RAILWAY MASTER MECHANIC

Security Building
CHICAGO

Bruce V. Crandall, President
Norman F. Rehm, Editor

Warren Edwards, Vice-President
C. C. Zimmerman, Secretary

Index to Volume XXXII

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RAILWAY MASTER MECHANIC

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Contents

Recognition of Men in the Ranks

NO feature of shop organization and operation is more commendable than due recognition of efforts made by men in the ranks to improve methods of doing work. Many of the shop kinks and home-made devices by which time and labor are saved, have their origin with the men actually engaged in the work for which such devices are specifically originated. These home-made devices are frequently the basis from which elaborate machines and mechanisms are developed. With more or less change to conform to local conditions, the kinks of one shop may be applied to another or to all shops of a system.

Assistance rendered by the men in originating methods of improvement are of inestimable value to the foreman. At the same time, the foreman owes it to his men to give due credit to each one who originates a worthy device or method, or who even advances an idea by which an improved condition may be reached. The advantages gained by such recognition on the part of the foreman are numerous. It imbues the men with the idea that he is honest and will not appropriate for himself the credit due to others and since he is square in this they are satisfied of a "square deal" from him in all questions that arise. Encouragement of early efforts will tend to induce greater endeavor and the more a man sees of the prominence of his personal work, the greater will be his personal pride in the organization and welfare of the whole. The greater the number of improved methods in operation in a shop, the greater the output and the lower the cost of operation, all of which reflects to the credit of the foreman in charge.

This journal has recently received a set of prints illustrating a number of shop kinks originated at a division shop of a prominent western road, the prints being accompanied by a letter requesting that the published article descriptive of these illustrations should include a statement giving due credit to the originator of each of the several devices. Such action on the part of a foreman is to be heartily commended and there is every reason to believe that, encouraged by the higher officials, sympathetic leadership of this nature will tend to increase the loyalty of all employes.

The Young Engineer in the School of Experience

THE variation in railroad business at different seasons of the year naturally requires certain changes in the disposition of working forces. As road work becomes dull there is a general change among engine crews, except among the older engineers who have secured the most desirable runs and whose positions are not affected by reduction in traffic. Some firemen are laid off or placed in the shop as drill press hands, machinist helpers and laborers. Some young runners are required to return to the fireman's side of the engine and these men immediately watch the bulletins for the most desirable runs and "bump" the younger men who have held such runs during the busier seasons. These in turn "bump" others lower down the list until the assignment of crews is largely readjusted.

The young engineers who have been set back temporarily usually apply for passenger runs, to which they are entitled by seniority. While such runs are more attractive and require less physical hardship than freight service, is it not a fact that both the young engineers and the railway company would profit by these men taking freight runs rather than the easier passenger runs?

Usually the men who are set back have been running yard engines and previous to this have been firing passenger engines for some time. Probably they have had little or no road experience as engineers and what information they have gained by firing in freight service is more or less hazy, due to the time which had elapsed since firing a freight locomotive. In many instances the experience of a young engineer leads him to believe that if he was firing again there are a great many things that he would investigate personally for the sake of instruction, instead of, say, taking a rest while the engineer is working around the engine.

In passenger service there is very little grief as compared with freight work and many a time a passenger fireman runs by a brother who is having grief with his freight train in the clear; however, it is just this grief that provides the requisite training and experience for making the best engineers. A man who can meet an emergency, who can get out of trouble quickly, who does not lose his head at a little delay and who can co-operate to advantage with the train crew, is the man sought when road foremen of engines are wanted —and a glance at the list of past presidents of the Traveling Engineers' Association will show the positions to which road foremen are advanced.

Several years have elapsed since some young engineers, not yet experienced as runners in freight service, have fired freight locomotives. Since that time material changes have been made in locomotive construction. Locomotives have increased in size, longer, heavier trains are hauled, couplers are subjected to severer treatment, the wide firebox has been introduced extensively and many roads have purchased engines equipped with Walschaert valve gear. These and other features have brought about changes in conditions surrounding locomotive operation and it would seem necessary for an engineer to acquire experience under circumstances peculiar to those that he will be expected to meet successfully, before attempting to enter heavy freight service as an engineer.

If an experienced engineer and an inexperienced fireman happen to get on the same run it would not be unnatural to expect an engine failure, drawbars pulled out, hills doubled and trains laid out all along the division.

The satisfaction of being a capable runner, the ability to get over the road with comparative ease and the necessity of sufficient experience to hold his job, would seem enough to induce the young engineer to gain the best training possible to be had, even at the expense of temporary sacrifice.

Technical Training

AT the December meeting of the Western Railway Club a paper on the subject of technical education was presented by Mr. Richard T. Crane, Sr., president of the Crane Company. The paper urged the futility of technical education, maintaining that college education seems almost fatal to success in the business domain as technical graduates will be distanced by clerks and mechanics.

On the second day after the presentation of this paper, the following editorial appeared in the columns of the Chicago Daily Tribune:

Large amounts of money have been given by practical men of affairs to establish and endow technical schools. The fact that, having been denied the advantages of training in the schools, they desire to give better opportunities to people of another generation is a pretty good reason for the existence of such institutions. It probably is true that the greater part of the millions given to higher education of whatever sort has come from the bounty of men who made their wealth without having had the advantages of the training which they seek to give to those who are to follow them. It is unreasonable to suppose that large endowments would be given in this way if the self-made donors did not realize their own loss because of the lack of educational opportunities.

Another fact is equally apparent. The technical schools cannot turn out well equipped men fast enough to meet the constant demand for their services. Any professor of standing will bear testimony that the requests made for trained men in his department exceed the available supply. In many of the technical schools the members of the graduating classes are placed before they receive their diplomas, leaving the institution on commencement day to begin work in good positions. In some lines no one but such a graduate can secure a place. Such a condition of things is eloquent of the worth of technical training.

If a thousand men whose training was limited to a grammar school course and practical experience in the shop were selected and put side by side with another thousand from Rensselaer, Massachusetts Institute, the Sibley School, Purdue, Stevens Institute, Worcester Polytechnic, and similar technical schools the chances are many that the latter group would furnish the larger number of efficient and successful workers. If the attainments of the entire body of graduates of American technical schools were compared with those of an equal number of workers without any advantages of the schools the result would not be doubtful.

The captains of industry are relatively few. Their success often has been due to native genius. Sometimes peculiar conditions have helped them forward. Leadership in other fields has come in the same way. Those who have been trained for command often have failed completely. But where one man has gone from the grammar school and the four years' observation in the shop to the head of a great establishment there have been thousands who have trudged their way through life with little enjoyment of its opportunities, with relatively small influence upon their fellows, and with a horizon limited by the walls of the factory.

Hundreds of educated men have wasted their chances. Hundreds have failed completely in a chosen profession. Leadership among them may have been less frequent than it should have been. But the great majority of those who crowd the technical schools to overflowing are there because of the encouragement of employers or friends who tell them of the better opportunities open to those who are educated. It is not by the relatively few captains of industry that the technical schools are to be judged. Nor are the many failures to be charged against them without frank recognition of the percentage of failures everywhere. It is in raising the average of intelligence that their greatest value lies.

Locomotive and Car Shops

Kansas City Southern Railway, Pittsburg, Kas.

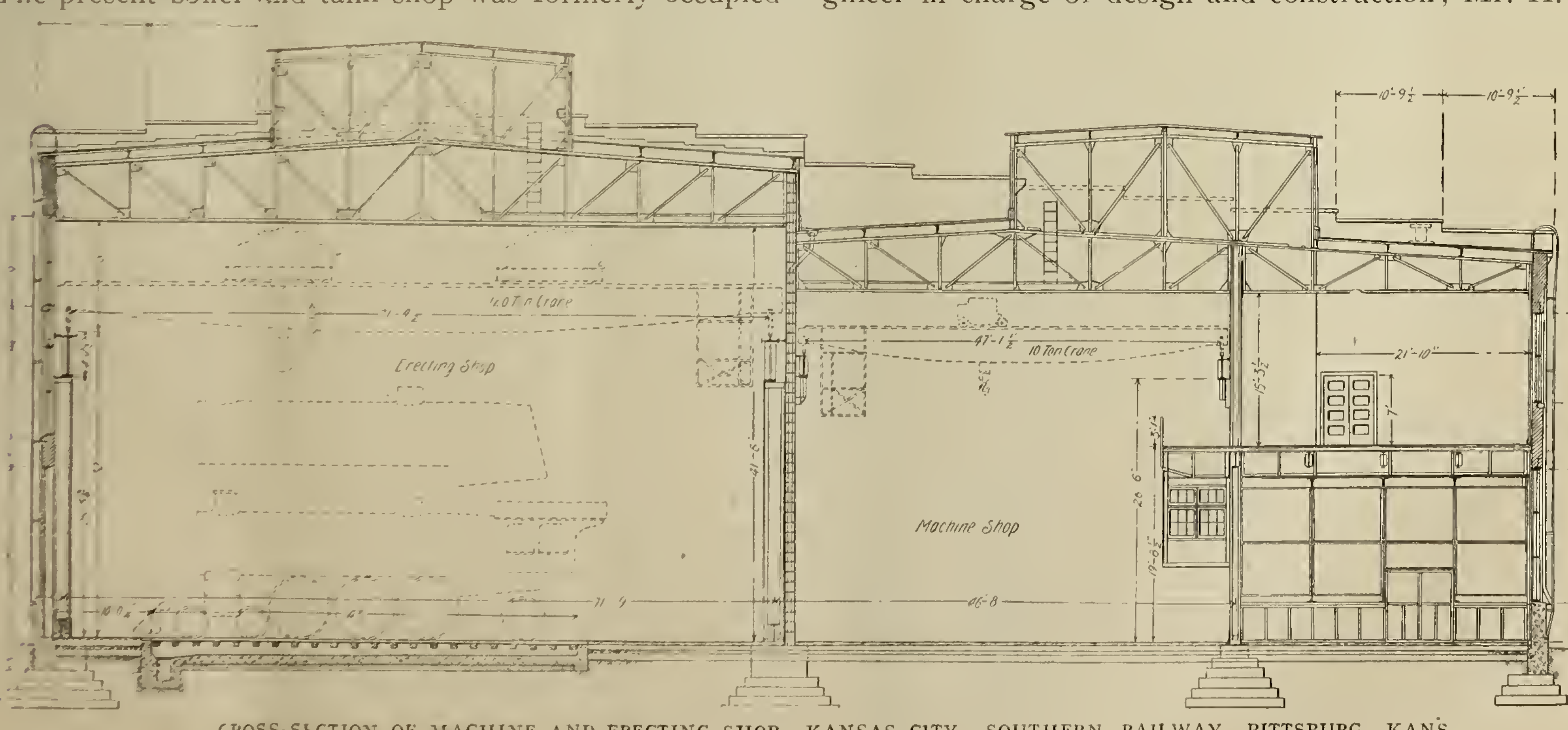
THE Kansas City Southern Railway is a trunk line operating from Kansas City, Mo., to Port Arthur, Texas. The total mileage of the road is 844, of which 786 miles are main line. The principal repair shops of the road are located at Pittsburg, Kan., 129 miles from the northern terminus and at Shreveport, La., 220 miles from Port Arthur or the southern terminal of the road.

In the past few years the road has enjoyed unprecedented prosperity, as it offers a southern outlet to the gulf for the roads centering at Kansas City. With the additions made to equipment and the increase in traffic on the road, the old repair shops and facilities became inadequate. Recently the shops at Pittsburg, Kan., have been remodeled and enlarged to cope with the greater volume of repairs necessary.

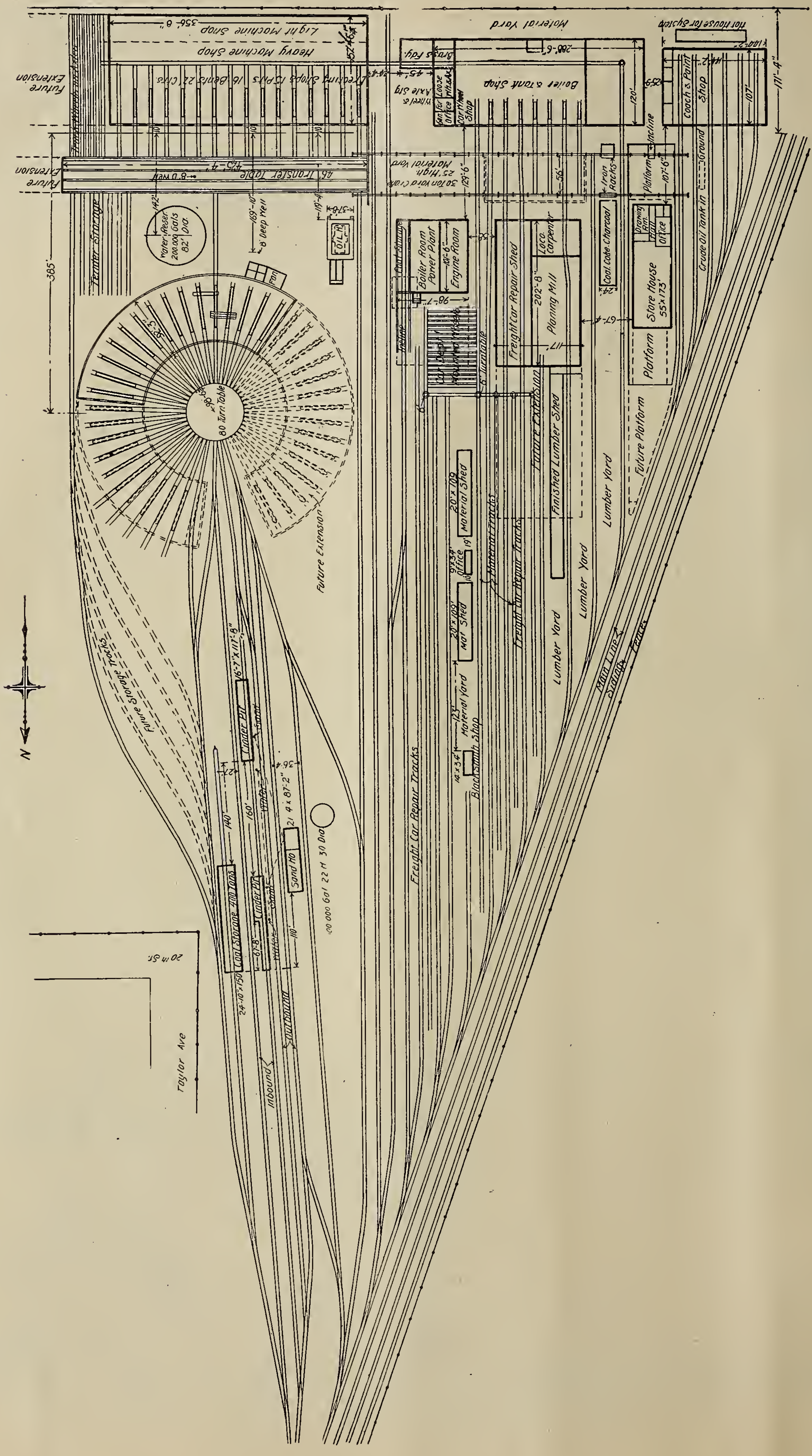
The problem of rearranging the general layout and providing certain new buildings presented an interesting study. The location of the old buildings that were to be continued in service, placed certain restrictions and any plans to provide for the layout as a whole were governed by the original layout and by property limitations. The present boiler and tank shop was formerly occupied by the machine and erecting shop and the former roundhouse was located on the site occupied by the present machine and erecting shop.

The new work includes the present roundhouse and terminal facilities, machine and erecting shop, power house, oil house, transfer table and yard crane, together with the incorporation of a number of modern facilities improving the plant.

The plans for remodeling the shops were prepared by the Arnold Company, acting in co-operation with the engineering and mechanical officials of the railway company and the construction of the entire plant was carried to completion by the Arnold Company. The work throughout was subject to the approval, for the railway company, of Mr. J. E. Edson, president, and Mr. W. Coughlin, general manager, Mr. A. F. Rust, resident engineer, directly supervising, and Mr. F. Mertsheimer, superintendent of machinery, representing the mechanical department; Mr. R. M. Galbraith occupying the latter position near the completion of the work. The Arnold Company was represented by Mr. P. L. Battey, engineer in charge of design and construction; Mr. H. H.



CROSS-SECTION OF MACHINE AND ERECTING SHOP—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.



GENERAL LAYOUT OF LOCOMOTIVE AND CAR SHOPS AT PITTSBURG, KANS.—KANSAS CITY SOUTHERN RAILWAY.

Dickinson, superintendent, and Mr. H. L. Senger, resident engineer.

While not as extensive as a number of new shops constructed within the last few years, the work of remodeling this plant is of unusual interest as illustrating some of the provisions necessary in disposing of old shops and arranging for an intimate relation between the various departments to increase the efficiency of the plant as a whole. The new buildings erected and the additional facilities provided are representative of experience gained from modern railway shops. In the ensuing article the layout of the entire plant will be considered as a whole and the features of the new work will be taken up individually.

LAYOUT.

The principle advanced in the general layout provides as fundamental the arrangement of all buildings tributary to a main avenue of distribution. Storage spaces and minor avenues of distribution are tributary to the midway and while the shop plant is very compact, departments are by no means crowded. The minimum distance between old buildings is about 26 feet and there is ample yard space tributary to each building to provide for the storage of material carried in stock. The midway includes a transfer table pit 425 feet 4 inches long and a crane served runway 460 feet long. These overlap for a distance of 22 feet in order that material may be conveniently transferred from the crane to the transfer table and vice versa. The transfer table pit is 46 feet wide and the span of the crane is 56 feet.

