giving warning when water is below safe level.

Please send your replies to D. Van Alstyne, chairman superintendent motive power, Chicago Great Western Railway, St. Paul, Minn., at as earily a date as possible.

D. Van Alstyne, C. E. Fuller, O. H. Reynolds, H. T. Bentley, W. F. M. Goss, committee.

Stake Pockets

The committee of the Master Car Builders' Association on "Stake Pockets" has issued the following inquiries:

1. Have you adopted a standard stake pocket on all flat cars, regardless of capacity? Give dimensions.

2. Have you adopted a standard stake pocket on all capacity coal cars? Give dimensions.

3. Do you recommend a standard stake pocket for all capacity flat cars, in designing new equipment or making renewals to old?

4. Do you recommend a standard stake pocket for all capacity coal cars, in designing new equipment or making renewals to old?

5. Do you recommend a tapering wedge being used, either loose or as part of the stake pocket, next to sill, so as to throw top of stake in toward load at top?

6. State preferred method of securing stake pocket to wooden frame cars.

7. State preferred method of securing stake pocket to steel cars, whether by rivets or U bolts.

8. State kind of material you prefer for stake pockets; pressed steel, cast steel or malleable or cast iron.

9. How many stake pockets do you use or recommend be applied to one side of a car of different lengths or capacities? Give spacing.

10. Please send blue-prints of your designs with any suggestions or recommendation that you care to furnish.

Please send your replies to John S. Chambers, chairman, superintendent motive power Atlantic Coast Line Railroad Company, Wilmington, N. C.

John S. Chambers, W. E. Fowler, J. E. Keegan, R. P. C. Sanderson, M. Dunn, committee.

Notes of the Month

Mr. Edwin S. Woods has withdrawn from the Kindle Car Truck Company, with whom he has been associated for the past six years as vice-president and general manager, to engage in business for himself, when he will handle his interests in the Woods roller side bearing and other specialties.

The Kennicott Water Saftener Company of Chicago have just issued an exceedingly handsome catalogue giving detailed description of their water softening plants. The catalogue is well illustrated with large half-tone cuts showing the various water softening plants erected by them on many of the railroads in United States and Canada.

Among the recent orders received by the Hicks Locomotive & Car Works are the following: 1 55-ton engine for the Butte City Railroad Co.; 1 4-wheel switch locomotive for the Hecla Belt Line; 1 4-wheel switch engine for the International Harvester Co.; 1 50-ton locomotive for General Construction Co., Davenport, Ia.; 1 coach for the West Virginia & Southern Railroad Co.; 1 57-ft. combination coach for the Green Bay & Western R. R. Co.; 1 private car for the Santa Fe Central Railway; 3 passenger coaches for the Duluth, Mesaba & Northern Railway; 1 passenger coach and 1 combination car for the Duluth & Iron Range Railroad; 3 coaches for the Louisiana Northwestern Railroad; 30 gondolas for the Newton & Northwestern Railroad; 15 tank cars for the Santa Fe Central Railway; 12 flats for the Muncie, Hartford & Fort Wayne Railway; 14 cars for the Ohio River & Columbus Railway.

Statement of cars, locomotives, etc., using Pintsch System of lighting to May, 1903.

	Cars	Locomotives	Gas Works
Germany	42,350	5,200	71
Denmark	45	.....	3
England	19,200	18	87
France	6,758	.....	27
Holland	3,487	5	10
Italy	1,537	.....	5
Switzerland	392	2	1
Austria	4,758	.....	10
Russia	3,360	132	13
Sweden	710	43	4
Servia	216	.....	..
Bulgaria	98	.....	1
Turkey	114	.....	..
Egypt	76	.....	3
Canada	202	.....	3
Brazil	974	31	1
Argentine	1,130	.....	10
Chili	46	.....	2
India	10,200	.....	16
Australia	2,053	.....	13
United States	20,550	.....	63
Japan	150	.....	2
China	...	.....	1
Mexico	121	.....	1
Total	119,031	5,431	347
Increase for the year	6,840	434	..

Allen Riveting Machines

John F. Allen, 370-372 Gerard avenue, New York city, reports the following sales of complete Allen portable pneumatic riveting machines for the month of September: Manning, Maxwell & Moore, New York city (2 machines); Levering & Garrigues Co., New York city (1); Jackson & Corbett, Chicago, Ill. (1); Standard Railway Equipment Co., St. Louis, Mo. (1); American Structural Steel Co., East Carnegie, Pa. (1), and Thompson Iron Works, Philadelphia, Pa. (1).

The New Century Car Cleaner

Formerly car cushions and backs have been cleaned by compressed air blown from a hose over the surfaces to be cleaned. It is well known that this plan has certain disadvantages, such as the dust settling down again after being blown off the seats and other fittings. Also, the compressed air contains a certain amount of moisture, which is deposited on the plush, etc., when the stream of air is passed over the surfaces.

The New Century Cleaner Co., 31 Equitable building, Boston, has recently placed upon the market a device which obviates these disadvantages by replacing the device by which the stream of air is directed over the plush or other areas, with another device in which a suction is induced

Fig. 2—The New Century Car Cleaner in Operation.

instead of the opposite. As observed in Fig. 1, this device consists of a small box which is operated by a current of air under low pressure forced over an opening, thus creating a vacuum which sucks the dirt from surfaces over which it is passed—from fabric or carpet as well as from a hard surface or floor. Fig. 2 illustrates the appliance in service within a passenger car of the Boston & Albany Railroad.

The device is the invention of E. E. Elston, an employe in

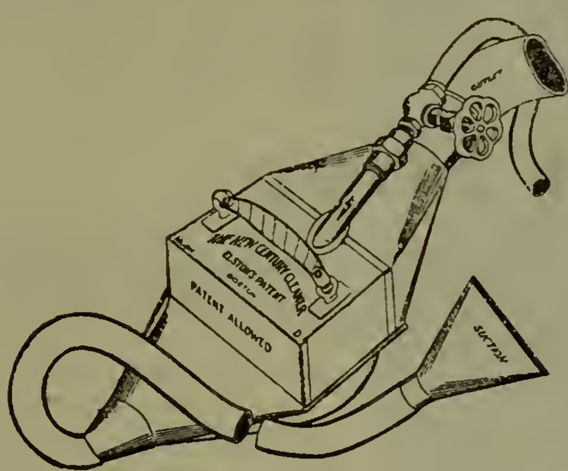


Fig. 1—The New Century Car Cleaner.

the upholstering department of N. Y., N. H. & H. R. R., and has been in use in the Boston car cleaning yards of that line for several months. The perfection with which it removes the dirt and dust from a car and deposits it in any desired receptacle outside, and the manner in which the suction raises up the nap of fabrics, has led to its being put on the market by the firm above mentioned, from whom any further desired particular may be obtained.

A number of these cleaners have been put in service during the past few weeks by the Pullman Company, New York Central & Hudson River and Pennsylvania Railroads.

The Hiett Improved Seal

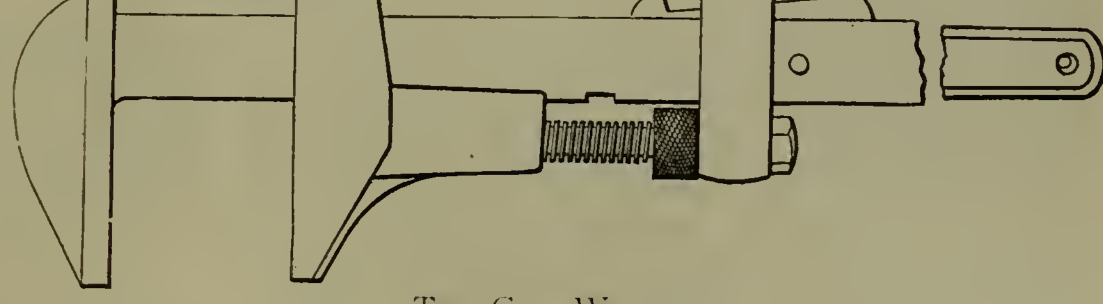
D. K. Hiett, 185 Dearborn street, Chicago, has invented and placed upon the market a seal called Hiett's Signature seal, which is a decided improvement over seals commonly used. The manufacturer says of this seal: This seal is composed of two parts—namely, the lock and breakable key. To seal any article, pass both ends of the wire through the eye of the block and then turn the key until it breaks off. Any signature may be written permanently with a pencil on one side of the block. Signatures may also be stamped or printed on the block. The stub of the key may be used to keep "tab" on the seals used, so that a count is easily kept by the sender. The number of stubs retained should correspond on the number of seals out, etc. No tools of any kind are necessary to the process of "sealing." It will be seen that this seal may be used wherever it is necessary to use a seal. It is the best known seal for bags, as it will be seen that the wire takes the place of a sewing-cord, being passed back and forth from both sides, the ends being drawn through the seal tightly and then secured by the key in the ordinary way. Car doors are sealed in the ordinary way, however it will be seen that the seal may be drawn very closely against the bolt. For boxes or packages any amount of wire may be used in place of twine or cord, passed through the seal and drawn so as to prevent removal.

The Coes Wrench

The Coes Wrench Company of Worcester, Mass., have just placed on the market a new wrench, designed especially for large nuts and on finished work where their 21-inch pattern is too small or is not suited on account of short leverage. The strap has two positions, for large and for small work, and is practically a part of the bar when locked. The key has a double head. The bolster for the screw has two positions and may be shifted to suit the work. The bar has two openings at the front which engage

The Coes Wrench.

a projection on the strap, and at the back is a key by means of which the strap is securely locked in either position. The head is formed with a rib and has a fillet under the shoulder to give increased stiffness. At the end of the handle an eye for a ½-inch rod is formd so that if desired the work may be strained up or suspended. The wrench is made in two sizes—26-inch, weighing about 17 pounds, and 30-inch, weighing about 28 pounds, the former when wide open taking a 5-inch and the latter a 6-inch nut. The accompanying illustrations show the wrench in detail.



The Coes Wrench.

Oil Groove Cutting Machine

The illustration presented by Fig. 1 shows the patent oil groove cutting machine No. 1, manufactured by the Garvin Machine Co. It has been considerably improved by the addition of a screw and hand-wheel for elevating the table. By using this table as a vise and clamping the work to the underside of the projecting top arms, the use of bolts and clamping plates for holding usual forms of bearings is avoided, and a greater output of work can be obtained. The machine effects a great saving of labor, does better and more uniform work than can be done by hand, and is particularly useful when cutting grooves in bushes where the work cannot be readily reached by ordinary methods, as shown by Figs. 2 and 3. By the provision of change gears, reversing gears and friction clutch, it is possible to cut oil grooves straight, spiral (either right or left hand), or straight with a spiral commencing and ending. The work is quite uniform on any number of pieces. The cutting tool works similar to that of a shaper and is withdrawn by hand upon each return stroke.

Fig. 1—Oil Groove Cutting Machine.

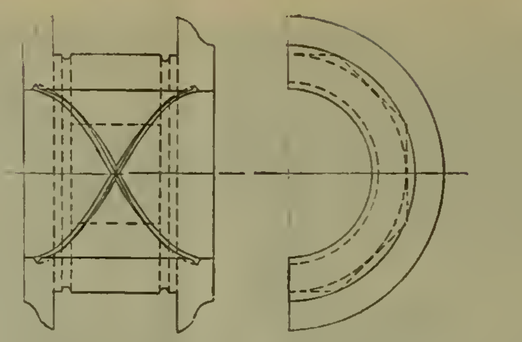


Fig. 2—Forms of Oil Grooves.

A micrometer feed and adjustable stop for depth of cut is also fitted. Each machine has two cutter heads for the largest and smallest brasses within its capacity. The No. 2 size can also have an extra small head to enable it to groove brasses the same as the No. 1 machine. The cutters used are made of round steel, have lines for setting to depth and angle, and can be sharpened without changing their form. Radial lines are marked on the cutter heads for setting to the correct angle of the spiral required. Furnished with each machine is a set of change wheels, clips, bolts and spanners, also instructions and table of change wheels. Special cutter heads and bars can also be furnished.

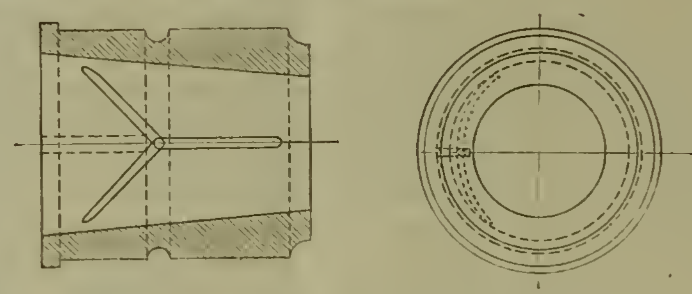


Fig. 3—Forms of Oil Grooves.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

The Sherwin-Williams Cleveland Factory After Ten Years

It is surprising what enterprise has in recent years been put into the manufacture of painting material. Painters themselves have been progressive in ways and means of doing their work, but it seems as though the manufacturers have led them in the march of progress.

Ten years ago (September, 1893) it was the privilege of the editor of these columns, on the way to his first western convention (in Milwaukee), to stop over in Cleveland, Ohio, and visit the immense plant of the Sherwin-Williams Co. Here Mr. M. L. Sims, a former confrere in the Master Car Painters' Association, had been employed a few years in the testing rooms and experimental department, and it was he who then showed us over the entire plant. It goes without saying that we were then astonished and delighted at the enterprise and push that were evident everywhere in this establishment, known world-wide in the manufacture of paints of a high grade.

But after ten years it was again our good fortune to be on the way to another western convention—that time at Chicago—and to stop off in Cleveland. Again visiting the Sherwin-Williams Co., we were piloted over the establishment by the superintendent, Mr. Sims. Everywhere were visible tokens of ten years' growth, though at our former view everything appeared full grown and perfection itself. It is a matter of intense pleasure to note the growth and progress in every way that ten years can make in such a concern as the S.-W. Co. We could but reflect upon what could be the possibilities of growth and improvement in the next ten years, rounding up in 1913, when we hope to be en route for some other western convention, perhaps in Denver, San Francisco or Manila! There is a limit to growth in everybody and everything, of course, but whether it has been reached in this enterprising concern remains to be seen. Progress seems no more impossible now than it did ten years ago.

As we went around with Mr. Sims we inquired where this and that machine was that excited our wonder ten years ago, notably a can-soldering machine. "Oh, that was thrown away years ago, and I will show you another and a better one," said Sims. And sure enough, it was. Machines of their own design, manufacture and repair characterize the S.-W. factory, whether it is in the making of the paint or the receptacle that it is to be shipped in.

Some of the things that have been installed in ten years here are compressed air and electric power, and these mean much throughout this extensive plant, as in every manufactory. They are right up to date here in all these things. The mill man was seen sharpening his millstones with a compressed air chipper, which formerly was done by hand, and this is a bare illustration or keynote of the progress everywhere. Every room has its electric motor to drive all mills and machinery in that room.

In the last ten years this concern has perfected itself in varnish making, as well as in paints and colors, and has a unique department in this line, and one of the finest storage plants that we have seen, having a capacity of 220,000 gallons.

To attempt anything like even an outline description of the workings of this great central plant of the S.-W. Co., to say nothing of their large branch factories that are still being enlarged at Chicago, Newark and Montreal, would use up our entire space this month. It must be seen to be appreciated.

To enlarge the general offices connected with the factory a block of buildings is being torn down, rebuilt and remodeled with this end in view, which, when completed, will afford much needed room for the executive and clerical departments.

M. C. & L. P. A. Portrait Gallery

For many months, and even years, we have been trying to adorn this page with the likeness of our good young friend from the historic spot of Fort Wayne, but as he is naturally bashful we have been unable to do so until now. Even now he has enclosed nothing but his card, so we shall have to write him up "by main strength," and if we do not do it right he shall have an opportunity to correct us.

Judging by his name we should say Mr. Rodabaugh is of German descent, and by his initials that he was named after the author of the constitution of the United States and the patron saint of the Democratic party. Also, judging by the nimbleness of Mr. Rodabaugh and the snap and ginger he puts into his discussion at our conventions he is about 35 years of age. But as it is no secret that he has been painting cars for around fifty years he will have to stand up and be counted with the veterans that are not yet old in spite of their years, like Warner Bailey of the Boston & Maine at Concord, N. H., and some others.

Mr. T. J. Rodabaugh.

He is a master painter of the Pennsylvania Lines west of Pittsburg, and is located at the Fort Wayne shops. He is always an attendant at our conventions and an active participant therein, as well as also the annual meetings of the advisory committee, and up to date in his ideas. Long live Rodabough! His name appears in the proceedings of the seventeenth annual convention at the Leland Hotel in Chicago in 1886, seventeen years ago, so he ought to celebrate the event this year. He was then, where he is now, with the Fort Wayne.

Economy on Paper

Economy on paper is one thing and economy in operation is often quite another thing. A fifteen-cent lunch looks better on paper than it does on the table; it eats worse still, and after you have got it down you go out and kick yourself for trying to cheat your stomach out of a decent meal at a fair price.

But those who try to fool their stomachs are not the only fools. There are those who try to fool their backs with a suit of clothes that they got cheap. They get no comfort and satisfaction out of it at all, and finally lay it aside and go and pay what they ought to for a suit of clothes they would not be ashamed to be found dead in and have them described in the morning paper.

There are other false economists. They may be found at the head of mechanical and purchasing departments of railroads. They fool themselves, but nobody else, by thinking they get a dollar's worth of paint or varnish for fifty cents, or anything else in that line. Paint is paint and varnish is varnish to them; it's all alike, only from different firms, some of whom have a knack of making it for less money than others, out of the same materials, and therefore can sell it for less money and make the same profit! A brush is a brush, and so long as one cannot tell the difference in the looks of two brushes they must be alike! Suppose we apply the same principle to men, and pay them the same salary regardless of their brains and training, and see how we will come out. One is as fair as the other. But it is what is in a man that makes him worth more than another; and the same is true of your brush, or your paint, or varnish. It is possible to make a brush of Mexican grass look as well as one of Russian bristles, but their use is vastly different. One black or brown or red paint may look as well as another, but its application and wear is what tells the story for the practical man. One man may look better than another, but he is not worth one-tenth of the salary of some little scrub of a fellow who has the ability and training to lead a host of men to victory.

Therefore pay a man what he is worth for the place you want him to fill. Do not expect an engineer at a fireman's pay; also pay for a brush what you want it to do. Pay for a paint and varnish what it is worth to you in wear and tear. You can soon tell whether your man is worth what he claims to be; you ought to be able to ascertain, through the proper channels, what paint-stock and brushes are worth. Do not expect to get silk for the price of calico, except of some philanthropist who has a fortune to give away. Do not expect to get a gum that is dug out of the ground in Africa for the price of that which comes from a North Carolina pine.

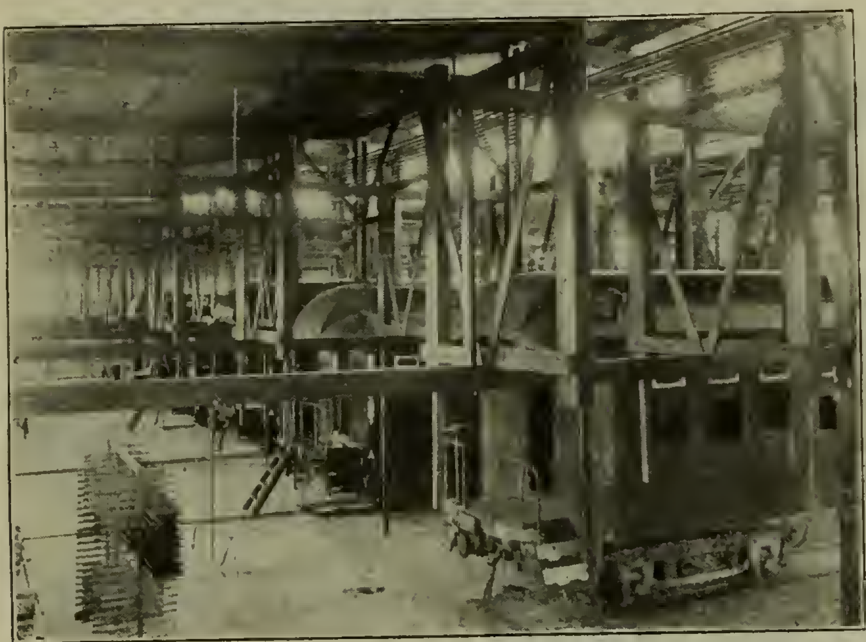
Of all the "innocents abroad" they "take the cake" who think they know what they are doing when they buy paint-stock on bids, thinking that the greatest economy is in the lowest price, because in their minds all brands are alike, regardless of how an article is made; in other words, who apply the same rule to the purchase of paints and varnishes (i. e., possibly their own unsophisticated eyesight) that they do to nails, shingles and boards or other articles not subject to adulteration. They have some things to learn; and if they find them out by this sort of experience, somebody will pay dear for it.

Another New Paint Shop

Editor Railroad Paint Shop:

As the west or southwest is seldom mentioned in your columns, and thinking perhaps it would be of some interest to your readers, I inclose a photo of our new paint shop recently built at Baring Cross, Ark., together with a brief description of same.

We are situated across the Arkansas river from Little Rock, which is rightly named "City of Roses." It is built, as photo shows, on the cross-track plan, with a capacity of nine cars. The floor is of concrete and the sanitary conditions are of the best. We have permanent staging, electric lights, etc. We have a coach carpenter shop of the same dimensions and an electric transfer table between the shops. The heating is the low-pressure hot water system, and for our mild winters gives entire satisfaction. In addition, we have a handsome



INTERIOR OF NEW PAINT SHOP—ST. L., I. M. & S. RY., BARING CROSS, ARK.

brick stock room, separate from the main building, which is 40x60 feet, where all paint, etc., is stored as it comes from factory.

We are running full time now, preparing for the World's Fair business. We get through the shop about 22 to 24 cars per month, and our record is an engine per day.

Would also mention that our company is building new shops at Kansas City, Mo., of the same capacity as our plant here. They are to be ready for occupancy about next fall.

Glad you like Atlantic City for our next convention, but us fellows "way down south" and west will have a long journey if we get there. However, I am with the majority, and hope to turn up in Atlantic City with the rest of "the boys," nothing preventing.

With best wishes, I am yours sincerely,

E. L. Younger,

Foreman Painter, St. L., I. M. & S. Ry. Baring Cross, Ark.

The Advisory Committee

The Advisory Committee is the most important committee —that on Tests coming next—connected with the work of the Master Car and Locomotive Painters' Association, for it is that committee which shapes the work of the next convention, not only formulating subjects to be discussed but by some years' usage it has come to the point of naming all committees on those subjects, though primarily that is the duty of the president. Later bylaws, however, have made it a joint duty between them, which state that there shall be a meeting at some central point for conference not later than March 1, and their legitimate expenses shall be paid by the association. Art. IX, Sec. 2.

Now since these bylaws were framed anti-exchange pass regulations have been made by the roads, which has the effect of confining the appointments on the Advisory Committee to a coterie of men centrally located—not far from Cleveland or Pittsburg—or contracting heavy expenses for fares, etc., to be charged to the always depleted treasury of the Association. For instance, in February, 1892, the writer was on this committee to meet in Pittsburg; but, not being able to procure free transportation, he stayed at home rather than to incur expenses to be borne by the association.

In view of these facts it would seem to be wise to make a change in our bylaws and practice; that is, if the rule of the roads is to hold and free transportation continues to be difficult if not impossible to obtain. For, if the present practice continues, it keeps the most important work in the hands of a few men centrally located and does not make the president's appointments on this important committee of sufficient scope to be representative of the association. Much as he would like to apoint this or that good man at a distant point on this committee he cannot consistently do so but is shut up within the circle before described.

But, some may say, all are invited to send in their contributions in the form of subjects to this committee. True, and this is better than nothing; but if this bears good fruit why may not the work of the advisory committee be conducted by mail by the chairman, as formerly, and as this present writer did when its chairman, no meeting being held, and as the chairman of the test and other committees have to do now? If it is going to continue to be impracticable for representative committee meetings thus to be held at some central point—and if it is advisable to hold them at a "central point"—why not the annual conventions as well Why not abandon these meetings and do this business by mail and save expenses? True, we admit there is wisdom to be brought out by men in conference as in no other way, and these committee meetings are pleasant midwinter affairs; but if conditions and the welfare of our association are such that we cannot do as we would we must adopt some other way out of it.

That the well-being of the association has not suffered so far from present practice in appointing the advisory committee goes without saying, but how far can it continue without detriment is a question that we are writing this article to get our members to considering. If men from Maine to California will feel the responsibility off a committee that they do on—which we doubt—and will study what are the best and most vital interests for the association to consider at its coming convention and will mail their deliberations to the chairman of the advisory committee and thus support that which is getting to be a local committee in their work, and the committee in turn will give an absent member's thought as much weight as the committee members do their own, then their work will become more perfunctory and less executive and thus the breadth and scope of the association's work will continue to be maintained indefinitely as formerly. But we entertain grave doubts on this subject, hence office. But we entertain grave doubts on this subject, hence these thoughts which are written for the good of the association and in no spirit of pique, fault-finding or dissatisfaction. Think it over.

ADVISORY COMMITTEE'S NOTICE.

Since writing our article entitled "The Advisory Committee" we have received the following self-explanatory letter and notice from Mr. Kahler, the chairman of that committee, which strikes us as a good idea, and shows that "great minds run in a similar vein."

Meadville, Pa., October 14, 1903.

Editor Railroad Paint Shop:

I think it a good plan to invite master car builders and master mechanics as well as painters for question material that would be useful at our advisory committee meeting. It helps us out and at the same time gives all concerned a privilege. If you will kindly insert the following standing notice, or something like it, in the Master Mechanic each month until February, when we have our meeting, I shall be obliged to you in advance.

NOTICE TO HEADS OF MECHANICAL DEPARTMENTS AND OTHERS.

It is the desire of the advisory committee of the Master Car and Locomotive Panters' Association that superintendents as well as car and locomotive foremen painters having questions to offer for subject matter at the next convention of the Master Car and Locomotive Painters' Association will kindly send them to the chairman of the committee before February 15, 1904, and oblige,

Yours truly,
JOHN H. KAHLER,
Chairman Advisory Committee.

Erie R. R., Meadville, Pa.

Grand Trunk Shops, London, Ont,

It was our happy privilege to stop off for a half day at London, Ont., en route to the Chicago convention, and look over the Grand Trunk shops at this point, where Mr. Treleaven, the master car builder, and Mr. Hutchinson, the foreman painter, showed us every courtesy and kindness, Mr. Hutchinson meeting us and taking us to dinner at the "Tecumseh," also to supper, and a trolley ride to the park and around the city, and both seeing us off for Detroit in the evening. London is rightly named "The Forest City," for we have rarely seen so many trees in a city in the States that is designated by that soubriquet. On many streets there are two rows on either side of the street, with the sidewalk between them. Not a large city in point of inhabitants—some 40,000, we believe—yet on account of its wide streets and large lots and lawns and its many trees it covers more area than some cities of twice its population.

The Grand Trunk shops, on its outskirts, constitute a large plant, and while not very recently built, are a good set of brick shops, commodious and up to date in most respects, and with their immense push-car trackage and turntables throughout make the handling of material a simple, easy and effective operation in comparison to some shops of more recent date of construction.

An enormous amount of freight car repairs is carried on here, situated as the shops are on the trunk line to Montreal, and nearly all roads in the States have "patients" in this "hospital" in the shape of disabled cars. We noticed one of the B. & M.'s in for end-sills, etc. Young Mr. McWood, son of the venerable superintendent car department of that system, runs this ranch, and judging by the amount of work going on there, should think he might be a busy man. Here we noticed that friend Hutchinson was hoeing the air-painting fellows a pretty good row with his long-handled paint brush, with which he paints the sides and ends of his cars from the floor, no staging being used. His piece-work prices for this work would seem to make it questionable whether or not it is best to bother with the air-paint gun and all its evils. He has a specially made brush, resembling a whitewash brush, only stockier in construction, and with a handle of suitable length thrust through the hole in its head at an angle, the man stands on the floor and paints the car, a la bill poster, in very quick time. And heavier paint can be used in this way than in the air-painting machine, and also, being spread more evenly, the results must prove more satisfactory. Of course, where the facilities are right the air painter could show him "cards and spades"—also some fog—and also a tint on his shirt-collar! However, Mr. H. paints his cabooses in the same manner with a very brilliant caboose red and at a low piece price. They were making many new ones of the four-wheel pattern with large observation decks. The interiors were painted, grained and varnished.

Mr. Hutchinson has been carrying on some tests of caboose red that are surprising in results, and though he is using one so fiery red in color that one would declare it to be of an aniline type, and fugitive, still it stands well—infinitely better than many against which he has tested it on panels nailed to his back fence. No wonder Mr. McWood, superintendent of the car department, questioned whether some panels had been painted red at all as there is no trace of red left, the appearance being that of some paint nearly white. These and others would have been excellent tests to have shown at the convention, but on account of the serious illness of Mr. H.'s sister in Cambridge, Mass., he had but just returned from there, and therefore must forego further leave to attend the convention. He has also been experimenting on tests in painting roofing canvas to make it elastic and non-crackable, and with evident success. He has a formula that those using canvas on roofs would do well to look into. He uses beeswax to some extent. This was also intended to be the subject of some report at the convention. However, it will be in order next year, as, we think, the committee was continued.

Mr. Hutchinson's stock-room, which was illustrated in our columns in a former paper, is a model in arrangement and neatness. In addition to many other useful contrivances, he has carboys so arranged on the bench, containing standard mixtures of priming oil and secord-coating vehicle, that any amount may be siphoned out by touching a valve. The importance of this lies in maintaining uniform standards of these mixtures all ready for use.

Under the same roof in adjoining rooms are a fire department room; a nice room for the men to eat their lunches, and a library and reading room; also games for those who do not care to read during the noon hour. These valuable adjuncts commend themselves to all who are thinking of building or fitting up railway shops, as a good return comes from the outlay in better and more intelligent men.

A Convention Correction

In looking over the convention proceedings before publication we found Mr. Forbes' remarks on the copper-sheathed car somewhat mixed and attempted to straighten them out, but as we were not satisfied that we had done him justice, we wrote him immediately and received his reply too late to make him right in the October issue. Hence we insert his letter, as follows:

Paterson, N. J., Oct. 4, 1903.

Editor Railroad Paint Shop:

I was misquoted in saying that I said the wood sheathing was all used up with dry rot. What I did say was that when some of the sheathing was removed I found traces of moisture which had loosened the glue with which the sheathing had been applied, and upon one occasion I found a well-developed case of rot which was not noticeable from the exterior on account of the metal covering, which retained its original form and did not show what was going on beneath the surface. I also said that there was a bad feature, to my mind, in metal covering for cars on account of the sweat caused by changes in the climate at certain seasons in the year which I thought would produce sweat.