The transfer table is operated by two motors of 15 h. p. each, operated at 150 feet per minute when loaded and attaining a speed of 350 feet per minute light.

The double trolley crane over the material yard has a capacity of 30 tons and the crane runways are 25 feet high. A general system of yard tracks at right angles with the midway and nearly parallel with the main line serve all departments and is connected to the main line at one end of the shop yard.

The erecting and machine shop, boiler and tank shop, blacksmith shop and the coach and paint shop are ranged along the south side of the midway with the storehouse, planing mill, freight car repair shed, power house, oil house and roundhouse on the north side of the midway.

The freight car repair tracks are beyond the power plant and planing mill so situated as to be easy of access from the planing mill and storehouse. Access to the repair tracks is by leads at one end of the yard, which connect with the main line. The repair tracks are arranged in two groups with a material yard, two material sheds, foreman's office and blacksmith shop between the groups. The repair tracks are evenly spaced on 24-foot centers with standard gauge material tracks midway between the working tracks. At the stub ends of material tracks cross movement of wheels and material is provided for by a short intersecting track having a 6-foot turntable at each intersection. Adjacent to this intersecting track is a storage space for mounted car wheels.

Engine pits in the erecting and machine shop are arranged transversely and are served by the transfer table. The erecting shop is at one end of the midway immediately opposite to the roundhouse. Communication between the roundhouse and the erecting shop is by means of a straight track from the turntable to the transfer table. Driving wheel and truck wheel drop pits are tributary to this track to facilitate the prompt delivery of wheels removed from locomotives in the roundhouse. Space beyond the erecting and machine shop tributary to the transfer table is provided for the storage of truck wheels on axles, while space on the opposite side is reserved for tender storage.

The boiler and tank shop is situated just west of the erecting and machine shop and is tributary to the crane served yard. The foreman's office occupies one corner and a wing for brass foundry and shop for car wheel work are included in this shop building. While the distribution of heavy material is provided for by the yard crane and transfer table, light material may be delivered over a standard gauge industrial track which extends through the erecting and machine shop, boiler and tank shop and the blacksmith shop. In the blacksmith shop a standard gauge yard track intersects with this distribution track and a 6-foot turntable is located at the intersection.

The blacksmith shop occupies a position at one end of the boiler and tank shop having a dividing wall between the two shops. The output of the blacksmith shop is consumed by both the locomotive and car departments and while its position is not central, it is so situated as to provide for the distribution of material over a direct route to both departments, as well as to the roundhouse.

The coach and paint shop occupies a position beyond the blacksmith shop, the space between being used for a storage yard. This shop is arranged transversely and access to the working tracks is by means of a ladder connected with the yard tracks.

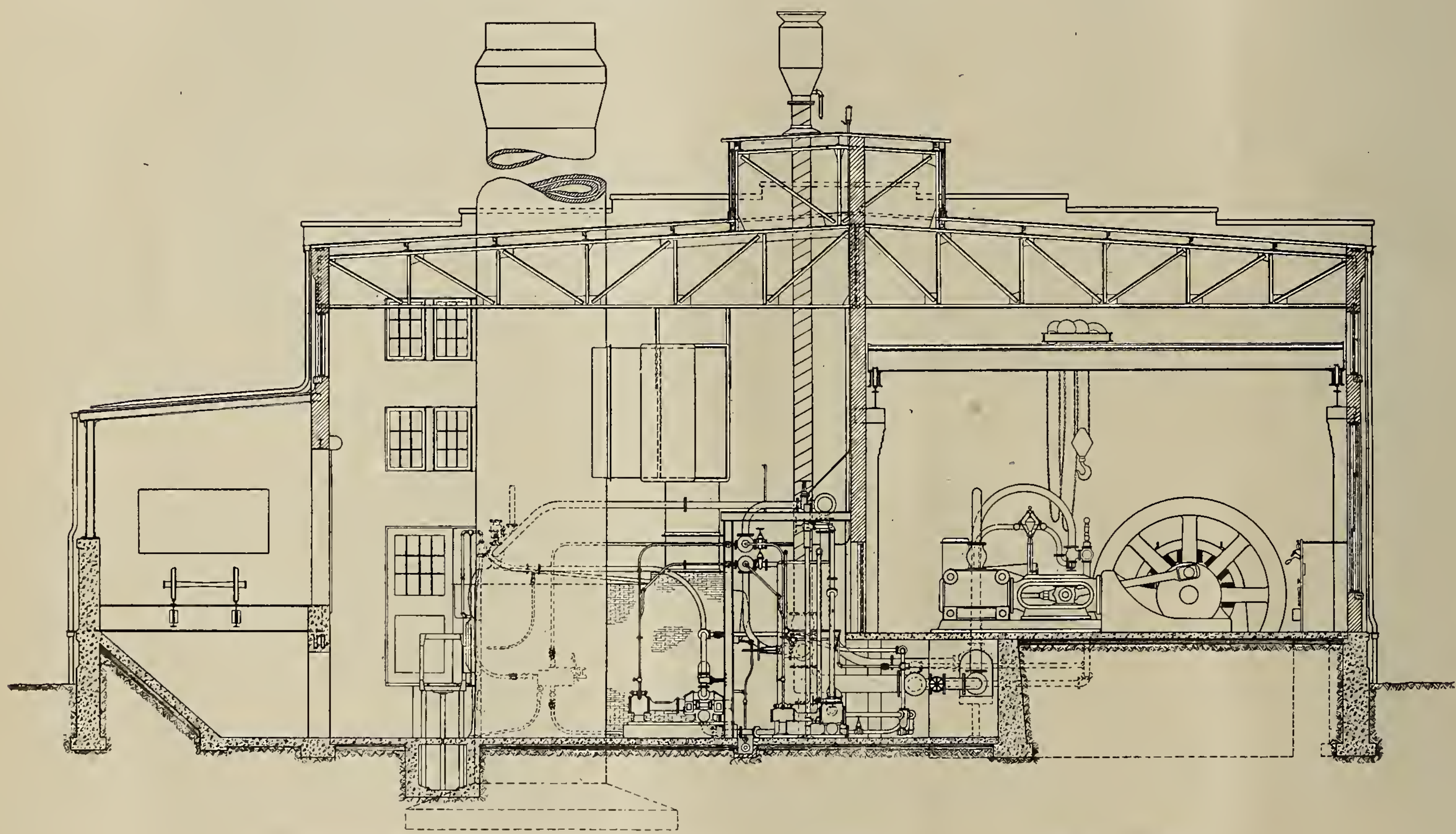
The storehouse is at one side of the territory occupied by shop buildings where the storehouse platform may be served by two tracks and where a string of cars on the storehouse track will not offer any obstruction to general yard traffic. The platform at one end is within the range of the yard crane so as to facilitate delivery either from the storehouse to any of the shop buildings or from any of the manufacturing shops to the storehouse.

The planing mill and freight car repair shed are side by side, with a common wall between them and both are tributary to the freight car repair tracks. North of the planing mill is a finished lumber shed.

The power plant occupies a position practically at the center of the plant and at the center of distribution. It is almost an equal distance from the erecting and machine shop, the boiler shop and the planing mill, the three shops consuming the greatest amount of power and at the same time it is located convenient to the planing mill from which provision is made for the delivery of shavings, scrap lumber, etc., for use as fuel.

The oil house is in an isolated building near the roundhouse, where it is conveniently situated for the delivery of oil, waste, etc., to engines turned at this terminal.

The roundhouse as erected for present needs includes fifteen stalls. However, provision is made for the complete circle to contain forty-one stalls, as future requirements may demand. In connection with the roundhouse a modern locomotive terminal has been provided, with large coal and sand handling facilities, cinder pits and inspection pit. For the present, tracks radiating from the roundhouse turntable will be used for the storage of locomotives not requiring to be placed in the house.



CROSS SECTION OF POWER HOUSE—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.

To provide for future storage tracks when the complete circle has been erected a space has been reserved for standing tracks east of the coal shed and cinder pit.

MACHINE AND ERECTING SHOP.

The machine and erecting shop is a brick and reinforced concrete building with an independent self-supporting steel structure, the whole being carried on foundations of concrete. The building is 356 feet long by 152 feet 2¼ inches wide. The roof trusses include two principal spans, one over the erecting bay and one over the heavy machine bay, with a short truss over the light machine bay.

Ample natural light is provided for by large windows in the side and end walls, by swinging sash carried in the sides of the monitor over each bay and by fixed clerestony sash in the structure of the erecting bay extending above the roof of the machine bay.

There are 15 transverse working pits in the erecting floor and one track at the extreme east end of the building from which the usual pit is omitted. The pits are 43 feet long, arranged on 22-foot centers.

The erecting floor is 71 feet 9 inches wide between centers of crane columns. The height from floor to bottom chord of roof truss is 41 feet 6 inches and the height from floor to top of crane rail is 30 feet.

The machine floor occupies a bay parallel with and adjacent to the erecting floor. It is divided into two sections, the division being marked by the row of columns carrying the crane girders for the machine floor crane, and the balcony girders. The section next to the erecting floor is for heavy machine work, while the further section is for light machine work and for the accommodation of the auxiliary departments. The floor area of the light section is increased by a balcony extending the full length of the shop.

The entire machine bay is 76 feet 8 inches from center of main columns to inner face of wall, of which 46 feet 8 inches is occupied by the heavy machine tool section. The height from floor to bottom edge of roof truss is 35 feet. The balcony floor line is 19 feet 8½ inches above the main floor and above the balcony floor is a clear height of 15 feet 3½ inches.

The general foreman's office is elevated above the floor, supported by the balcony structure, and extending out into the heavy machine section it occupies a position practically at the center of the machine floor, whence a commanding view may be had of the machine department.

The erecting floor is served by a crane of 120 tons capacity having a span of 71 feet 4½ inches. The lowest portion of the crane girder is 30 feet above the floor, of sufficient height to transfer a boiler above engines standing on the erecting pits.

The heavy machine section is served by a crane of 10 tons capacity having a span of 42 feet 1½ inches. The top of the crane rail is 28 feet 9½ inches above the floor and the crane runway girders are supported on brackets carried by the columns supporting the roof structure.

BOILER AND TANK SHOP.

The present boiler and tank shop was originally used for the machine and erecting shop. It contains seven transverse working pits in addition to an entering track at one end. One end of the shop is occupied by the office of the foreman, a car wheel and axle shop and a brass foundry. The brass foundry occupies the space formerly devoted to the original power house. The erecting floor occupies the section of the building toward the yard crane and the floor in the parallel bays is used for machine work, steel plate work, laying out, etc.

BLACKSMITH SHOP.

The blacksmith shop is adjacent to the boiler and tank shop. The interior of the shop is 120 feet by 90 feet. This is one of the old shops of the original plant, but it has been improved and enlarged 100 per cent by removal of the boiler shop from this section of the building.

COACH AND PAINT SHOP.

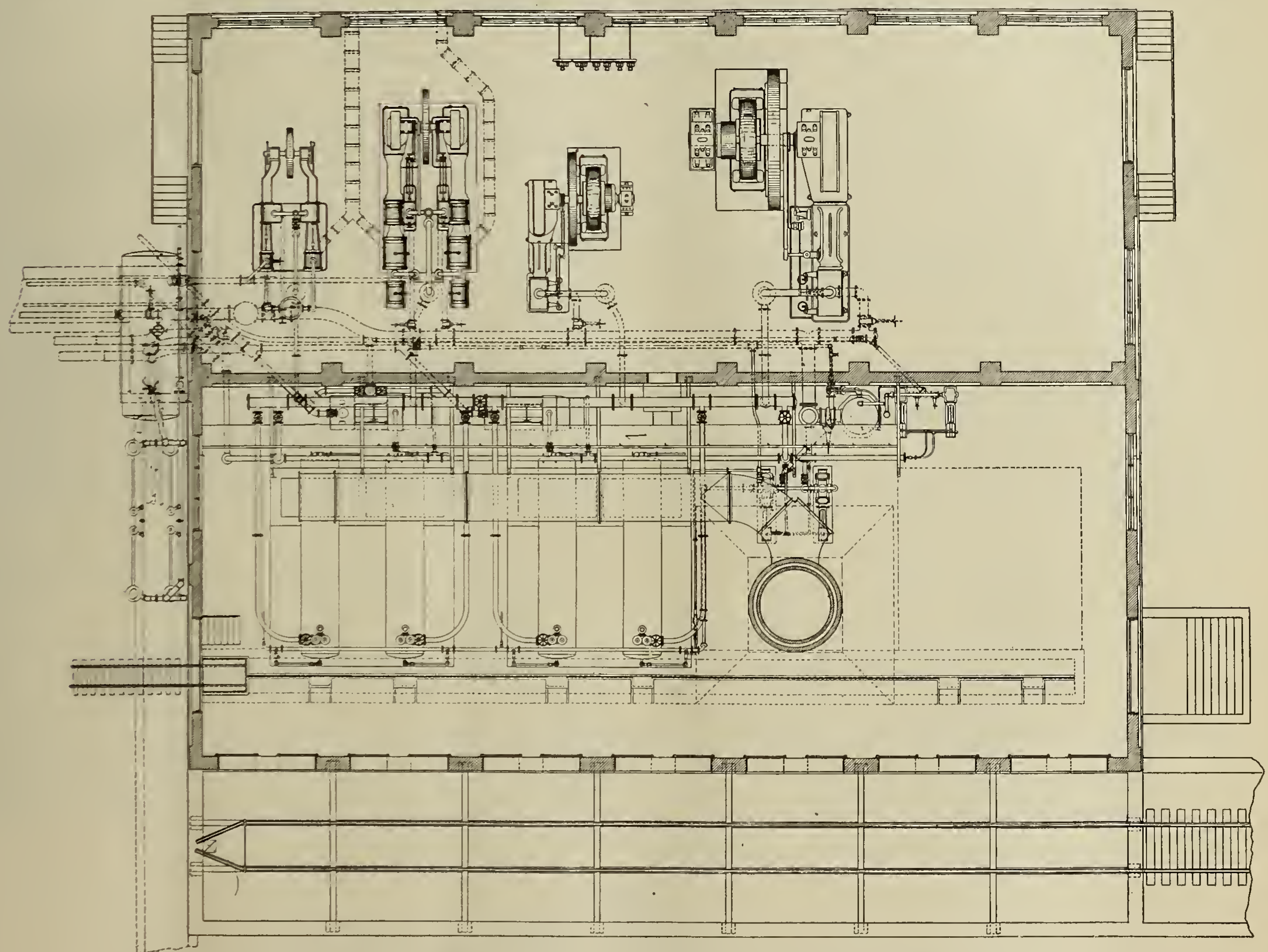
The coach and paint shop is another of the old buildings of the original layout and no change in the building structure was made here. The building is 144 feet 2 inches long by 107 feet wide, covering six transverse working tracks arranged on 21-foot centers, approached by a ladder system of yard tracks. Each track has a standing capacity of two coaches of small size. Varnish room, cleaning room, drying room, etc., occupy compartments at one end of the shop.

STOREHOUSE.

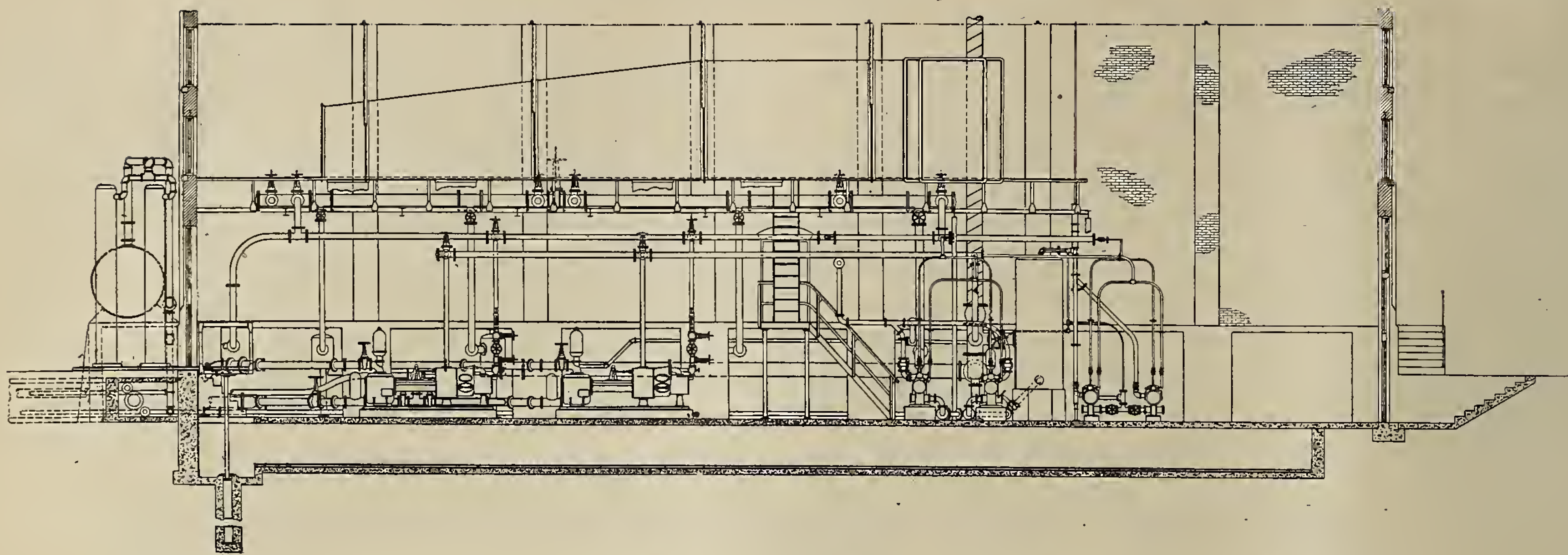
The storehouse is one of the original buildings. It is situated almost at the extreme end of the midway, on the north side, and one end platform is served by the yard crane. In addition to the office of the stores department, this building houses the offices of the superintendent of machinery and his entire force, including the drafting room. The building is 173 feet long by 55 feet wide, of one story, entirely surrounded by storage, loading and unloading platforms.