I was very much interested in this one particular subject, and I would have liked to have had it more thoroughly discussed, but several—in fact, about all—the members paid but little attention to it, and seemed annoyed at the attempt to discuss the subject after a motion to adjourn had been entertained. I suppose the confusion incident to adjournment rattled the stenographer and she could not hear what was said very plainly. I would have answered sooner, but your letter was delayed in reaching me through our having moved the location of our shops. We were burned out a year ago last May, and were transferred to North Paterson, on the New York, Susquehanna & Western branch of our system, which is now the main shop on the eastern end of the road.

Thanking you for your favor, I remain yours fraternally,

H. W. Forbes.

Notes and Comments

Noticing in a Boston paint store the other day twenty five-pound boxes of No. 40 carmine piled atop of each other or 100 lbs. in all we inquired of the dealer whether he had much sale for such an expensive article nowadays and he replied that he had, but most of it went to the paper mills and confectioners. The latter of course color their candies with it and so we have to eat paint in other ways than from the paint-sprayer. The paper makers use it with blue to make a purple to mix with their white paper stock while in the liquid state to make it whiter when it comes out into paper than it otherwise would be. This writer once used to paint parlor cars on the B. & M. with No. 40 carmine, also occasionally the letter boards, corner and door posts and side ovals of the then yellow passenger cars, though for the latter equal parts of scarlet and Munich lake were generally used. We also painted the last red parlor cars with this combination color. Then we got tired of it and of its fading propensities and walked up into the Master Car Builder's office one day in the spring of '91 and advocated its abandonment and asked if we could not paint with Pullman color two parlor cars that were then in the shop. He replied that he would see what the management said and let us know. In a day or two he said it was all right to paint the two parlor cars Pullman color and the chances were that it was coming to be the color for the whole equipment, then yellow! And so it went on by easy stages, which took seven years to turn all the B. & M.'s great equipment from yellow to Pullman. It used to take about a pound of No. 40 carmine, if our memory serves us well of an experience so long ago, to give a parlor car two coats of color. This we did not put on in the form of a glaze but mixed it to dry flat and applied it over Tuscan red, which gave a solid appearance of color. For the benefit of any who may have anything to finish in that color, will say that we ground the dry color to a paste in raw linseed oil and added about a gill of Japan drier and thinned it to working consistency with spirits of turpentine. With a three-inch camel's-hair brush it went on slickly and dried well and gave good results. We then applied a coat of rubbing varnish, which, when dry, was rubbed to a dead finish, and then the goldleaf striping and ornametation was put on (taking about five packs of goldleaf per car outside!), and when the finishing varnish was applied the most gaudy effect was produced. What would be thought of such a job today? It would be mistaken for a circus advertising car. That there has been an evolution in taste in car painting from worse to better, and a saving of shekels, goes without saying. At one time we paid twelve dollars per pound for No. 40 carmine. That would buy three or more today.

That our Report of Tests read at the late convention on Varnish Removers touched a responsive chord is evidenced by the compliments and inquiries that are coming in daily. The following is a fair sample: "Will you oblige me with the key to your list of varnish removers which was presented at the recent convention of your association? I thing it one of the most important tests ever made and I congratulate you on the able manner in which you made your report." Eight letters similar to this have been received. What our mail on this subject will be then we wonder. It is gratifying to know that we did not miss fire in our choice of a subject for tests. All our members shall, of course, have the benefit of the key to this test, if they will write us, inclosing stamp. as it belongs to them.

The New York Central turns out a large amount of work at its West Albany shops. For the year ending June 30th last. 1530 cars of its passenger equipment were put through for its various classes of painting and varnishing; 193 being painted new from the wood, 745 over the old paint, 577 cut in, and 15 touched up and varnished, but the latter only sponged out with water inside and floor painted. The bulk, or 1136 cars, of this work was done in the seven months ending May 31st. These shops are run on the piece-work plan. In April last 209 cars were put through.

The following, clipped from a recent Wilmington paper. will be of interest to the many friends of our associate, Mr. McCracken: "John T. McCracken resigned as master painter at the shops of the Jackson & Sharp plant of the American Car and Foundry Co., last evening. He has been in the employ of the firm for twenty-eight years, sixteen of which was in the capacity of master painter. He resigned with the regrets of the firm. He will engage in the paint business at 707 Market street about November 25th."

If any were impatient waiting for the convention proceedings in the October issue, be it known that it was not our fault. As the stenographer's typewritten copy had to be revised by Assistant Secretary Dane and the editor of these columns before publication, it was received Monday evening, September 28, and returned Wednesday morning, the 30th, and we came near burning midnight oil at it to hurry it to the printers.

We regret to learn by a letter from his daughter (Sept. 26) that Mr. M. C. Hillick, an assistant of Bro. Dutton's at the Lehigh Valley shops at Sayre, Pa., is down with appendicitis. Bro. Hillick is the author of "Practical Carriage and Wagon Painting," and has been a contributor for years to the paint trade press and well and favorably known. We trust before this gets into print that he will be convalescent.

Mr. A. P. Dane, of the Boston shops, B. & M. R. R., read a paper at the October meeting of the New England Railroad Club, entitled "True Economy in Painting and Maintaining a Locomotive."

A Lynn, Mass., firm is engaged upon a large contract to furnish electric fans for the shops of the Burmah railway in India, to replace the time-honored punkah.

Established 1878.

RAILWAY MASTER MECHANIC

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Bruce V. Crandall, Editor. Charles S. Myers, Manager.
Maham H. Haig, Associate Editor.

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AT the expense of no small amount of time and labor a set of tables has been prepared and the data accumulated therefrom arranged in graphical form to indicate the trend in the proportion of locomotive parts during the past twenty years. The well-known 1897 committee report to the Master Mechanics' Association investigated very thoroughly the then existing ratios of heating surfaces and grate area to cylinder volume and recommended relations apparently very practical. These recommendations, however, have not been adhered to by locomotive designers, especially since the introduction of the modified wide firebox for burning bituminous coal. While many believe the 1897 recommendations to be representative of best practice, others again favor ratios of different proportions. There is at the same time a current discrepancy regarding the true relationship actually existing, for instance the idea that increased grate area has been accompanied by an increase in firebox heating surface. As no comparative data has been accumulated showing the average trend in the proportioning of locomotive parts, the tables here presented are believed to be of interest.

The data appearing in this issue relates to passenger locomotives only. The proportions of freight and switch engine parts will be presented in future issues.

AN editorial appearing in our June issue advocated the appointment of a man to the immediate supervision of the scrap shed and bins, whose experience has taught him the value of the material which is constantly passing before him as scrap. An intelligent, skilled mechanic in such a position is capable of discriminating between useful scrap and that which has passed beyond redemption, and for this reason it is believed that a salary sufficient to induce a good man to accept such a position would result economically to the company so employing him.

The stand thus taken is borne out in an article by Mr. J. P. Murphy, general storekeeper of the Lake Shore & Michigan Southern Railroad, appearing on page 540 of this issue, entitled the "Selection of Useful Scrap." This paper deals with the recovery of good material from scrap bins about railroad shops, an important question in the economical operation of the road concerned. For the lack of systematic management, it often happens that usable material is lost sight of at the scrap bins which might otherwise be returned to commission and continue to give good service.

THROUGH the courtesy of the Atchison, Topeka & Santa Fe Railway, we were enabled to accompany Mr. A. L. Beardsley, road foreman of engines, in riding the new balanced compound locomotives recently placed in service on this line. Upon the trips we were particularly impressed with the comfortable riding of these machines at both high and low speeds.

It is interesting to observe these engines personally and note how completely those leaks have been eliminated which resulted from a tendency of the piston rods to pound the packing, a feature which has been so much a source of objection to the arrangement whereby two piston rods were attached to the same cross head wth unequal pressure behind the pistons. The elimination of this leak in the present engine is, of course, principally due to the horizontal arrangement of cylinders, by which a cross head is provided for each piston. It is therefore evident that the effect upon the packing is the same as in a smple engine.

An improvement apparent in the design of the present type of engine, which, while pertaining to any Vauclain compound, adds materially to the free distribution of steam is the enlargement of diameter of piston valve bushing and piston to equal the diameter of the high pressure cylinder and a corresponding enlargement of the ports through the bushing. This offers opportunity for a freer flow of steam into the high pressure cylinder, provides a larger receiver between the cylinders and gives a more extensive opening for exhaust steam from the low pressure cylinder.

A further feature of interest is the very kindly feeling on the part of the engine crews towards this new machine. Replies to questions on the part of impartial and apparently disinterested parties have evidenced these engines to stand in high favor with the crews operating them.

IN looking through a recently published hand-book on locomotive breakdowns we were impressed by the apparent uselessness of much of the information ordinarily presented, from the standpoint of present day practice. In the abtsract it is, of course, desirable that an engineer should know how to cope with nearly any breakdown. In the concrete, however, railway managements do not desire an engineer to "go carpentering around" in case of a breakdown. He is desired to get into the nearest side track and out of the way as soon as possible. Even in the side track his efforts at elaborate disconnecting are frowned upon. Such disconnections but cause additional work for the roundhouse. The days of bringing his engine in under its own steam are past, as it is cheaper to haul to a point where facilities are provided for doing the work and getting the engine back into service promptly. What is demanded of an engineer at present is that he "get over the road," and if he cannot, "get in out of the way" of the following men who "can"—a designated one of whom will pick up the disabled engine and haul it to a place where it can be most quickly repaired.

In glancing over the work mentioned we were left with the conclusion that a modern breakdown book should be divided into two parts, of which the first would contain recommended practice, while the second would contain information on what one could do if occasion required. An actual case, for instance: "Front cylinder head knocked out." Part I, "Recommended Practice," would say: "Disregard it and keep going. If the engine does not furnish enough steam, set out a few cars at the first side track, if on freight; or exchange engines with the first freight train overtaken, if on passenger." Part II, "if occasion requires," would explain how to disconnect. Another instance: "Cross head gib lost." Part I, "Recommended Practice," would say: "If bottom liner, keep going, but do no switching. If top liner, keep going where no more than half-inch play is a result of loss." Part II would tell how to improvise a temporary liner.

MR. C. A. GOODNOW,
GENERAL MANAGER OF THE CHICAGO & ALTON RAILWAY.

Mr. Goodnow was born at Baldwinsville, Mass., in December, 1853, and has been in continuous railway service since 1868, his first situation having been with the Vermont & Massachusetts, now the Fitchburg, as telegraph operator. He has since held a number of responsible positions in both the east and west. On April 15th, 1902, he resigned his position as general superintendent of the Chicago, Milwaukee & St. Paul to accept service with the Chicago, Rock Island & Pacific as general manager, and was appointed to a similar position with the Chicago & Alton on November 2d.

In this line there is also a field for recommending practice tending to prevent failures; in other words, a sort of instruction book feature. It is surprising to note the inability of many men "to get over the road" who can pass a splendid examination on breakdowns. Railroads today want men who do not have breakdowns rather than men who can patch up or disconnect. They want engineers to run the engines and leave to machinists and boiler makers the work of repairing them. An actual instance: An engine died because both injectors failed to work, resulting from a dirty tank allowing cinders to get up into the injector cones. Our breakdown engineer took out the cone and cleaned out the cinders, etc. an excellent mechanical job under the attendant difficulties. An engineer who is an engineer, however, gives sufficient attention to his injectors to see that they do not both fail at once, and hence has had time enough on a failing injector to shut the heater and blow back the cinders without even having had to stop his train, not to mention a failure. If the injectors become so heated by this operation as not to take up water, a few buckets of water is amply sufficient to cool them.

Another case that breakdownbooks are silent upon is leaking tubes. It is generally accepted that when tubes start leaking the crew is absolved. Yet on any division where leaking of tubes is prevalent it will be observed that some crews never have a failure from this cause, no matter what particular engine falls to their lot, while other crews fail with much better engines. Why? Because a crew which knows its business does not let its engine start leaking. How? Simply by never letting her get cool, which means giving just as much attention to the fire down hill and in side tracks as when working on a hill. We know of bad water divisions where the state of the tube sheet on delivering the engine to the crew fixes the responsibility for failure from leaking tubes; if the sheet is dry when delivered to the crew, they are held responsible for an engine failure from such a cause, though if the sheet is wet the crew is absolved at the start and the roundhouse held responsible.

THE Car Foremen's Association of Chicago, an organization whose monthly proceedings have heretofore been published in the columns of the Railway Master Mechanic, is now presenting its transactions in pamphlet form. The work of this association has been beneficial as well as interesting, a feature of the result accomplished being in that it is representative of the ideas and impressions of those in immediate contact with car inspection and repair. As the name implies, the membership is composed principally of car foremen. The rules of interchange are carefully considered each year and actual cases of dispute are often presented to the meetings for consideration as a means of inciting suggestions for guidance in future similar cases. These features, taken together with other practical considerations of daily situations, place a value on the proceedings which render them worthy the appreciation of those associated in any way with the maintenance and transportation of cars.

The Trend of Locomotive Proportions

THE relationship existing among the important features of locomotive design have been subjected to a more or less degree of variation throughout the development of the locomotive engine. In order to make a practical comparison of the several ratios and to observe the changes which these ratios have undergone a number of engines have been selected representative of practice during the past twenty years, their details tabulated and several curves plotted therefrom to illustrate more readily the trend which the proportions have followed. In making this comparison, locomotives have been divided into but three classes, viz., passenger, freight and switch. Beginning with passenger engines, their tables and curves are presented herewith. Freight and switch engines will be presented later in the order mentioned.

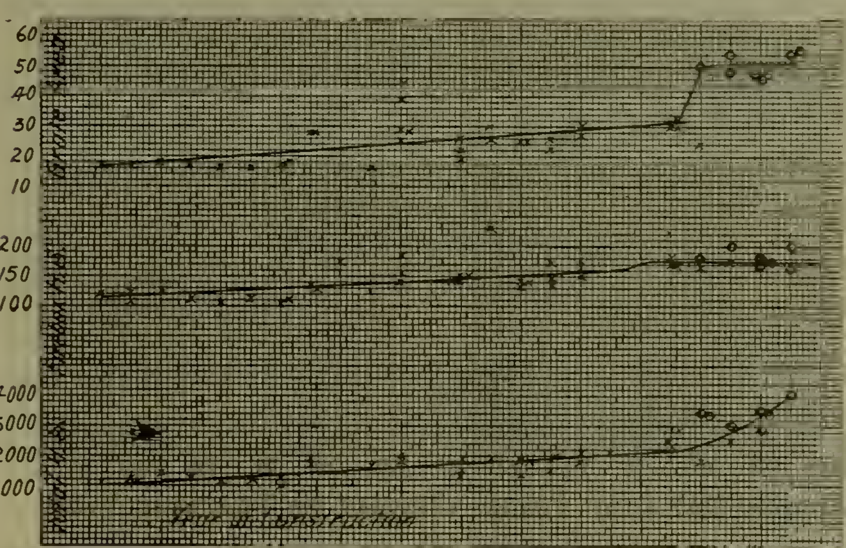


FIG. 1—HEATING SURFACE AND GRATE AREA.

The bituminous coal burning locomotive being representative of the more general American type, is given the greater prominence in the presentation of these tables, though a few anthracite coal burning, single expansion locomotives, using the Wooten, or modified Wooten, firebox and several bituminous coal burning, compound locomotives, are also presented to show to some extent the lines followed by their design as well.

The introduction of the modified wide firebox for burning bituminous coal, requiring the adoption of trailing wheels of small diameter where the drivers are large, has brought about such a noticeable change in the ratio of heating surfaces, the size of grate area, the ratio of total weight to weight on drivers, and the ratio of total weight to tractive effort, that each locomotive operated by a boiler having this type of firebox is indicated by a circle, while a locomotive with narrow firebox is indicated by a cross, in order that any noticeable change brought about by this arrangement may be readily recognized.

While the tables include the several features of design of the locomotives here considered, the curves are probably more interesting as showing the trend followed by designers and the diversity of opinion evidenced by the wide limits between which the figures vary while representing locomotives designed at the same time.

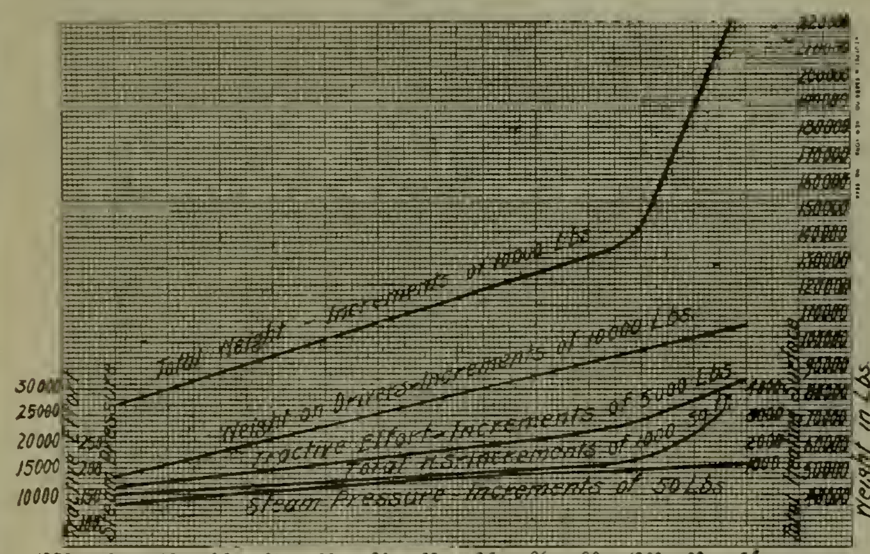


FIG. 2—GENERAL FEATURES.

As the proper proportioning of boiler parts is attracting the greater attention of designers at present, greatest interest attaches to those curves which demonstrate the more radical changes incident to the introduction of the modified wide firebox for burning bituminous coal.

The adoption of this design, as shown by the curves, has effected a material and noticeable increase in the grate area, while the firebox heating surface accompanying the wide grate is no larger than the same heating surface of a narrow grate. The total heating surface is seen to have increased noticeably at the same time. This, however, is due to the additional length of tubes, and in some cases to a greater diameter of tube as well. The

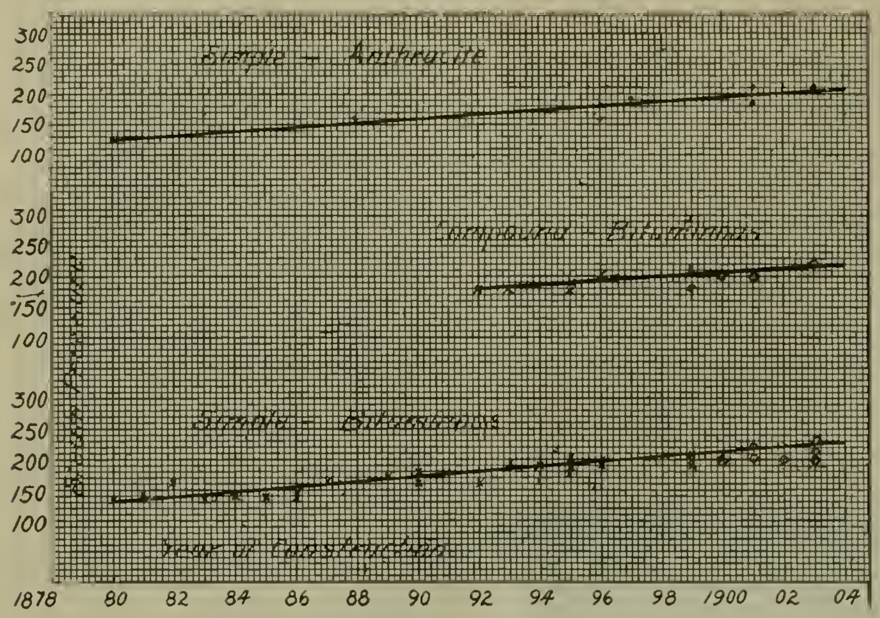


FIG. 3—STEAM PRESSURE.

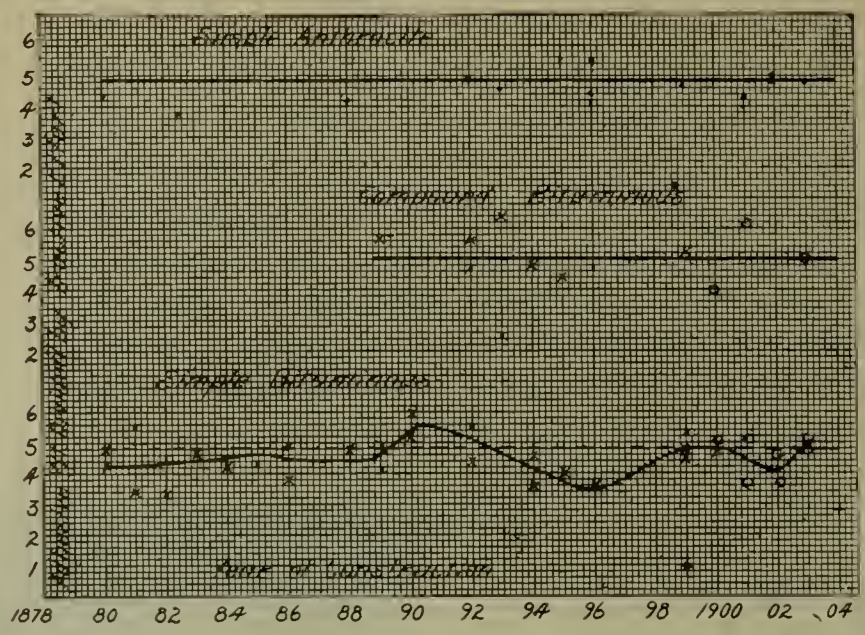


FIG. 7—RATIO OF WEIGHT ON DRIVERS TO TRACTIVE EFFORT.

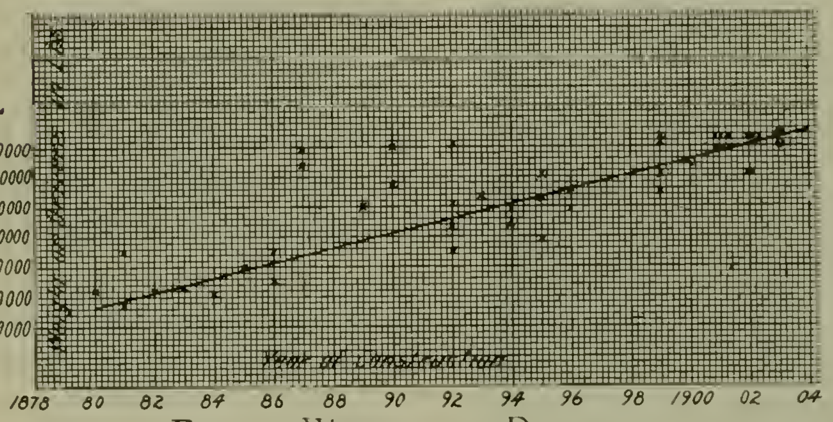


FIG. 4—WEIGHT ON DRIVERS.

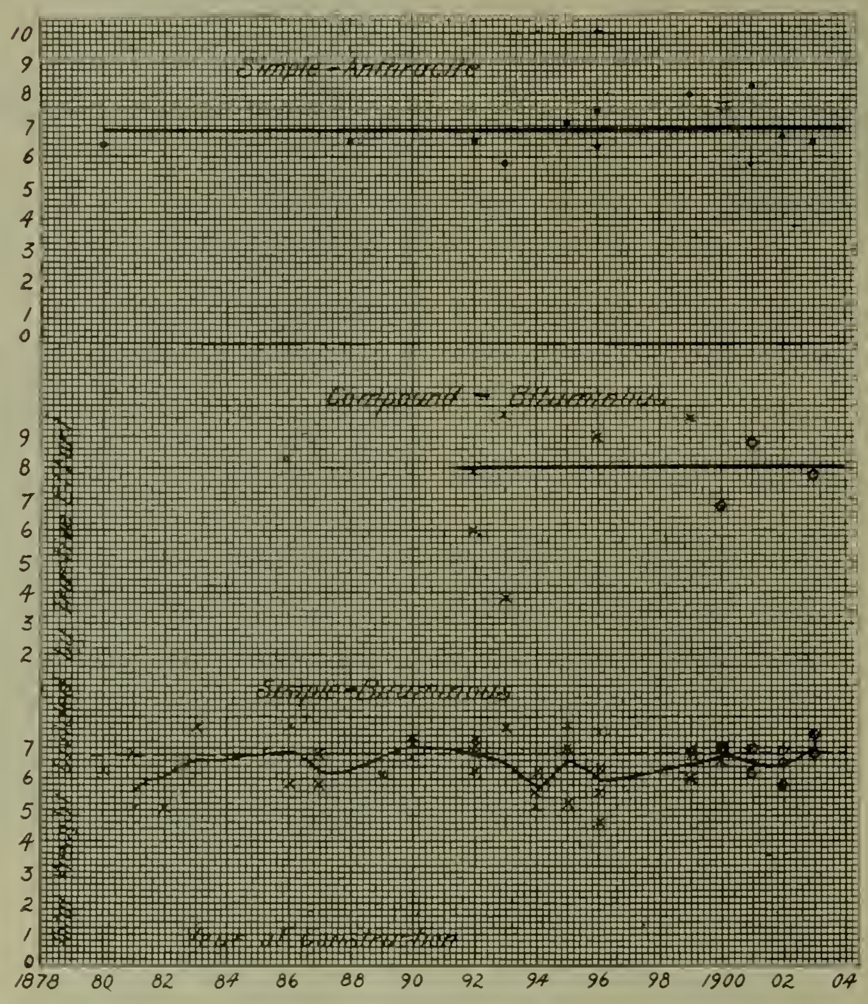


FIG. 8—RATIO OF TOTAL WEIGHT TO TRACTIVE EFFORT.

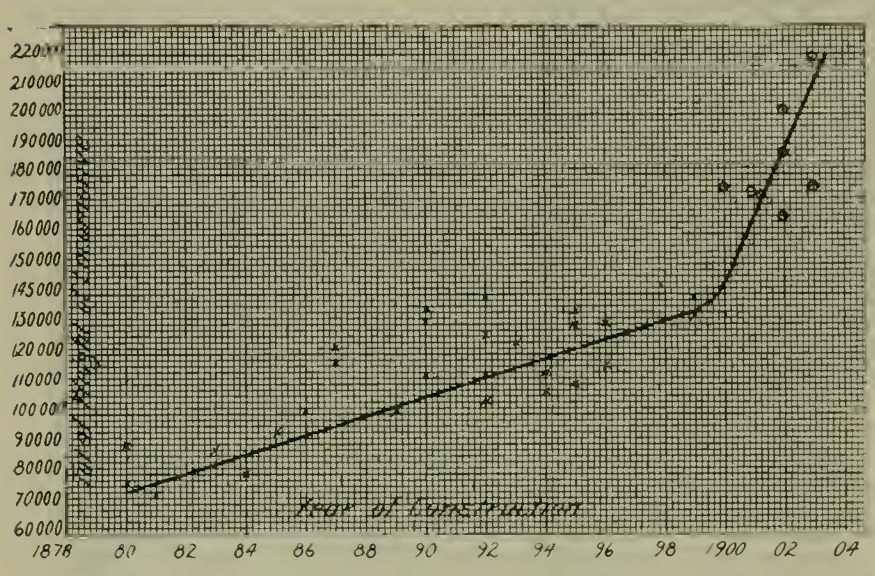


FIG. 5—TOTAL WEIGHT.

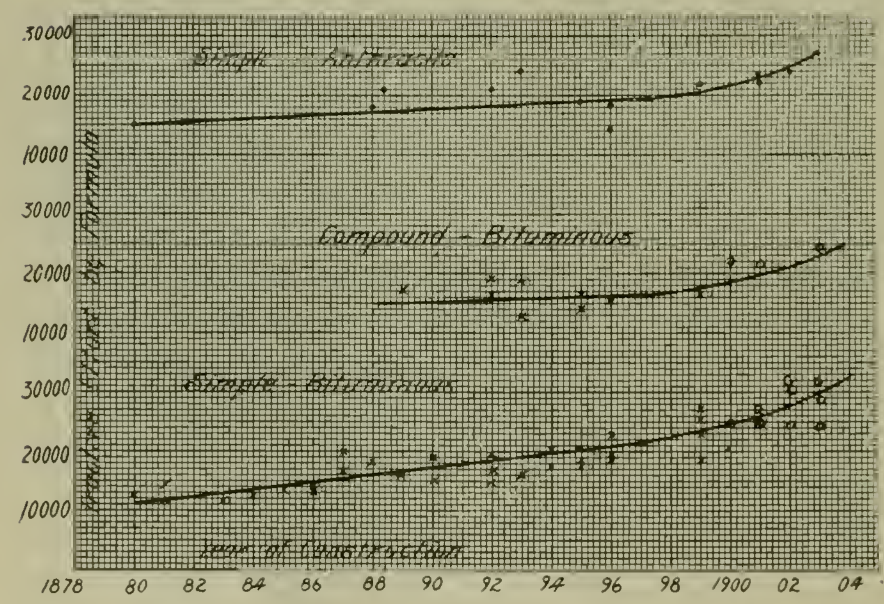


FIG. 6—TRACTIVE EFFORT BY FORMULA.

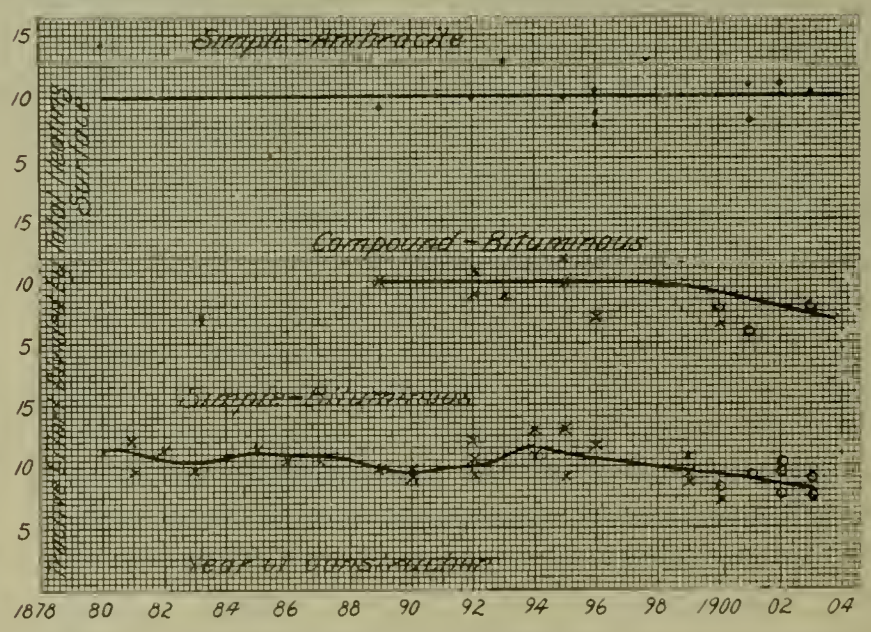


FIG. 9—RATIO OF TRACTIVE EFFORT TO TOTAL HEATING SURFACE.

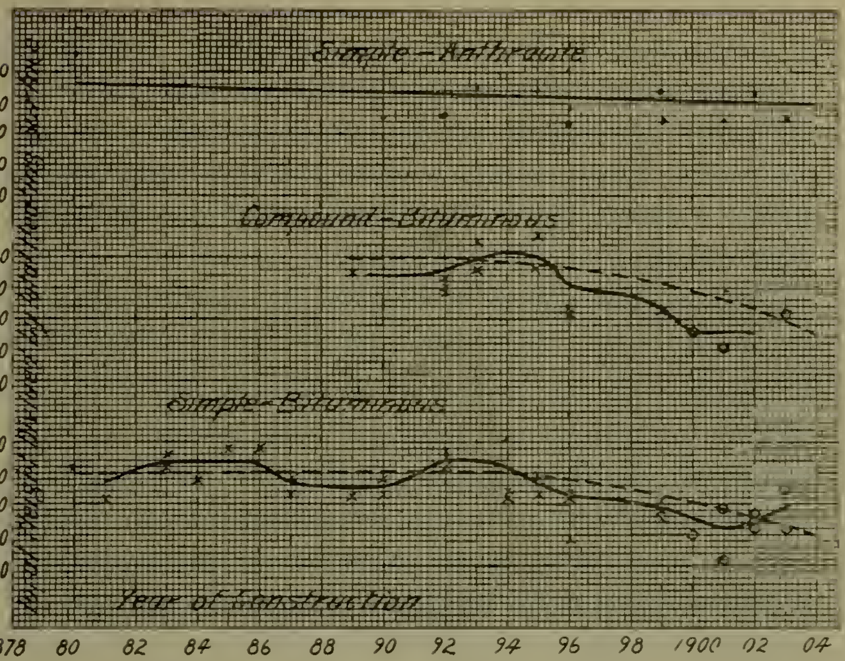


Fig. 10—Ratio of Total Weight to Total Heating Surface.

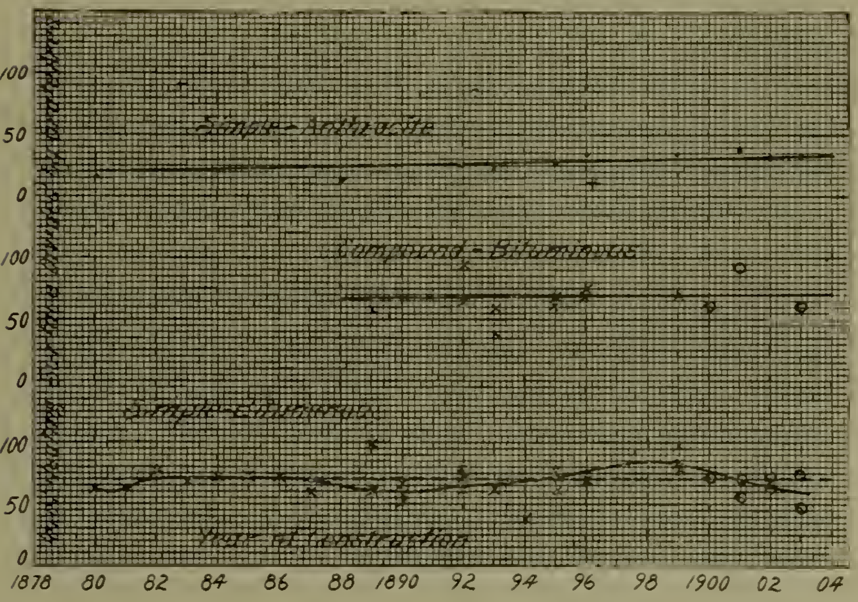


Fig. 11—Ratio of Total Heating Surface to Grate Area.

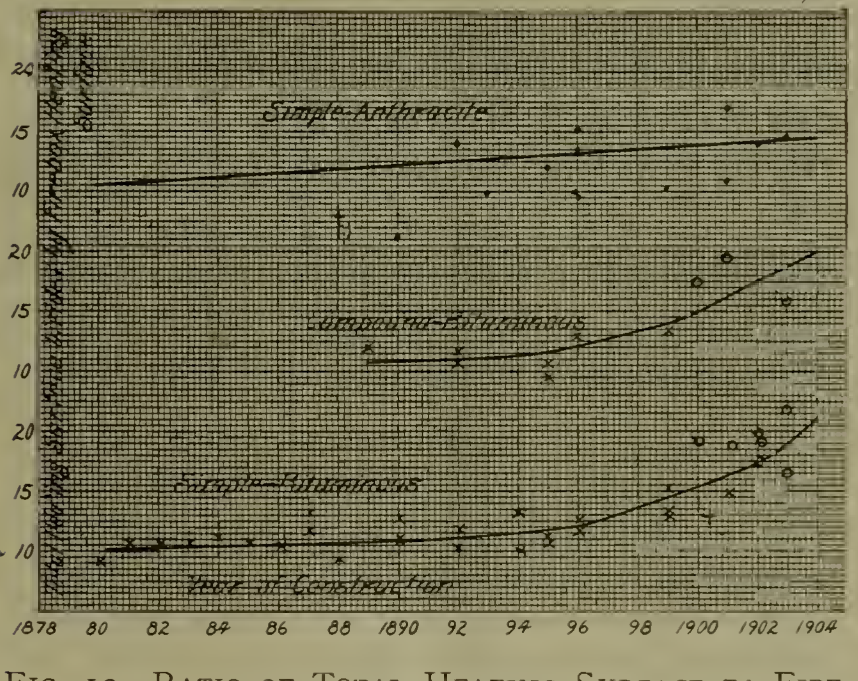


Fig. 12—Ratio of Total Heating Surface to Firebox Heating Surface.

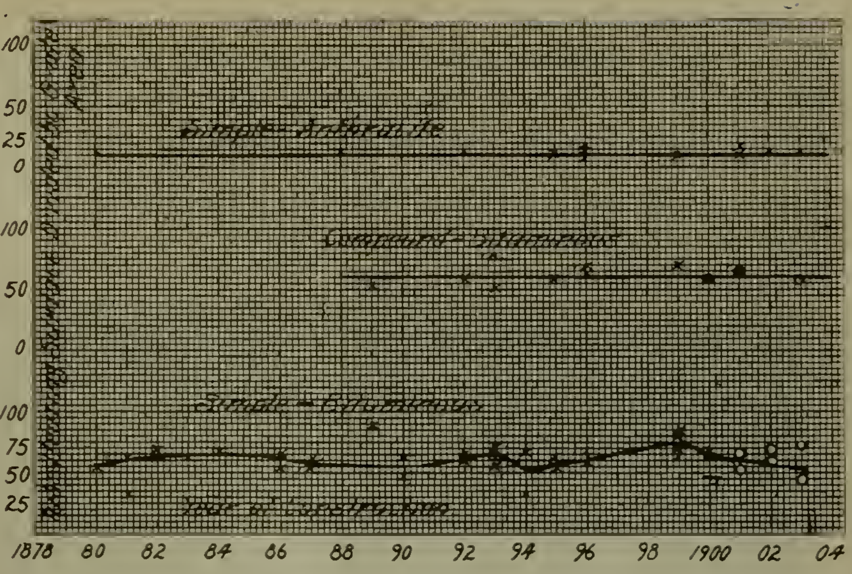


Fig. 13—Ratio of Tube Heating Surface to Grate Area.

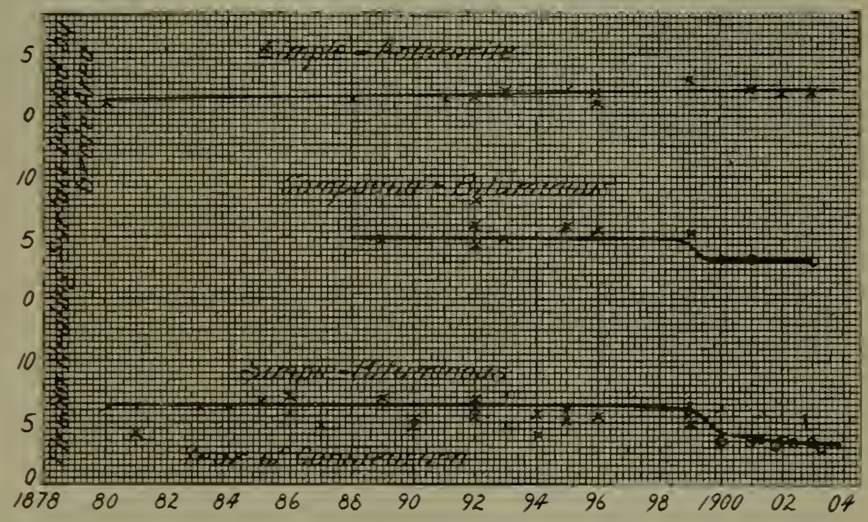


Fig. 14—Ratio of Firebox Heating Surface to Grate Area.

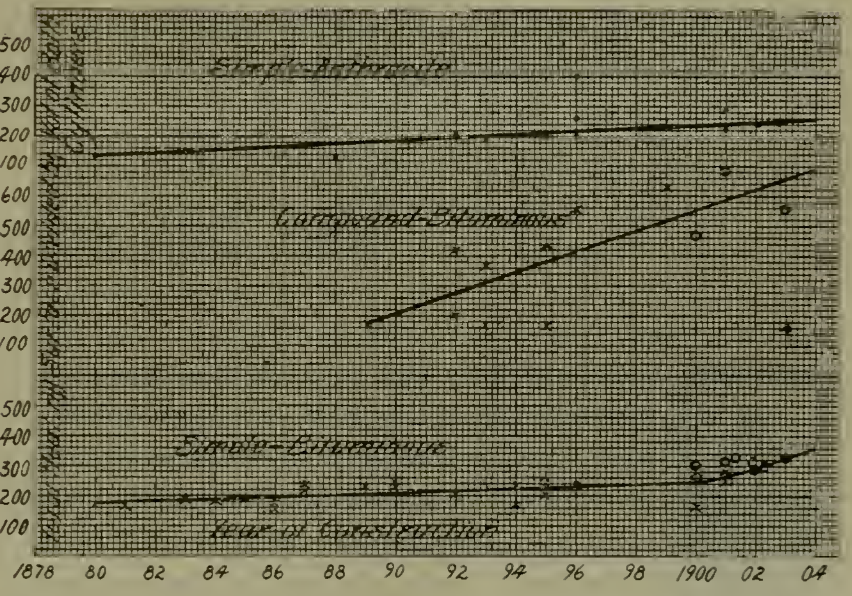


Fig. 15—Ratio of Total Heating Surface to Volume of Both Cylinders.

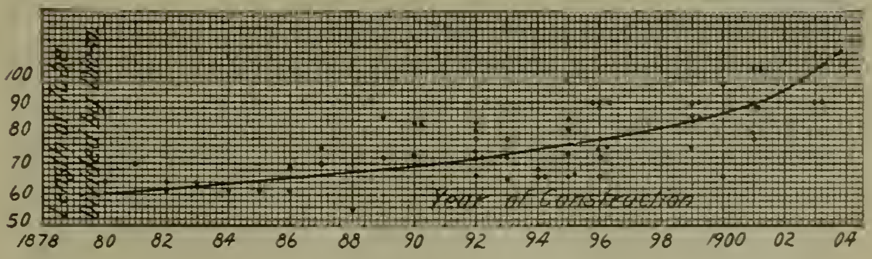


Fig. 16—Ratio of Tube Length to Diameter.

committee of the Master Mechanics' Association, reporting in 1897, recommended as best practice a length of tube equal to 70 to 90 diameters. The accompanying curve shows that the ratio of tube length to tube diameter has been continually increasing, tube length having attained 106 diameters.

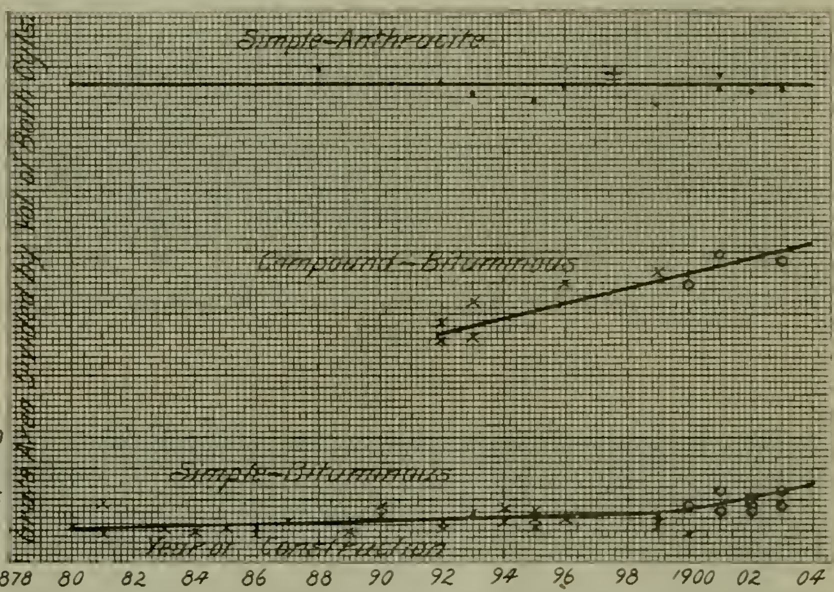


FIG. 17—RATIO OF GRATE AREA TO VOLUME OF BOTH CYLINDERS.

Turning now to the curves representing weights, it is observed that while the average weight on drivers has increased steadily (the addition of the trailing wheel having made no material difference); yet it is seen that the adoption of the trailer accompanied a decided increase in total weight; the curve indicating this point by an abrupt change of form. The effect of the provision of the trailer, being, of course, to enable the increase in total weight to be accompanied by a corresponding increase in boiler capacity while retaining the same rigid wheel base and weight per journal.

Steam pressure is seen to have increased gradually and consistently, the same increase having been general. Tractive effort has increased steadily until during the years 1898 to 1900, when a more decided increase is noticeable, the apparent tendency being to add still more to the present figures in order to handle long trains at high speeds.

The ratio of adhesive weight to tractive effort has varied between rather wide limits showing the diversity of opinion among designers relative to the per cent of weight on drivers which should be exerted in starting power of the locomotive. While the ratio existing in modern locomotives is very similar to that in past practice, a curve showing the variation of the average from year to year is very irregular. At the same time, however, we include a dotted line showing the general average of the entire number plotted, to be a straight line parallel to the axis of abscissae. This indicates that while the weight on drivers has been continually increased, the steam pressure, cylinder volume and diameter of driving wheel have been correspondingly increased.

The relation between tractive effort and total heating surface is of much interest and while both have been materially increased, the increase in heating surface during the past few years has been more rapid than that of tractive effort.

The gradual substitution of a larger cylinder volume has been attended by an increased cylinder diameter rather than by a material addition to length of stroke. Diameters have varied from 17 to 22 inches. Length of stroke has seldom exceeded 26 inches at any time in general practice, while a 24-inch stroke was not uncommon twenty or twenty-five years ago.

The Selection of Useful Scrap

By J. P Murphy

A GREAT deal has been said regarding the recovery of good material from scrap bins about railroad shops. The question of scrap is, of course, a very important one, particularly in so far as the operation of a road is concerned. Scrap receptacles of various designs have been installed from time to time by different roads, each one having its redeemable features. This has to do only with regard to least cost in handling.

The question of allowing good material to go to scrap bins is an all important one. It seems fair to contend that unless good material is allowed to pass to scrap bins, it cannot be recovered there, and, inasmuch as more or less labor attends the recovery of usual material from dismantled equipment, the question of how this labor should be applied seems essential; that is, whether the dismantled pieces should be sent promiscuously to bins or scrap receptacles and resorted there.

To recover usable material requires a certain knowledge: certain experience by those accustomed to using the material itself. For instance, the car repairer in doing work on cars, will know whether a draw rod, brake rod or a hanger is fit for use again, much more readily than a man whose business it is to handle scrap only and who is not conversant as to the requirements of various articles of material relative to their actual use. It would seem that the proper place to do the sorting, or rather to select the good from the bad, is while it is in the hands of workmen accustomed to its use. The same thing applies to branch oil pipes taken from engines, and brass nipples on them; it applies to driving brake parts from engines undergoing repairs in shop, etc.

You would say that this might be practicable about a large shop, car repairer houses or round houses, but it would not be practicable where a considerable quantity of wreckage was picked up, the body of the equipment having been destroyed, leaving a net work of wrought, malleable, steel and cast iron. This is true. Such material should go direct to scrap bins, and after being worked by the shears, should be sorted and the various articles of material which appear to the men employed on scrap dock to be usable, set aside, and a man conversant with the use of the material, called to select such as may be applied again.

It is the practice where it is understood that all sorting is done by men employed on scrap dock, for the heads of the departments to simply send everything to the scrap bins, assuming that it will be taken care of there, and many times this is overdone and good material is lost sight of in that way. It is a fact that more or less good material is lost sight of in any event, no matter how complete the system, nor what methods employed, but it would seem that it should be the duty of any one handling second-hand material, to select at once, immediately the same comes to his notice, any piece that from his knowledge is usable. It should not be left to those assigned to particular duty of handling scrap. The work of sorting usable material from scrap to be done by shop men and car men as they find such material, turning the material back into service, or turnit over to the storehouse for distribution.

In view of the great waste incurred in handling scrap and old usable material, the following list of instructions is appended with the idea in mind of eliciting discussions and expressions of results of experience from others interested in this department of railroad work. Much benefit may be derived from a discussion of the most practical methods of sorting and selecting usable material from the scrap pile and any correspondence discussing this interesting subject will undoubtedly redound to the good of the cause.

All rods should be cut with the shears and the pieces retained that can be converted into bolts.

All brass parts, such as nipples, etc., should be taken to the brass room each night, and no brass allowed to accumulate at the bins or remain there over night.

Clinker hooks from engines, even though they be bent, should be retained and taken to the blacksmith shop to be repaired.

Turn buckles and truss rods should be saved.

All square and hexagon nuts should be retained and taken to the shops periodically for retapping.

Frequently the draw lugs and other irons can be recovered from luggage where the wood work has been destroyed by fire.

Cellar bolt keys can be straightened.

Oil house lids removed from broken oil houses.

Inner and outer drawbar springs can be remated.

The bands should be removed from engine springs.

Gas pipe of all sizes, both single and double thickness, if bent or broken, can be made into nipples or used for rollers at freight houses, and no straight pieces should be disposed of as scrap.

All chains of whatever size or description should be retained and carefully sorted over before being disposed of.

Brake chains worn out as such may frequently be converted into hand car chains and used by section men.

Bolts which have had the threads stripped off may be sheared off and by re-threading make good bolts of shorter lengths.

Old blizzard and signal lamps should in every case have the lenses removed before they are consigned to the scrap.

All rubber hose should have the fittings, nipples, etc., removed and cared for.

Wire wound corrugated hose should be kept separate from pure rubber.

Sheet rubber clippings should be kept separate from other scrap rubber. The side sheets from tanks can be frequently cut up into running boards to be used at stations for transferring freight from platform to car.

Broken couplers should have the pockets removed; the pockets are good.

All knuckle pins should be saved and scrapped only after a thorough inspection.

Malleable and steel knuckles and couplers should be kept separate.

When selling scrap the greatest care should be exercised in obtaining the actual gross and tare weight of the car.

If a drop-bottom gondola, care should be taken to see that the hoppers are not filled with refuse.

When necessary to block scrap material, care should be taken to deduct the weight of the blocking before making collection bill.

As soon as possible after the carload of scrap is weighed and ready for shipment, information should reach the purchasing agent.

Track spikes, bolts, part of frogs, etc., should be kept and listed separately.

Frequently good spikes can be selected from those picked up as scrap if care is exercised when loading on sales order.

Clean steel borings and turnings should be kept separate from greasy and oil chips.

A Convenient Cinder Pit---C. B. & Q. Ry.

THE accompanying half tone engravings illustrate a new cinder pit recently built by the Chicago, Burlington and Quincy Railway at their Grand Crossing round house. The depressed track wall and bottom of the pit are constructed of concrete, while the side and end walls are of brick. The rail nearer the depressed track is supported upon cast iron pedestals, which rest on piles and are partially embeded in the concrete floor, and the further rail rests upon the brick wall forming the side of the pit, which is also built on a foundation of piling. An interesting feature of this design is the extension bottom, about six feet beyond the nearer rail. This arrangement permits cinders to be dumped from the locomotive ash pans and the pit cleaned without requiring laborers to stand between the rails, or beneath the engines, and allows the pit to be used when cinder cars are full or being switched. The ash pans in service are self-cleaning so that it is not necessary to get beneath the locomotive to clean them, and by using a long-handled shovel, ash and cinder may be drawn from between the rails while the attendant is standing on the extended bottom between the locomotive track and depressed track.

In constructing this pit provision was made to accommodate twice the number of engines at one time as was provided for by the former pit. This feature is commendable in view of the time lost by locomotives standing idle until there is room for them over the cinder pit.

New Cinder Pit of the C. B. & Q. Ry.

New Cinder Pit of the C. B. & Q. Ry.

When "held up" in such manner an engine is idle in every sense of the word, for it is not only out of service, but furthermore, so located that it is impossible to perform running repairs or wash out the boiler.

The Iowa Railway Club

By Al. Moore

THE Iowa Railway Club, which, soon after its inception in January, 1902, attained to prominence among similar organizations of the country, has gained rapidly both in numerical strength and prestige. Unlike a majority of the railroad clubs of the country, there is a breezy democracy in its composition in that a brakeman, a conductor, fireman, switchman, bridge foreman, section man or clerk in any of the various departments is not only welcomed as a member, but is privileged and encouraged to express opinions upon any topic under discussion before the club with the same freedom as an official. The membership, far from being restricted to general superintendents, division superintendents, roadmasters, chief engineers and those known in the parlance of the rail as "brass collars," is almost as varied as the occupations of its individuals composing the organization. The sponsors for the club assumed at the start that the best foundations upon which to erect a durable structure would be to invite the utmost freedom of expression from any and all members, regardless of their positions in the service. Not only this, but employes in the different departments were extended cordial invitations to affiliate with the club. The result has been more than gratifying; it has more than fulfilled the expectations of the men who were wise enough to take so broad and catholic a view of affairs.

It was in the brain of Hiram J. Slifer, then superintendent of division for the Chicago & Northwestern, since made general superintendent of the Rock Island, that the plan for the organization of the club was born. He conferred with George A. Goodell, superintendent of division for the Burlington, Cedar Rapids & Northern; Charles M. Levy, superintendent for the Burlington in Iowa; W. D. Hodge, superintendent for the Northwestern at Eagle Grove; W. J. Lawrence, division superintendent for the Rock Island; C. N. Gilmore, superintendent for the Fort Dodge division of the Rock Island; H. B. Earling, superintendent for the Chicago, Milwaukee & St. Paul; C. W. Huntington, general superintendent for the Iowa Central, and a number of others. and following a preliminary meeting in November, at which the matter was informally gone over, a meeting was called January 1, 1902, and a permanent organization effected by the election of the following officers: President, Hiram J. Slifer, Boone; first vice-president, George A. Goodell, Cedar Rapids; second vice-president. C. M. Levy, Burlington; third vice-president, W. J. Lawrence, Des Moines; fourth vice-president, C. W. Huntington, Marshalltown; secretary, P. M. Plumb, Marion; treasurer, C. P. Stembel, Des Moines.

One of the striking features associated with the presidency of the club is that in every instance, with the exception of the present incumbent, J. A. Wagner, the president soon achieved to a decided advancement. Mr.

H. J. Slifer was, at the time he was chosen to the presidency, superintendent of the main line division of the Northwestern in Iowa. A few months afterward he was tendered and accepted the general superintendency of the Rock Island for all lines east of the Missouri river. He was succeeded by the first vice-president, G. A. Goodell, division superintendent for the B., C. R. & N., with headquarters at Cedar Rapids. In a short time Mr. Goodell was appointed general superintendent of the Chicago Great Western system, and removed to St. Paul. He was succeeded by H. B. Earling, division superintendent of the Chicago, Milwaukee & St. Paul, with headquarters at Marion. In May he was made assistant general superintendent and transferred to Milwaukee, tendering his resignation soon after. It was accepted and Superintendent J. A. Wagner, of the Des Moines Union, elected to succeed him. C. W. Huntington, another of the charter members, was general superintendent for the Iowa Central. In less than six months afterward he became general superintendent for the New Jersey Central. He

Mr. J. A. Wagner, President of the Iowa Railway Club.

has been in virtual charge of the operating department of the New Jersey line ever since. Twenty years ago Mr. Huntington was a brakeman in the employ of the Rock Island company. His mother and two sisters reside in the city, which has been their home for many years.

C. M. Levy, the second vice-president, did not escape the general order of promotions. From superintendent of the Burlington in Iowa he was made general manager for the lines in Missouri and transferred from Burlington to St. Louis.

The original membership of the club was about fifty. It now numbers 235. When it was made known the club invited members from every department of the service to affiliate with the organization applications began to pour in at each meeting. Conductor Paul Vermillion, of the Great Western, who was known to possess peculiar genius for organizing, was selected for secretary. Mr. Vermillion more than realized the highest expectations, and the vigor with which he pushed the interests of the club to the front soon made a perceptible impression upon the membership, which increased very fast. He edited and supervised the preparation and printing of the official proceedings, solicited advertising, read proofs and meanwhile made regular trips over the line.

As was only natural, many of the conductors, engineers, bridge men, yard men, dispatchers and employes holding minor positions entertained a decided diffidence to speaking freely on papers submitted. However, they were given to understand the objects of the club were in the interest of a full, free and exhaustive discussion of all matters pertaining to the entertainment or instruction of the organization. In a short time these men, who "do" things and are familiar with the details of practical operation of railroads, not only took part in the discussion, but prepared and submitted papers treating upon leading topics. The effects were most gratifying. In many instances the leading railroad journals reproduced some of the papers in part or entire, commenting upon them favorably, and interest in the topics which engaged the attention of the Iowa Railroad Club awakened an ever-widening circle of outside interest.

Of the prominent railroad officers who are members of the club are C. M. Levy, general manager for the Burlington in Missouri; H. C. Nutt, superintendent Burlington lines in Iowa; Hiram J. Slifer, general superintendent Chicago, Rock Island & Pacific; George A. Goodell, general superintendent of the Chicago Great Western; H. B. Earling, assistant general superintendent of the Chicago, Milwaukee & St. Paul; C. P. Stembel, superintendent Chicago Great Western; O. E. Stewart, superintendent Burlington, Creston; W. D. Hodge, superintendent Chicago & Northwestern, Sioux City; E. G. Schevenell, superintendent Chicago & Northwestern, Mason City; W. H. Given, W. J. Lawrence, C. N. Gilmore, superintendent Rock Island; Frank Hoot, superintendent Milwaukee & St. Paul; G. W. Fabens, superintendent Burlington, Ottumwa; J. B. Smalley, superintendent Rock Island, Des Moines; A. W. Kelso, assistant superintendent Rock Island, Des Moines; C. H. Caswell, division freight agent Rock Island, Des Moines; J. C. Pugh, freight agent Rock Island, Des Moines; F. C. Hubbell, president Des Moines Union Railway, Des Moines; J. A. Wagner, superintendent Des Moines Union, Des Moines; F. B. Harriman, superintendent Illinois Central, Dubuque; S. G. Strickland, superintendent

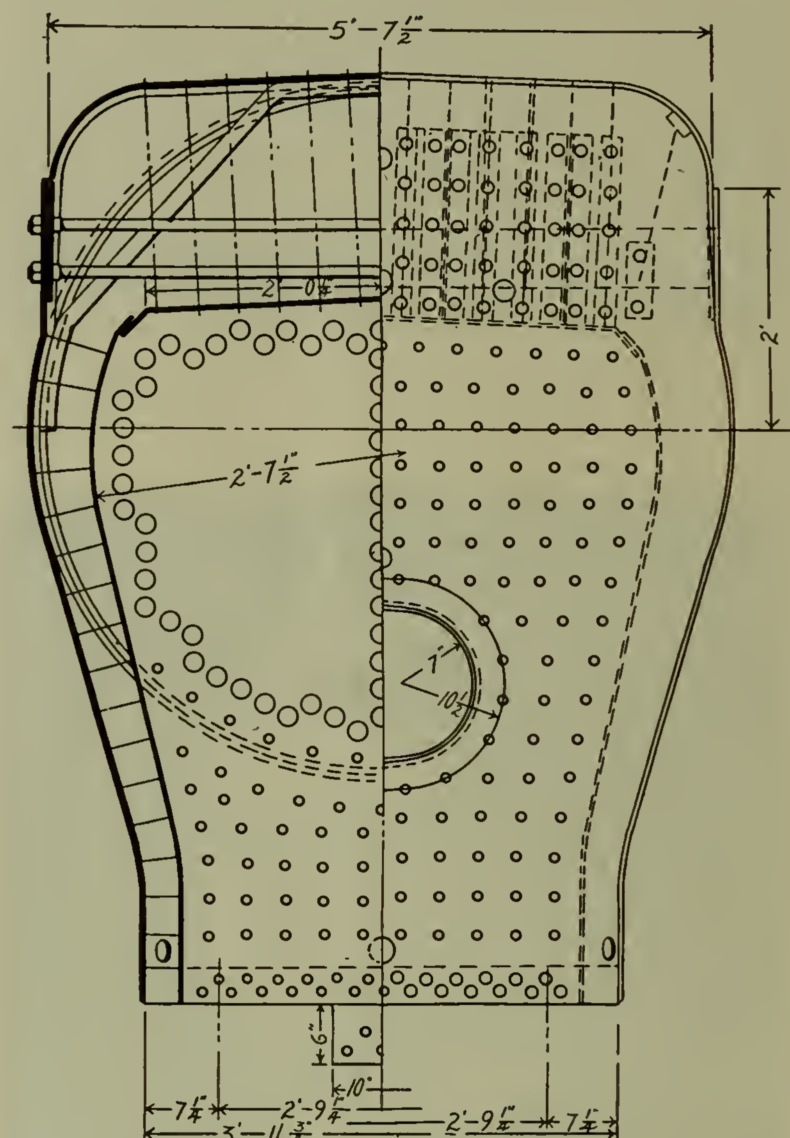
Milwaukee & St. Paul, Omaha; C. L. Brown, trainmaster, Fort Dodge division Rock Island; William Walker, freight agent Rock Island, Des Moines; R. A. Belding, commercial agent, Burlington, Des Moines; Fred Patt, chief dispatcher, Rock Island, Des Moines; L. F. Berry, division freight agent, Chicago & Northwestern, Des Moines; O. Cornelison, Great Western, Fort Dodge; C. H. Nettels, division freight agent for Milwaukee & St. Paul, Des Moines; F. S. Rogers, chief train dispatcher, Rock Island, Des Moines; F. E. Allen, assistant trainmaster, Chicago & Northwestern, Council Bluffs; C. F. Miley, freight agent, Northwestern, Des Moines.