PLANING MILL.

The planing mill is adjacent to the crane served portion of the midway with which it is connected by a standard gauge material track. The section of the mill



PLAN OF POWER HOUSE—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.



PARTIAL LONGITUDINAL SECTION OF POWER HOUSE—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.

nearer the midway is separated from the remainder of the building by a wall and is occupied by a locomotive carpenter shop. The building occupied by these two shops is 202 feet 8 inches long by 68 feet wide. This building and the freight car repair shed are portions of the original plant, but the mill has been considerably enlarged at the sacrifice of some of the car repair space.

FREIGHT CAR REPAIR SHED.

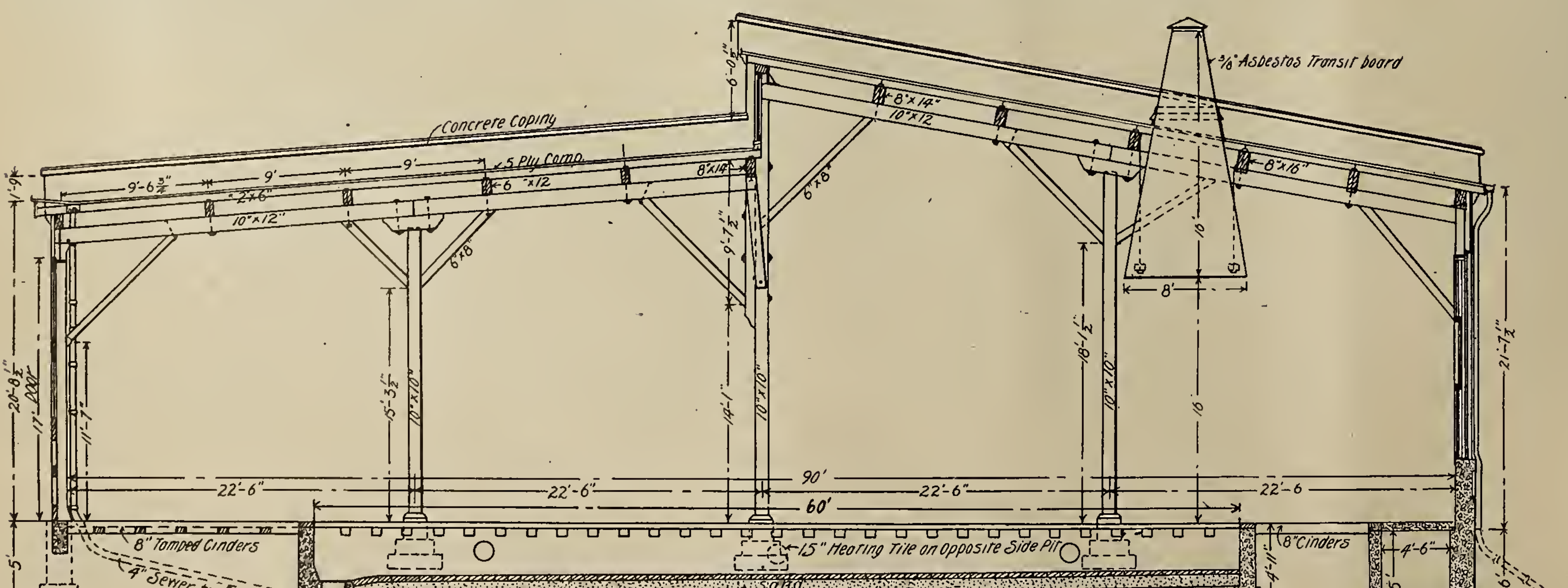
The freight car repair shed is next to the planing mill, with a common wall between the two, and is tributary to the midway. The shed is 202 feet 8 inches long by 48 feet wide, covering two longitudinal tracks, spaced on 24-foot centers. These tracks are continuations of yard repair tracks and extend into the yard served by the crane.

POWER HOUSE.

The power plant occupies a position at the center of the layout and is but a short distance from the planing mill. It is housed in a brick and reinforced concrete building with steel roof trusses carried by the walls. The foundation is of concrete. The building is 101 feet 6 inches by 98 feet 7 inches, divided longitudinally by a brick wall 13 inches thick, into two sections for the boiler room and engine room respectively. The separating wall extends from the foundation to the roof of the monitor traversing the full length of the building. The floor of the boiler room is 4 feet below grade and the floor of the engine room is 4 feet above grade. The floors are of reinforced concrete. The interior of the boiler room is 39 feet 11 inches wide and the clear height from floor to roof truss is 38 feet. The interior of the engine room is 37 feet wide and the clear height is 25 feet.

The engine room is served by a traveling crane of 24,000 lbs. capacity operated by hand from the floor, having a span of 35 feet 4 inches. The crane runway girders are 15-inch I beams carried on 12-inch pilasters corbeled to 18 inches at the top and capped with concrete. The top of the runway girders is 19 feet 6 inches above the floor.

Coal is carried in a reinforced concrete pocket just outside of the boiler room to which access is had by openings through the intervening wall. The bin has hoppered floor. One wall slopes from a point 16 feet from the wall of the boiler room to a point 6 feet 8 inches from the wall, so that coal will fall by gravity toward the boiler room floor. Above the coal pocket is a standard gauge track supported on steel beams to which coal cars are delivered. The coal pocket and delivery track are covered by steel canopy roof immediately adjacent to the wall of the boiler room.

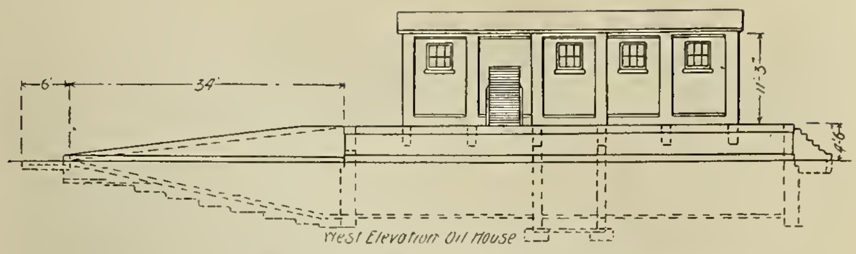


CROSS SECTION OF ROUNDHOUSE—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.

The boilers are operated with natural draft produced by a chimney 175 feet high and 7 feet 6 inches in diameter. The chimney is built of reinforced concrete of the Weber design. The location of the chimney is such that it will occupy a central position when the power plant shall have been increased to the capacity of the building or 100 per cent.

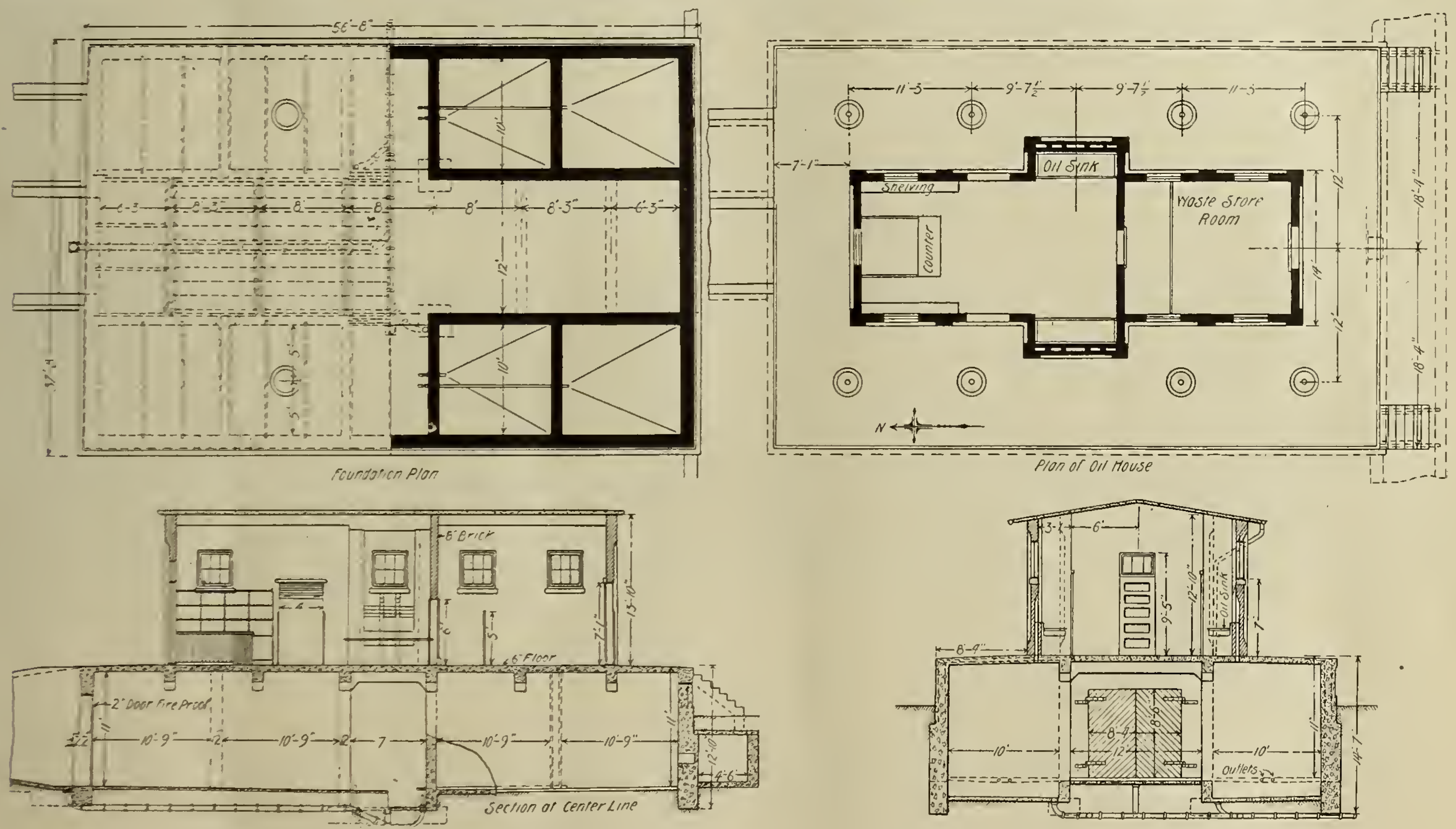
The boiler equipment includes two batteries, each with two Heine water tube boilers of 250 h. p. each, fired by hand. The grates are of the Dorrence type made by the Chicago Rocking Grate Co.

Boiler feed water is heated by a Colles 1,200 h. p. feed water heater and delivered to the boilers by two 10-6½-12 "American" boiler feed pumps. Condensation water from steam piping is returned directly to the boilers by a special system. Condensation water from



OIL HOUSE AND PLATFORM—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS

type, operating at 115 and 230 volts. They were furnished by the Western Electric Company and we believe are the first machines of this kind made by the above company. The switchboard is of Monson slate made by Kohler Brothers. The 1,500 cubic foot air compressor was furnished by the J. Geo. Leyner Manufacturing Company and is of rather an unusual type being provided with duplex steam cylinders and duplex



PLANS, SECTION AND ELEVATION OF OIL HOUSE—KANSAS CITY SOUTHERN RAILWAY, PITTSBURG, KANS.

the heating system is returned to the feed water heater by two Marsh vacuum pumps. The general water service is maintained by two Platt Iron Works 750-gallon Compound Underwriter fire pumps arranged with switch valve for connecting high pressure steam to both cylinders, when pumps are used for fire service with 100 pounds pressure.

The engine room equipment consists of the following:

One 300 kw. direct connected generating unit.

One 150 kw. direct connected generating unit.

One 1,500 cubic foot air compressor.

One 750 cubic foot air compressor.

The engine for the 300 kw. unit is of the Corlis heavy duty type operating at 100 r. p. m. while the 150 kw. engine is of the 4-valve type operating at 150 r. p. m. Both engines were furnished by the H. N. Strait Company. The generators are of the 3-wire direct current

two-stage air cylinders, thus being practically two complete two-stage air compressors connected together. The 750 cubic foot compressor was in the original plant and removed to the new building and is of the Chicago Pneumatic Tool Company make.

ROUNDHOUSE.

The roundhouse occupies a position convenient of access from the machine and erecting shop and being near the midway, communication with the other departments is easy. By being situated at one side of the property the terminal tracks and auxiliaries serving the roundhouse offer no impediment to the operation of the shop plant.

The roundhouse is constructed with wood framing and brick end walls on concrete foundations. The outer wall is of reinforced concrete, sill high, and above this height the structure is of wood with large windows. The columns on the inner circle are of cast iron with wooden swinging doors, reinforced with steel.

The construction of the roof provides for its main portion to slope gradually upward from the outer wall to a point just back of the cab of the average locomotive when standing with its stack under the smoke jack and headed away from the turntable. The roof over the inner portion of the house in which the tanks stand is lower than the main portion and slopes towards the doors. The vertical portion of the structure between the two sections of the roof is equipped with swinging glass sash and ventilators, thus admitting light at a point above the cab and adding to the means of ventilation.

The span of the roundhouse is 92 feet 3 inches with 98 feet 6¾ inches from inner wall to center of turntable. The table is 80 feet long, furnished by the Strobel Steel Construction Co., operated by an electric tractor furnished by Geo. P. Mehoes & Bro.

Smoke jacks are of ⅜-inch Johns-Manville asbestos transite board, having a flare of 8 feet by 3 feet at the bottom and tapering to 2 feet by 3 feet at the top.

The heating system is of the hot blast type with a slight variation from the usual manner of leading ducts from the main heating duct to the pits. Each lead duct is connected with two openings in the wall of one pit and with one opening in the wall of the next pit, so that hot air enters both sides of each pit.

The pits are 60 feet long by 3 feet 11 inches wide, with side and end walls of concrete. They are 2 feet 8 inches deep at the outer circle and 3 feet 2 inches in depth at end toward turntable. Bottoms are of paving brick on edge resting on a bed of sand. A small cesspool at the end of each pit, covered by cast iron grating, is piped to the general sewer system.

The roundhouse floor is covered with a coating of cinders 8 inches thick, well tamped.

Drainage of the roof sloping toward the inner circle is provided for by a gutter extending the full length of the roof. Outside of the gutter is a crown sloping toward the gutter to provide against any water falling in front of the doors which would freeze in winter. The gutter is drained by 4-inch cast iron pipes leading down inside the house to the cesspools of the pits. This arrangement is clearly shown by the sectional drawing of the roundhouse. The house is piped throughout for water, air, steam, and a blow-off main is provided with connections for each pit. A portable injector is used with the steam and water connections.

The arrangement of terminal facilities provides for the rapid movement of locomotives turned at the roundhouse without unnecessary switching or delay. There are two inbound and two outbound tracks. On one inbound track is an inspection pit with cinder pit adjoining and a second cinder pit nearer the turntable. At each cinder pit is a water column and a sand column serving both an inbound and an outbound track.

The sand columns represent a novel and unique arrangement which is at the same time quite simple. Wet sand is stored and dried in the usual manner, but instead of delivering dry sand to a bin elevated immediately above the sand house, it is delivered to two tanks elevated 24 feet 6 inches above the rail and conveniently situated at the cinder pits. Each tank is carried on a column built up of two 10-inch channels laced together with angle bars, and supported on a concrete base. One column is about 150 feet from the point of supply and the other is about 115 feet. Sand is delivered by air through pipes 3 inches in diameter.

A coal storage space 150 feet long by 24 feet 10 inches wide, having a capacity of 400 tons, is situated east of the cinder pit and inspection pit. This is traversed by a trestle to facilitate the delivery of coal in dump cars. Coal is delivered to locomotive tenders by a locomotive crane operating over the track between the cinder pit and the coal storage. The cinder pit is cleaned by the same crane transferring cinders and ash from the pit to suitable cars.

Three cross-over tracks connect an inbound and outbound track in order to facilitate movement around one or both cinder pits in case of a blockade.

An engine entering the terminal is spotted over the inspection pit where inspection is made immediately upon arrival. The report is made to the roundhouse at once in order that any necessary preparations may be made or required parts ordered before the engine enters the house. Over either cinder pit an engine may be spotted to take sand and water at the same time, while the fire is being knocked. Following the principle that a roundhouse is a repair shop and not a storage shed, ample provision is made for standing locomotives ready for dispatching on outside storage tracks in order that roundhouse pits may be reserved for boiler washing and for repairs that are absolutely necessary.

OIL HOUSE.

The oil house is one of the new buildings of the plant and includes a number of novel and interesting features. It provides for the storage and distribution of oils and waste for the terminal at which it is situated only. Its location as a portion of the general layout is near the roundhouse and at the same time easy of access from the machine and erecting shop, in order to provide for delivery of supplies to locomotives entering the roundhouse and for the distribution of such oil as is required in the machine shop.

The oil house includes a basement in which the storage tanks are located and a single story above for the storage of waste and for the distribution of supplies. The basement is built entirely of reinforced concrete and is 58 feet 8 inches long by 37 feet 8 inches wide and as the upper portion of the house is but 41 feet 6 inches long by 14 feet wide, the roof of the basement forms a platform around the storehouse. The surface of the platform is 4 feet above grade and the floor of the basement is 7 feet below grade. A double incline paved with brick provides a convenient means of traffic between the basement and the platform.

The walls of the oil house above the basement are of brick and the roof is made of 4½-inch cinder concrete reinforced with No. 10 expanded metal and supported on trusses of 45-pound old rail.