Switching Locomotive---Great Northern Railway

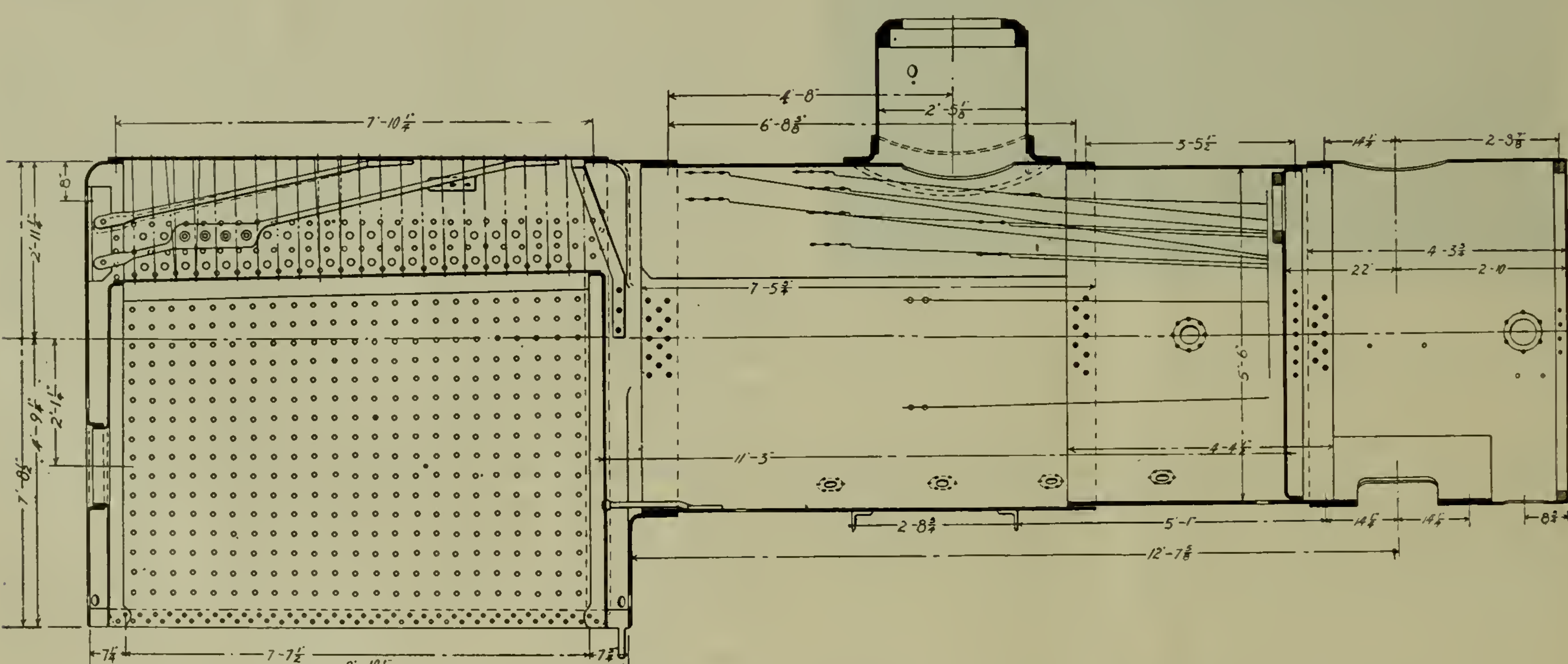
THE Rogers Locomotive Works have recently built ten switch engines for the Great Northern Railway according to the designs published herewith. It will be noticed that the weight on drivers is unusually heavy for the size of cylinders. The boiler pressure is higher than usual past practice in switching service, and it is owing to the high boiler pressure that so great an adhesive weight could be provided. Further than this the design presents no unusual features, except perhaps that it is not common to observe a Belpaire firebox and all flanged wheels in connection with a switch engine. The engines appear to be heavy, compact and well balanced. A contemplation of the present dimensions and ratios suggests a serviceable and efficient machine.

Determining the tractive effort by the usual formula, the locomotive is capable of a starting power of 32,400 lbs., a figure equal to 23.4 per cent of the adhesive weight. The ratio of adhesive weight to tractive effort is 4.25; the ratio of tractive effort to total heating surface is 17.3; the ratio of total heating surface to grate area is 68.8; the ratio of total heating surface to cylinder volume is 273.6, and the ratio of grate area to cylinder volume is 3.97.

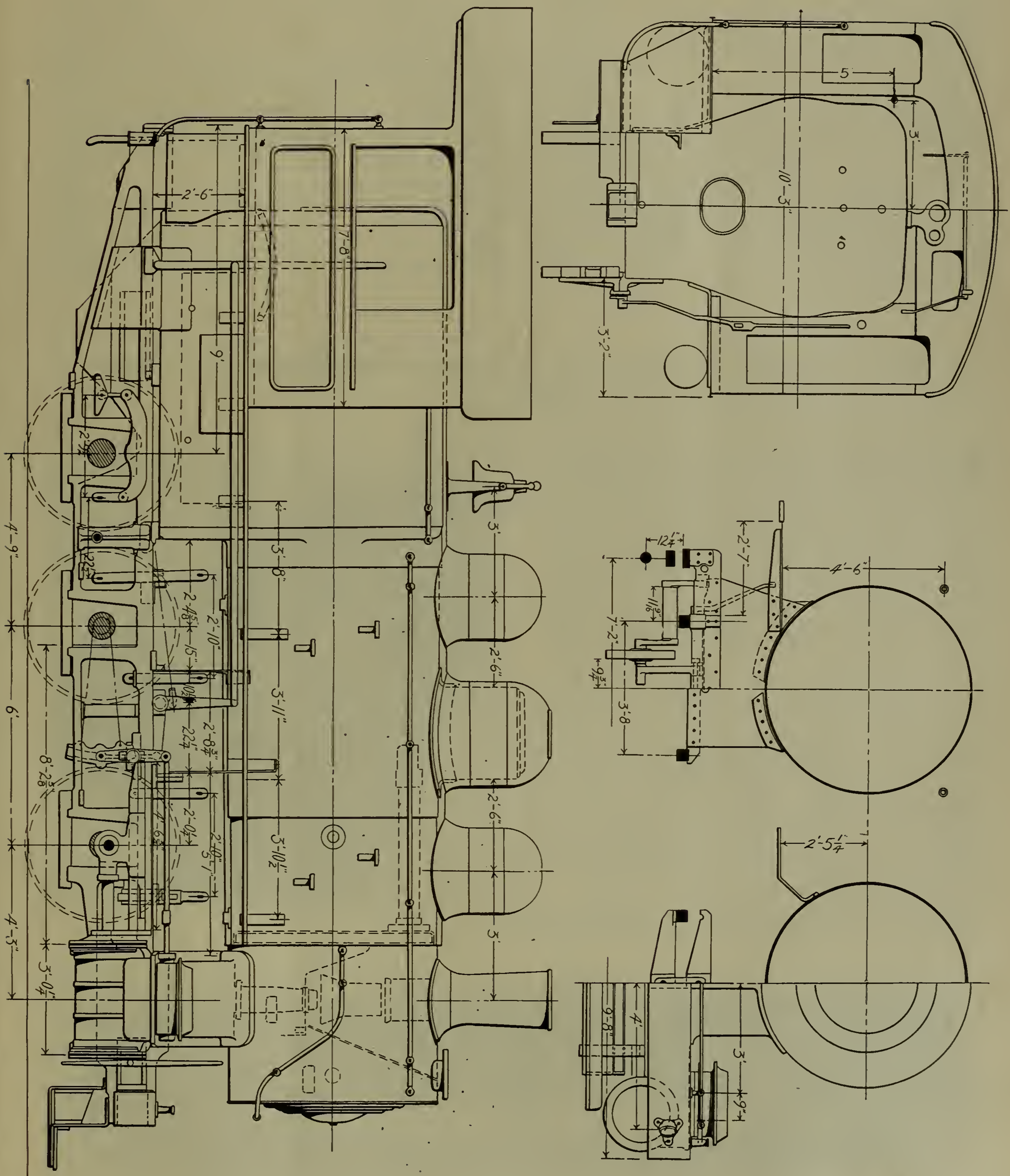
Further details of construction are presented by the following table:



SWITCHING LOCOMOTIVE, GREAT NORTHERN RAILWAY—CROSS SECTION OF FIREBOX.



SWITCHING LOCOMOTIVE, GREAT NORTHERN RAILWAY—SECTIONAL ELEVATION OF BOILER.



Switching Locomotive, Great Northern Railway—Cross Sections and Elevation.

Road	Great Northern.
Fuel	Bituminous coal.
Class	7-A.
Cylinders	19 ins. x 26 ins.
Drivers—number	Six.
Drivers, diameter	49 ins.
Driving wheel material	Cast steel.
Driving axle material, steel. Journals	9 x 12 ins.
Driving wheel base	10 ft. 9 ins.
Total wheel base of engine	10 ft. 9 ins.
Weight on drivers	138,000 lbs.
Weight, total	138,000 lbs.
Heating surface, tubes	1,708 sq. ft.
Heating surface, firebox	164 sq. ft.
Heating surface, total	1,872 sq. ft.
Grate area	27.2 sq. ft.
Tubes	Diameter, 2 ins.; length, 11 ft. 3 ins.
Tubes	Thickness, No. 11; number, 291.
Tubes, material	Seamless steel.
Grate	Length, 98 ins.; width, 40 ins.
Boiler, type	Belpaire, straight top.
Boiler, diameter, outside front	67½ ins.
Boiler, material	Steel.
Boiler, working pressure	200 lbs.
Boiler, thickness of barrel	¾ in.
Boiler, thickness of dome course	¾ in.
Boiler, thickness of crown	7-16 in.
Boiler, thickness of tube	⅝ in.
Boiler, thickness of side	⅜ in.
Tender, capacity	4,000 gallons.
Tender, frame	10 ins. steel channel.
Tender, trucks	Diamond Arch Bar.
Tender, wheels, diameter	33 ins.
Tender, wheels, kind	Cast iron, double plate.
Safety valves	Two 3 ins., one Muffled and one plain.
Lubricators	Triple sight feed.
Headlight	Two 18 ins., round case.
Brakes	Automatic air, drivers, tender and train.
Boiler covering	Sectional magnesia.
Metallic packing	With.
Couplers	Automatic.
Bell ringer	With.
Tires	Crucible steel, 3 pair 3½ ins. x 5¾ ins.
Sanding device	With.
Injectors	Two No. 9 Lifting.
Springs	Half elliptic.
Brake beams	Steel.

Steel Gondola Cars of the Chicago, Burlington & Quincy Railway

LAST month's issue of the Railway Master Mechanic contained an illustrated description of a number of composite gondola cars built by the Standard Steel Car Company for the Chicago, Burlington & Quincy Railway. We mentioned also the steel gondola cars for coal traffic built for the "Burlington" by the Cambria Steel Company. Want of space prevented us from describing the latter type at that time, and we therefore take this occasion for presenting the illustrations and details.

The design of these cars was prepared jointly by the mechanical staff of the road, the builders and the Caswell Car Company. The Caswell system of side dumping, drop bottom doors are used in the construction. The car body is built entirely of rolled sections and sheets. The floor and sides are made of ¼-inch plates. The floor is level and a large part of it is composed of drop doors, by which it is possible to discharge about 80 per cent of the load without the use of shovels. The cars have the following general dimensions: Capacity, 100,000 lbs.; cubical capacity, 1,615 sq. ft.; length over end sills, 41 ft. 8 ins.; length inside, 40 ft.; width over all,

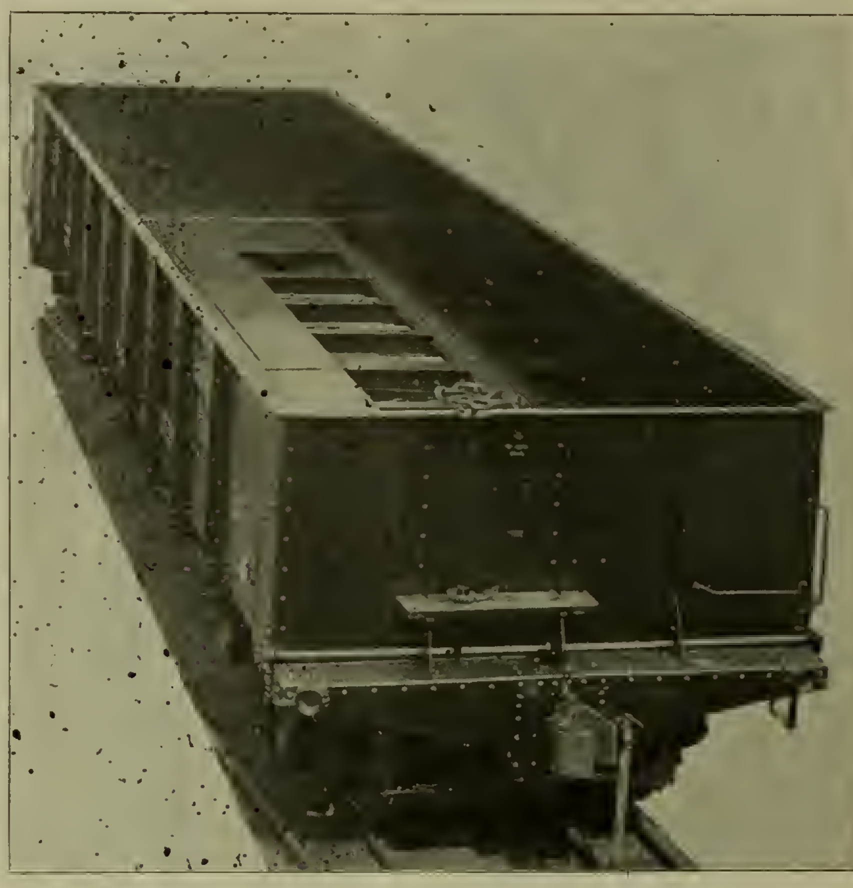


FIG. 2—STEEL GONDOLA CAR OF THE C. B. & Q. RY.

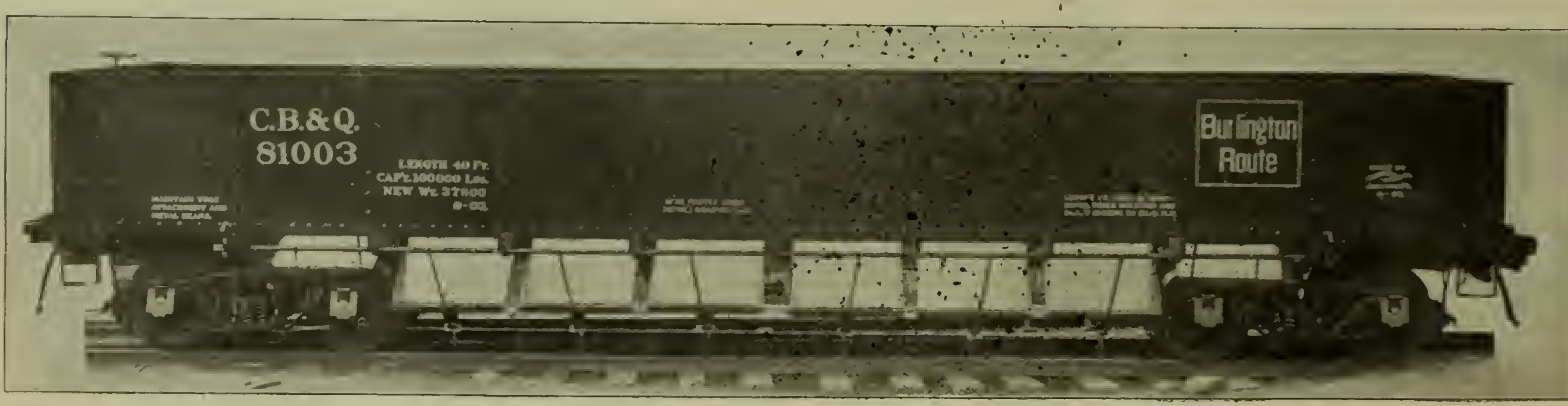


FIG. 1—STEEL GONDOLA CAR OF THE C. B. & Q. RY.

10 ft. ½ in.; width inside, 9 ft. 6 ins.; height of box inside, 4 ft. 3½ ins.; height over sides, 8 ft. ½ in.; height over staff, 8 ft. 6½ ins.; distance truck centers, 29 ft. 8 ins.; wheel base trucks, 5 ft. 2 ins.

The conditions prevalent in the locality in which these cars are principally to be used impelled the adoption of the type of dump door provided. The construction of the coal trestles is such that it is more desirable to dump coal on the outside of the rails, and it is further difficult to provide a center dumping arrangement capable of discharging a desirable percentage of the load. The car is built upon two heavy center sills which are continuous from end to end and are located at such height that the stops of the draft rigging are riveted directly thereto. These center sills are composed of 15-inch channels, of 33-lbs. weight, placed 13 ins, apart, with the webs turned outward. A portion of their length between the trucks is connected by a bottom cover plate, while over the top the quarter-inch plates comprising the flooring serve as a top cover plate. The car has no side sills, the sides being stiffened with plates consisting of quarter-inch material, strengthened with 3x2-inch angles disposed at varying widths of panels which they compose, thus transforming the sides into essentially plate girders. At the bottom the two girders thus formed are connected with the center sills at each panel by means of transverse 8-inch, 11¼-lb. channels, except at the body bolsters. The body bolster is made of a web plate on each side of center sills, and to this is riveted 3½ by 3 by ⅜ inch angles, on each side, top and bottom. There is also a 15 by ¼ inch cover plate. It will be noted that this construction, taking into account the filler used between the center sills, gives practically a body-bolster continuous in the line of its length, through which the center sills also are continuous in the line of their length. The end sills extend 10 inches beyond the car body and

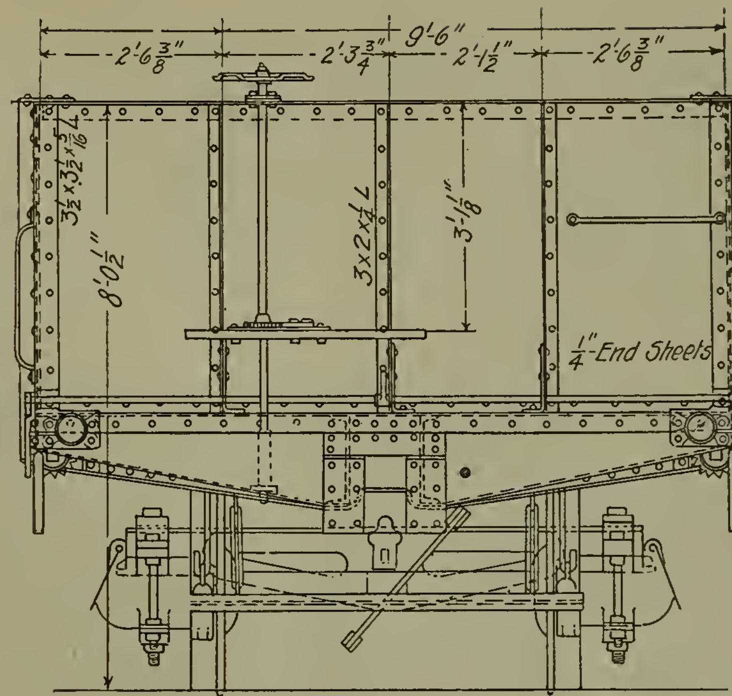


Fig. 3—Steel Gondola Car of the C. B. & Q. Ry.—End Elevation.

they are made up of angles and plates in a very simple construction, as shown by the accompanying engraving.

A coping composed of 3½x3 ins. angles completes the structure, which is essentially a framework braced in all directions desired by considerations of the load, separated from coupling shocks. The latter are amply taken care of by the weight of the center sills and the manner in which they are disposed with respect to the stresses thrown upon them by the draft rigging. Regarding the draft rigging it may be mentioned that 500 of the cars are equipped with Westinghouse friction draft gears and the remaining 500 with the Miner tandem gear, Tower couplers being used with both gears.

There are sixteen doors extending through the bottom of the car, eight of which are located on each side of the

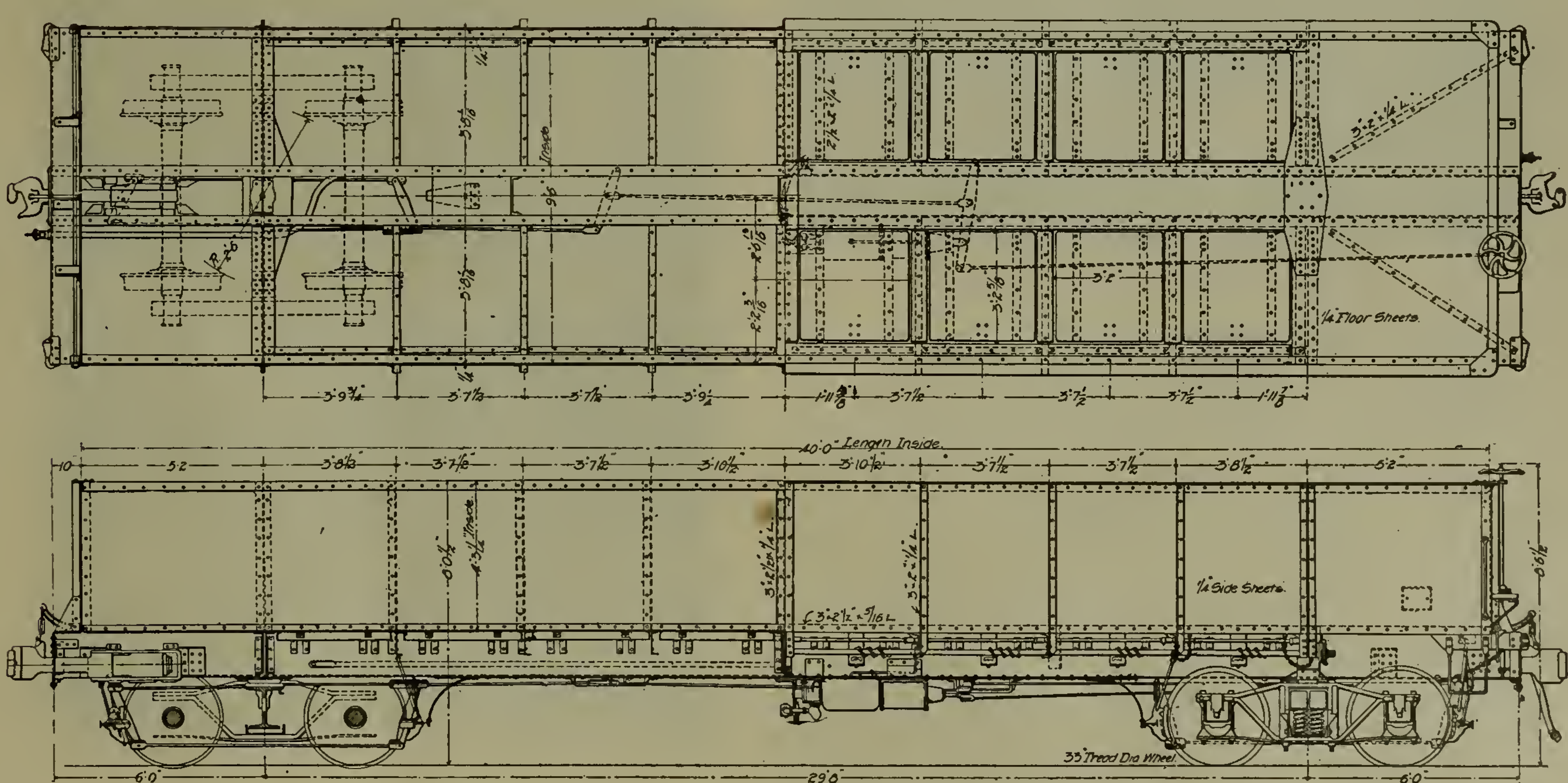


Fig. 4—Steel Gondola Car of the C. B. & Q. Ry.—Plan and Side Elevation.

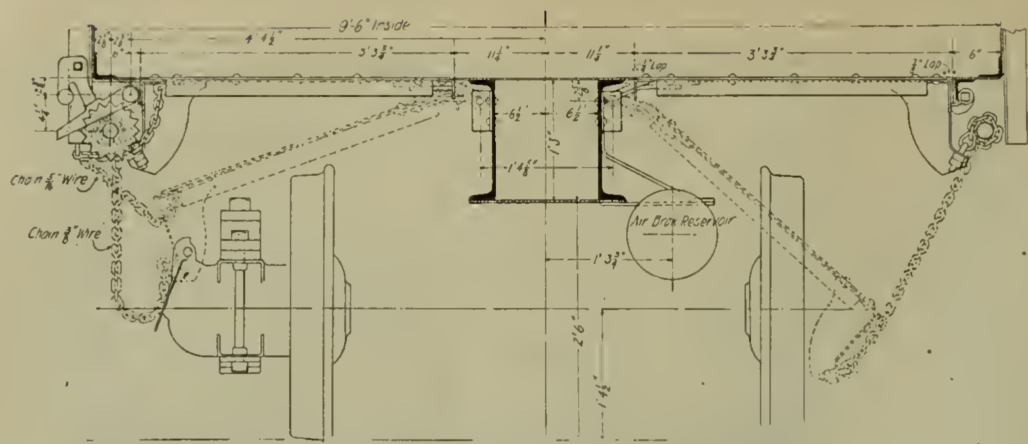


FIG. 5—STEEL GONDOLA CAR OF THE C. B. & Q. RY.—DETAILS OF DROP DOORS.

center sills and between the body-bolsters. The four doors near the trucks give an opening of 39¾ ins. by 38 ins., while the openings of each of the other twelve doors is 38⅜ ins. by 38 ins. The doors are made of ¼-inch plates with an angle iron rim and two intermediate ribs made of 2½ by 2 by ¼ inch angle irons. Each door has a bracket at center, to which is attached a ⅜-inch chain. The doors over trucks have in addition two 5-16 inch safety chains. The doors are hinged at the center sills, and consequently open by swinging down and towards the sills. As demonstrated in Figs 5 and 6,

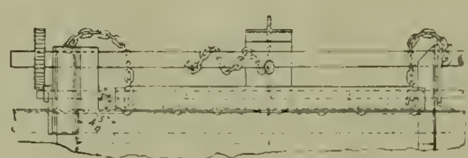


FIG. 6—STEEL GONDOLA CARS OF THE C. B. & Q. RY.—SHAFT AND CHAIN FOR OPERATING DROP DOORS.

the chains are connected to two circular shafts, 2 ins. in diameter, arranged longitudinally with respect to the length of the car. For the sake of flexibility in dumping the load, the shaft on each side is arranged in two sections, making practically four shafts, each one operating four doors. Each shaft is operated at the end of the car at which it terminates, and is revolved by means of a detachable crank. A gear and locking device are provided for the maintenance of the shaft at any point of its revolution.

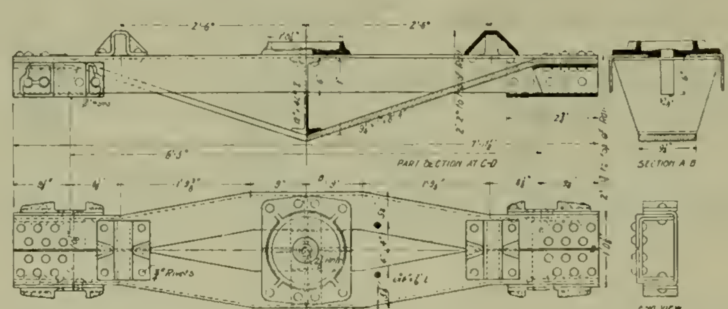


FIG. 7—STEEL GONDOLA CARS OF THE C. B. & Q. RY.—CAMBRIA BOLSTER.

The trucks are of the arch-bar type, in which the Commonwealth cast steel bolster is used in 800 of the cars and the Cambria bolster is used in the other 200, the construction of the latter being shown in Fig. 7. Drop forge steel journal bearing keys are used at the journals and Soule dust guards are placed in the journal boxes. The brake beams are outside hung, are of the Cambria Steel Co.'s make and have peculiar brake shoe slack attachment in being provided with a spring which reaches up and connects to the center sill, as shown by Fig. 4. The side bearings are disposed 2 ft. 6 ins. from the center pin. The brake system consists of Westinghouse equipment. The brake cylinder, with its auxiliary reservoir, is attached to a plate projecting outwardly from the bottom cover plate and braced upward against the center sill, as shown in Fig. 5.

In presenting these illustrations and details we acknowledge the courtesy of Mr. F. H. Clark, superintendent of motive power, and Mr. C. B. Young, mechanical engineer.

Dr. Robert H. Thurston

Late Director of Sibley College.

AT the age of sixty-four, after a life of activity and achievement, Dr. Robert H. Thurston, director of Sibley College, Cornell University, died suddenly of heart failure at his home on the University campus, Ithaca, N. Y., October 25th. The end came unexpectedly and peacefully while he was apparently enjoying good health. At the time of his death Dr. Thurston was waiting in his library where he expected to be joined by former presi-

DR. ROBERT H. THURSTON.

dent of Cornell Andrew D. White and several members of the faculty who were to assemble at his home to celebrate his sixty-fourth birthday. Dr. Thurston enjoyed high standing in his profession as a mechanical engineer both in this country and abroad and was recognized by the most eminent authorities in the department of applied science.

He was born at Providence, R. I., on October 25, 1839, and was the son of Robert L. Thurston. He was graduated from Brown University in 1859 with the degree of bachelor of philosophy and at once became a designing engineer in the employ of the firm of Thurston, Green & Company of Providence. At the outbreak of the Confederate War he entered the United States Naval Engineer Corps and served with distinction in the fleets of Dupont and Dahlgren. In 1863 he was made engineer-in-charge of the Chippewa and in the following year was commissioned first assistant in charge of the iron-clad, Dictator.

At the close of the war he was appointed professor of natural philosophy in the United States Naval Academy at Annapolis and filled that position from January 1, 1865, to June, 1871, when he became professor of engineering in Stevens Institute of Technology.

In 1855 he resigned from the faculty of Stevens Institute to become director of Sibley College, then about to be organized. A college of mechanic arts was at that time a new thing and it is largely due to his careful thought and untiring effort during the past eighteen years that the institution has acquired its present high standing.

When the American Society of Mechanical Engineers was organized in 1880 he was elected its first president and served two years. He was also a member of the American, French, Scotch, German and Austrian societies of civil engineers, the British Naval Institute of Architects, the American Institute of Mining Engineers, was three times vice-president of the American Association for the Advancement of Science and once president of the corresponding British association. He served on many government commissions, being on the United States board for testing iron and steel and other metals from 1873 to 1878, and was a member of the board to investigate boiler explosions. He recently was one of the advisors for the establishment of the Carnegie Institute.