The oil tanks are of novel design, being built of reinforced concrete and the basement walls form a portion of the walls of the tank. The tanks are nearly square; they are lined with No. 9 sheet zinc and the floor of each tank slopes toward the outlet. The interior dimensions of each tank are 10 feet 9 inches by 10 feet by 10 feet 6 inches in depth. There are eight tanks so arranged along the outer walls as to leave a longitudinal space in the basement 12 feet wide and a transverse space 8 feet wide, between the pairs of tanks, to be used for the storage of barrels of oil. In the platform above each tank is a manhole 16¾ inches in diameter. Each manhole is covered with a cast iron cap fitting a cast iron lining.

The upper portion of the house is divided into two sections by a fire wall, one section for general distribution of supplies carried and one for the storage of waste. The waste room is still further subdivided by a woven wire partition 4 feet 6 inches from the intermediate wall, providing separate compartment for loose waste convenient to attendant.

Oil is delivered from the storage tanks by a system of auxiliary steel tanks to faucets in the delivery room by compressed air. Pipes from the several tanks lead to two sets of faucets, one set on each side of the delivery room, arranged in a recess in the wall so that they will not extend out into the room. Beneath each set of faucets is an oil sink to provide against waste and to collect drippings. The delivery counter is at the end of the delivery room opposite to the door of the waste room. All openings are equipped with steel rolling shutters and doors.

Feed Water Heater

Central of Georgia Railway

A NOVEL method of utilizing waste heat for raising the temperature of locomotive boiler feed water has been devised and put in operation by Mr. F. F. Gaines, superintendent of motive power of the Central of Georgia Railway. The apparatus used in this connection includes a duplex pump, two feed water heater drums and a nest of tubes in the front end. The arrangement of the apparatus and connections, together with several details, is illustrated by accompanying line drawings reproduced from prints kindly provided by Mr. Gaines.

Under the running board on each side of the engine is a feed-water heater drum. These heaters are supplied with exhaust steam from the air pump and the duplex feed pump and a certain proportion of the exhaust steam from the cylinders. On one side of the engine is a duplex pump taking steam from the steam valve stand in the cab. In the front end is a nest of tubes which is

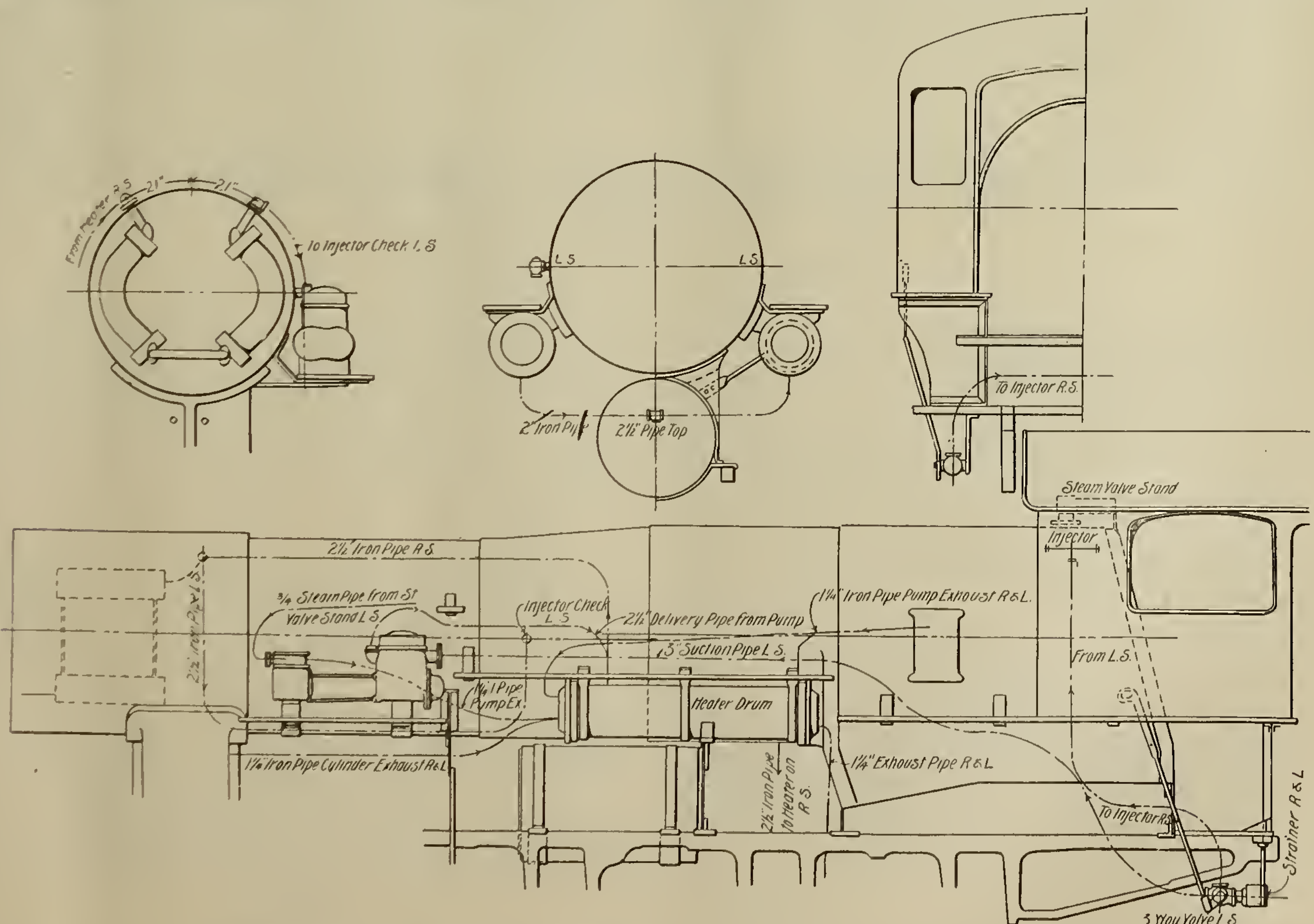
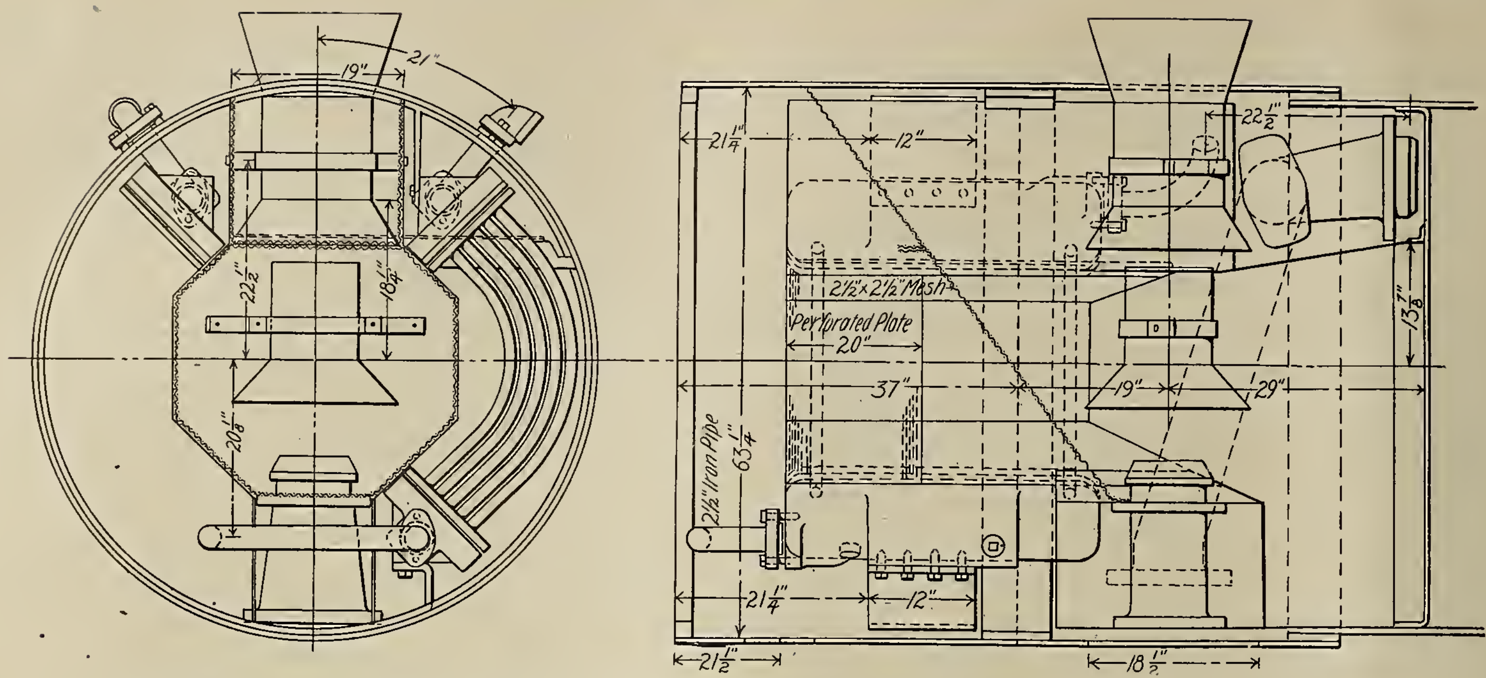


DIAGRAM OF FEED WATER HEATING APPARATUS—CENTRAL OF GEORGIA RAILWAY.



APPLICATION OF BALDWIN SUPERHEATER AS FEED WATER HEATER—CENTRAL OF GEORGIA RAILWAY.

practically a Baldwin super-heater converted into a feed-water heater. Water is drawn from the cistern by the duplex pump and forced through the heaters under the running boards first. After passing through these auxiliary heaters the water then passes through the main heater in the smoke box and thence into the boiler.

The heater has been applied to consolidation engine No. 1222, recently built for the Central of Georgia Railway by the Baldwin Locomotive Works. At the time that information was received concerning the device the engine had just been delivered to the railway company and consequently there has been no service to indicate its results. While considerable economy in the fuel bill might naturally be looked for, it is fully expected that economy in boiler repairs will result from the introduction of this device, due to the fact that feed water will go into the boiler at very nearly steam temperature and that the strains on flues and firebox due to cold water ordinarily put in by an injector, will be materially decreased.

AUXILIARY HEATER DRUM FOR FEED WATER HEATING APPARATUS—CENTRAL OF GEORGIA RAILWAY.

A Few Specialties of the Clinton Shop

Chicago & Northwestern Railway

A NUMBER of practical appliances have been devised by several mechanics in the Clinton, Iowa, shop of the Chicago and Northwestern Railway, for accomplishing various kinds of work by original and improved methods. Through the courtesy of Mr. Charles Markel, shop foreman, we have been provided with illustrations of many of these devices and descriptions of them are presented herewith.

Fig. 1 illustrates a device originated by Mr. William Clancy, gang foreman, for determining the length of draw bar between engine and tender, when engine and tender are not standing together, for instance when engine is in erecting shop and tender in tank shop. The device or

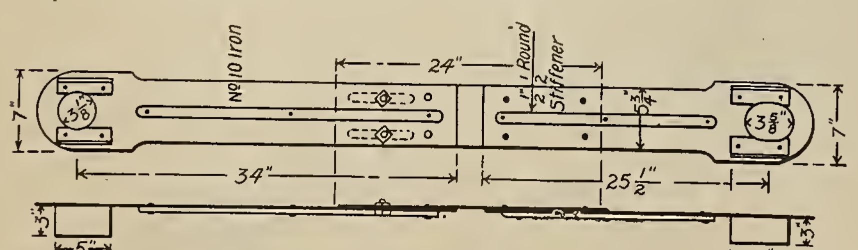


FIG. 1—DEVICE FOR DETERMINING LENGTH OF DRAW BAR BETWEEN ENGINE AND TENDER.

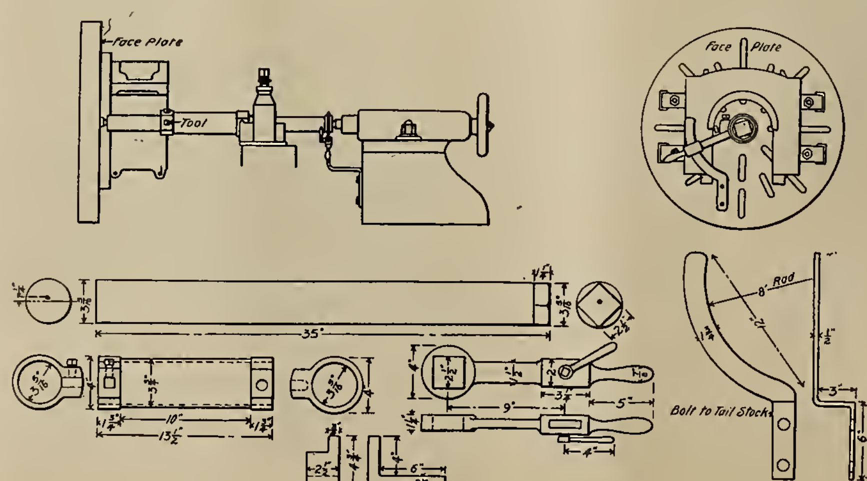


FIG. 2—BAR FOR BORING DRIVING BOX BRASS ON LATHE.

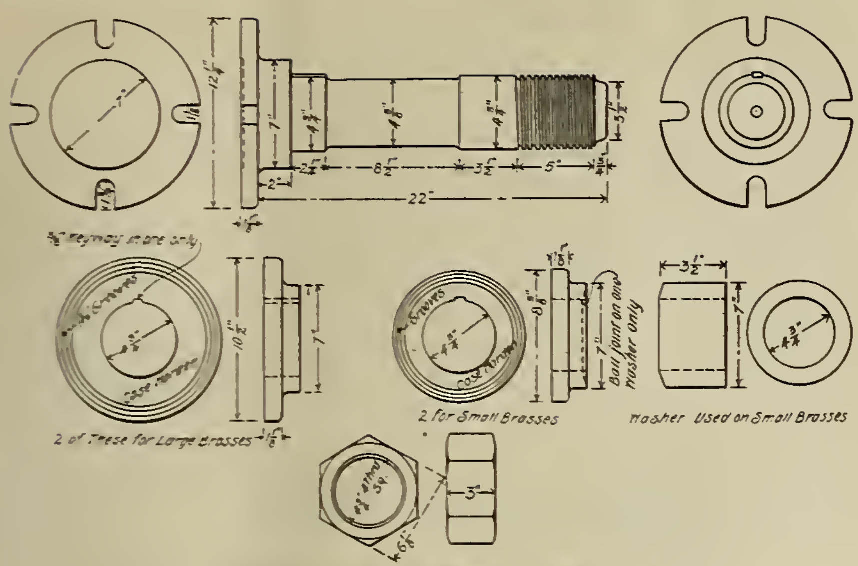


FIG. 3—MANDREL FOR TURNING DRIVING BOX BRASS.

template is made of number 10 sheet iron reinforced by stiffeners of half round iron ½ inch in diameter. A hole in each end of the device accommodates the draw bar pins and the distance between these two holes may be adjusted at any desired length within limits and fixed securely.

To determine the length of a draw bar, one end of the template is placed in draw bar casting of engine and the pin is dropped in place. After taking up slack a mark is scribed on the template at the face of the chafing iron. The other end of the template is then placed in the draw casting of the tender and the pin dropped in place. When slack is taken up the template is so adjusted that the line on the template representing the face of chafing iron on engine corresponds with face of chafing iron on tender. The distance between holes of the template then represents the length of the draw bar between holes. Where a spring is used between engine and tender, the draw bar is made 1 inch shorter than the length represented by the template.

Where the machine tool equipment of a shop is limited and it is necessary to bore driving box brasses on a lathe, the boring bar illustrated by Fig. 2, proves to be a handy and serviceable device. The principal support of the device is a round bar 35 inches long by 3 5/16 inches in diameter, having one end squared for a distance of 1¼ inches to fit a socket wrench. The machine centers of this bar are offset ¼ inch from the actual center. Carried on the bar is a sliding sleeve one end of which is arranged to hold a tool. The other end is designed to engage a driver in the tool post, so that the tool is fed forward by the tool post in the usual manner. The tool is adjusted in or out of cut by turning the bar with the wrench fitted to its squared end, such movement being provided for by the eccentric arrangement of the centers. The position of the bar is secured by clamping the wrench

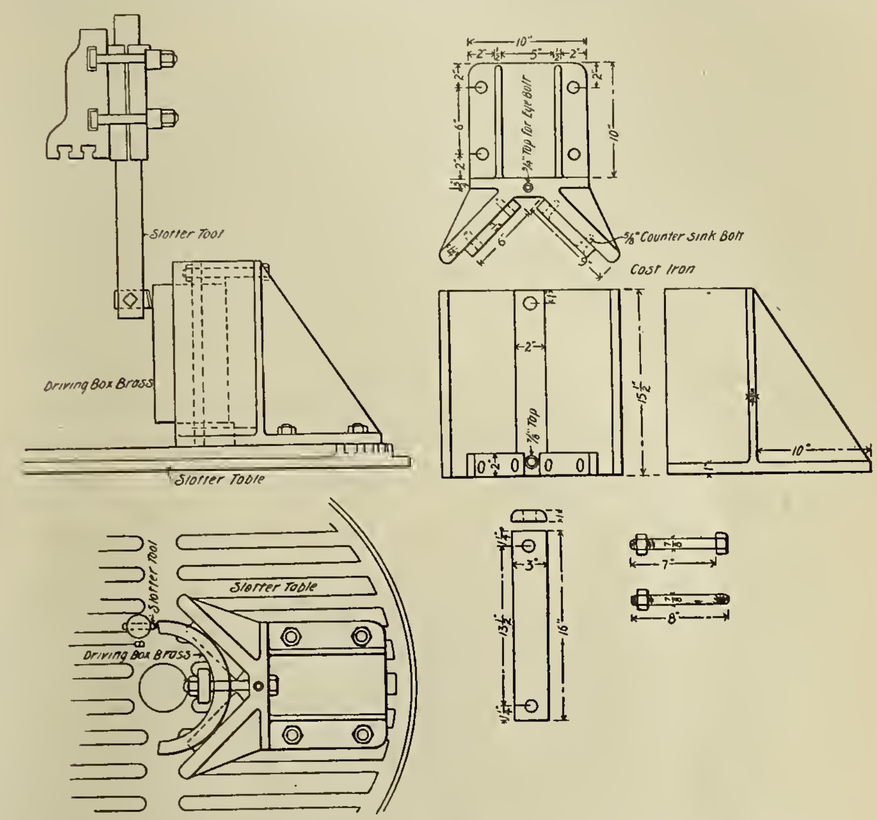


FIG 4—DEVICE FOR SLOTTING LUG FITS ON DRIVING BOX BRASS.

to a quadrant bolted to the tail stock. The power necessary to maintain the position of the tool is provided by the tool post and very little force is exerted against the quadrant.

A mandrel for turning driving box brasses is illustrated by Fig. 3. This was devised by Mr. Otto Godiskesen, machinist, and has been found quite satisfactory and capable of quick adjustment. The mandrel is driven direct from the face plate of the lathe, an arrangement superior to

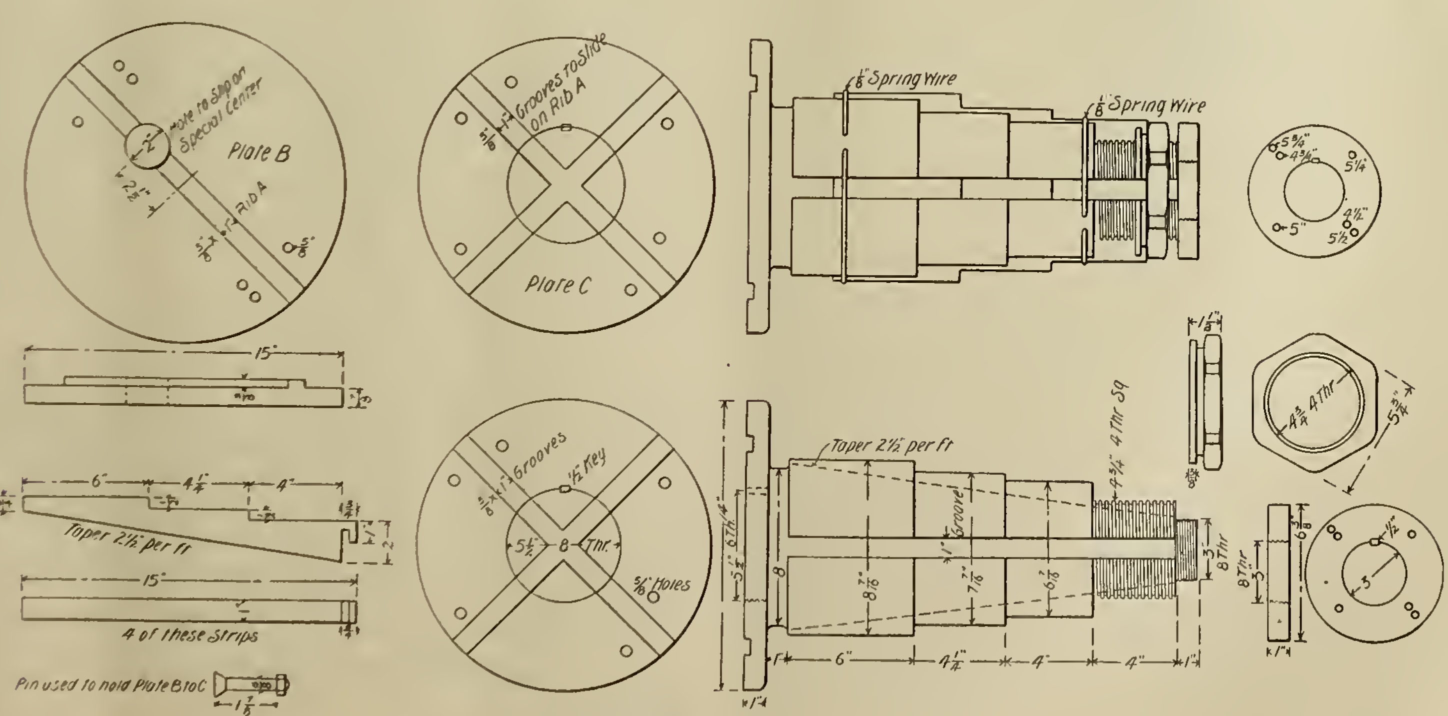


FIG. 5—EXPANDING ECCENTRIC MANDREL.

driving it by a dog. The body of the mandrel is 4⅜ inches at its smallest diameter and is solid and steady in operation.

Another device for facilitating work on driving box brasses is illustrated by Fig. 4. It is a "V" block used in connection with a slotter for slotting the lug fits on brasses. The block is bolted to the slotter table as shown, and the brass is clamped securely in a vertical position. Lugs 2 inches in depth and 1 inch thick hold the brasses above the table, providing clearance for the tool at the end of stroke.

Machining the lug fits on a slotter with this method of adjustment, provides a number of advantages over methods of machining them on a planer. Clamping a brass in the "V" block squares it naturally and with no loss of time for this adjustment, and as the brass is then attached securely to the slotter table, it can be adjusted to lines on the brass by the table screw feeds more readily and in less time than it can be set up accurately on a planer. By machining on the slotter there is also the advantage to be gained with the quick return of the tool which is more rapid than the return stroke of the planer.

Fig. 5 gives the details of an expanding eccentric mandrel designed by Mr. Otto Godiskesen, machinist, for turning new or old eccentrics. The device was made from an old driving axle and very satisfactory results are obtained from it in every day service. The mandrel is 21¼ inches long and capable of taking eccentrics of various sizes. The bar of the mandrel is screwed into a plate 14 inches in diameter by 1 inch thick. On the bar are three steps decreasing in diameter by increments of 1 inch, with

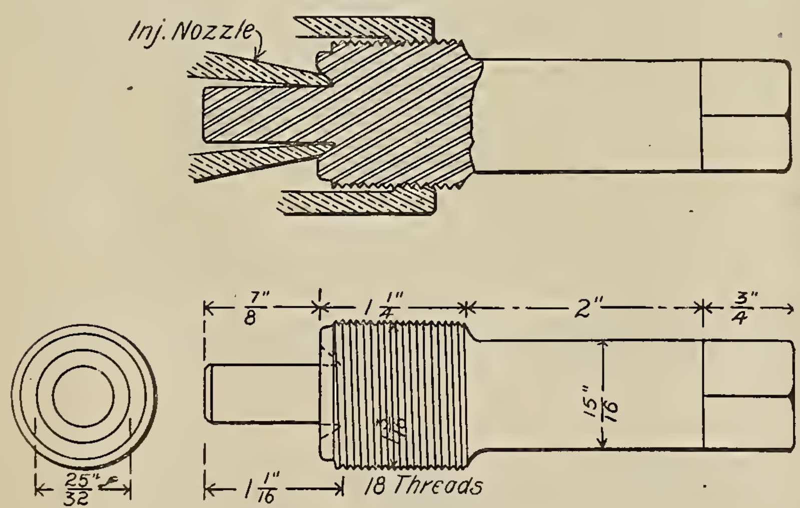


FIG. 6—TOOL FOR REDUCING NOZZLE OF MONITOR INJECTOR.

length of face varying according to the thickness of eccentrics of different sizes. Four grooves, 1 inch wide, having a taper of 2½ inches per foot, accommodate four strips 1 inch by 15 inches, of the form shown by the detail drawing. The holding surface of the mandrel is adjusted by varying the position of the strips in the grooves through the medium of a special nut engaging a groove in the end of each strip. This nut traverses a portion of the bar 4¾ inches in diameter having 4 square threads per inch. The extreme end of the bar for a distance of 1 inch is turned to a diameter of 3 inches and threaded with 8 threads per inch. This accommodates the threads on a washer 6⅜ inches in diameter, keyed securely when adjusted. In this washer are several centers properly offset from the actual center of the bar to accommodate the throw of each of the various classes of eccentrics standard to the road.

The tool illustrated by Fig. 6 was devised by Mr. Edward O'Hern, machinist, and provides for extending the life of nozzles in Monitor injectors. Injector nozzles become worn from constant use and unless the nozzle opening can be contracted after it has been in long service, it

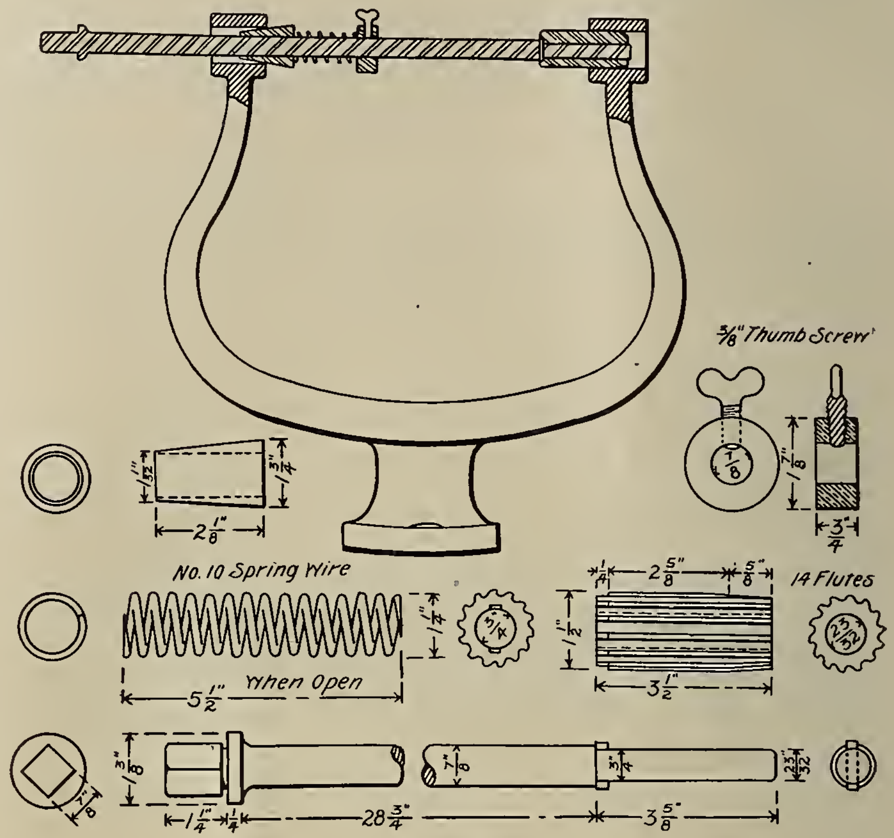


FIG. 7—BELL YOKE REAMER.

becomes necessary to scrap the nozzle. The tool illustrated is so designed that by screwing it into the body of the injector the tip of the nozzle is forced against a spindle, which reduces the nozzle opening to standard size.

The details of a bell yoke reamer, together with a drawing showing its application, are represented by Fig. 7. An arbor of tool steel 31⅞ inches long is made to take shell reamers of various sizes. The holes are kept in line while reaming by steadying the arbor with a hardened steel cone inserted in the hole opposite to the one being reamed. The reamer is fed forward by a spring placed between the cone and a sleeve locked in position by a thumb screw. The arbor may be driven by a square socket wrench, but preferably by a motor.

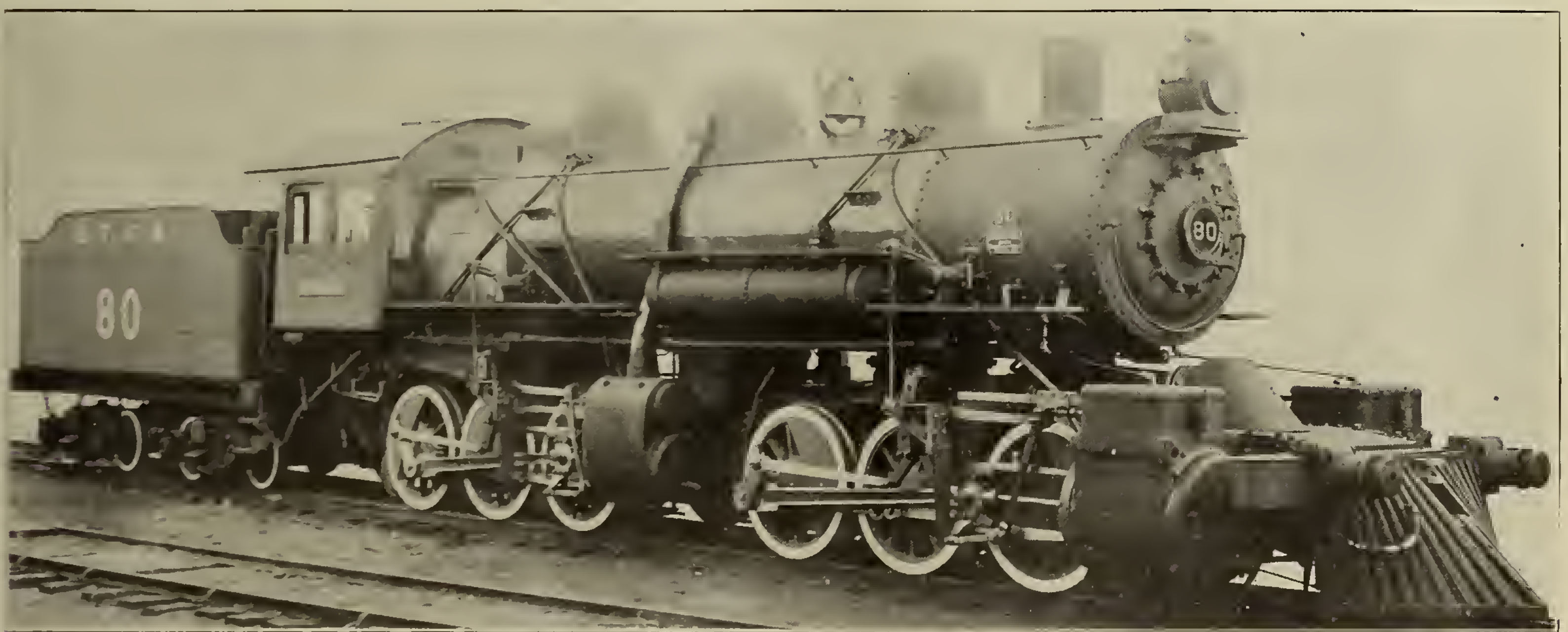
Rock Island officials are being steadily urged to establish an automobile freight service between small points along the line in Nebraska. This would do away with the usual freight delay and would give the small merchants in the small towns better accommodation. It is thought this service will be probably installed next spring if it is found that the expense would not make it impracticable.

Mallet Compound Locomotive

Central Railway of Brazil

THE development of the Mallet compound locomotive in this country has been exclusively toward heavy units, the final step being the helper locomotives of the Erie Railroad, the heaviest and most powerful engines in the world. That the design may be successfully adapted to units of smaller size and weight, has been illustrated in an order of three locomotives recently furnished the Central Railway of Brazil by the American Locomotive Company. These locomotives weigh in working order 206,000 lbs., which is 204,000 or nearly 100 per cent less than the Erie locomotives.

In an effort for increased weight and power, railroad men in the United States are apt to lose sight of the fact that the articulated design of locomotive is as well adapted for engines of light weight and power as it is for the heavier machines. The engines here illustrated are very good examples of the advantages offered by this type of engine for maximum power with minimum pressure per wheel on the rail. It is an interesting fact that with 15 per cent less weight than the Consolidation engines built by the same company for the New York Central Lines, with a total weight of 240,000 lbs., these engines have a greater maximum tractive force, that is working simple, and in fact when working compound their maximum tractive power is 42,420 lbs., which is only 10 per cent less than that of the Consolidation engine above referred to.



MALLET COMPOUND LOCOMOTIVE—CENTRAL RAILWAY OF BRAZIL.

At the same time this power is distributed between the four cylinders and two sets of crank pins, and the weights of the reciprocating and revolving parts are much less than those of the ordinary freight engine of the present day. To illustrate this point a comparison of the weights of the reciprocating parts between this engine and a heavy consolidation engine is given.

	Central Ry. of Brazil, 0-6-6-0 type. Total lbs.	Consolidation, 2-8-0 type. Total lbs.
Main Rod	417	825
Front Rod	208	183
Intermediate	...	406
Back Rod	95	330
Cross Head	228	...
Piston High Pressure	182	415
Piston Low Pressure	344	...
Piston Rod	115	230

It will be seen from the comparison given above that the rods or reciprocating parts of the engines for Brazil can be handled by two men, which in case of accident on a road is a very advantageous feature.

As far as the distinctive features of the design are concerned, it will be seen from a study of the illustrations that these engines differ very little from the Mallet Articulated Compound locomotive built by this same company for the Baltimore & Ohio Railroad. Owing to the lighter weight, however, a single articulated connection between the forward and rear frames has been employed in the engines here illustrated instead of an upper and lower joint as in the case of the Baltimore & Ohio design before referred to.

Because of the difficulty of locating the reverse shaft counter-balancing spring in the usual position in this design, two springs have been attached one on each side of the engine to the bottom of the reverse lever itself. With this arrangement each spring is lighter than that usually employed where a single counter-balance spring is used, thereby making a satisfactory arrangement.