He contributed many valuable works to engineering literature, among which may be mentioned his "Manual of the Steam Engine," "Materials of Engineering," "Treatise on Friction and Lost Work in Machinery and Mill Work," "Manual of the Steam Boiler," "Steam Boiler Explosions" and other valuable books of history and reference. He designed a number of devices, including testing machines, a steam engine governor and an oil-testing machine, which was designed particularly for railway use. Among his more important research work was the determination of the useful qualities of the alloys of copper and tin, copper and zinc, and the ternary alloys of the three metals.

Dr. Thurston possessed a simple dignity, a cordial, generous nature and a kind and sympathetic personality. These gifts, together with his wonderful ability as an organizer and his skill in securing the hearty co-operation of his associates, rendered him a power for good which has been felt and appreciated by the many engineers who have felt his influence, both as students under his instruction and from the results of his work in the engineering field.

A HEAVY forging, interesting because of its having been accomplished in a shop supplied with only the usual facilities of a car repair plant, is shown in the accompanying half-tone engraving from a photograph forwarded us through the courtesy of Mr. W. E. Sharp, superintendent of the Armour Car Lines. This forging was made at the Kansas City shop of the Armour Car Lines, under the special supervision of Mr. G. F. Laughlin, shop superintendent. The work speaks well for the skill of the mechanic who accomplished it so thoroughly with the meagre facilities for a job so uncommon in ordinary car shop work.

Heavy Forging Made in Car Shop.

The forging represents a band which was shrunk on a shaft of a large ice machine. The dimensions of the shaft are 3-32 in. larger than the inside dimensions of the band. After having cooled the work was found to be perfect and the results received therefrom have proved satisfactory in every particular.

The forging was made under an ordinary steam hammer which is partially shown at the left of the engraving. The band measures 21 ins. by 45 ins. and was made from a steel bar 8 ins. by 8 ins. The total weight of the finished piece is 2,750 lbs.

Railroad Shop Tools

By Charles H. Fitch

TOUGHNESS is an essential quality in all the mechanical fitttings of railroad cars and locomotives. When the forged parts were made by blacksmiths at the anvil their aggregate cost was very heavy. In recent years an enormous saving has been effected in the cost of such parts, which has been accomplished by forging presses. This progress has been step by step. Railroad men are finding out what they can do. The devices used for light parts have been applied to forgings of massive proportions. The weight and resisting power of the presses has been increased to the limit of space, and by consultation with die makers, ingenious devices have been applied to make action more automatic and continuous. One heavy piece already made at considerable saving of labor by power presses and dies at the rate of 200 per day, requiring three operations and reheating, was, by use of improved dies, made in one operation at the rate of 1,000 a day. Not only was the output greatly increased, but the labor handling and reheating was only about half that required for the smaller output. This work was done on a 5-inch heading, upsetting and forging machine, made by the Ajax Mfg. Co., Cleveland, O.

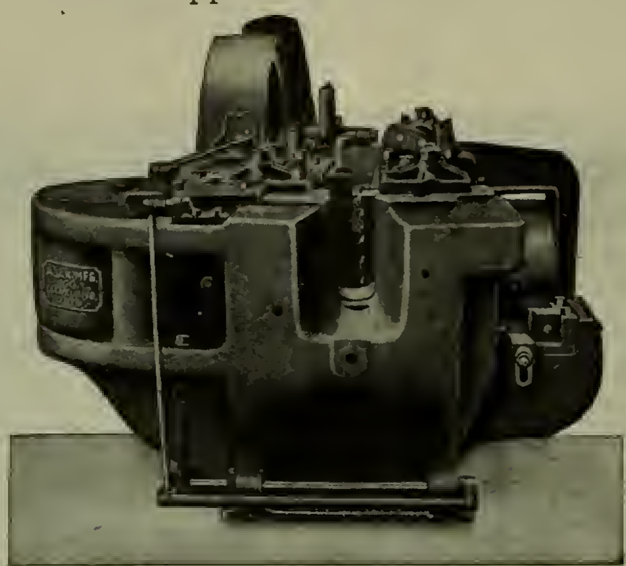


FIG. 1—AJAX 3-INCH HEADING, UPSETTING AND FORGING MACHINE.

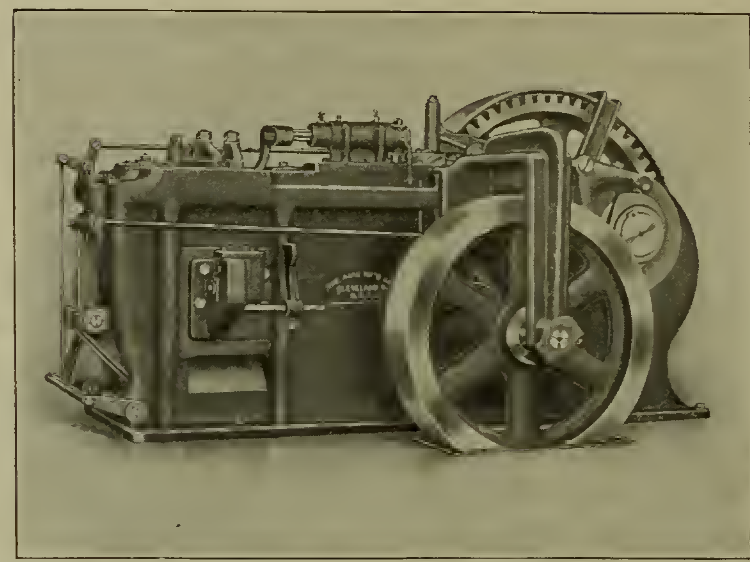


FIG. 2—2-INCH BOLT HEADING, UPSETTING AND FORGING MACHINE, WITH RIVET ATTACHMENT.

The Ajax machines appear to have reached the limit of solidity, that is they appear to be as nearly solid as practicable, allowing for the spaces necessary for mechanical movements and the insertion and removal of work. In Fig. 1 is shown an end view of the 3-inch machine, in Fig. 2 a side view of the 2-inch machine. The claim is made for them that they weigh more per square foot of floor space occupied than any other forging machines built. Regular sizes are built up to 6 inch, that is working stock 6 inches round or square, this size handling flats 18 inches by 2 inches. All gears are cut, all slides lined, and all journals bushed.

Merchant stock to be forged is inserted at the front into what may be called the mouth of the machine to a distance determined by stop gauges. It is powerfully gripped by side dies, one stationary and the other deriving a sliding motion from a series of bell cranks and knuckles on vertical shafts operated from the main horizontal shaft. This train of levers contains the safety brake pin, which yields in case work is attempted beyond the capacity for which the machine is designed. The work being gripped, the same main crank or eccentric shaft forces home the header slide and makes the forging, not, however, until the foot treadle in front has been pressed down, which causes a pitman to drop into gear, bringing the power of the crank shaft to bear upon

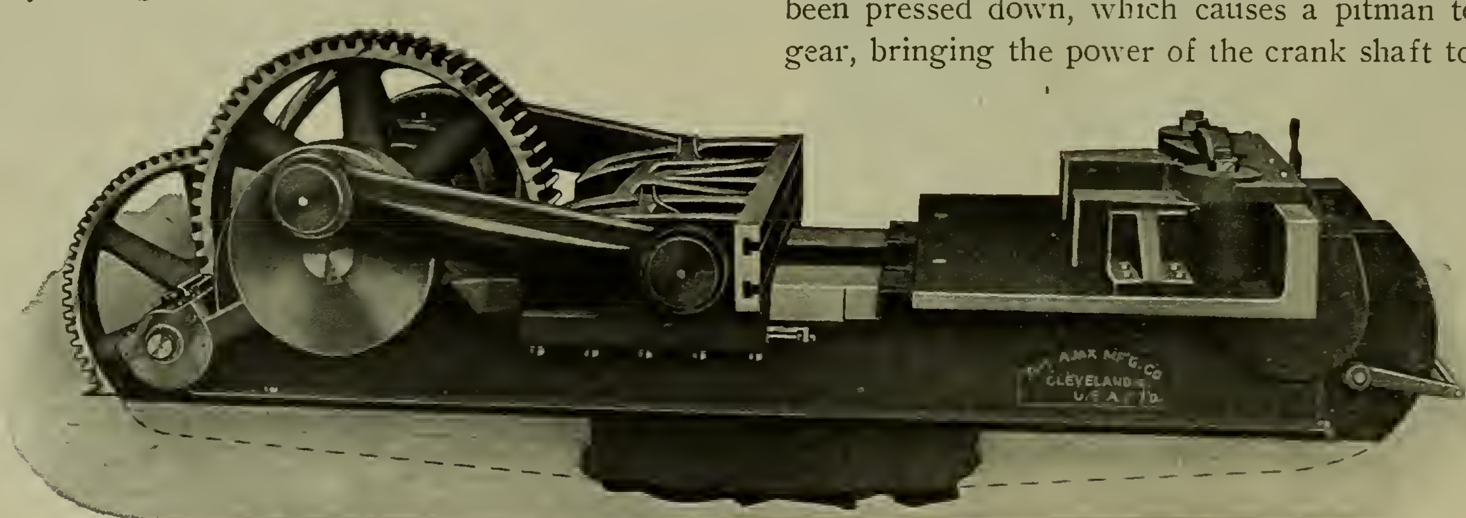


FIG. 3—AJAX BULLDOZING MACHINE.

Railway Master Mechanic's Table of

Road	#StL&P	P&R	Penn	MP	NYNS&B	B&A	CP	WofA	NYNS&B	B&O	CB&Q	CM	MC	Wabash
Builder	Rogers	P&R	Penn	Rogers	Rogers	B&A	Rogers	Rogers	Rogers	Rogers		Sch'dy	Sch'dy	Wabash
Service	Pass.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Fuel	Bit C	Anth C	Anth C	Bit C	Anth C	Bit C	Bit C	Bit C	Bit C	Bit.C	Bit.C	Bit C	Bit C	Bit C
Type of Locomotive	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-6-0	4-6-0	4-6-0
Year of Construction	1880	1880	1881	1881	1982	1882	1883	1884	1885	1886	1886	1887	1887	1889
Type of Boiler	Wagon Top	Str'ght Top	Wagon Top	Wagon Top	Str'ght Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Wagon Top
Type of Firebox	Narrow	Wooten	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow
Type Engine	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Dia. of Driving Wheels - Ins.	63	68	78	63	68	60¾	69	69	62	69	69	57	68	69
Dia. of Cylinders - Ins	17	21	18	19	18	18	17	17	17	18	18	19	19	18
Length of Stroke - Ins	24	22	24	22	24	22	24	74	24	24	24	26	24	24
Volume of Both Cylinders - Cu. Ins.	6.3	8.82	7.06	7.46	7.06	6.47	6.3	6.3	6.3	7.06	7.06	8.5	7.87	7.06
Kind of Valve	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide
Steam Pressure - Lbs	135	125	140	135	148	160	135	140	140	140	145	160	160	170
Dia. of Boiler Shell at Front - Ins.	48			49⅞	55	51	51	51	52	54	49½	60	58	54.5
Height Center of Boiler Above Rail - Ft. & Ins		7-8	7-5¼										7-10	7-0¾
Total Wgt. of Locomotive Lbs	77600	96200	92700	73750	98070	80000	88300	80650	94000	101500	82800	121000	118000	101000
Wgt. on Drivers - Lbs.	52500	64250	65300	48800	64700	52330	53900	51575	60000	65600	54500	99000	94000	80000
Wgt. on Engine Truck - Lbs	25100	31950	27400	24950	33370	27670	34400	29075	34000	35900	28300	22000	24000	21000
Wgt. on Trailers - Lbs.														
Percentage of Total Wgt. on Drivers	67.6	67	70	66.1	66	65.4	61	63.9	63.8	64.6	66	82	80	79
Number of Boiler Tubes	161	184	201	185	188	221	180	184	188	200	189	234	247	203
Dia. of Boiler Tubes - Ins.	2	2	1⅞	2	2	2	2	2	2	2	2	2¼	2	2
Length of Boiler Tubes - Ft. & Ins	11-6¾	10-2½	10-10 5/16	11-1	11-0		11-7	11-0	11-0	11-0	11-6⅜	13-0	12-6	14-3⅞
Length of Tube Divided by Diameter	64.37	61.2	70.5	61.5	61		64.5	61	61	61	69.1	69.8	75	85.7
Tube Heating Surface Sq. Ft.	975	982	1085	1074	1083	1272	1092	1060	1081	1152	958.2	1780.85	1605.8	1510
Firebox Heating Surface - Sq. Ft.	120	135	120	109	121	128	110	103	113	124	102.1	133.34	129.3	127
Total Heating Surface - Sq. Ft.	1095	1117	1205	1183	1204	1400	1202	1163	1194	1276	1060.3	1914.09	1735.1	1637
Grate Area - Sq. Ft.	17¼	76	34.8	17	33.33	18	17.32	15.8	16.52	17.47	17.7	28.6	28.5	16.5
Wheel Base Driving - Ft. & Ins			7-9								8-6	12-0	12-2	15-10
Wheel Base Total - Ft. & Ins.		21-1	22-7½								22-6¼	22-3	22-6	25-10½
Tractive Effort by Formula - Lbs	12400	15000	11800	14400	13500	15900	11500	12300	13700	13200	14100	20640	17300	16200
Tractive Effort by ¼ Wgt on Drivers - Lbs	13125	16062	16325	12200	16175	13082	13475	12894	15000	16400	13625	27250	23500	20000
Weight on Drivers divided by Tractive Effort	4.23	4.28	5.5	3.38	4.8	3.27	4.68	4.19	4.38	4.9	3.8	4.8	5.4	4.9
Total Weight Divided by Tractive Effort	6.25	6.4	7.8	5.12	7.26	5.03	7.67	6.55	6.86	7.68	5.8	5.8	6.8	6.1
Tractive Effort Divided by Total Heating Surface	11.3	14.3	9.8	12.17	11.2	11.4	9.56	10.6	11.47	10.36	13.3	10.7	9.9	9.9
Total Wgt. Divided by Total Heating Surface	70.8	86.1	76.9	62.3	81.4	57.1	73.4	69.3	78.7	79.5	78	63	68	61
Total Heating Surface Divided by Grate Area	63.4	14.7	34.6	63.7	36.1	77.7	69.4	73.6	72.2	73	59.8	67.1	61	99
Total Heating Surface Divided by Tube Heating Surface	1.12	1.2	1.1	1.1	1.11	1.1	1.1	1.09	1.1	1.1	1.1	1.12	1.08	1.08
Total Heating Surface Divided by Firebox Heating Surface	9.12	8.28	10.5	10.85	9.95	10.9	10.9	11.3	10.56	10.3	10.4	14.4	13.4	12.88
Tube Heating Surface Divided by Firebox Heating Surface	8.12	7.35	9.04	9.85	8.95	9.9	9.9	10.3	9.56	9.3	9.4	13.37	12.42	11.9
Tube Heating Surface Divided by Grate Area	56.5	12.91	31.4	63.2	32.4	70.6	63	67	65.3	65.9	54.2	62.3	56.4	91.5
Firebox Heating Surface Divided by Grate Area	6.95	1.77	3.45	6.41	3.63	7.11	6.35	6.5	6.8	7	5.77	4.67	4.54	7.7
Total Heating Surface Divided by Volume of Both Cylinders	173.8	126.5	170.6	158.5	170.8	216.3	190.8	184.6	190	180.7	150.18	247.5	225.1	231.9
Grate Area Divided by Volume of Both Cylinders	2.74	8.61	4.92	2.27	4.72	2.78	2.75	2.5	2.62	2.47	2.5	3.36	3.62	2.33

Road	MC	CCC&StL	LS&MS	Erie	DL&W	Gt N	LS&MS	CH&O	Penn	AGS		AGS	CofNJ	World's Fair Ex	NYC&HR	B&A	DL&W
Builder	Sch'dy	Brooks	Brooks	Baldw	DL&W	Brooks	Brooks	Brooks	Sch'dy	Pitts	Baldw	Pitts	Baldw	Baldw	NYC&HR	Sch'dy	Cooke
Service	Pass	Pass	Pass	Pass	Pass	Pass.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass.	Pass.	Pass
Fuel	Bit C	Bit.C	Bit C.	Bit.C.	Anth C	Bit C	Bit.C	Bit C	Bit C	Bit C	Soft C	Bit C	Anth C	Soft C.	Bit.C.	Bit C	Anth C
Type of Locomotive	4-6-0	4-6-0	4-6-0	4-6-0	4-6-0	4-6-0	4-4-0	4-4-0	4-4-0	4-6-0	4-6-0	4-4-0	4-6-0	2-4-2	4-4-0	4-4-0	4-4-0
Year of Construction	1889	1890	1890	1890	1892	1892	1892	1892	1892	1892	1892	1893	1893	1893	893	1894	.894
Type of Boiler	Wagon Top	Wagon Top	Wagon Top	Wagon Top	Str'ght Top	Belp WagTop	Belp	Belp	Ext. WagTop	Str'ght Top	Wagon Top		Str'ght Top	Str'ght Top	Wagon Top	Extend. WagTop	Wagon Top
Type of Firebox	Narrow	Narrow	Narrow	Narrow	Wooten	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Narrow	Wooten	Narrow	Narrow	Narrow	Narrow
Type Engine	C Comp	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	C Comp	V Comp	Comp	Simple	V Comp	Simple	Simple	Simple
Dia. of Driving Wheels - Ins.	68	68	68	68	62	72	72	73	78	56	72	72	64	84½	86	69	64⅜
Dia. of Cylinders - Ins	20&29	18½	17	20	20	19	17	18	19	19&29	14&24	19&29	21	13&22	19	19	18½
Length of Stroke - Ins	24	24	24	24	24	26	24	26	24	26	24	26	26	26	24	24	24
Volume of Both Cylinders - Cu. Ins.	9.62	8.05	6.3	8.72	9.62	8.53	6.3	7.67	7.87	8.53	4.27	8.53	10.42	3.99	7.87	7.87	8.05
Kind of Valve	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Slide	Piston	Piston	Slide	Slide		Slide	Slide	Slide
Steam Pressure - Lbs	180	80	180	160	160	180	180	180	180	180	180	180	160	180	190	190	160
Dia. of Boiler Shell at Front - Ins.	58	58	52	60	64	60	52	58	58	60	60	58	66	56	58⅛	60	54
Height Center of Boiler Above Rail - Ft. & Ins	8-2	7-8	7-7½		8-7	8-1	7-9	7-11½	8-7½		8-3		8-8	8-9⅛	8-11½	8-1 15/16	7-0½
Total Wgt. of Locomotive Lbs	126800	135500	113500	130000	137000	138000	104600	112000	126700	120000	131680	112000	140980	126600	124000	114700	108150
Wgt. on Drivers - Lbs.	97000	109500	88500	100000	110000	111000	65100	74000	81500	95000	93580	72000	110780	83140	84000	74000	79650
Wgt. on Engine Truck - Lbs	29800	28000	25000	30000	27000	27000	39500	38000	45200	25000	38100	40000	30200	22500	40000	40700	28500
Wgt. on Trailers - Lbs.														21000			
Percentage of Total Wgt. on Drivers	76.5	81	78	77	80.3	80	62	66	64	79	71	64	78.5	65	68	65	74
Number of Boiler Tubes	247	252	202	275	288	202	200	226	268	240	296	240	248	198	268	298	200
Dia. of Boiler Tubes - Ins.	2	2	2	2	2	2¼	2	2	2	2	2	2	2	2	2	2	2
Length of Boiler Tubes - Ft. & Ins	12-0	13-10⅛	13-10 1/16	12-2	12-10	13-10⅛	12-0⅛	11-7⅛	12-0	12-5½	13-6	10-10	13-1	13-1¼	12-0⅛	11-0	11-5
Length of Tube Divided by Diameter	72	83.06	83.03	73	77	83.06	72.06	66.43	72	74.75	81	65	78.5	78.62	72.06	66	68.25
Tube Heating Surface Sq. Ft.	1540.3	1819	1462	1885	1935	1646	1258	1372	1672.2	1555	1640.5	1350.88	1688	1349.9	1697.4	1703.3	1191
Firebox Heating Surface - Sq. Ft.	137.1	155	141	186	147	152	140	152	144.3	159	152.5	123.7	174	128.23	232.9	141.4	131
Total Heating Surface - Sq. Ft.	1689.1*	1974	1603	2061	2082	1798	1398	1524	1831.8*	1714	1793	1474.05	1862	1478.13	1930.3	1844.8	1322
Grate Area - Sq. Ft.	28.5	29.1	28	39.5	83⅓	25.3	18.8	22.6	26.2	25.6	18.7	26.8	81.65	24.6	30.7	25.29	35
Wheel Base Driving - Ft. & Ins	12-2	15-6	15-0	13-6	11-8	14-6	9-0	8-0	8-0	11-0	15-4	8-0	12-0	7-4	8-6	8-6	8-6
Wheel Base Total - Ft. & Ins.	22-6	25-8	25-2	24-2	22-0	25-0	23-9	22-8	23-5	21-8	27-0	22-6	22-11	24-7	23-11	23-11	22-8½
Tractive Effort by Formula - Lbs	17000	18400	15600	19200	21000	19900	14739	17650	17000	20800	16500	29300	24300	12980	16200	20270	17300
Tractive Effort by ¼ Wgt on Drivers - Lbs	24250	27375	22125	25000	27500	27750	16525	18500	20375	23750	23395	18000	27695	20785	26000	18500	19912
Weight on Drivers divided by Tractive Effort	5.705	5.9	5.6	5.2	5.24	5.5	4.4	4.2	4.8	4.73	5.67	2.46	4.55	6.42	5.2	3.6	4.6
Total Weight Divided by Tractive Effort	7.46	7.3	7.2	6.7	6.52	6.9	7.06	6.34	7.4	6	7.9	3.8	5.8	9.7	7.6	5.6	6.2
Tractive Effort Divided by Total Heating Surface	10.06	9.3	9.7	9.3	10.08	10.6	10.5	12.1	9.28	11.73	9.2	19.8	13.05	8.72	8.4	10.9	13.08
Total Wgt. Divided by Total Heating Surface	75	68	70	63	65.8	76	75	73	69	70	73.4	75.9	75.7	85.6	64	62	81
Total Heating Surface Divided by Grate Area	59.2	68.1	57.3	52.3	24.9	71	79	67.5	69.8	66.8	96	40.5	22.8	60.2	67.8	72.9	37.8
Total Heating Surface Divided by Tube Heating Surface	1.09	1.08	1.09	1.09	1.07	1.08	1.11	1.11	1.09	1.1	1.09	1.09	1.10	1.09	1.13	1.13	1.11
Total Heating Surface Divided by Firebox Heating Surface	12.3	12.72	11.4	11.09	14.1	11.83	9.85	10.02	12.7	10.8	11.7	11.1	10.7	11.5	8.27	13.25	10.1
Tube Heating Surface Divided by Firebox Heating Surface	11.2	11.72	10.38	10.15	13.1	10.82	8.98	9.1	11.6	9.07	10.7	10.9	9.7	10.5	7.28	12.02	9.08
Tube Heating Surface Divided by Grate Area	54.04	62.4	52.3	47.7	23.2	65	66.8	60.7	63.8	60.8	87.75	50.5	20.6	54.8	55.3	66.6	34.1
Firebox Heating Surface Divided by Grate Area	4.81	5.33	5.03	4.72	1.76	6.01	7.44	6.73	5.52	6.22	8.15	4.63	2.13	5.02	7.58	5.58	3.74
Total Heating Surface Divided by Volume of Both Cylinders	175.5	247.5	254.2	236.1	216.4	210.9	221.9	198.7	232.6	200.4	421.8	172.8	178.6	370.3	247.5	234	164.3
Grate Area Divided by Volume of Both Cylinders	2.96	3.61	4.44	4.52	8.66	2.96	2.98	2.94	3.32	3.001	4.37	3.14	7.83	6.16	3.9	3.21	4.34

*Water Tubes 11.7

*Water Tubes 15.3

Supplement to the Railway Master Mechanic

December, 1903

Passenger Locomotive Proportions

FC&P	Penn.	L.V.	Gov. of Chile	Chile	DL&W	NY.NH&H	I.C.	DL&W	CM&StP	C.of N.J.	CM&StP	L.V.	C&NW	Penn	LS&MS	N.Y.C &H.R.	CB&Q
Rogers	Penn.	Bald	Rogers	Baldw	Dixon	Sch'dy.	Brooks	Dixon	Baldw.	Baldw	Baldw	Bald.	Sch'dy	Penn.	Brooks	Sch'dy.	Baldw.
Pass	Poss.	Pass	Poss	Poss	Pass	Pass.	Pass.	Poss.	Pass.	Pass.	Pass	Pass	Pass.	Poss.	Poss	Poss	Pass
Bit C	Bit or Anth.C.	Anth C	Bit C	Bit.C	Anth C	Bit C.	Bit C.	Anth.C.	Bit C	Anth.C.	Bit C	Anth.C	Bit C	Anth.C	Bit C.	Bit.C	Bit.C.
4-4-0	4-4-0	4-6-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-0	4-4-2	4-4-2	4-4-2	4-4-0	4-4-2	4-6-0	4-6-0	4-4-2
1895	1895	1895	1895	1895	1896	1896	1896	1896	1896	1896	1896	1896	1899	1899	1899	1899	1899
Ext WagTop	Belp.	Str'ght Top	Ext WagTop	Wagon Top	Str'ght Top	Ext. WagTop	Belp.	Str'ght Top	Str'ght Top	Str'ght Top	Str'ght Top	Radial Stay	Ext. WagTop	Belp.	Ext. WagTop	Ext. WagTop	Str'ght Top
Narrow	Narrow	Wooten	Narrow	Narrow	Wooten	Narrow	Narrow	Wooten	Narrow	Wooten	Narrow	Wooten	Narrow	Wooten	Narrow	Narrow	Narrow
Simple	Simple	Simple	C.Comp	V.Comp	Simple	Simple	Simple	Simple	V.Comp.	V.Comp.	V.Comp.	Simple	Simple	Simple	Simple	Simple	V.Comp.
69	80	68	66	66	68	73	75	68	78	84¼	78	76	80	80	80	70	84¼
18	18½	20	19&28½	12½&21	19½	20	18	19½	13&22	13&22	13&22	19	19	20½	20	20	13½&22
26	26	24	24	24	24	24	26	24	26	26	26	26	26	26	28	28	26
7.67	8.09	9.62	7.87	3.4	8.3	8.72	7.67	8.09	4	3.99	3.99	8.53	8.53	9.93	10.18	10.13	3.99
Slide	Slide	Slide	Slide	Piston	Slide	Slide	Slide	Slide	Piston	Piston	Piston	Slide	Slide	Slide	Slide	Slide	Piston
200	185	160	190	180	160	190	200	160	200	200	200	180	190	185	210	200	210
58	60	61	58	58	56	62 5/8	62	56	60	58¾	60	61	62	68⅛	66	66 5/16	62
8-0	8-11½	8-10	8-0½	7-2¼	8-6	8-4½	8-8	8-6	8-7	8-9¼	8-7	8-8	8-11	9-1	9-2	8-10 21/32	9-0
108000	134800	138000	117000	111900	117000	131000	88000	117000	140700	147300	14700	14950	133800	173450	171600	164000	159050
69000	91600	108000	72000	67200	79500	86000	59000	79500	71600	79500	71600	81800	85700	101550	133000	126000	85850
39000	43000	30000	45000	44700	37500	45000	29000	32500	40000	38000	40000	29100	48100	38125	38600	38000	40200
										29800	29100	30050		33775			33000
64	68	78.2	61.5	60.	68	66	67	67.9	50.8	54	51	58	65	58	77	77	57
248	310	248	208	231	220	312	274	220	264	278	264	265	320	333	345	360	248
2	1⅞	2	2	2	2	2	2	2	2	1¾	2	2	2	1¾	2	2	2¼
11-0	11-5¾	13-6½	11-0	11-0	12-6	12-0	11-7⅛	12-6	15-0	13-0	15-0	15-1	13-0	13-1	15-0¼	14-4	16-0
66	73.4	81.25	66	66	75	72	66.43	75	90	89.14	90	90.5	78	89.7	90.12	86	85.3
1427.5	1746.6	1758	1198	1311	1439.9	1946.72	1649.4	1439.9	2073.5	1644.9	2073.5	2081.24	2164.14	2102	2694	2685.99	2324.7
145.5	171.4	157	140	132	175.22	167.52	152.2	175.2	171	136.4	171	148.98	173.68	218	223	187.53	186
1573	1918	1915	1338	1483	*1719.84	2114.24	1801.6	*1719.8*	2244.5	*1855.1	2244.5	2230.2	*2353.39	2320	2917	*2886.16	2510.7
22.5	33	67.7	20	20	80	30.22	27.2	80	30	76	30	63.97	30.33	68	33.6	30.32	33.6
9-1	7-9	12-0	8-3	8-4	8-6	8-6	8-9	9-0	6-9	7-3	6-9	6-7	8-6	7-5	16-6	14-8	7-6
23-6	22-9½	22-11	22-11	22-8	22-11½	23-9	23-7	24-2½	25-6	26-7	25-6	24-0	14-8	26-6½	27-4	26-0	27-1
20600	17500	19200	16500	14000	18200	23700	19000	18200	15600	14400	15500	18900	18800	21500	25000	27200	16500
19250	22900	27000	18000	16800	19875	21500	14750	19875	17900	19875	17900	20450	21425	25387	33250	31500	21462
3.35	5.2	5.62	4.36	4.8	4.35	3.6	3.1	4.36	4.58	5.52	4.62	4.33	4.56	4.72	5.32	4.63	5.2
5.2	7.7	7.18	7.09	7.99	6.3	5.5	4.6	6.42	9.01	10.2	9.07	7.45	7.1	8.06	6.8	6	9.6
13.09	8.8	10.02	12.3	9.7	10.5	11.2	10.5	10.5	6.9	7.89	6.9	8.48	8	9.27	8.58	9.42	6.57
68	70	72	87.4	77.5	68	62	49	68.1	62.6	80.2	62.6	63.2	57	74.7	58.6	56.7	63.3
70.04	58.2	28.2	66.9	72.1	21.3	69.8	66.3	21.4	74.8	24.19	74.8	34.8	77.6	34.1	83.6	98.3	75.6
1.11	1.09	1.08	1.11	1.10	1.18	1.07	1.09	1.19	1.08	1.11	1.08	1.07	1.09	1.1	1.08	1.07	1.08
10.82	11.2	12.1	9.55	10.9	9.75	12.72	11.82	9.71	13.1	13.4	13.1	15	13.5	10.6	13	15.3	13.5
9.8	10.18	11.1	8.55	9.9	8.22	11.6	10.82	8.21	12.1	12	12.1	14	12.4	9.6	12	14.3	12.5
63.5	52.8	25.9	59.9	65.5	18	64.3	61.1	17.9	69.1	21.63	69	32.5	71.4	30.9	80.2	88.7	69.2
6.45	5.19	2.31	7	6.6	2.15	5.54	5.6	2.19	5.7	1.79	5.7	2.33	5.73	3.2	6.64	6.18	5.54
204.8	237.5	199	170	424.4	207.1	242	235.5	217.5	501.1	459.9	562.5	261.4	275.9	233.6	286.5	283.5	629.2
2.93	4.07	7.03	2.03	5.88	9.63	3.46	3.53	9.88	7.5	19	7.51	7.49	3.55	6.84	3.3	2.94	8.4