It would seem that a design such as is here illustrated, with a tractive force of 42,420 lbs., and a load per axle of only 33,400 lbs., and a rigid wheel base of only 9 ft., is an excellent one to meet conditions such as exist on South American roads, and in fact its adaptability is not confined alone to South America, but it would satisfactorily meet conditions existing on a great many of our own roads.

The prinicpal dimensions and specifications are as follows:

Type of engine	Mallet
Service	Freight
Fuel	Cardiff coal
Tractive force	42,420 lbs.
Gauge	5 ft. 3 ins.
Cylinders	H. P. 17½x26 ins., L. P. 28x26 ins.
Valve gear, type	Walschaert
Valves, kind	Piston and slide

Valves, steam lap, ⅞ in.; exhaust clearance .... 3-16 in.
Valve travel, in full gear, piston 5 ins.; slide .... 5½ ins.

BOILER.

Type .... Straight top
Working Pressure .... 200 lbs.
Diameter first ring .... 64¼ ins.
Staying .... Radial

FIRE BOX.

Length .... 90⅛ ins.
Width .... 65¼ ins.
Depth, front .... 61½ ins.
Depth, back .... 48½ ins.
Thickness of sheet, sides .... ⅜ ins.
Thickness of sheet, back .... ⅜ ins.
Thickness of sheets, crown .... ⅜ ins.
Thickness of sheets, tubes .... ½ ins.
Water space, front .... 5 ins.; sides, 4 ins.; back, 4 ins.

TUBES.

Material .... Char. iron
Wire Gauge .... No. 11
Number 234
Diameter .... 2 ins.
Length .... 18 ft.

HEATING SURFACE.

Fire box .... 121.5 sq. ft.
Tubes .... 2,195.2 sq. ft.
Total .... 2,316.7 sq. ft.
Grate area .... 41.0 sq. ft.

DRIVING WHEELS.

Diameter, over tires .... 50 ins.
Diameter, wheel centers .... 44 ins.
Journals, diameter and length .... 7½x9 ins.
Material centers, main .... cast steel; others, cast iron

WHEEL BASE.

Driving .... 9 ft.
Total engine .... 27 ft. 8 ins.

WEIGHT.

On driving wheels .... 206,000 lbs.
Total, engine .... 206,000 lbs.
Total, engine and tender .... 304,000 lbs.

DIMENSIONS.

Distance from rail to top of stack .... 13 ft. 9½ ins.
Distance from rail to center of boiler .... 8 ft. 9¾ ins.

TENDER.

Style .... Water bottom
Wheels, diameter .... 30 ins.
Journals, diameter and length .... 5x9 ins.
Water, capacity .... 4,500 gals.
Coal capacity .... 8½ tons

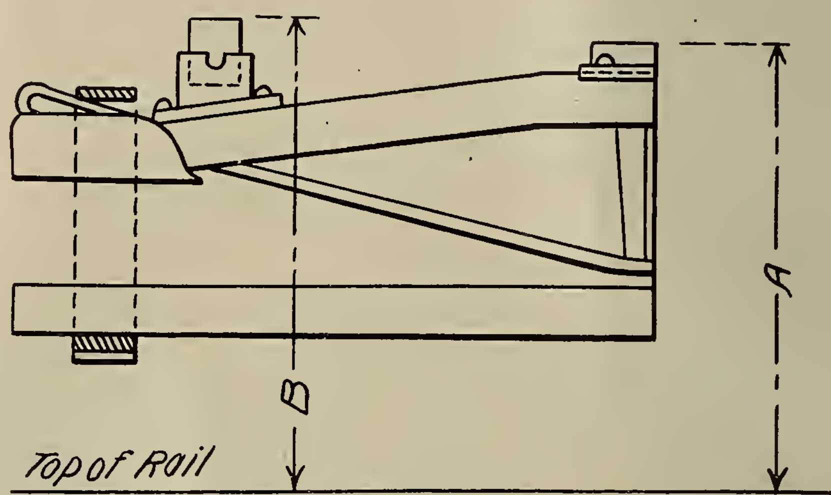
Appointments on New York Central Lines

Mr. M. J. McCarthy, master mechanic of the Lake Shore & Michigan Southern at Elkhart, Ind., has been appointed master mechanic of the new Beech Grove shops of the Cleveland, Cincinnati, Chicago & St. Louis, near Indianapolis, Ind. Mr. O. M. Foster, assistant master mechanic at Elkhart, is promoted to master mechanic. Mr. J. T. Carroll, assistant superintendent of shops at Collinwood, Ohio, is appointed assistant master mechanic at Elkhart. Mr. A. R. Ayers, superintendent of shops at Elkhart, succeeds Mr. Carroll, and Mr. A. O. Berry, general foreman at Collinwood, is appointed superintendent of shops at Elkhart.

To Adjust Height of Coupler After Truck Repairs

WHEN replacing trucks under cars after repairs, it is necessary to so adjust the height of center plate that the coupler will come within the limits of the specified height above rail. Unless this height is adjusted accurately befor the car body is lowered on the trucks, it will be necessary to jack up the car and readjust the height according to the measurements made after the trial. Such a method entails the loss of considerable time and induces a tendency, on the part of workmen, to allow a car to leave the repair track with an improper adjustment rather than make the exertion to adjust it correctly.

The adjustment of side bearing clearance is often imperfect and unless side bearings are properly arranged they will be of little practical service.



Kind of Car	Body		Truck		A	B
	Side Bea'g	Ctr. Plate	Side Bear'g	Ctr Plate		
Fruit	C-185	C-35	C-14	C-30	30¾"	32⅜"
"	" 179	A-113-A	"	A-112-A	"	"
"	C-185	"	"	"	"	"
"	62	C 61	76	a-86	31⅛"	32¾"
"	Cast Ste.	Cast Ste.	C-14	C-30	29¼"	30¾"
Beef	"	"	"	MBI	29¾"	31½"
"	C-341	S-29	"	"	30⅞"	31¾"
"	C-185	"	"	"	"	"
"	B-20	B-12	MB-18	a-86	30¾"	31⅞"
CFX	a-26	E 32	E 54	E-33	33¼"	32¼"
"	P 5	E 51 X	E 61	E-58	"	32½"

TABLE OF DIMENSIONS FOR ADJUSTING HEIGHT OF COUPLERS AFTER TRUCK REPAIRS—ARMOUR CAR LINES.

To eliminate this time-consuming element of adjusting height of cars the repair department of the Armour Car Lines has prepared a table giving the proper height above rail for the upper surfaces of center plates and side bearing castings. These heights are arranged according to the various classes of cars and to suit the different patterns of side bearings and center plates. The figures given do not allow for compression of springs.

Through the courtesy of Mr. W. E. Sharp, superintendent of the Armour Car Lines, we have been allowed to reproduce this table.

Adjustable Scaffolds for Car Paint Shops

THE adjustable scaffold as one of the adjuncts of the modern paint car shop is interesting in its development. From the first crude affair of many limitations it has grown into a convenient and indispensable shop accessory. There are many different types of scaffolds in use, as a number of prominent shops have worked out designs adapted to existing conditions. While the details of construction and method of operation have been treated in various ways a number of satisfactory scaffolds have been developed. A few of the typical ones are here illustrated and described.

LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY.

The adjustable scaffold in use at the Collinwood shops of the L. S. & M. S. Ry., is worthy of note on account of its simplicity and ease with which it can be operated. The platforms can be adjusted in any position from 19 inches above the floor to 10 feet above, by merely lifting them up and down, the counter weight holding them in any desired position.

The columns are 6-inch I beams arranged in double rows 4 ft. 3 ins. apart, adjacent to each track in the paint shop. The columns are set 3 ft. in concrete and extend 10 ft. 2 in. above the floor, and are braced both laterally and longitudinally, in order to stiffen the entire structure.

The platforms are 15 in. wide by 24 ft. 1 in. long and constructed of 3 planks, with two truss rods to support the center. The platforms are carried upon special cast iron brackets which have grooved guides to engage the flanges of the I beam columns. The weight of the platforms and the load put upon them, is counterbalanced by weights which are connected to the platforms by means of a cable passing over a sheave at the top of the column.

The scaffold is of simple, yet strong construction and is a very successful arrangement for use in a car paint shop.

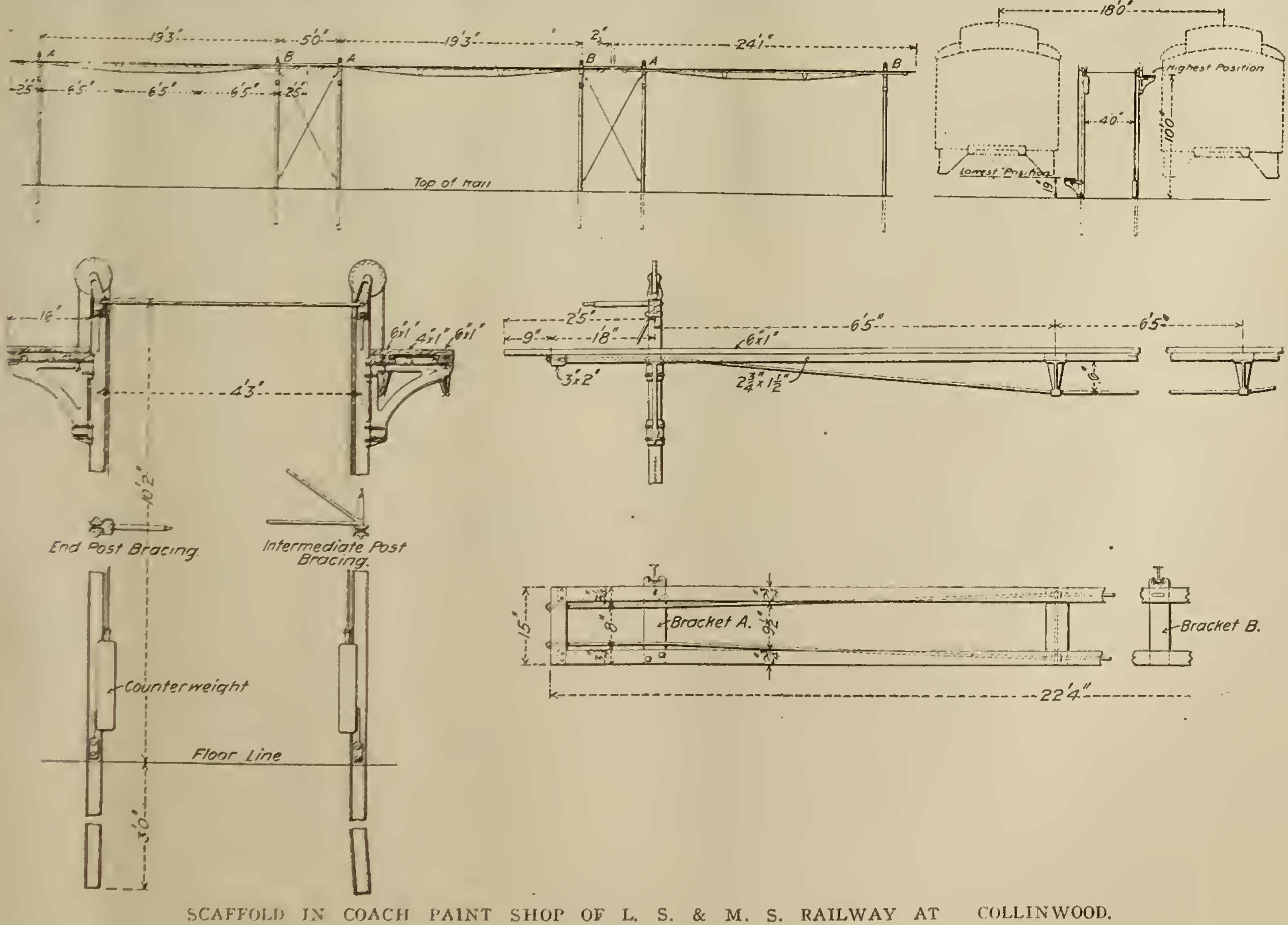
PITTSBURGH AND LAKE ERIE RAILROAD.

A scaffold of a design entirely different from that just described is in the paint shop of the P. and L. E. Railroad, at McKees Rocks. The columns are of wood and are placed 14 ft. 1½ in. apart. The platform is raised and lowered by means of a rope and is adjusted at various heights by notches cut in the face of the column, on which the brackets rest.

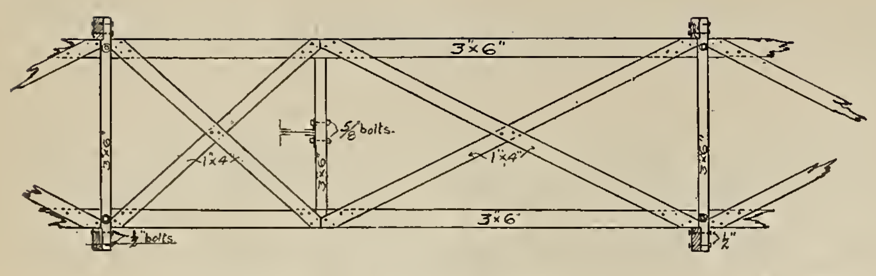
The columns are 15 ft. 10½ in. long, of 3 by 6 in. yellow pine and are anchored to the floor by two bolts set in concrete. The upper ends of the columns are supported by lateral and longitudinal braces. On the face of each column are 11 notches 1 in. deep, 13 in. apart, which form the support for the brackets and provide for adjustment of the platforms.

The platforms are 10½ in. wide and made in sections 14 ft. long. These are provided with flexible connections in order to secure a continuous walk the length of the shop. The connections permit one section to be moved a notch higher or lower than the one next to it. The brackets are malleable iron with ½-in. pipe rollers placed in the handles to prevent the brackets binding the column when raising and lowering.

Two cast iron sheaves are placed at the top of each column and one is secured to the bracket. The operating rope is run over these sheaves and connected to the lever as shown by the accompanying illustrations. To raise the



SCAFFOLD IN COACH PAINT SHOP OF L. S. & M. S. RAILWAY AT COLLINWOOD.



DETAIL OF SCAFFOLD IN COACH PAINT SHOP OF P. & L. E. RAILROAD AT MCKEES ROCKS.

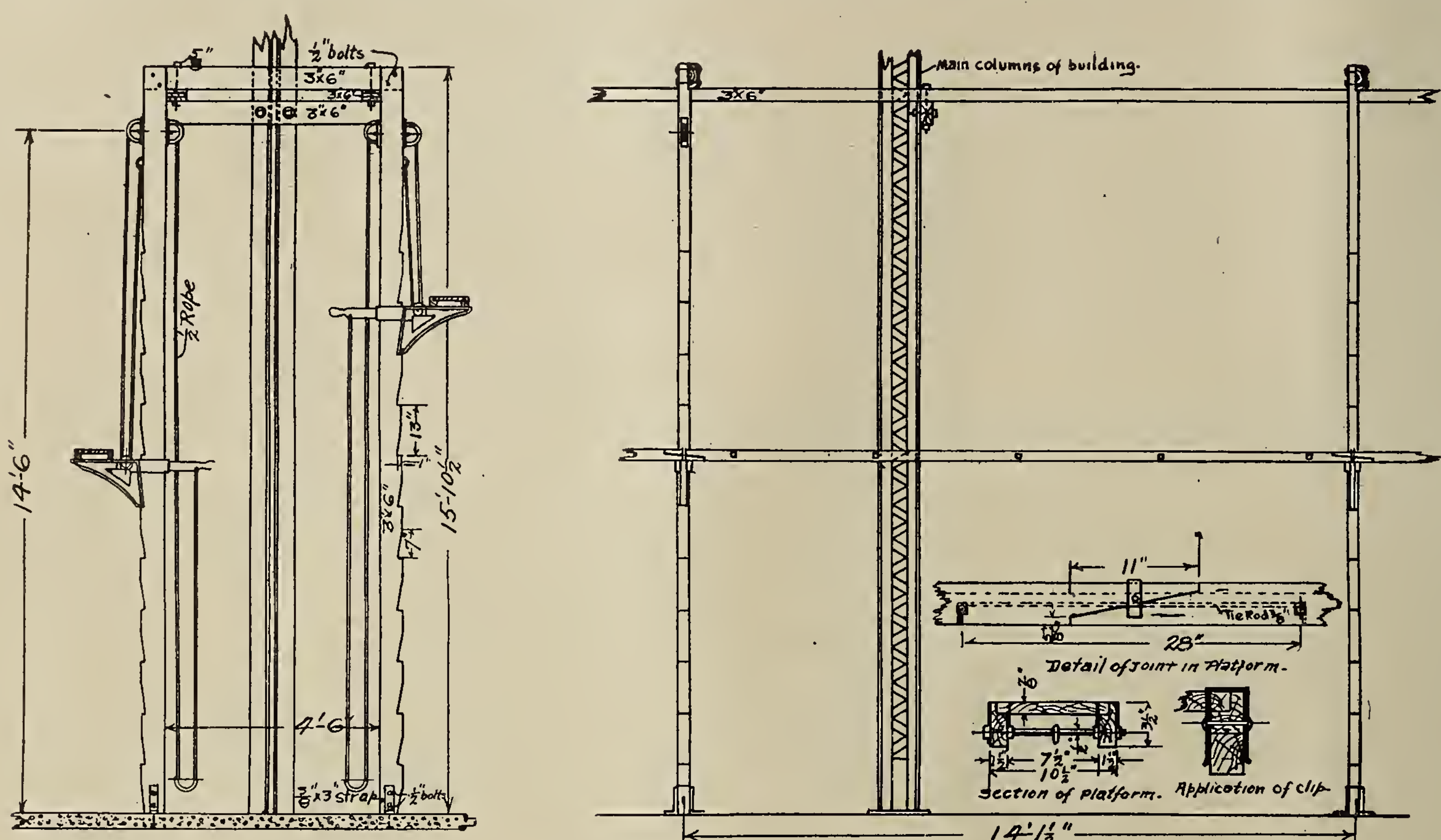
platform it is merely necessary to pull down on the rope until the desired notch is reached. The platform can be raised or lowered by a man standing upon the platform and it is therefore unnecessary for a workman to descend

platforms, the toe of the brackets resting against the next lower pin and preventing rotation of the platform about the upper supporting pin.