C&A	N.Y.O. &W	N.Y.C. &H.R.	B&O.	L.S&MS	I.C	D.L&W	A.T.&S.F.	B.R.&P	C of N.J	C&O	Vandalia	N P	C of N.J	C&A	O&H.	Penn.	A.T.&S.F.
Brooks	Cooke	Sch'dy	Baldw	Brooks	Baldw.	Sch'dy.	Baldw.	Brooks	Brooks	Sch'dy	Sch'dy	Brooks	Brooks	Baldw	Am	Penn	Bald
Pass.	Poss.	Pass	Pass	Poss	Poss	Pass	Poss	Poss	Pass	Pass.	Pass	Pass	Pass	Pass	Pass	Poss.	Pass
Bit.C	Bit C	Bit.C	Soft.C.	Bit.C	Bit C	Fine Anth.C.	Soft C	Bit.C	Anth C	Bit C.	Bit C	Bit C	Anth C	Bit C	Anth.C	Bit C	Bit.C.
4-4-0	4-4-0	4-4-2	4-4-2	2-6-2	4-6-0	4-4-0	2-6-2	4-4-2	4-4-2	4-6-2	4-4-2	4-6-2	4-6-0	4-6-2	4-6-0	4-4-2	4-4-2
1899	1900	1900	1900	1901	1901	1901	1901	1901	1901	1902	1902	1902	1902	1903	1903	1903	1903
	Ext WagTop	Str'ght Top	Str'ght Top	Ext WagTop	Vanderbilt	Str'ght Top	Str'ght Top	Str'ght Top	Wagon Top	Ext WagTop	Str'ght Top	Str'ght Top	Wagon Top	Str'ght Top	Str'ght Top	Belp	Wagon Top
Narrow	Narrow	Mod Wide	Mod Wide	Mod Wide	Vanderbilt	Wooten	Mod Wide	Mod Wide	Wooten	Mod Wide	Mod Wide	Mod Wide	Wooten	Mod Wide	Wooten	Mod Wide	Mod Wide
Simple	Simple	Simple	V.Comp.	Simple	Simple	Simple	V.Comp	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	V.Comp
73	69	79	78	80	63	69	79	72	85	72	78	69	69	80	72	80	73
19	20	21	15&25	20½	20	20	17&28	20¼	20½	22	20½	22	19	22	21	20½	15&25
26	28	26	28	28	28	26	28	26	26	28	26	26	26	28	26	26	26
8.53	10.18	10.42	5.72	10.69	10.18	9.45	5.36	9.69	9.93	12.32	9.93	11.44	8.51	12.32	10.42	9.93	5.31
Piston	Slide	Piston	Piston	Piston	Slide	Slide	Piston	Piston	Piston	Piston	Slide	Piston	Piston	Piston	Slide	Slide	Piston
210	200	200	200	200	180	185	200	220	210	200	200	200	210	220	200	205	220
66⅛	64¼	72	63	66		61	70	70⅛	68	65	68	70 9/16	60⅞	70	66¼	67	
8-11½	8-5⅛		8-7	9-2			9-4	9-7½					9-5½	9-5			
139000	133000	176000	149600	174500	167880	138000	190000	173000	191000	187000	164500	202000	161000	219500	175000	176000	187000
90500	88000	95000	83400	130000	137040	94000	135000	99000	99400	131000	91500	134000	120000	141700	131500	109000	90000
48500	45000		37940	21500	30840	44000	25000	40000	48400				41000	36300	43500		52000
			28260	23000			30000	34000	43200					41500			45000
65	66	54	55	74	81	68	71	57	57	70	55	66	74.5	65	75	62	48
306	297	396	300	285	350	280	318	336	325	291	338	301		328	308	315	273
2	2	2	2	2¼	2	2	2¼	2	2	2¼	2	2¼		2¼	2	2	2¼
12-7⅜	11-1	16-0	16-1	19-0	13-0	13-4	19-0	16-1¼	16-6¼	19-6	16-0	18-6		20-0	15-0	15-1	18-1
75.68	66.5	96	96.5	101.3	78	80.4	101.3	90.6	99.12	104	96	96		106	90	90.5	96.4
2000	1696	3298.08	2513	3169	2362.5	1947.87	3543	2805.6	2793	3328.28	2816.87	3264.3	2031	3848	2405.5	2474	2839
177	167	180	150	174	135	195.4	195	202.3	174	182	169.8	175.1	156	202	179.68	165.7	190
2177	1863	*3305.17	2663	3343	2497.5	2143.27	3738	3007.9	2968	*3533.28	2986.67	*3462.42	2187	*4078	*2663.7	2639.7	3029
31.8	24.47	50.32	42.5	48.5	33	87.67	53.5	54.43	82	47.07	46.36	47.2	67.7	54	84.85	55.5	49.4
8-9	8-6	7-0	6-9	14-0	13-6	8-6	13-8	8-0	7-8	12-8	7-0	12-0	13-3	13-9	16-0	7-5	6-4
24-10	23-2	27-3	25-7	31-10	24-4	23-3	32-2	29-2	29-10	32-8	26-9	33-0	24-1½	32-8	26-4	36-9½	29-6
23000	20100	24600	22000	25000	27000	23700	21500	27700	22900	32000	23800	31000	24200	31600	27200	23700	23900
22625	22000	23758	20850	32500	44260	73500	33750	24750	24850	32750	22875	33500	30000	35425	32875	24750	22500
3.93	4.38	3.87	3.8	5.2	5.07	3.97	6.28	3.58	4.33	4.09	3.84	4.32	4.95	4.47	4.84	4.61	3.77
6	6.6	7.1	6.8	7	6.2	5.8	8.8	6.2	8.3	5.84	6.9	6.51	6.25	6.94	6.43	7.42	7.8
10.5	10.78	7.02	8.25	7.47	10.8	11.05	5.71	9.21	7.73	9.07	7.95	8.95	11.06	7.74	10.2	8.98	7.9
63.8	71.3	50.2	56.1	42.2	67.1	64.3	51.9	57.5	64.3	52.9	55.07	58.3	73.6	53.8	65.7	66.6	61.7
68.4	76.3	69.7	62.7	69	75.6	24.5	69.8	55.3	36.2	75	63.2	73.4	32.3	25.6	31.4	47.6	61.4
1.08	1.09	1.06	1.05	1.05	1.05	1.1	1.05	1.07	1.06	1.06	1.06	1.06	1.07	1.05	1.1	1.07	1.06
12.25	11.1	19.4	17.7	19.1	18.5	10.9	19.6	14.8	17	19.5	17.6	19.8	14.01	22	14.7	15.9	15.9
11.3	10.1	18.3	16.7	18.2	17.5	9.9	18.1	13.8	16	18.3	16.6	18.65	13.01	19.05	13.4	14.9	14.9
63	69.3	65.6	59.1	65.3	71.6	22.2	66.4	15.6	34.02	69.8	60.7	59.3	30	71.4	29.4	44.6	57.4
5.56	6.82	3.58	3.53	3.59	4.08	2.23	3.65	3.73	2.12	3.85	3.57	3.72	2.30	3.74	2.11	3.01	3.85
255.4	183	336.3	465.5	312.7	245.3	226.8	697.3	320.7	298.7	285.7	300.7	302.6	256.9	331	255.6	265.7	569.7
3.7	2.4	4.82	7.43	3.97	3.24	9.27	9.98	5.61	8.25	3.85	4.66	4.12	7.95	4.38	8.14	5.58	9.31

*Water Tubes 104.72 · *Water Tubes 104.72 · *Comb. Chamber 53.8 · *Water Tubes 15.57 · *Water Tubes 12.61 · *Water Tubes 27.09 · *Water Tubes 23 · *Water Tubes 23.02 · *Water Tubes 28 · *Water Tubes 78.54

Fig. 4—Examples of Machine Forging.

the header slide. On release of the treadle it springs up, and as soon as the dies are full open, a stop causes the disengagement of the pitman. The dies, therefore, have to stop full open.

The usual scheme of gripper and header dies operating on a very simple piece is shown in sketch Fig. 5. Some auxiliary devices may be noted. Where a very

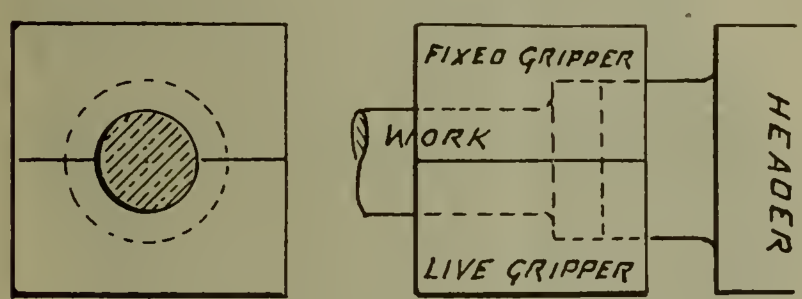


Fig. 5—Arrangement of Gripper and Header.

large collar is upset on an axle the ordinary movement of gripper slide will not release the work, and it is released by a second treadle giving an additional slide

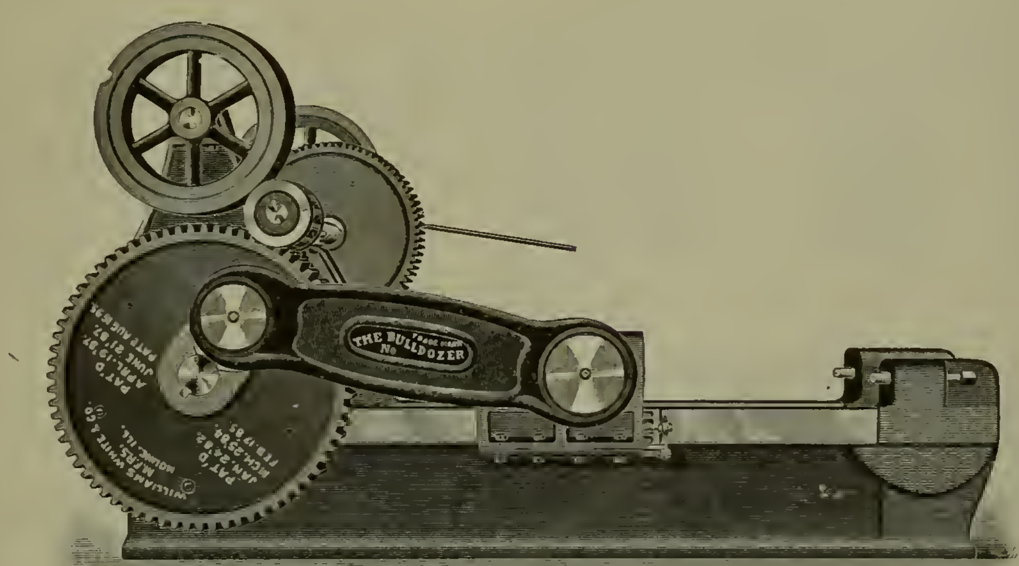


Fig. 6—Bulldozing Machine Manufactured by Williams, White & Co.

movement. The gripper slide movement may be used on dies on bracket at side of machine, independently for bending, angle forming, and other simple die work. In Fig. 2 is shown a horizontal side rod with lever nearly vertical at the front of the machine. These are part of the mechanism of a "kicker," which is used to give rivets a rap after they are formed, so that there will be no possibility of sticking in the rapid operation of the tool.

Among interesting pieces of work done by these machines, we note the coupler safety link and pin shown in Fig. 4. These are made in large quantities by the Pullman Company, on machine working 4-inch round iron, two operations for each piece, but a turnbuckle end loop included is made in one operation. Fig. 4 shows also a switch socket made by the Maiden Frog & Crossing Co., of South Chicago, on a 5-inch machine. It is made from the flat with one press, and is punched and eccentric bolt

Fig. 7—Bulldozing Machine Manufactured by Bremer Machine & Tool Co.

made by same machine. Special nuts are made by upsetting the rod to hexagon form, after which the hole is punched.

The word "bull-dozer" implies a forceful bullying method, and a powerful horizontal bending and forging press put upon the market by Williams, White & Co., was given this name. This machine, shown in Fig. 6, was double-geared, 25 to 1, double side connection, a simple machine of great power. The "bull-dozer," made by the Ajax Mfg. Co., is shown in Fig. 3 and that made by the Bremer Machine & Tool Co., in Fig. 7; with

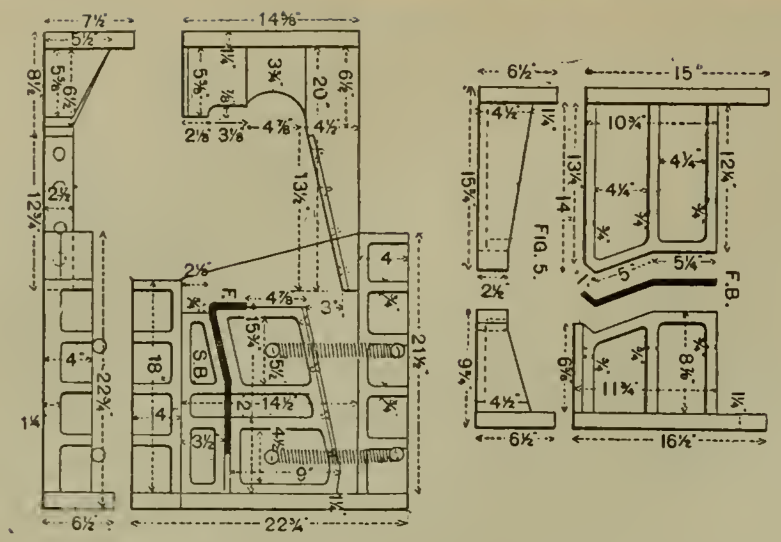


FIG. 8—FORMS USED WITH BULLDOZING MACHINE.

other step in the economical production of forgings. Rolling is the most natural and economical means of producing tapered pieces. It was employed to produce bayonets in the manufacture of fire arms years ago, but its application to heavy railroad forgings, brake levers, cross beams, keys, axle ends, etc., is quite recent, and produces uniform work at a minimum cost. In Fig. 9 are shown the No. 3 Ajax rolls. The rolling dies are sectional, and counterweighted. We see the edges or ends of the sections, and the dies roll together toward us. Stock may be reduced by several passes, or a double taper piece like a brake beam can be formed at both ends at a heat, and with special attachments other operations such as proper fly-wheel capacity electric drive is easily applied to any of these machines.

The beauty of their application lies in the design of the dies. These dies are not expensive, being of cast iron. They may have pockets to be water-filled. They may be made two-storied, one operation below and within the dies provided for a previous operation. Roller and lever dies may be provided to turn a piece and curl it into an eye. From a great multiplicity of examples of the formation of pieces in such dies we select one used in the Moline bulldozer for making rail braces from old fish plates. Two sets of dies are used, as shown in Fig. 8.

The ingenious feature lies in the second set of dies which combine a wedge with springs so as to exert both side and end pressure at once in forming the piece which is made from nearly worthless material at a cost of 2½ cents, where new braces would cost 12½ cents. These dies were devised by Geo. Tutbury, foreman smith shop C. R. I. & P. Ry., Chicago.

As is well said, the advent of forging rolls in the equipment of the modern blacksmith shop marks an-

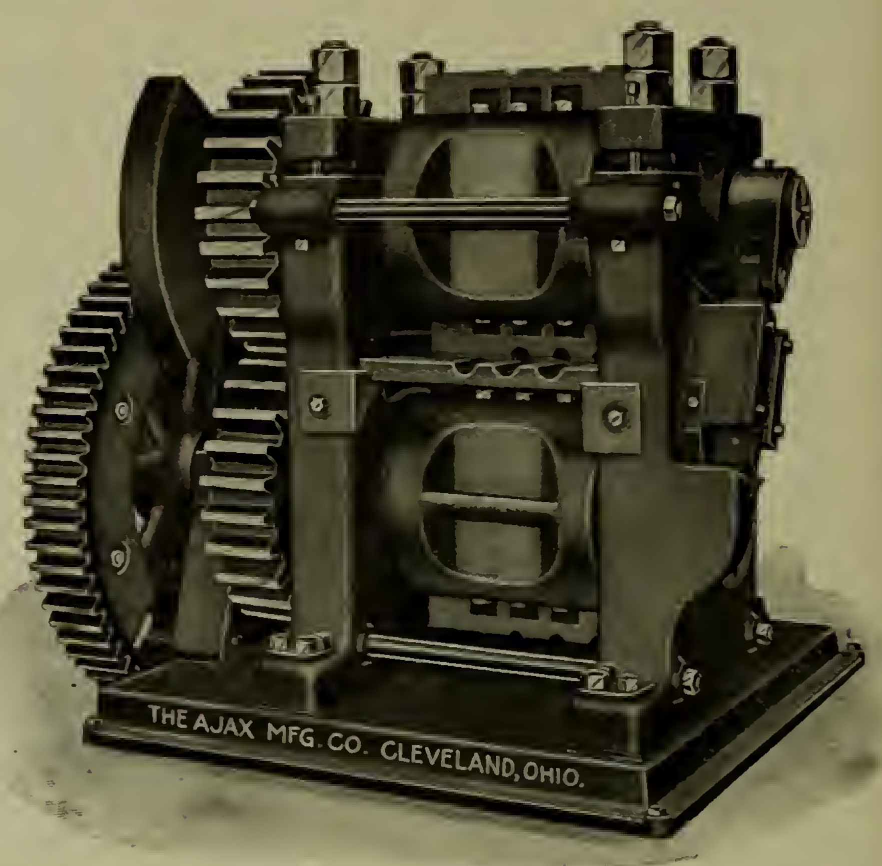


FIG. 9—AJAX FORGING ROLLS.

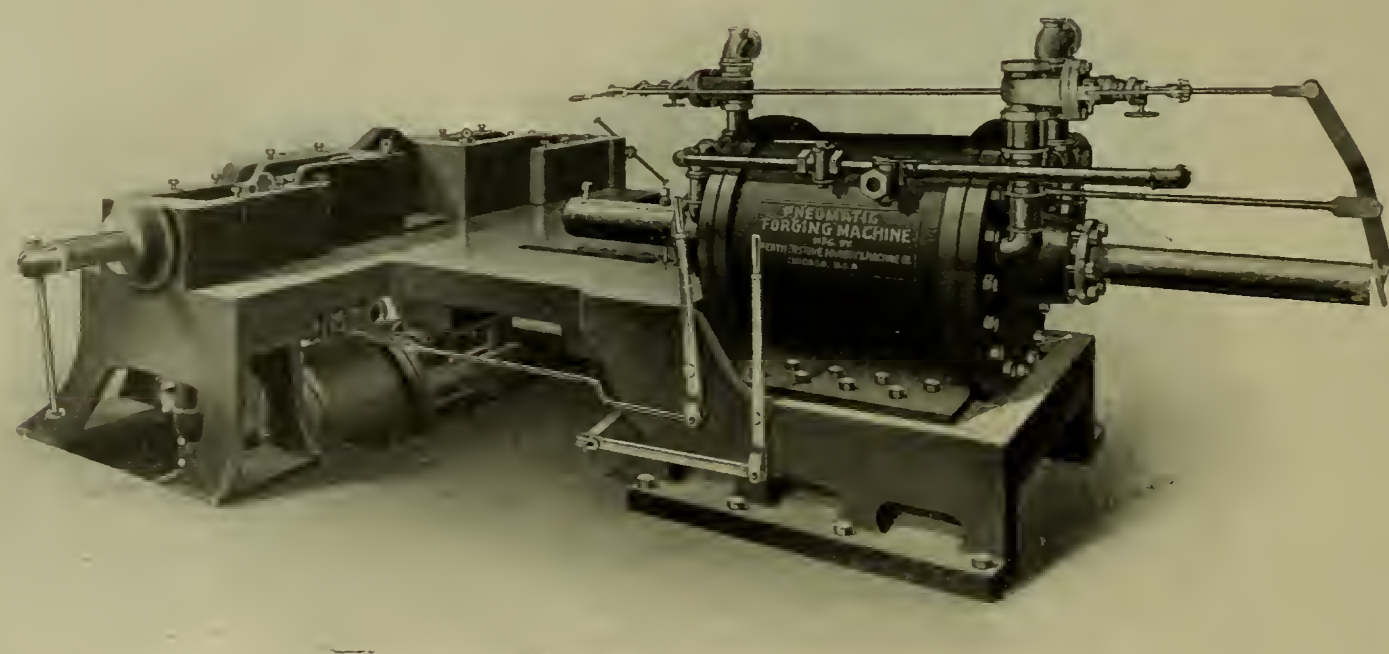


FIG. 10—PNEUMATIC FORGING MACHINE.

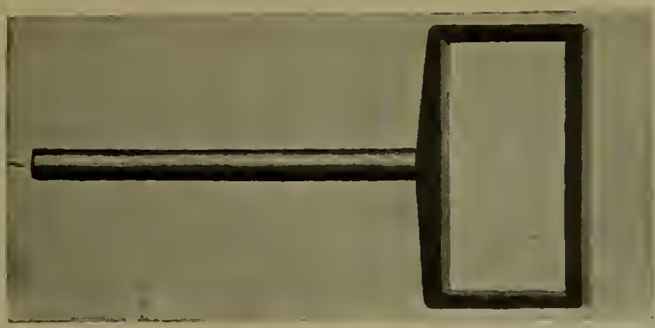


FIG. 11—VALVE YOKE MADE WITH PNEUMATIC FORGING MACHINE.

squeezing, bending and punching can be performed on the same machine, saving the expense and labor of reheating. Variations can be made in tapers rolled and thickness of stock.

Power presses do not have it all their own way in this class of work, i. e., mechanical blacksmithing. Where air power is available it is well to know that there are upon the market pneumatic forging presses of great capacity, approaching hydraulic presses in power. These are not hydraulic presses with pneumatic valve action such as described in a previous article, but purely pneumatic machines.

A favorite tool at the Burnside shops of the I. C. R. R. is the Kennedy pneumatic bulldozer or "mechanical blacksmith;" which is made by the Featherstone Foundry & Machine Co., of Chicago. These machines have a great range of work and combine heavy power with quick action. We show in Fig. 12 (No. 24) a boiler brace made in this machine, and in Fig. 12 (Nos. 10-11-12) the dies for the same. Fig. 11 shows a valve yoke made in this machine which makes also wrecking chain hooks, heavy equalizing beams, and all forms that can be produced in a two-cam press. The abutment or resisting frame extends like the head of a T, so as to give place for large dies. There are two cylinders giving powerful ramming movements in two directions at right angles, an end upsetting and a side closing movement.

The movements are as simple and direct as possible; the turning of an air-cock applies the rams, while their withdrawal is governed by stops actuating release cocks. The claim is made that dies can be changed in three minutes ready for new work, even of a complicated character. The strokes are adaptable to any requirements, and that almost instantly. The dies are of two kinds, one coupled to piston rod of main cylinder, and the other in the form of gripping and forming blocks operated by the lower cylinder.

By placing liners over the face of the die in forming pipe clamps, 25 different sizes of clamps have been forged in one minute, a valve yoke has been forged in five minutes, and a locomotive main rod strap, weighing 236 pounds, in 47 seconds. Draw bar yokes are formed by operating upon them in 3 positions. Rollers are used at the corners of dies, which facilitate the movement and justification of the work. Two part dies are used and work with four bends is easily done. With the pneumatic machine a blacksmith and two helpers turn out 5 to 8 times as many valve yokes as can be made by hand (when two constitutes a day's work). A blacksmith and two helpers forge five 250 lb. locomotive rod straps in 10 hours without and 50 with this machine. The usual air pressure carried is 125 lbs. per square inch, cylinders 16 inches, 20 inches and 24 inches in the three standard sizes of machine.

Enough has been said to stimulate attention to eco-

FIG. 12—EXAMPLES OF DIES USED WITH PNEUMATIC FORGING MACHINE AND TYPES OF FORGINGS MADE.

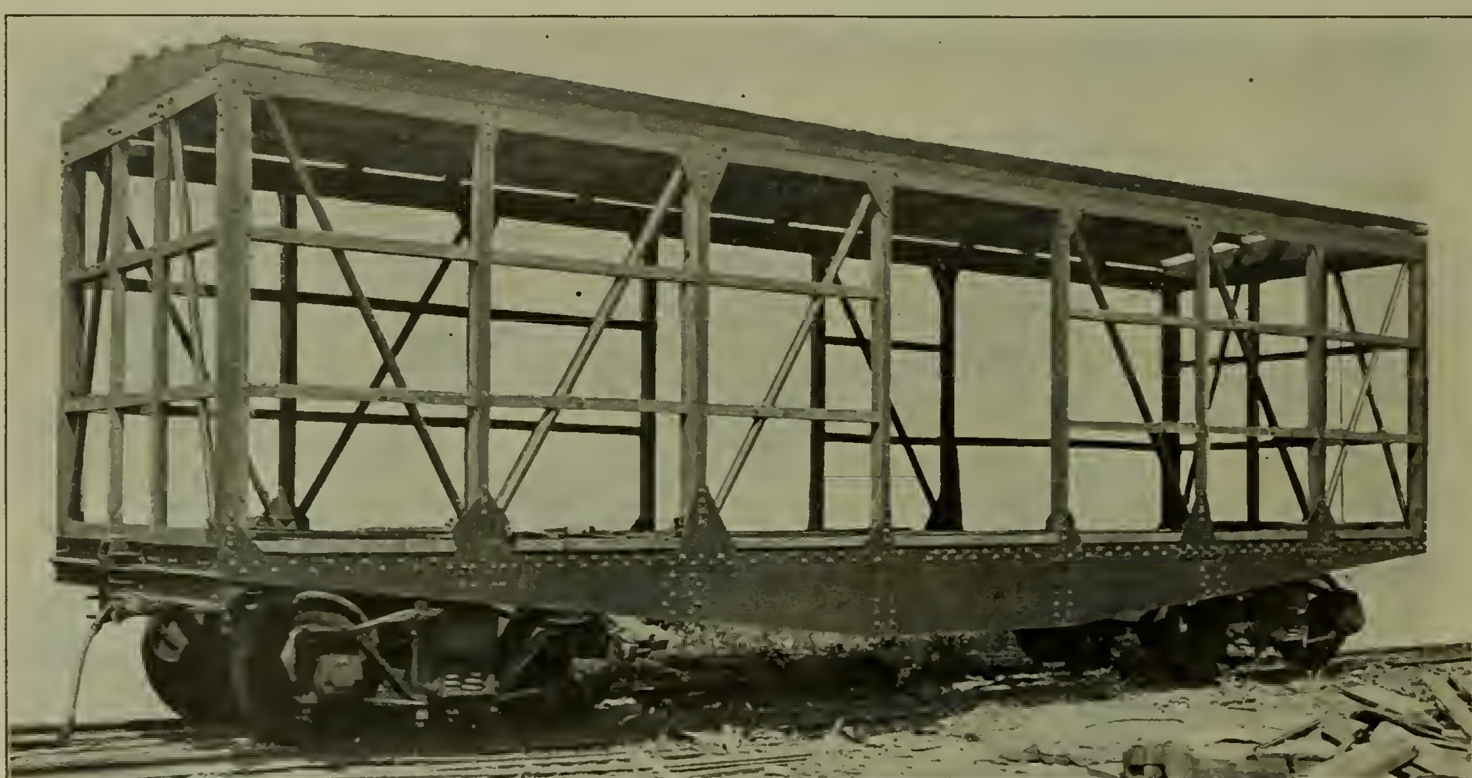
nomic expedients in the blacksmith shop. An engine builder visiting the works of a competitor looked about him to compare notes with his own practice, and counted the number of blacksmith fires, saying that the expense of this department was such that he could save most by economy here. But blacksmithing is a much greater factor in railroad than in general engine work. It is however of growing importance in all machine work, as the tendency is to produce tougher machine parts of greater reliability than can be obtained in cast material.

Hence we emphasize the great importance of mechanical blacksmithing; there are still many dollars to be saved by ingenuity in making dies, and the makers of forging machinery are ready to lend the assistance of many valuable suggestions in adapting machine power to special requirements.

Forty-Ton Steel Car--Michigan Central Railway

THE rapid evolution in the construction of the steel car in the short period since its introduction, to the present state of development, and the constantly increasing adoption of this type of freight car tends to assure its future, whether it be a pressed steel or a structural steel frame car. The principle which has been generally followed in the design of the steel car has been merely the construction of a steel underframe strong enough to safely carry the total load, withstand the severe shocks, etc., the box serving only as a means of protecting the load that is carried. Following this reasoning, if that portion of a 40-ton capacity steel car below the box weighs say 28,000 lbs., then the gondola will weigh 28,000 lbs., plus the weight of the sides and ends, and a box car will weigh 28,000 lbs., plus the weight of the double sides and end and the roof, with the cost of construction correspondingly increased. When an amount of material is necessary to constitute the sides and ends of a gondola car and a box car, it would be of advantage to so construct the sides and ends that they will be strong enough to do an additional duty in carrying a certain part of the load on the car and thus make it possible to reduce the material in the underframe, together with a proportionate reduction of weight and cost, without any loss of strength. This is done in the all-steel gondola car, where the sides and ends are plate girders, doing service also as sills. This principle is also applicable to box-car construction. In a side 8 ft. high a trusswork can be arranged strong enough to carry a large proportion of the load on the car. An all wooden truss would make a heavy and clumsy construction. A truss made up of metallic members can be substituted.

In the accompanying illustrations are shown views of steel frame and finished car constructed on the above principle, which is the invention of Mr. H. C. Hodges, of Detroit, Mich., and for which patents have been granted. This car was designed and built for Mr. Hodges, to be placed in service on the Michigan



STEEL FRAME BOX CAR—SKELETON.

Central Railroad, by Stevens and Blume, engineers of Detroit. The sides of the car are trusses with steel tubes as compression members and angle irons as tension members, and the principle used is applicable to all forms of high side cars, either for steam or electric railroads.

The result obtained shows that a lighter, cheaper and simpler steel framed car is comprised in this design, which compares very favorably in strength with any of the present forms of steel car construction. The car here shown with a load limit of 96,000 lbs. weighs 34,600 lbs., giving a ratio of paying freight to total haul of 73.5 per cent. As a test of its strength under load the car was loaded with 38,000 lbs. of pig iron, concentrated in the center of the car within a space of 40 sq. ft. After 48 hours under this load the frame showed no deflection whatsoever.

Steel Frame Box Car—Finished.

sidesill or plate, and are clamped by two longitudinal girths running between the sidesill and top plate, thus acting as a stiffener against the vibration in the car frame. All shapes used in the construction are standard, so that repairs may be easily made at any shop. The reduced cost of a car of this kind is another feature greatly to its advantage.

As for the details of this construction, the accompanying illustrations require little explanation. The greater part of the load on the centre sills of the car is transferred to the side sills through two 12 in. I beams across and underneath the sills. The tubes are screwed into malleable iron foot pieces riveted to the

Plan and elevation drawings of this type of car, together with certain detail views were presented in the August, 1902, issue of the Railway Master Mechanic.

Revised Locomotive Classification---Central Railroad of New Jersey

DESIRING a system of arranging data by which the locomotives of the Central Railroad of New Jersey may be classified, Mr. G. W. Wildin, mechanical engineer of the road, has arranged a table, examples of which are shown herewith, by reference to which principle dimensions of the several classes may be readily obtained. By this method a given class of engine will be represented by a given number, this number being the minimum number of the series by which the engines in that class are designated. For instance, the engines constituting class 1 are 6-wheel switch engines numbered from 1 to 19 inclusive, their cylinder dimensions are 20-in. diameter and 26-in. stroke, the diameter of driving wheel centers being 44 ins. The number of engines in a series and represented by a given number is variable, depending upon the number of engines of the class in service and the probability of the number being increased or substituted for by a more efficient design.

As there are now engines on the road which are of equal tractive effort and the same general dimensions, but whose numbers are not arranged consecutively, it is necessary to rearrange these numbers and place other numerals on the locomotives. Therefore, in order to keep a record of the numbers changed, the table is arranged to register the original number borne by the locomotive, the number to which the engine may have been changed at some time during its service and the number applied to conform with the requirements of the new classification, as indicated in

1

CLASS	ENGINE No. NEW	OLD	ORIG	TYPE OF ENGINE	BUILDER	IN SERVICE MO.	YEAR	CYLINDER DIA.	STROKE	DRIVERS No.	DIA OF CENT.
1	1	1	1	6-W.SWITCH	BROOKS	JULY	1901	20"	26"	6	44"
"	2	2	2	"	"	"	"	"	"	"	"
"	3	3	3	"	"	"	"	"	"	"	"
"	4	4	4	"	"	"	"	"	"	"	"
"	5	5	5	"	"	"	"	"	"	"	"
"	6	6	6	"	"	"	"	"	"	"	"
"	7	7	7	"	"	"	"	"	"	"	"
"	8	8	8	"	"	"	"	"	"	"	"
"	9	9	9	"	"	MAY	1902	"	"	"	"
"	10	10	10	"	"	"	"	"	"	"	"
"	11	11	11	"	"	"	"	"	"	"	"
"	12	12	12	"	"	"	"	"	"	"	"
"	13	13	13	"	"	"	"	"	"	"	"
"	14										
"	15										

Locomotive Classification Form—C. R. R. of N. J.

the columns headed new, old and original engine number.

In preparing for the arrangement of this table, the classification was begun with small engines, the new engines representative of the most recent design of the several classes being classified first, as it is probable that such locomotives will remain in service the greatest length of time before being substituted for by improved machines. By this arrangement the "old timers," which will either be sold or soon consigned to the scrap pile, are made to appear at the end of the list and their numbers may be removed without affecting the remainder of the table. To arrange this method successfully it was found expedient to head the table with light engines, as indicated above, and work towards the center from each end of the table. For further convenience the numbers appearing in the table exceed the number of engines in service on the road in order that new designs of locomotives introduced may be added to the table without in any way affecting the classification then in vogue. For instance, 650 represents a class including number 699 while 659 is the highest number of the class actually representing an engine of that type in service. The additional numbers provide for the introduction of new engines of the same type and should this type

2

CLASS	ENGINE No. NEW	OLD	ORIG	TYPE OF ENGINE	BUILDER	IN SERVICE MO.	YEAR	CYLINDER DIA	STROKE	DRIVERS No.	DIA OF CTR
	16										
	17										
	18										
	19										
20	20	43	43	6-W.SWITCH	BALDWIN	SEP	1891	19"	24"	6	44"
"	21	44	44	"	"	"	"	"	"	"	"
"	22	45	45	"	"	"	"	"	"	"	"
"	23	40	51	"	"	AUG.	1893	"	"	"	"
"	24	41	52	"	"	"	"	"	"	"	"
"	25	42	53	"	"	"	"	"	"	"	"
"	26	46	56	"	"	AUG	1893	"	"	"	"
"	27	47	47	"	"	"	"	"	"	"	"
	28										
	29										
	30										

Locomotive Classification Form—C. R. R. of N. J.

become obsolete the remaining numbers may be used to represent locomotives of another class, the smallest number of those so chosen being representative of the newly elected type.

The table is originally arranged in pamphlet form, the sheets of which are 5¾ ins. by 3½ ins. The pamphlets are provided for distribution among the several officials interested, while a large table of corresponding data is arranged on a single sheet and placed in a conspicuous place in the shop for guidance in rearranging engine numbers.

This numerical table is to be substituted for by a pamphlet containing a series of outline sketches presenting the principal dimensions of locomotives in the several classes, at such time that the classification has been satisfactorily completed.

In order to observe the performance of locomotives in service a complete record is kept of all failures on each engine during each run. This information is registered on a special form prepared for such data kept in the office of the mechanical engineer and re-

11

CLASS	ENGINE No. NEW	OLD	ORIG	TYPE OF ENGINE	BUILDER	IN SERVICE MO.	YEAR	CYLINDER DIA.	STROKE	DRIVERS No.	DIA OF CTR.
150	151	491	491	10-WHEEL	BROOKS	JUNE	1900	20"	28"	6	62"
"	152	492	492	"	"	"	"	"	"	"	"
"	153	493	493	"	"	"	"	"	"	"	"
"	154	494	494	"	"	"	"	"	"	"	"
"	155	495	495	"	"	"	"	"	"	"	"
"	156	496	496	"	"	"	"	"	"	"	"
"	157	497	497	"	"	"	"	"	"	"	"
"	158	498	498	"	"	"	"	"	"	"	"
"	159	499	499	"	"	"	"	"	"	"	"
"	160	483	483	"	"	AUG	1901	"	"	"	"
"	161	484	484	"	"	"	"	"	"	"	"
"	162	485	485	"	"	"	"	"	"	"	"
"	163	486	486	"	"	SEP.	"	"	"	"	"
"	164	487	487	"	"	"	"	"	"	"	"
"	165	488	488	"	"	"	"	"	"	"	"

Locomotive Classification Form—C. R. R. of N. J.

ports all breakages, failures of parts, hot boxes, low steam, poor coal, etc. To determine whether or not failures are due to the machine or the crew, a record is kept of the engineer and the fireman, so that by comparing these several reports definite information is accessible of failures encountered and shortcomings reported.

Personals

Mr. W. E. Anderson, master mechanic of the Chicago, Rock Island & Pacific at Goodland, Kan., has resigned.

Mr. R. S. Wickersham, assistant engineer of tests of the Santa Fe Coast Lines at San Bernardino, Cal., has resigned.

Mr. J. B. Musgrave has resigned as master car builder of the Great Northern Railway of Canada and the position has been abolished.

Mr. R. M. Crown has been appointed superintendent of motive power of the Warren & Corsicana Pacific, with headquarters at Warren, Tex.

Mr. D. Brown has been appointed superintendent of motive power of the Brunswick & Birmingham, with headquarters at Brunswick, Ga.

39

CLASS	ENGINE NO.			TYPE OF ENGINE	BUILDER	IN SERVICE		CYLINDER		DRIVERS	
	NEW	OLD	ORIG			MO.	YEAR	DIA.	STROKE	NO.	DIA OF CTR.
570	571	581	457	ATLANTIC	REBUILT BY R. R. CO.			18"	26"	4	78"
"	572	597	597	"	BALDWIN	OCT	1902	"	"	"	"
"	573	598	598	"	"	"	"	"	"	"	"
"	574	599	599	"	"	"	"	"	"	"	"
	575										
	576										
	577										
	578										
	579										
580	580	586	586	ATLANTIC	BALDWIN	NOV	1899	13-22"	26"	4	78"
"	581	587	587	"	"	"	"	14-24	"	"	"
"	582	582	582	"	"	"	"	"	"	"	"
"	583	583	583	"	"	"	"	"	"	"	"
"	584	584	584	"	"	"	"	13-22	"	"	"
"	585	585	585	"	"	"	"	14-24	"	"	"

Locomotive Classification Form—C. R. R. of N. J.

Mr. John Hair has been appointed superintendent of motive power of the Baltimore & Ohio Southwestern Railway, effective Nov. 1, 1903.

Mr. Charles H. Hines has been appointed electrical engineer of the Canadian Pacific Railway, with office at Montreal. Effective Oct. 1, 1903.

Mr. W. H. Taft, division master mechanic of the Boston & Albany at Allston, Mass., has resigned, and has been succeeded by Mr. A. J. Friese.

Mr. W. D. Watkins has been appointed master mechanic of the Illinois Central at Water Valley, Miss., to succeed Mr. John F. Price, resigned.

Mr. A. L. Robinson has been appointed master mechanic of the St. Louis-Louisville lines of the Southern Railway, with headquarters at Princeton, Ind.

Mr. Philip Reeves, heretofore general foreman of the Baltimore & Ohio Southwestern at Chillicothe, O., has been appointed master mechanic at that point.

Mr. E. T. Munger has been appointed master mechanic of the Metropolitan West Side Elevated Railway of Chicago, to succeed Mr. F. M. Brinkerhoff, resigned.

Mr. James H. Smith, formerly traveling inspector, has succeeded George H. Miller as car foreman for the Delaware, Lackawanna & Western at Phillipsburg, N. J.

Mr. J. J. Flynn has been appointed master mechanic of the Louisville & Atlantic, with headquarters at Richmond, Ky., to succeed Mr. Louis Wellisch, resigned.

Mr. John Collins has been appointed general foreman of the car department of the Terminal Railroad Association of St. Louis, vice Mr. John J. O'Brien, resigned.

Mr. W. G. Wallace has been appointed master mechanic of the Duluth, Missabe & Northern, with office at Proctor, Minn. He will have full charge of the locomotive department.

12

CLASS	ENGINE NO.			TYPE OF ENGINE	BUILDER	IN SERVICE		CYLINDER		DRIVERS	
	NEW	OLD	ORIG			MO.	YEAR	DIA.	STR.	NO.	DIA OF CTR
150	166	489	489	10-WHEEL	BROOKS	SEP	1901	20"	28"	6	62"
"	167	481	481	"	"	JUNE	1902	"	"	"	"
"	168	482	482	"	"	"	"	"	"	"	"
"	169	169	169	"	"			"	"	"	"
"	170	170	170	"	"			"	"	"	"
"	171	171	171	"	"			"	"	"	"
"	172	172	172	"	"			"	"	"	"
"	173	173	173	"	"			"	"	"	"
"	174	174	174	"	"			"	"	"	"
	175										
	176										
	177										
	178										
	179										
	180										

Locomotive Classification Form—C. R. R. of N. J.

Mr. T. W. Newell, who has been general foreman of the shops of the Wabash at Montpelier, O., has resigned, and Mr. B. F. Loop has been appointed to succeed him.

Mr. John R. McIntosh has been appointed boiler inspector of the Grand Trunk Railway System, with headquarters at Montreal, vice Mr. J. Black, resigned. Effective Oct. 5, 1903.

H. W. Cadott has resigned the position of general car foreman on the Big Four Railway at Delaware, O., to accept the position of master car builder on the T. & O. C. Railway at Kenton, O.

Mr. F. C. Cleaver has been appointed superintendent of motive power and rolling stock of the Rutland Railroad, with headquarters at Rutland, Vt., to succeed Mr. P. T. Lonegran, resigned.

Mr. John Cullinan has resigned as master mechanic of the Toledo division of the Pennsylvania Lines at Toledo, O., and will retire from active railroad service, taking up his residence at Newark, O.

Mr. C. Kyle, formerly master mechanic of the Algoma Central & Hudson Bay, is now master mechanic of the Lake Superior division of the Canadian Pacific, with headquarters at North Bay, Ont.

Mr. Peter H. McGuire has been appointed master mechanic of the Superior and Mesabi divisions of the Great Northern, with headquarters at Superior, Wis., in place of Mr. George A. Bruce, promoted.

Mr. H. J. Allen, heretofore assistant general manager of the United Verde & Pacific, has been appointed general manager, with headquarters at Jerome, Ariz., to succeed Mr. J. L. Giroux, resigned to engage in other business.

Mr. J. R. Skinner has been appointed assistant superintendent of motive power of the Delaware & Hudson, with headquarters at Oneonta, N. Y. Mr. Skinner has heretofore been division master mechanic of the company at this point.

Mr. T. M. Ramsdell, chief car inspector of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan., has resigned, and it is stated that he has been appointed to the position of master car builder of the Chesapeake & Ohio, with headquarters at Huntington, W. Va.

F. J. Smith, master mechanic at the Baltimore & Ohio Southwestern shops in Chillicothe, will go to the Washington shops to succeed John Hair, promoted to superintendent of motive power, and Philip Reeves, now general foreman at the Chillicothe shops, will be made master mechanic in place of Mr. Smith.

Mr. L. H. Turner, superintendent of motive power of the Pittsburg & Lake Erie, was chosen as president of the Railway Club of Pittsburg, at its recent meeting, and Mr. F. T. Hyndman, master mechanic of the Buffalo, Rochester & Pittsburg at Du Bois, Pa., was elected vice-president. Mr. J. D. McIlwain was re-elected as treasurer.

Mr. Eliot Sumner has been appointed assistant engineer of motive power of the Pennsylvania R. R., at Altoona, Pa., succeeding to the position recently made vacant by the transfer of Mr. I. B. Thomas to Pittsburg, Pa., as master mechanic. Mr. Sumner heretofore has held the position as assistant engineer of motive power at Buffalo, N. Y.

Mr. John G. Neuffer, superintendent of motive power of the Baltimore & Ohio Southwestern, has resigned, and has been appointed assistant superintendent of machinery of the Illinois Central with headquarters at Chicago. Mr. Neuffer will be succeeded as superintendent of motive power of the Baltimore & Ohio Southwestern by Mr. John Hair, who has heretofore been master mechanic of that road at Washington, Ind.

Universal Screw Machine

2 Inches by 12 Inches.

The screw machine which is illustrated by the accompanying half-tone engravings is caller a universal machine because it comprises a full set of tools universally applicable for any job, and is also fitted for regular screw-machine tools and will do standard screw-machine work as well as long shaft work. The machine is simple and strong in construction, and the movement of the turret is light and quick, making the tool a large producer.

A cross-slide bolted down solid on the bed is furnished with the machine for cutting-off purposes, but which also allows of forming operations. The cross-slide has the advantage that forming or facing operations can proceed simultaneously with the operation of the turret, allowing of quicker handling of work and saving a hole in the turret as well. It permits a regular line of screw-machine work to be turned out, in addition to the advantage of a universal set of turret tools.

The capacity of the machine is such that it will handle bars 2 inches in diameter with wire feed, and 2⅜ inches without wire feed, and turn any length up to 12 inches.

The bed is heavy and is closed on the bottom, forming a box construction of great stiffness. It is mounted on a swivel joint at one end to avoid distortion, and set in a large oil-pan with oil reservoir fitted with pump and piping. Running the full length of the bed is a large T-slot, in which the head-stock, cross-slide and turret base are bolted.

The head-stock casting is built up around the cone, giving great strength and stiffness, and is bolted down solid to the bed at both ends by large bolts. The spindle bearings are large and fitted with bronze cap boxes. The machine is geared 6½ to 1 and driven by a large cone pulley and thoroughly efficient friction clutch for changing instantly from cone to slow gear speed while running.

The spindle has a large threaded end to take a chuck. There is no loose nose-piece, as the collet stands within the spindle, and there is no overhang. One handle, brought forward within easy reach of the operator, serves to open and close chuck and feed the rod.

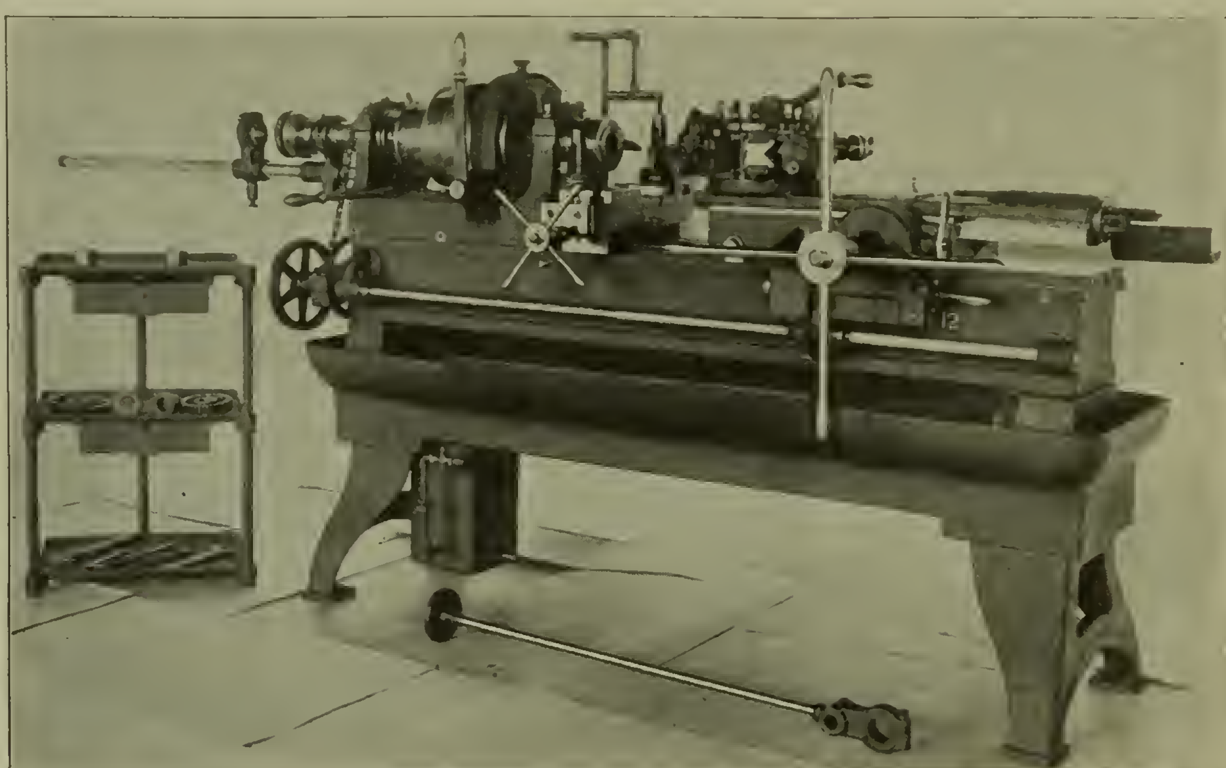


Fig. 1—Universal Screw Machine.

The collet is simple and strong and of ample length, so that it will not break. Different sizes are obtained by sets of interchangeable bushings, ranging from ½ to ¼ by 16th, and from 1½ to 2 by 8th, and standard hexagons ⅞ inch, 1 1-16 inches and 1¼ inches.

The design of turret is new. It is a steel hollow circular turret, with a V-ledge around the bottom, in which the tools are held and forced back against the turret by drop-forged steel clamps on top. This design admits of a light, strong turret, and the tools are held much more firmly than is possible with any form of bolting on. Embracing the turret at back and resting in the groove at the bottom, the tools are held very rigidly with little effort, as any tendency to tilt in any direction is resisted by the locking action of the curved surfaces. A tool cannot rock in one direction without being forced to move in another direction at the same time, and this fact tends to check all movement. The tools are thus solidly supported and do not depend on bolts, and by loosening the clamps a tool can be at once removed without unscrewing any bolts. The turret rests on a large bearing surface and rotates on a large taper sleeve, giving ample provision for taking up wear. When unlocked the turret may be freely rotated. A powerful central binder is provided which maintains a constant position and does not interfere with the free passage of the largest bar right through the turret. The indexing is automatic, and the momentum is taken on a stop in the turret base, so that the lock bolt does not enter the turret until the bushing is at rest and in position to receive it, and thus the locking bolt and bushing are relieved of the wear and shock and their accuracy preserved.

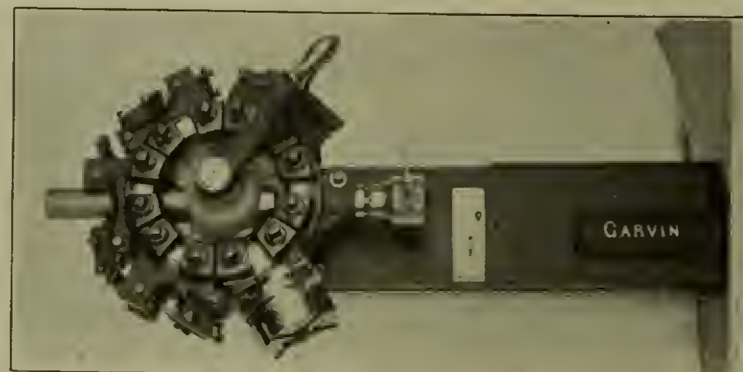


Fig. 2—Universal Screw Machine—Turret with Full Complement of Tools.

Fig. 2 shows the turret with a full complement of tools and a bar of stock being turned. The compactness and small overhang of the tools are evident, and the clear way for the stock right through the turret clearly indicated. The complete set of tools includes one top holder, three turning tools, one pointing tool and stop combined and one automatic opening die.

Each turret tool has an independent, adjustable trip and stop. A cylinder geared with the turret carries six screws, and each screw may be set to trip the feed at any point, and then a slight additional movement brings it up against the dead stop. These stop screws are protected and have a range of 6 inches, and by throwing a small lever on top of the turret slide the turret may be stopped at any point in the entire range of 12 inches. The turret slide has great width and depth to give it strength, but moves lightly, and is fitted with wide bearing surfaces to reduce wear to a minimum. Sliding in a raised block, all trouble from chips and grit, common to turrets sliding on the bed, is avoided.

The turret slide base provides a very long bearing for the slide and is adjustable along the bed, and is bound by two hook binder bolts and bolted down to the bed by a large bolt in front, where solidity is most essential, to prevent lifting.

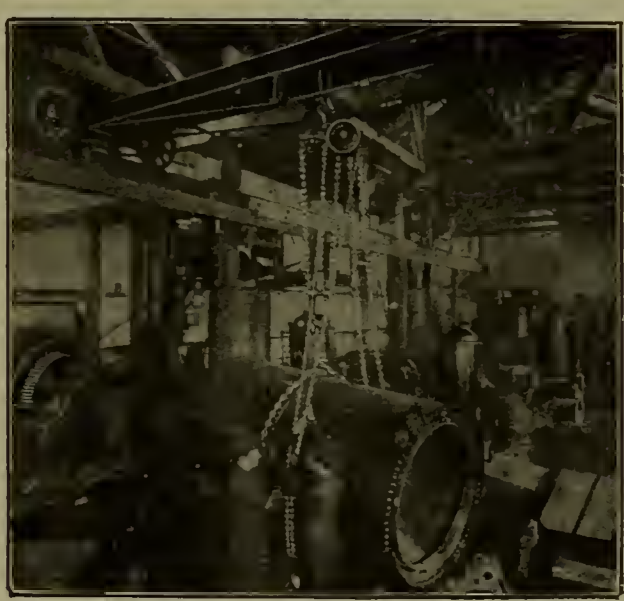
A taper attachment is furnished with the machine when desired, the design and action of which are similar to that of a lathe and which is simple and substantial. Block stock can be used as the leading tool turns off the stock, and sizes it to enter the steady bushing, while the taper-turning tool follows close behind the bushing. A fine adjustment for size, without loosening the tool, is provided by an eccentric. The eccentric can be clamped in any position, and an adjustable fixed stop is also provided. A relief in the length of the taper can be turned. The guide-bar can be set for tapers in either direction, and is held on a bracket, bolted in the T-slot, anywhere along the bed. The base-plate of the attachment is clamped on the turret, and holds the steady bushing and leading tool. Sliding on the base-piece is the tool-block, which has a shoe, traveling on the guide-bar. The taper-turning tool can be ground on the end, and remains always on the center, and the chips fall clear to the bed.

A large oil-pan, giving abundant chip room, is provided, and a pump and piping leading from an oil reservoir in the bottom of the pan. The piping is connected to the center of the turret and travels with it, so that it stands in constant relation to the tools. As each of three of the turret tools comes round it is automatically connected to supply oil to oil-tube drills, etc. A two-way cock is fitted, so that when oil is not needed for oil-tube drills it can be led to the spreader to supply the other tools. The reservoir is protected by a double strainer. A stop-cock is fitted in the piping, and by closing this cock the pump is always kept primed.

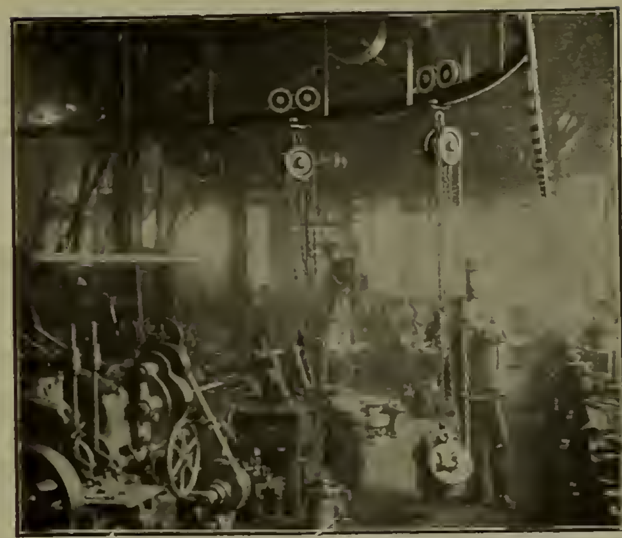
As may be noticed, all the fixed gearing is protected, and all operating handles located convenient to the operator. The machine is manufactured by the Garvin Machine Company, New York City.

Triplex Hoisting Blocks

In our July issue we illustrated a chain block system for unloading cars while standing on spurs and switches, as a means whereby much time and labor might be saved. We now present several illustrations of the application of chain blocks to shop practice demonstrating the remarkable efficiency with which hand hoists can be applied in many situations. To handle material quickly and economically is one of the universal needs in the modern shop.



Handling Finished Boiler with Six-Ton Block on Hand Traveling Crane.



A Traveling Crane Block.

The half-tone engravings presented herewith illustrate several of the applications made with the Triplex Blocks, which are manufactured by the Yale and Towne Mfg. Co., 9-13 Murray street, New York. The late Prof. R. H Thurston made a test to determine the efficiency of chain blocks and his reports are as follows concerning the triplex. He explained that all of the blocks tested, except the triplex block, depend for their self-sustaining feature upon the use of some gearing or purchase having a very low mechanical efficiency, so that the friction of the working parts holds the load and resists hoisting as well lowering. Proceeding, his report said: "The new Yale-Weston triplex block, on the contrary, has a simple and compact triple train of spur gearing and thus develops remarkably high efficiency, so that it becomes impossible to rely upon friction to sustain the load. For this, a separate

Triplex Blocks in the Erecting Shop.

Delivering Finished Material on Overhead Trolley in Bridge Works.

and simple device is introduced. This independent sustaining mechanism automatically holds the load safely, and yet enables it to be lowered with slight effort and at high velocity, but without acceleration or danger." Accompanying the report were tables giving in figures the high efficiency noted.

In a booklet, called Triplex Hoisting Hints, many additional illustrations are presented, showing the wide uses to which these chain hoists may be applied.

Holland Whitewashing Machine

The great success met with in the use of the Holland whitewashing machine lies in the fact that it is no experiment, but a thoroughly tested and practical labor-saver which will accomplish the maximum work at the minimum price, thereby more than doubling the profit on all work turned out and making a neat job. The time gained by this method of doing the work cheapens the cost of labor, which is invariably the greatest expense in all work of the kind.

In setting up the machine for whitewashing the only additional apparatus or attachments needed are two or three good, clean barrels in which to mix the whitewash. Connect all parts; then clean water from a barrel should be pumped into the machine in order to understand the working of the different parts and at the same time to clean out any loose dirt or scale that might have been gotten in it when being tested and which might clog the machine.

After a little practice with the spray the operator will be able to adjust and operate it successfully and accurately.

Holland Whitewashing Machine.

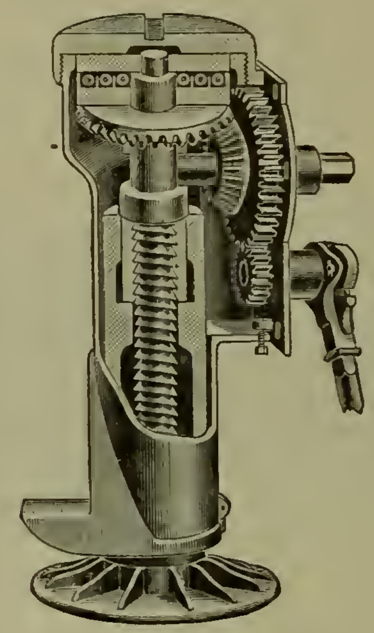
After getting through with the machine let whatever is left in the hose and the air chamber escape through the spray nut; then pump clean water in order to clean pump and connections.

To put the machine under pressure you must close the discharge faucet at the side of the tank and put the suction hose into clean water, and then pump up to about 50 lbs. pressure; take the suction hose out of the water and put into the mixture and pump up to the desired pressure (generally about 100 lbs.). As soon as there is sufficient pressure the man who works the pump opens the discharge faucet and the man directing the spray opens the spray faucet and allows the liquid to run into a bucket for a few seconds to drive out the water that may be left in the hose or pump. When the mixture is found to be running properly the spray cock should be regulated. It should not be further away than 15 inches from the work. In working strike the spray squarely on the surface and not in a slanting position.

The machine herein mentioned is manufactured by the Holland Brass Works, 50-60 South Canal street, Chicago.

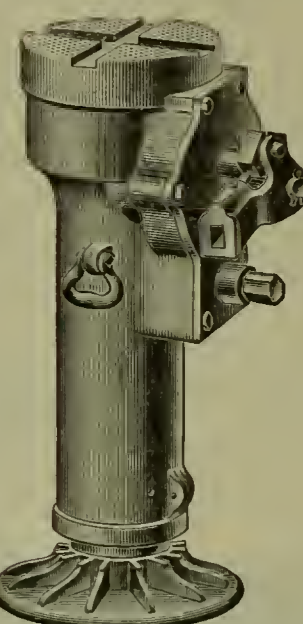
A New Type of Norton Ball Bearing Jack---Capacity Sixty Tons

A. O. Norton, 286 Congress street, Boston, Mass., has recently designed and brought out a new ball-bearing ratchet screw jack having a capacity of sixty tons, and which is intended for use under 80,000-lb. and 100,000-lb. loaded cars as well as for wrecking equipment.