There is no apparatus for counterbalancing the platform but as the construction is very light it can be easily handled.

LONG ISLAND RAILROAD.

The scaffold used in the Richmond Hill shops of the Long Island Railroad combines a number of features brought out in the other designs, at the same time including a number of details prepared in an original manner. The scaffold platforms are supported by heavy wooden



SCAFFOLD IN COACH PAINT SHOP OF P. & L. E. RAILROAD AT MCKEES ROCKS.

to the floor in order to adjust the scaffold. This scaffold includes a number of original features and is giving very good service.

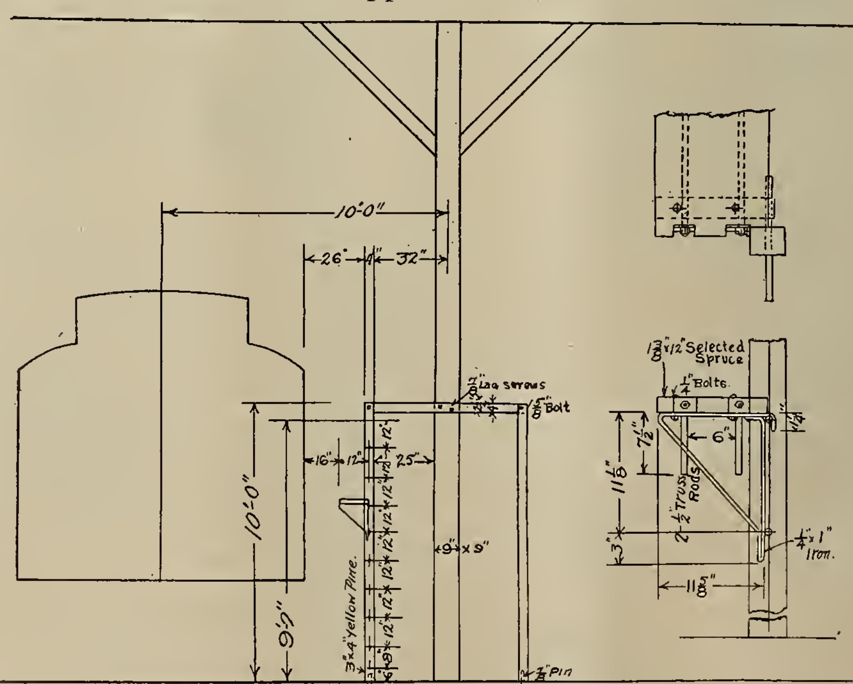
CENTRAL RAILROAD OF NEW JERSEY.

A scaffold of simple design is in service in the Elizabethport paint shop of the Central Railroad of New Jersey. Two rows of wooden columns support the platforms and these are adjusted in different positions by hooking the bracket over iron pins driven in the column at various distances above the floor.

The columns are of 3 by 4 in. yellow pine, 10 ft. long, placed 5 ft. 4 in. apart and fastened to the floor with ⅞ in. pins. They are supported at the upper end by 2½ by 4 in. wooden braces, bolted to the shop pillars. Through each column a series of ten ½-in. round iron pins are driven at intervals of 12 in. These form the support for the brackets and provide the adjustments of the platform.

The platform is made of 1⅜ by 12 in. selected spruce and is trussed by two ½-in. rods. The brackets are made of ¼ by 1-in. wrought iron and have a hook 1¼ in. deep at the upper end, which form the upper support for the

posts, each post being common to two lines of scaffolds. On the working face of each column is a steel strip with 12 openings, the metal being pressed out leaving a tongue which is attached at its upper end and bent in at the lower



SCAFFOLD IN COACH PAINT SHOP OF C. R. R. OF N. J. AT ELIZABETHPORT.

end. These openings form the sockets which support the bracket and gives the various adjustments of the platform.

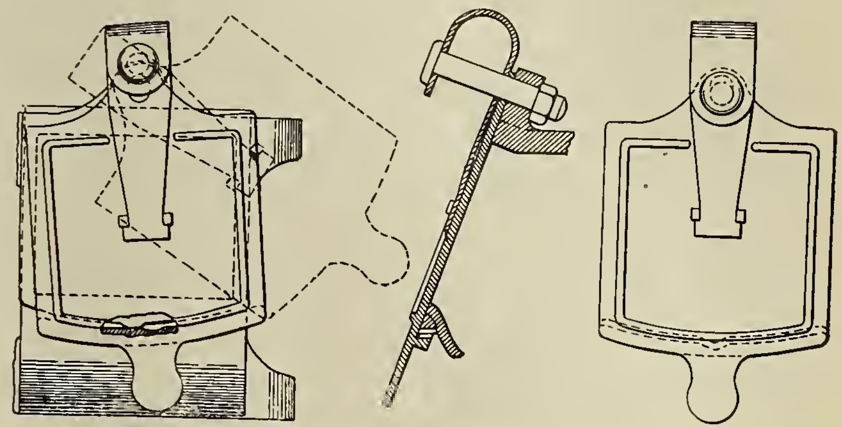
The bracket is of wood with an iron dog bolted at the bottom and fitting into the openings of the steel strip. At the top and bottom of the bracket are clamps that guide its movement. On the top of each column is a sheave over which a cable runs connecting the platform with the counterweight. The platform is made of selected spruce and is trussed with one rod.

The dog on the lower end of the bracket rests in the slot of the steel strip and the clamp on the upper end prevents the platform from tipping forward. To adjust the platform it is necessary only to raise the bracket, as the tongue back of the slot in the strap forces the dog out of the opening and allows free movement of the platform. The bracket will naturally seek the next slot lower down, so there is no danger of the platform falling any distance. The platform is carefully counterbalanced and little force is required to move it in either direction.

Sorensen Journal Box

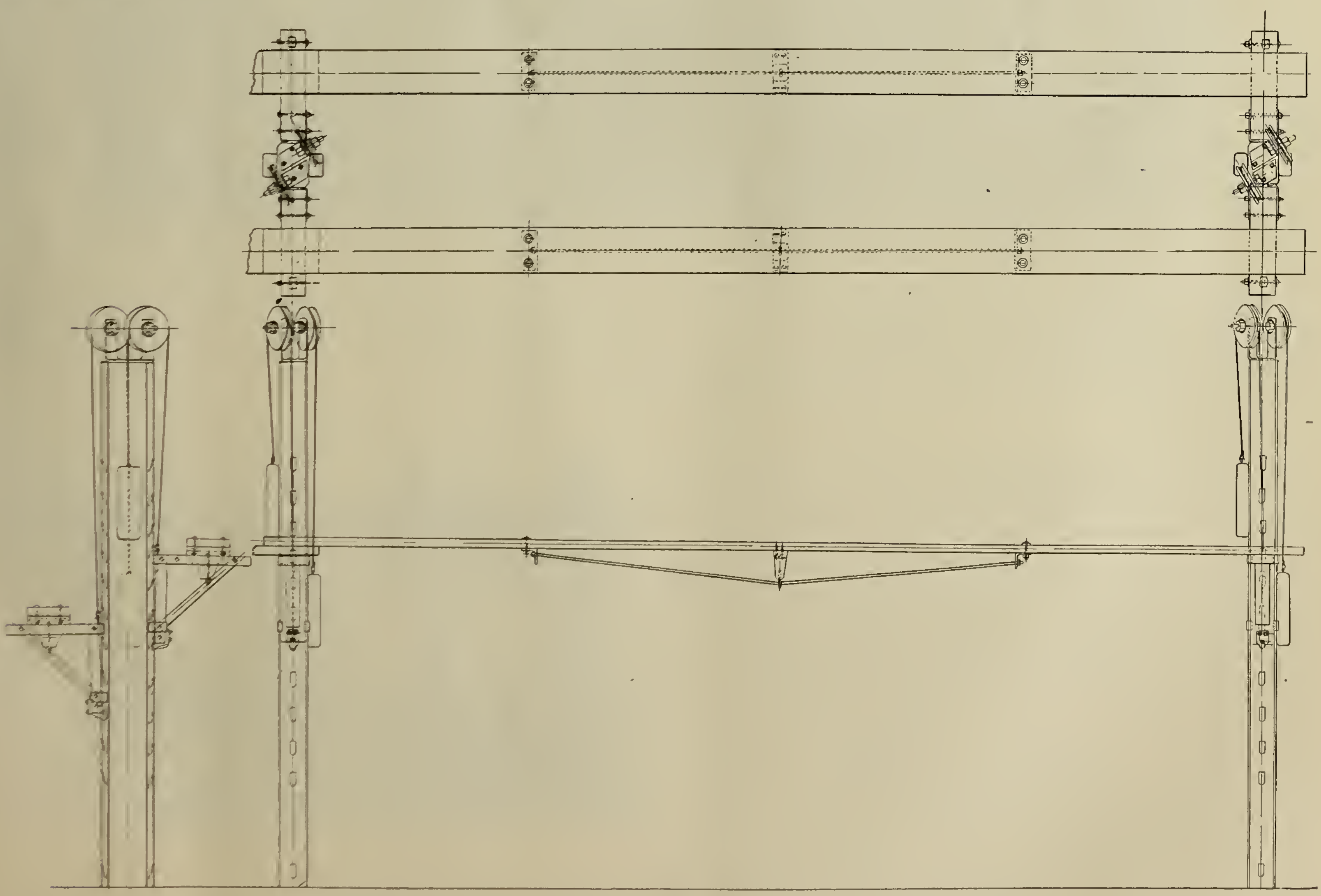
A NEW journal box and lid have been designed by Mr. F. C. Sorensen, in which an ingenious and novel feature has been introduced for so closing and securing the lid as to exclude dust and grit and to provide against loss of lubricating material. The lid is of the swinging type so arranged that it will remain in any position in which it is left when opened and when closed will be securely held, latched or locked in such position, to prevent accidental opening of the box. The lid is simple in form and construction and the device for closing the lid is effective and positive.

In general the journal box is of ordinary construction, conforming to the requirements of the M. C. B. Association. The outer end is inclined slightly, having the usual opening. Above the opening is a lug with a hole through it to accommodate the bolt on which the lid is pivoted.



SORENSEN JOURNAL BOX.

This lug can be located at one side of the opening instead of above it, but more commonly it is cast at the top of the box. Beneath the journal box opening is a curved rib or projection with its under rim conforming to the arc of a circle concentric with the bolt hole through the lug. The under surface of this ledge inclines upward and toward the rear, with respect to the face of the box. Midway of the curved surface is a latch lug, or swell in the casting,



SCAFFOLD IN COACH PAINT SHOP OF LONG ISLAND RAILROAD AT RICHMOND HILL.

which engages a corresponding depression in the lid securing the lid in position when closed.

The lid is little more than a flat plate taking its shape from the end of the journal box. A lug at the upper end conforms with the lug on the journal box. A short slot through this lug accommodates the pin on which the lid is pivoted and the length of the slot allows a short vertical motion of the lid. Upon the lower end of the lid is a depending lug providing a means by which to swing the lid when required. On the under side of the lid is a curved rib conforming with the rib on the end of the journal box below the opening, the upper surface of the rib on the lid being inclined to fit the under face of the rib on the box. Midway of this rib is a recess corresponding with the lug or projection on the under surface of the rib on the box. The slot in the lid accommodating the pivot is of such length as to allow the lid to drop down sufficiently for the recess and lug to disengage, whereupon the lid may be swung to one side.

A spring is employed to cause the effective engagement of the inclined surfaces of the box and lid and to hold the lid in engagement with the latch lug of the box. The spring is so formed and attached as to exert a lifting force upon the lid, thereby drawing the rib of the lid firmly into engagement with the corresponding part of the box and at the same time holding the body of the lid solidly against the end face of the box. The spring is "U" shaped, with legs of unequal length, having the necesary holes to accomodate the pivot pin and the large leg terminates in a "T" shaped head. This head engages two lugs cast on the outer face of the lid. The spring is compressed by the head of the pivot pin.

The pressure exerted by the spring, operated by the inclined or wedge surfaces of the ribs, firmly seats the lid at all points against the face of the boss surrounding the opening of the box. At the same time the draft of the spring forcibly engages the lug and depression of the curved surfaces, preventing a swinging movement of the lid. The force of the spring is such that considerable effort must be exerted to disengage the lid from the retaining lug, but once having been disengaged the lid may be opened the rest of the way quite easily being opposed only by the friction between the parts. When the lid is swung upward it will be held in position by the pressure of the spring, which constantly forces the lid against the end of the box.

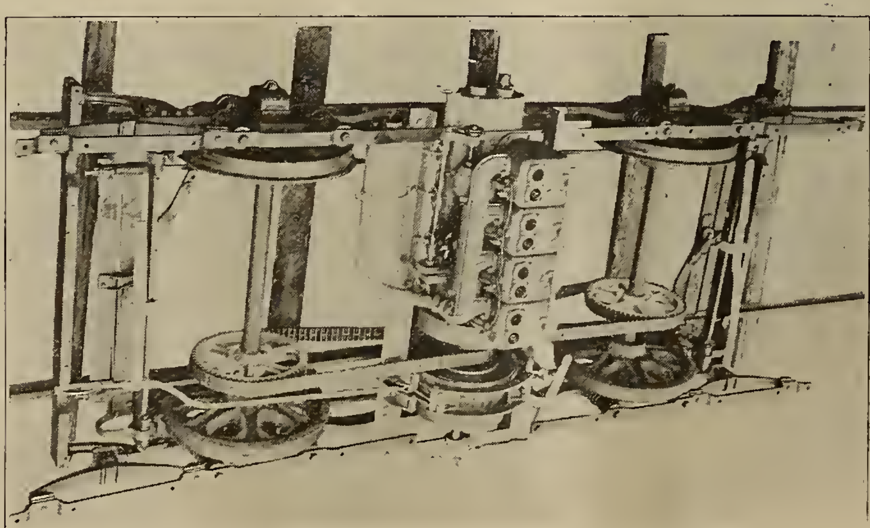
Gasoline Motor Car

Aurora, Dekalb & Rockford Railway

SEVERAL interesting cars have recently been delivered by the G. C. Kuhlman Car Co., to the Aurora, De Kalb & Rockford Railway, which are fitted with gasoline motor equipments as the motive power. The equipments were furnished by P. H. Batten & Co., Harvey, Ill., and are designed so as to be suitable for installing in any standard type four wheel car such as are in common use on electric railways. The electric car standards are maintained throughout the car construction and provision is made to extend the controlling handles to both ends of the car to allow operation in either direction.

The equipments consist of a 7 by 7 inch four cylinder gasoline motor rated from 50 to 60 horsepower which drives a large planetary speed change gear. The latter has two sprockets side by side which drive to both axles of the truck by means of Morse silent chains. A multiple disc clutch is used for the high speed with alternate plates of steel and bronze running in oil. The engines are reversible and run equally well in either direction so that no reverse gearing is used in the transmission. The equipment is notable for its simplicity of design and the accessibility of all wearing parts for inspection and renewal.

The cars thus equipped on the Aurora, De Kalb & Rockford Railway are operated on a run of about thirty miles between Aurora and De Kalb on a schedule of one hour and a half each way, and make two round trips each a day. The stops average two miles apart and it is necessary to maintain an average running speed of from twenty-five to thirty miles per hour. The engines use a gallon of ordinary gasoline for five miles run, which at fifteen cents a gallon amounts to three cents a mile for fuel. The water used for cooling the engine cylinders is used for heating the cars in winter and a small dynamo may be run for car lighting if desired.

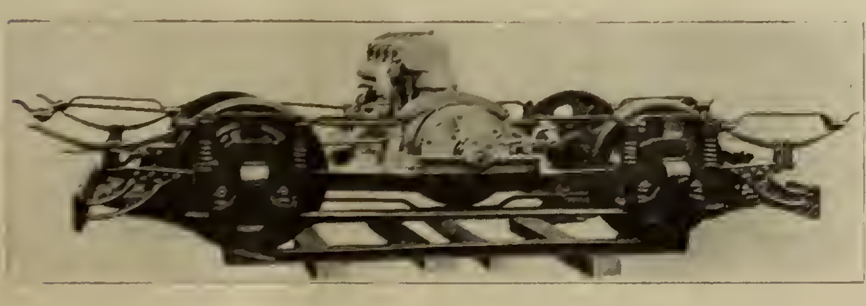


EQUIPMENT OF TRUCK FOR GASOLINE MOTOR CAR—AURORA, DEKALB & ROCKFORD RAILWAY.

The car shown in the illustration has a length of 20 feet 8 inches over corner posts, and 36 feet over the vestibule. The extreme width is 8 feet 2 inches. While this design is essentially of the type now in use on street railways, the motor equipment can be adapted to any existing design. A swinging door at one side connects the two compartments of the car and a bench seat for four passengers is arranged on each side of the partition. These seats form a casing for the engine and are made removable for access to the engine. The cars seat thirty-two passengers.