New Norton Ball-Bearing Jack.

This jack is similar in construction to the earlier type of Norton ball-bearing jack in that the gears are cut from solid steel forgings, and it has ball bearings to reduce the friction. All the working parts are protected from grit and rust; and, being a screw jack without filling, packing or valves, it is absolutely safe under all conditions. It cannot slip or drop the load and it is always ready for instant use.



New Norton Ball-Bearing Jack.

Hollow Staybolts

An Abstract from a Paper read before the Master Steam Boiler Makers' Association, by John Livingstone.

Your chairman produced a board to show 171 heads of staybolts from the right side of the firebox on the fireside sheet of a locomotive; at least 75 out of the 171 were burned. You have held that the breakage of staybolts is due to expansion and contraction, and unable to counteract the expansion and contraction with the solid staybolt, discussion centered on flexible staybolts. Too little heed was paid to the lesson taught on the board, too little consideration was given to the prima facie fact, that 44 per cent of the heads of those staybolts were burned. When the bolts commence to burn at the inside of the sheet, the burning continues inward until protected by the water. The heat that causes the burning causes expansion at its inner end, and in the hole of the sheet; and that expansion is met by resisting expansion in the sheet (solid against solid) with risk that both the sheet and the bolt will crystallize. The sheet, which may also burn, may crack between the bolts; the bolts will break, not always where the force of rigid compression obtains; sometimes where by the concentration of force there, the other part of the bolt snaps under the varying vibrations and strains it has to endure. The sheet in ordinary service cannot be burned so long as there is water behind it, for iron has capacity to convey to the water the heat it obtains from the fire, however fierce; but if burning is commenced at the inner end of the staybolt it will extend outward and imperil the sheet immediately around it. Though riveted close to the plate the inner end of the bolt is only mechanically in touch with the plate, and cannot exercise the functions of the sheet in giving to the water the heat by which it is attacked. The water protects the sheet from burning and the heat passes through the iron to the water. To avert the risk of burning from the inner end of the bolt outward there is only one way, and that is with air through the center of the bolt and the water around it; nor can you unduly expand a bolt of that character. It will receive the force of the expanding sheet without the resistance of its own power of expansion to the extent in a solid bolt. The impact of molecules from expansion in the sheet is communicated to the bolt, in which the impact of the molecules from the heat and compression is cushioned in the air passing through the center of the bolt, expanding perhaps three-fold between the outer and inner air from the heat by it taken up in its passage through the center of the bolt, giving a natural elasticity to the bolt. Some people make light of a little crystal; in one of a number of tests which I saw made there was a difference in tensile strength in a sample where a speck of crystal about an eighth of an inch in diameter was the cause for the loss of 2,640 pounds in the tensile strength as compared with another test of the same sample where there was no crystal; how much greater must be the breakage in staybolts from iron which shows an excessive amount of crystal, say two-thirds, as seen in a sample on the table.

JOHN LIVINGSTONE.

Teahnical Publications

LOCOMOTIVE BREAKDOWNS, EMERGENCIES AND THEIR REMEDIES. By George L. Fowler. This is a book prepared for those concerned with the operation of the locomotive on the road, including a consideration of roundhouse work in connection with accidents and breakdowns. Discriptions are given of the handy tools and appliances that are specially adapted for the kind of work treated. The book treats of all classes of accidents that are liable to happen to a locomotive in service, giving a remedy to be applied in each instance. The various types of compound locomotives are included and accidents that may happen to them are discussed. The work is prepared in the form of a catechism, so that a direct answer is given to a plain, definite question upon each subject included. The text is well illustrated by sketches representing the methods advised. Published by the Norman W. Henley Company, New York City. Price $1.50.

UP-TO-DATE AIR BRAKE CATECHISM. By Robert H. Blackall. The eighteenth revised and enlarged edition of air brake catechism is just off the press. The work has been entirely rewritten and revised and is right up to date. Many more illustrations have ben included as well as two large Westinghouse air brake educational charts, each 14 x 50 inches, printed in ten different colrs, which in themselves are a regular air brake course.

This book is a complete study of the air brake and signal equipment, including the very latest devices and inventions used. All parts of the air brake, their troubles and peculiarities, and a practical way to find and remedy them are explained. It contains over 1,500 questions with their answers, giving the necessary information to enable a railroad man to pass a thoroughly satisfactory examination on the subject of air brakes.

The author has treated the subject in a manner as the one best adapted to beginners; he has taken up each topic in its simplest form, and then by progressive work has covered the more intricate parts of the topic as well, thus making a book valuable to men already advanced in their knowledge of the air brake. Trainmen and engine crews will find special and practical assistance to their work under the subjects Train Handling and Train Inspection. The author's many years' experience as air brake inspector and instructor enables him to know at once how to treat the subject in a plain, practical manner. Published by the Norman W. Henley Company, New York City. Price $2.

Recreation and Business Combined

In these days of strenuous effort where gigantic enterprises are the one absorbing question wearing to the extreme on one's vital forces, and with the whirl and excitement of the busy city with its crowded, noisy streets, there can be no rest. The close application which is demanded of the business man make it necessary that he be healthy, hence the demand for resorts the environments of which tend to that aim. Half a day of golf, a brisk walk through the pines, or to indulge in any one of the numerous out of door sport sort of braces one up, but the trouble is where is there a place having just these opportunities.

A ninety-minute railroad ride takes you to Lakewood, the most famous, the most popular resort known for the business man. A perfect atmosphere, a healthful climate, delightful surroundings, fine hotels and a select social following are the qualities Lakewood possesses, and the resort is reached by the New Jersey Central. Its trains are fast and frequent, and coaches and parlor cars are of the latest design, in fact fully in keeping with the resort. If you are interested in Lakewood send to C. M. Burt, G. P. A., 143 Liberty St., New York City, for Book No. 1; it's free for the asking.

Notes of the Month

Mr. H. C. Lafferty, for many years at the head of the Paint Department Pressed Steel Car Company, Allegheny Plant, has severed his connection with that company and is now manager Pittsburgh Department for the American Graphite Company, with headquarters at 306 Frick Building.

An attractive and unique pamphlet entitled "Graphite Suggestions" is being distributed by the Joseph Dixon Crucible Company, Jersey City, N. J. In an interesting manner the book tells about the different kinds of graphite and the uses to which it is put; the problem of lubrication and the results derived from mixtures of graphite and oil and mixtures of graphite and grease.

The Duff Manufacturing Company, Pittsburg, Pa., is distributing its '94 catalogue, which supersedes all previous issues. The pamphlet illustrates and describes the Barrett jacks, among which may be mentioned track jacks, automatic lowering jacks, car and car box jacks, differential screw jacks, oil well jacks, pipe forcing jacks, automobile jacks, motor armature lifts, and traversing jack bases.

The Washburn Company of Minneapolis, Minn., announce that they have made arrangements with the Pennsylvania Malleable Company of Pittsburg, Pa., to manufacture and sell all their different types of couplers in the Central, Eastern and New England States. The Washburn Company will continue the sale and manufacture in other parts of the country.

American manufacturers of freight cars and locomotives will be interested in the following from Consul Brainard H. Warner, Jr., at Leipzig, Germany: "A telegram has been received from Brussels, Belgium, informing German manufacturers that the Belgian State railroads are about to ask for bids upon 3,200 freight cars and 100 locomotives, in addition to a large quantity of other railroad supplies. Detailed information, in book form, may be had by applying to the Bureau Central des Renseignements, Rue des Augustins, 15, Brussels, Belgium."

Mr. W. H. Van Sickle, superintendent of the Thos. H. Dallett Co., Philadelphia, says the outlook for business has never been more encouraging than the present time. They are receiving a larger number of inquiries from all parts of this country and abroad for their portable electric and rope driven drills, pneumatic hammers, hand drills, stone surfacing machines, carving tools, plug drills, etc., than ever before, and have booked many large orders from well-known firms here and on the continent, among whom are the U. S. Metal & Wrecking Co., New York; Milne & Chalmers, Quincy, Mass.; Manning, Maxwell & Moore, New York; Robert Wood, Philadelphia; Henry A. Hitner Sons, Philadelphia; Allentown Boiler Works, Allentown, Pa.; Sangamon Coal Co., Springfield, Ill.; Winston Co. & Locher, Clinton, Mass.; Cutter, Wood & Stephens Co., Boston, Mass.; Schuchardt & Schutte, Berlin, Germany; Niles, Bement, Pond Co., New York; Detrich & Harvey Co., Baltimore, Md. Schuchardt & Schutte, Vienna, Austria; Hudson & Chester Granite Co., Chester, Mass.; Norcross Bros., Worcester, Mass.; Elkurtz & Son, Berwick, Pa.; Charles Sangster, Aberdeen, Scotland, for heavy tools, and in addition they are doing a large volume of business in small orders.

The chief engineer of the Rapid Transit Commission of New York City this week announced that all the excavating for the underground railroad from the City Hall to 119th street had been completed, the last two remaining heads—the one at Leonard street and the one at 77th street—having been removed almost simultaneously. The engineer stated that at this rate of progress the company would be running experimental trains through the entire subway some time in December. With the exception of one small gap at the Times building, at Longacre Square, the tunnel is complete and tracks laid from Walker street to 77th street. From 77th street to 79th street there is still some track to be laid, but from 77th street to 92d street the work is finished. Within ten days there will be an unbroken line of complete tunnel and track from City Hall to 104th street. There are 24 miles of the route finished now. The East and West Sides lines will join at 104th street, and on account of an extremely deep cut it was necessary to make at that point it has required a longer time for completion. By the last of November, however, this gap will be filled and tracks laid from City Hall to 150th street. It is now anticipated that some time during March or April actual traffic will be carried on.

Official reports state that the new railroad Y. M. C. A. building at Topeka, Kan., will be finished in a few days and that the dedication ceremonies will take place at an early date. Entering the building from the street there is a reception hall 20x48 ft. To the left is the reading room and the libraries and on the north are several game rooms. The secretary's office is at the end of the hall and on the same floor is the gymnasium and assembly room combined. This room has a seating capacity of about 500. The stage has two dressing rooms. In the basement there are bowling alleys and a swimming pool, 18x30, and eight bath tubs. Two hundred lockers, ten shower baths and the furnace room are also in the basement. In the third floor above the basement are three class rooms, which are divided by sliding doors so that on special occasions the rooms may be opened into one. A barber shop is also to be on this floor and three chairs will be ready to accommodate the members at any time. In connection with the class rooms is the kitchen, where the ladies' auxiliary will preside on occasions of banquets. All floors are to be reached by a large winding stairway in the center of the building and at the top of the stairway ventilating appliances have been arranged so that the whole building may be very easily aired by opening the skylights. On the fourth floor are sleeping rooms, which will be furnished with beds 3x6. These are to be rented to members for 10 cents per night. All rooms will be heated by steam and lighted by electricity and the lighting and water supply will come from the Santa Fe source.

Railroad Paint Shop

Edited by
CHARLES E. COPP
General Foreman Painter B. & M. Ry.

Devoted to the Interest of
Master Car and
Locomotive Painters

Official Organ of the Master Car and Locomotive Painters' Association.

M. C. & L. P. A. Portrait Gallery

E. L. Younger.

We take pleasure in presenting herewith the portrait of a member of the South, Mr. E. L. Younger, foreman painter of the new shops of the St. Louis, Iron Mountain & Southern Ry. at Baring Cross, Ark., near Little Rock, which were illustrated and described in these columns last month. It was our intention to have both the shop picture and the portrait of its foreman appear in the same issue, but due to an unavoidable delay the matter could not be so arranged.

Mr. E. L. Younger.

Accompanying his picture, Mr. Younger, who, no matter how much older he grows, is always Younger, writes the following interesting biographical sketch of himself:

"As per your request at our last convention held in Chicago, I am mailing you under separate cover a flattering likeness of my 'top-piece.' In order to help your readers, I will submit a short biography.

"As Mark Twain would say, 'I was born at a very early age' in Covington, Ky. After four years' apprenticeship under my father Cincinnati, Ohio, I drifted west and entered service with the Kansas City, St. Joseph & Council Bluffs Ry. at St. Joseph, Mo., under Mr. C. F. Harral. From there I worked in nearly all the large cities, principally at sign and carriage painting. In February, 1894, I accepted service with the Missouri Pacific Ry. at Osawatomie, Kan., and on the retirement of the foreman, Mr. John Devlin, I was appointed to the vacancy. I remained at Ossawatomie until March, 1898. when I was transferred to the De Soto, (Mo.), shops on the St. Louis, Iron Mountain & Southern Ry., a part of the Missoruui Pacific system. After a service of four years and seven months I was October 1, 1902, transferred to our new shops at this point, which we are proud of; and, I think, we are justified in our opinion of these same shops."

Mr. Younger joined the association in 1896 at New York.

Shop Heating and Ventilating

There seemed to be quite a difference in opinion in the discussion on the subject of "Heating and Ventilating Car and Locomotive Paint Shops" at our last convention as to the point where the delivery of hot air should be made—whether at the floor line, or five, ten or twenty feet from the floor; though there was a general agreement that the hot-air, fan-blower system was the best, all things considered. We think that the disagreement was largely through misapprehension of others' views upon the subject. All kinds of heating were discussed together, and that barbarism of trying to heat a shop with coils of steam pipes above the tops of the cars came in for its share of notice; and if there is anything under the sun that needs delivering "at the floor line" (or out of shop) it is this system of heating. In fact, any system of heating by direct steam needs to be at the floor line. But not necessarily hot air by the Sturtevant system. Here is where the misapprehension came in. If those who argued that this system should deliver its heat at the floor line would stop to think a minute they might easily see that it matters not whether pipes or the air itself becomes the medium of the circulation of the heat downward so long as the suction is on the floor line at the end of the shop drawing in the air of the shop as fast as heated and blown out at the top of the shop again. What odds does it make, we repeat, what the means of circulation are so long as you get the heat? What's the odds what the means of financial circulation are so long as it is honest and you get the money, to use an illustration? From personal observation, we believe the odds as to heat are in favor of the openings at the top of the shop on the line of the main leading pipe for the reason that the whole volume of air between these openings and the suction heating coil at the bottom of the shop becomes the conveyance of this heat by circulation and thus the shop becomes warmer quicker by the more rapid and greater diffusion of heat. In the instances cited, where the pipes pass through this volume of air down to the floor line, of course that hot air so delivered at the floor line must be the first to be again drawn into the heating coil on its level, and thus the cubical contents of the shop's air are left behind to become heated indirectly instead of directly, as in the case of the steam coils at the top of the shop. We know this to be true in the case of Mr. Bailey's shop at Concord, with the outlets at the top of the shop and the suction at the bottom, that his large shop is as comfortable as a sitting room at all times in that cold locality in winter time. We truly believe our hot-air friends would do well to experiment by taking off one or two, or more, pipes at a time that drop downward from the main stem and see how it works.

Nor is this all. We believe the dust-circulation question would also be obviated because the hot air is emitted up where there is no dust and comes down by a gentle movement to the floor line and stirs up no dust whatever there, and thoroughly warms the whole shop. If anyone doubts this let him visit Warner Bailey this winter and get some posies from his plant collection at the end of the shop farthest from the heating coil, ten tracks away. And he has to have windows open to feed his heating apparatus with fresh air, and thus his shop becomes ventilated.

Poisonous Painting Preparations

As to poisonous painting materials and their effects there is a deal of ignorance in the public mind, if not in the painter's mind also. The unsophisticated are scared where they need not be frightened, and are confident where they need to be cautious. We have known of persons—not professional painters, of course—who, feeling sick while painting the outsides of their houses, concluded that the business must be very harmful to the health. They will make the same remark in smelling paint anywhere. Now, this is because the smell of the oil is nauseating to their sensitive nostrils and stomachs because they have not become accustomed to it, and not that the air is laden with poisons, or because there is not a sufficient volume of pure air. As a matter of fact, if a person is painting on the outside of a house in the open air with a brush, even though he is using lead, the amount of poison he would take into his nostrils would be such a small per cent as not to be worth considering. Where the trouble would be is with his hands, and how he cared for them to keep them clean of lead paint, especially at lunch time. Even in this case, though he were absorbing lead poison through the pores of his hands, it might take months and even years before its effects were manifest. In a word, the absorption of poison of this kind is slow and its eradication is equally slow, if not slower; and the nauseating effect of paint is not poisonous at all, though it is felt so suddenly and forcibly. In fact, one might be nauseated by painting the outside of a building with pure raw linseed oil and earth paint and there be no poison in it. The oil might be taken in quantities and its only effect would be that of physic, like castor oil; and the earth pigment would hurt them no more than any earth that is eaten, like terre alba in candy, etc. It is well to be cautious of poisons, but we should know what they are and how they may be taken into the system and how antidoted, disinfected or eradicated from the system or our surroundings. Doubtless the very unsophisticated persons referred to, who were nauseated in using the mixed paint, would sandpaper lead paint that is dry in a confined room, say, that has been applied years ago, in order to get the surface ready for the painter, and think it perfectly harmless so long as they felt no ill effects, when in fact in the shape of lead dust they are getting more poison into their system in five minutes than they would in week of painting on the outside of a building. As long as people do not collapse at once in what they do they are apt to think it harmless, and if they feel sick at something they smell, though it is not poisonous at all, they want the nuisance abated. We have known a community to turn up its nose and rave at the smell of a paper mill, when it was nothing but chloride of lime used in bleaching rags, and really a benefit in the shape of a disinfectant for germs that unsuspectingly might be in the air.

It is this fright of smells on the one hand of a comparatively harmless nature that we wish to assuage and the poisons on the other that people are ignorant of that we wish to point out; and we might write a volume about it—how folks will live and breathe in, unnoticed for months, the most noxious poisons until they come down with malaria, typhoid, or some equally terrible disease—but we are not going to do that now. We do wish, however, to remind varnish remover makers and users once more of the dangers that lurk sometimes in mild smells. It is not the worst smelling article of this nature that is always the worst to have around. Although it may be the most unpleasant for the time being. Some of these removers that are said to have "no odor" contain slow poison, nevertheless, in the shape of bisulphide of carbon. We are told by interested parties, who ought to know better, that this is harmless to work in; "men do everything with it, except to eat it," etc, etc., "and are healthy." So men were healthy who used to rub lead with their hands into carriage gears—until, yes, until their systems got filled with the poisons, which might not be for months or years. Then what? Months or years to patch up their wrecked systems, if indeed it could ever be done and they saved from palsy or from the grave. We restless, impatient yankees are too apt to condemn that which has no immediate effect, be it medicine or what not, when in fact it takes months to accomplish some of the best results in the world by patient application. Just because a man does not collapse at once in the use of bisulphide of carbon, which he would do in a small, closed room, it is no indication its continued use in a large room, or even in the open air, will not harm him. Is it best to experiment with that which learned authorities condemn to find for ourselves and repent at our languishing leisure?

We wish to forearm the thoughtful by warning them of this subtle and dangerous poison; but if they will not be warned, then let the simple pass on and be punished.

Annual Convention of Sherman-Williams Company Representatives

Representatives from every territory in Canada and the United States, and managers of the various departments and divisions of the Sherwin-Williams Company, the large paint and varnish makers, met in annual convention at the company's general office, Cleveland, during the week beginning November 9. The convention, which was the twenty-third the company has held, was most successful in every way, largest in attendance and greatest in amount of work accomplished.

Plans and methods for the conduct of business during the coming year were considered and approved and quite generally the whole paint situation was reviewed. The tone of the discussion at the sessions was optimistic. The representatives who come closely in touch with trade conditions in all parts of the North American continent had no premonition of hard times ahead, and the past successes of the company give confidence for the future.

And the growth of the Sherwin-Williams Company during the last few years would surely inspire confidence. Since 1898 the average increase in all departments of the big paint concern has been 200 per cent. In the last year entirely new paint and varnish plants and a dry color works, the largest in the world, were built at Chicago; a new paint plant, which will be the largest plant of its kind in Canada, is now being erected at Montreal; the plant at Newark was extended so as to double its capacity; new general offices are under construction at Cleveland; and offices and warehouses are established at San Diego, Cal., and London, Eng.

"Concentration" was the keynote of the convention and will be the guiding principle in the business of the ensuing year. The company will work more closely than ever with their customers and render them greater assistance in obtaining the best results with the S-W paint products.

The convention closed with a banquet in the Auditorium of the Cleveland Chamber of Commerce to the representatives and all the Cleveland employes of the company. Over 700 were in attendance.

A striking feature of the convention was the enthusiasm and loyalty and get-together spirit that characterized all connected with the Sherwin-Williams Company. Every single employe considers himself an integral part of the organization and takes a personal interest in all the affairs of the company.

A New Booklet

"How many colors are there?" This question is often asked of the painter by the unsophisticated as though it was a simple thing that might be answered off-hand. It would be as ridiculous to ask in return how many hayseeds there are in a barnful of hay. While there are seven colors in the rainbow, four of them are blendings of the other three—red blue and yellow. So there are really but three distinctive primary solar colors. But the earth teems with colors and pigments in vegetation, minerals, etc., and in chemicals capable of producing many others, an almost infinite variety of which are compounded into various colors, which in turn, by the use of white lead, can be made into as many distinct shades of each color as you may vary the amount of white lead to each mixing.

For instance, here is a little "Treatise on Best Colors in Oil, Supplemented by a Color Chart," just gotten out in a tasty manner by the Heath & Milligan Manufacturing Company, of Chicago, that shows twenty-six groupings of colors for painters' use, of six shades to each color, or 156 sample colors on the card, according to whether 160, 80, 40, 20 or 10 pounds of white lead are mixed with a certain specially strong color, and less with some others. This gives some idea of the infinite variety of colors and shades of colors that such an enterprising firm can manufacture to suit the many fancies of a fastidious clientage.

This little booklet is otherwise of value. It tells from what substances and how colors are made, etc. It is put up in a neat, strong envelope and may be carried in the painter's pocket.

We have received an intimation that every master car and locomotive painter who was at the late convention in Chicago can have one free, although the price thereon is fifty cents and "sold to painters only." This, we suppose, comes about because Mr. Gorham B. Coffin, of that company, was chairman of the entertainment committee at the convention, and now that he has got rested he feels happy and wants to do something else to make "the boys" pleased.

Origin of Air Painting

The Boston Sunday Globe, October 25, 1903, publishes a portrait of Frank D. Millet, the artist, who was born at Mattapoisett, Mass., November 3, 1846; and from among other things in the sketch of his career we clip the following as of interest to our readers regarding the history of air painting. Personally we supposed Mr. Bryce, of Pittsburg, had as much to do with this business in painting the world's fair buildings as did anybody. Of Mr. Millet the Globe says:

"He had charge of the art work of the world's fair at Chicago, and when the question of painting the buildings came up it was found there was not time enough to do it in the regular way, so he invented a machine to do the job.

"He took a gas pipe about a foot long, pounded flat at one end so as to leave an opening about an inch across and wide enough to insert a sort of perforated cardboard. This he attached to a long piece of hose, the other end of which he dipped into a barrel of paint. An electric motor then pumped air and paint through the hose. The force of the air scattered the paint in a fine spray.

"It worked like a charm and the work was done on time. This method has since become popular in painting shops, etc. It does the work of forty or more painters."

Pleasantly Remembered

Having noted with regret in our last issue the resignation of their old associate, Mr. J. T. McCracken, from his long and honored term of service with the Jackson-Sharpe Company (now the American Car & Foundry Company), the following from a Wilmington paper will be read with interest by his many friends, who will miss him at conventions as a member of the M. C. & L. P. A., but may hope to see him as "a supply man."

"John A. McCracken, of 1802 West street, who was for twenty-eight years connected with the American Car & Foundry Company, and for the last sixteen years foreman in the painting department, resigned a few days ago to go into the business of selling paint materials, and last evening a large delegation of the men who worked under Mr. McCracken went to his residence in a body to show their appreciation of a model foreman.

"Harry C. Hackett acted as the spokesman, and told Mr. McCracken of the genuine regret about the works because of his absence, and in behalf of the painters of the company presented him with a handsome gold watch. Mr. McCracken was taken completely by surprise, and it was several minutes before he was able to say a word. He afterwards said that those few minutes were the happiest of his whole lifetime. When he spoke he alluded to the relations that always existed between them, but that he did not think that he was deserving of such a costly present.

"The watch contained Mr. McCracken's monogram on the outside case and on the inside was engraved: 'Presented to Mr. McCracken by the painters of the American Car & Foundry Company, October 16th, 1903.'

"Mr. McCracken was then escorted to a cafe in the city where the evening was pleasantly spent, and as the hours passed different ones of the knights of the brush sang songs and gave recitations."

Notice to Heads of Mechanical Departments

It is the desire of the advisory committee that the master car builders, master mechanics and superintendents of motive power, as well as foreman car and locomotive painters, having questions to offer for subjects at the next convention of the Master Car and Locomotive Painters' Association, will kindly send them to the chairman, as below, before February 15, 1904, and oblige, Yours truly,

John H. Kahler,
Chairman Advisory Committee, M. C. & L. P. A.

An Old Veteran Foreman Painter Heard Frem

The following letter from Mr. Lord, of the Fitchburg shops of the Boston & Maine, will be read with interest by Mr. May's many friends in the M. C. & L. P. A. among our readers. His portrait and sketch appeared in these columns in our June issue. By Mr. Lord's letter it appears that the last time Mr. May was in Boston it was the year the editor of these columns was born!

"Fitchburg, Mass., October 28, 1903.

"Editor Railroad Paint Shop:

"As I was sitting in my office Monday, the 26th inst., who should walk in but our old friend, C. L. May, late of the Houston & Texas Central R. R. He was on a visit to Templeton, his old home. Being so near to Fitchburg, he said he couldn't return without giving me a call. Mr. May was not looking as young as I have seen him; nor was he so spry. Rheumatism was getting in its work, and it told on the old gentleman's movements.

"He inquired after you and was sorry he could not see you, but sends his kind regards.

"It seems the road on which he was employed has adopted the pension system, so they retire and pension the employes at the age of seventy. Mr. May being seventy-three, he was retired the first of last January, his assistant taking his place.

"Mr. May started east earlier in the season, but was called back by a telegram telling him his son was dead, he having left him but two days before in good health apparently. This was another severe blow, and it told on the old gentleman, as he did not seem like the jolly Mr. May that he was in years gone by. Had I thought at the time about writing you a letter I would have made a few notes of some things he told me about. Shall not dare to now, as I may not get them right.

"Mr. May and a friend of his were going to Boston the next day after he was here. As he had not been there since 1848, what a change it must be to him—55 years! I can remember big changes in my day, but what will it be to him!

Yours truly,

Geo. W. Lord.

Test Committee Notice

To the Editor:

The Committee on Tests will appreciate any suggestions from members of the Master Car Painters', Master Mechanics' or Master Car Builders' Associations that will be of interest to the railroad fraternity. J. H. Pitard,

Chairman Committee on Tests, M. C. P. Assn., Mobile, Ala.

Notee and Comments

H. C. Lafferty, late foreman painter Pressed Steel Car Co., Allegheny, Pa., has resigned his position there, we are informed, as the works are entirely closed down, and he is now resident agent at Pittsburg of the American Graphite Co., of Cleveland, Ohio.

His many friends among the M. C. & L. P. associates will be pained to learn that the continued illness of Mr. W. T. Ledford, of the Southern Ry. at Manchester, Va., has assumed such a character, according to rumor, as to require his confinement in an asylum.

Mr. George Paulis, of Lima, Ohio, has taken a position in a Texas shop, we are, told. Mr. W. White, M. M., at Lima, who was at our convention and made an honorary member of our association, has also accepted a position at the same place, but we do not yet know the location.

Mr. Jos. A. Glass, engineer on the Yazoo & Mississippi Valley Railroad, and son of J. A. P. Glass, Master Painter on the same road, died recently of appendicitis at the age of twenty-five years. Mr. Glass learned the painter's trade, but after a few years, gave up painting to become an engineer, in which capacity he served up to two weeks of his death.

Some may have wondered why the portrait of the first vice-president did not appear with the other officers in the October issue containing the proceedings of the M. C. & L. P. A. convention. It was up to "John," but he failed to send us a photo, and the old plate used a year ago was destroyed. We understand, however, that arrangements are being made to insert it in the bound volume. The customary list of members in attendance at the convention was also omitted for the reason that we did not have it and by correspondence with Secretary McKeon and the office it was considered more appropriate for the bound volume where it will appear.

It is said that Mr. R. W. Scott, familiarly known to "the boys" of the M. C. & L. P. A. as "Bob" Scott, among whom he is deservedly popular, has been appointed Master Painter of the American Car & Foundry Co.'s shops at St. Charles, Mo., dating Nov. 1st. He was formerly Master Painter on the Seaboard Air Line at Portsmouth, Va. Here's wishing him success.

We learn that "Charlie" Mason has regained his health and resumed his duties at the Altoona shops of the P. R. R., Oct. 1st. We congratulate him and hope to see him at our next convention at Atlantic City. It has been some six years since he has met with us on account of the illness of his estimable wife and her final taking away, since which time he has been out of health himself. It would do us all good to see him again.

In a personal letter from Mr. M. C. Hillick of the Lehigh Valley shops at Sayre, Pa., who was mentioned in our Nov. issue as very ill with appendicitis, he writes: "I am quite well again and working about 14 hours a day and try to believe that the work doesn't hurt me." We hope it will not, and that he will not need to continue at that rate of work very long. He mentions a recent visit of Mr. J. J. H. Kahler of the Erie R. R., and pays "John" such a compliment as we hardly dare to repeat here.

One of the pleasantest incidents to the editor of these columns at the late Chicago convention was our meeting and acquaintance with brother editor Chas. H. Webb of the Western Painter, of that city. He showed us many courtesies and proved himself to be as enjoyable company as the bright and entertaining magazine that he edits and publishes. There was a sort of "triple alliance" around a table at the Bismarck restaurant one day at lunch, arranged by Mr. West, Mr. Edward Hurst Brown of the Painters' Magazine and the present writer being present.

We are in receipt of two leaflets from the Columbia Paint & Varnish Co., entitled "Facts About Pyramid Wood Preserver," and "Why Columbia Oil is Superior to Linseed Oil." The former is a wood and shingle stain and for a preservative for all wood surfaces exposed to water and dampness. The latter is one of the several substitute oils upon the market intended to take the place of linseed, for which they make such high claims as that "it wears longer than linseed oil; it dries with a higher gloss; it dries quickly; it needs no driers; it is absolutely sun-proof; will not blister, crack, scale, or peel; it is a wood preservative; it is not affected by gases, acids, dampness, cold, heat or salt water fogs; it is an anti-corrosive for iron or metal—prevents rust, and checks it where it has already taken hold; an hour after application the hardest rain will not wash it off; it is always cheaper than linseed oil," etc.