The illustration showing the equipment placed in the truck gives an excellent idea of the general arrangement. Seven of these cars are now in regular service on three different railroads and all are giving excellent results. Short light traffic branch lines can be operated much cheaper with cars of this type than with steam locomotives. The gasoline motor car is especially adapted to this service. By substituting them for steam locomotives on branch lines which fail to pay the operating expenses, it is not only possible to turn loss into profit but give better and more frequent service. The attention of railway mechanical men is now directed toward the motor car, propelled either by steam, electricity or gasoline, and as development progresses it is expected that the superior economy of the gasoline car will lead to its wider adoption.

GASOLINE MOTOR CAR—AURORA, DEKALB & ROCKFORD RAILWAY.


TRUCK FOR GASOLINE MOTOR CAR—AURORA, DEKALB & ROCKFORD RAILWAY.

Personal Mention

Mr. C. F. Stevens has been appointed storekeeper of the Tonopah & Goldfield, with office at Tonopah, Nev.

Mr. H. A. Rouse, storekeeper of the Chicago & Alton, has had his jurisdiction extended to include the Toledo, St. Louis & Western.

Mr. D. D. Briggs, assistant master mechanic of the Louisville & Nashville at Montgomery, Ala., has been appointed master mechanic at Mobile, Ala., succeeding Mr. C. B. Gifford, resigned.

Mr. R. L. Doolittle, assistant master mechanic of the Central of Georgia at Macon, Ga., has been appointed master mechanic of the Atlanta Birmingham & Atlantic at Fitzgerald, Ga.

Mr. Chandler C. Coats, who was master mechanic of the New York & Philadelphia division of the Pennsylvania Railroad for 40 years, died at his home in Newark, N. J., Dec. 2, aged 82 years.

Mr. F. W. Schultz has been appointed master mechanic of the Missouri Pacific and St. Louis, Iron Mountain & Southern at McGehee, Ark., in place of Mr. I. T. Johns, resigned.

Mr. William Walter, formerly master mechanic of the Chicago, Milwaukee & St. Paul at Dubuque, Iowa, has been appointed master mechanic of one of the new divisions of the extension to the Pacific coast, with headquarters at Mobridge, S. D.

Mr. W. H. Williams has been appointed master mechanic of the Buffalo and Rochester divisions of the Buffalo, Rochester & Pittsburg, with office at East Salamanca, N. Y., succeeding Mr. H. C. Woodbridge, transferred.

Mr. J. W. Evans, master mechanic of the Alabama Great Southern, at Birmingham, Ala., has been appointed superintendent with headquarters at Birmingham. Mr. W. H. Dooley, master mechanic of the Cincinnati, New Orleans & Texas Pacific at Somerset, Ky., has been transferred to master mechanic at Birmingham, Ala., vice Mr. Evans. Mr. T. O. Sechrist has been transferred from master mechanic at Chattanooga, Tenn., to master mechanic at Somerset, Ky., and Mr. J. Quigley, general foreman at Somerset shops has been appointed master mechanic of the Chattanooga division with headquarters at Chattanooga, Tenn.

Mr. Storm Bull, professor of steam engineering in the University of Wisconsin, Madison, Wis., died Nov. 18. Prof. Bull was born at Bergen, Norway, Oct. 20, 1856, and was graduated from the Federal Swiss Polytechnic Institute at Zurich with the degree of Mechanical Engineering in 1877. He came to this country, and in 1879 he became instructor in mechanical engineering at the University of Wisconsin. In 1884 he became assistant professor, and in 1886 was made professor of mechanical engineering. He held this position until 1890, when he was appointed professor of steam engineering. Prof. Bull was a member of the American Society of Mechanical Engineers; the Western Society of Engineers, in which he won the Chanute medal in 1903; the Society for the Promotion of Engineering Education, of which he was vice-president in 1901-02, and the Western Railway Club.

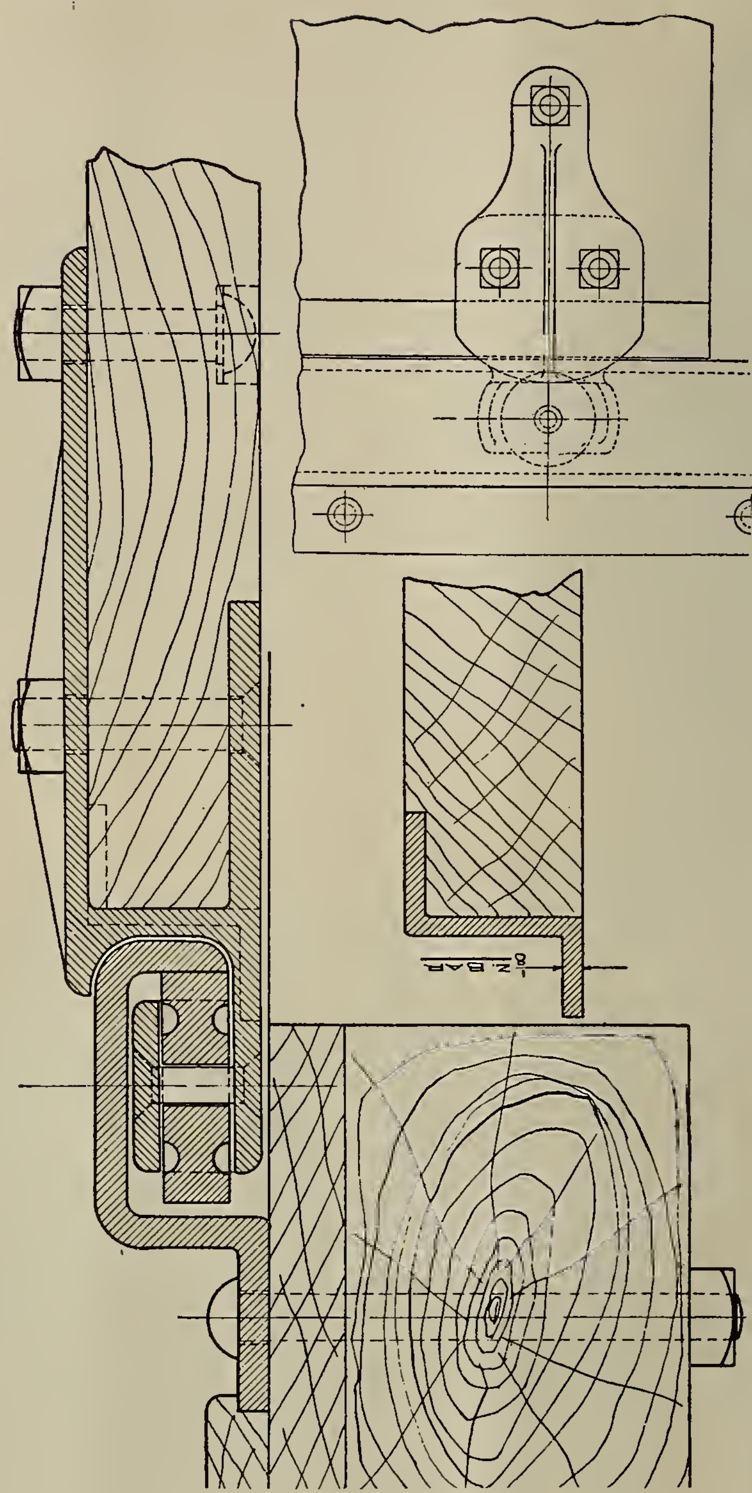
Mr. Charles O'Brien has been appointed Supervisor of Stores for the National Lines of Mexico. This is a new position. Mr. O'Brien has been storekeeper for the company at its chief store in Mexico City. He will now have superintendence of all the company stores on the Mexican National, Mexican International, Interoceanic Ry. and the Hidalgo and Northeastern. Mr. O'Brien is well known in the mechanical departments of several roads in the United States, especially on the Frisco System, where he held the position of Chief Clerk of the Motive Power Dept. at Springfield, Mo., up to 1904.

Bundy Car Door Hanger

Patents have been secured by Mr. C. L. Bundy, superintendent of the coach department of the Hicks Locomotive and Car Works, Chicago Heights, Ill., upon a car door hanger which is of novel design and embodies several features of advantage. The principal features are that it is practically impossible for the door to fall from its fastenings and it provides unusually good protection against all weather conditions.

The line drawing reproduced herewith clearly illustrates the construction and operation. The door track and cap are made in one piece of rolled section, of such form that the hangers and rollers are inside and thus fully protected from the weather. A slight lifting of the door brings the rollers in contact with the upper shoulder or flange of the track and with suitable end stops it is impossible for the door to become derailed. A Z bar secured along the top of the door protects it and keeps water from getting into the car. The simplicity of the design, the small number of parts and the clever arrangement of the device seem to render it a storm proof and thoroughly safe method of car door suspension. The track and Z bar are of rolled steel and the hangers are malleable castings.

The device will be placed on the market by Mr. F. L. Holmes, Fisher Building, Chicago.



BUNDY CAR DOOR HANGER.

A Gigantic Plainer

Probably the largest and heaviest metal working planer ever built has recently been shipped from the Bement-Miles Works (Philadelphia) of Niles-Bement-Pond Co. The total weight of the machine is 845,000 lbs., or 422½ tons. Four motors with a total capacity of 207½ H. P. are required to operate this remarkable tool.

The machine is, in general effect, an extremely large planer, but in addition to the movements found on a standard machine, many new ones have been added.

Each head is fitted with a slotter bar indepedently driven by rack, giving a cutting speed that is practically constant from one end of the stroke to the other, and a quick return. Through motor and change gears, the cutting and return speeds can be changed as desired.

Each head is arranged for transverse planing, having a planing movement across the bed which can be varied within desired limits, and having a quick return.

These movements for slotting and transverse planing make it necessary to throw out the regular driving mechanism to the table and connect it to a separate feed motion which, in this case, is entirely distinct from the regular feed motion. This throwing out of the driving mechanism, however, means simply that the pneumatic driving clutches are thrown into and left in their idle position.

The machine is fitted with its own air compressor and motor, thus making it independent of the air supply in the shop, to which, however, it can be connected if it seems desirable.

A complete switchboard is furnished for control of all the motors.

The distance between uprights is 14 ft. 4 ins.; the maximum distance from table to bottom of cross slide is 12 ft. 2 ins.; maximum stroke of table is 30 ft.; maximum stroke of slotter bar is 8 ft.; total width of bed 13 ft.; length of bed 60 ft.; table ways 15 ins. each in width; tool slides 7 ft. 8 ins. with 4 ft. vertical transverse; cross rail is long enough to admit full traverse of either head between the posts; face of uprights 2 ft. 6 ins.; vertical height of cross slide, including the top rib bracing, is 5 ft.

The main driving motor is 100 H. P.; slotting and cross planing motor is 50 H. P.; lifting motor to cross slide 20 H. P.; traverse motor for heads on cross slide 7½ H. P.; air compressor motor 30 H. P.

The cutting and return speeds are variable through the motor, which has a 1 to 1¼ variation and further range by change gears. The cutting speeds are 14 ft. to 25 ft. and return speeds 52½ to 65¾ ft. The same style of drive is used for slotter and gives a cutting speed of 18½ ft. to 30 ft. and return speed of 57 ft. to 71 ft. Cutting speed for cross planing is 11½ to 19 ft. and return speed 35 ft. to 43½ ft. The cross traverse speed to the heads is 50 ins. a minute; the vertical speed for raising and lowering cross slide is 26 ins. a minute.

The main drive from the 100 H. P. motor is through gearing to pneumatic reversing clutches at the base of the upright. The speed of these clutches can be varied, as stated above, to some extent by changing the speed of the motor and a great variation obtained by the simple reversal of two change gears. The pneumatic clutches, which are thoroughly incased, are of the well known N-B-P type with a large number of friction discs, whereby great friction area is obtained in a comparatively small compass. These clutches, as their name implies are operated by compressed air. A small valve, easily moved by hand, controls the stopping, starting and reversal of table and handles satisfactorily the power given out by the large driving motor. In the handling of this amount of power in a motor driven planer, it is unnecessary to state that it would be quite impracticable if a belt drive was employed. From this point on to the rack the drive is, in practically every respect, that which is found on any planer, except of course, in this instance it is exceptionally heavy and powerful.

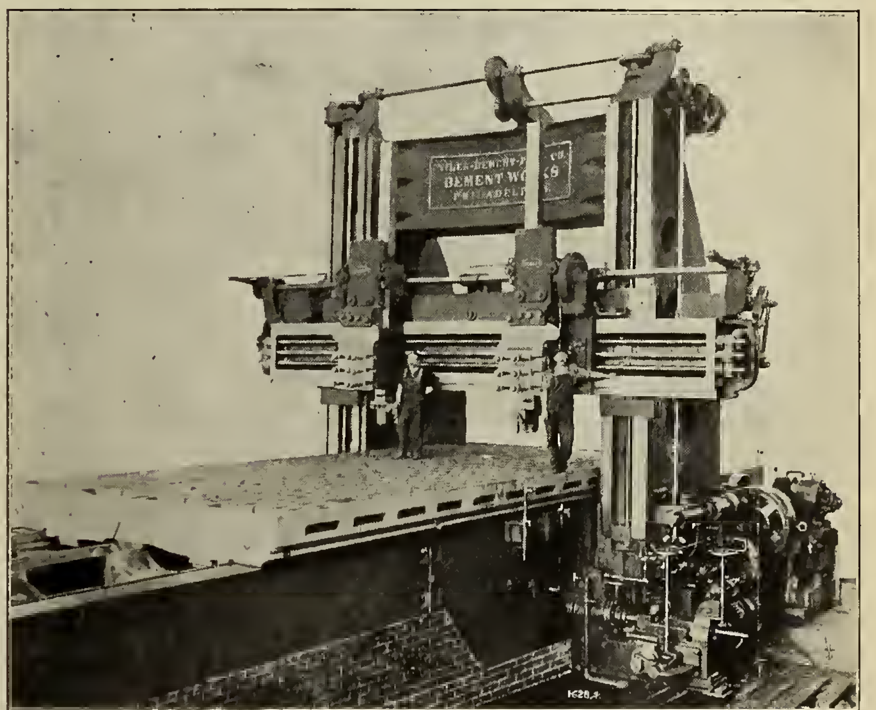
It might be noted, however, that the drive is all of steel and the two bull pinions are forged directly on the shaft being cut half pitch apart, in order to give smoothness of motion.

Among the many other new features, not the least is the pneumatic feed.

The feed for the cross heads is very clearly shown in the accompanying illustration. On the side of the upright just above the gearing is a cylinder with piston rod extending to left. This rod carries a rack which meshes into a gear near the bottom of the vertical feed shaft, and this shaft, on its lower end, has a bevel gear meshing into a bevel gear on a horizontal shaft which transmits motion to the vertical feed shaft on the left hand upright. The movement of these feed shafts is constant at all times and variation in amount and direction of head feeds is obtained by adjusting the connecting rod in the slotted cranks on the ends of the cross slide. These cranks are graduated in such a way that definite cross and vertical feeds can be obtained and by using at the same time the cranks on both sides, an angular feed can be given to the tool, which is at times desirable as the whole heads were not designed to swivel. The valve for controlling the air to the feed cylinder is thrown automatically at each end of the stroke, this movement being taken from either the main driving gear train to the table or the slotter gearing, when slotting is being done. To throw out the feed, it is simply necessary to close a valve, cutting off the air supply.

The feed for the table, when slotting or transverse planing is being done, is shown, by the illustration, directly in front of and at the base of the upright. This feed operates practically the same as the feed for the cross head previously described, except that variation in stroke or amount of feed is obtained by an adjustable step which regulates the amount of movement of the piston in the cylinder. This adjustment is made by the right-hand hand-wheel, the left-hand hand-wheel is for connecting and disconnecting this feed mechanism to the main driving works.

The description of the main drive fits this one up to and including the pneumatic clutches. For the main drive, the power is then carried through the upright into the bed while for the slotter drive it is transmitted to the vertical square shaft and thence by bevels and spur gearing to the horizontal square shaft running along the top of the cross slide. The pinion on this shaft drives the large gear, and the rack pinion which gears into the back of the cutter bar is on the shaft with this gear. The pinion on the square shaft slides and can be thrown in or out of gear as desired, so that either or both bars can be used. The disc just above the motor controls the length of stroke. This disc is driven from the main train of slotter gearing and the adjustable stops on its periphery can be set at any desired point



GIGANTIC PLANER BUILT BY NILES-BEMENT-POND COMPANY.

and effect the reversal in the same way as do dogs on the side of a planer table. Near the bottom of the square vertical shaft is a bevel gear on the end of a horizontal shaft which goes across the bed and which can be connected to the mechanism operating the value of the feed cylinder on the opposite side, as mentioned in the description of the feed for the heads.

In the illustration can be seen a vertical shaft where the reversing hand lever of a standard planer is usually found. It will be noticed that there are two sockets at the upper end, in one of which is a handle. The upper socket is connected to a shaft which runs down to the bottom lever or crank. This is the hand-control of the slotter.

The lower socket is the one that controls the movement of the table when regular planing is being done and is connected by lever and rods to the reversing dogs on the bed on both sides. But one handle is furnished for each side and thus mistakes arising from throwing the wrong lever are avoided.

Owing to the great weight and large dimensions, it was impracticable, both from a manufacturing and a shipping standpoint, to make the bed or table in one piece. They were, therefore, divided to bring them within reasonable limits. The central section of the bed is divided longitudinally into three parts and the two end sections into two parts, or seven parts in all. The total weight of the bed is about 275,000 lbs. The table is made in two sections divided longitudinally in the center and weighs about 140,000 lbs.

The holes in the table for stop bolts, etc., run clear through the upper plate while below this is a second plate without openings extending the entire width of table for catching all chips. The chips can then be removed through the side openings of the table.

The motor for fast traverse of heads is located on the end of the cross slide. Reversing is done through friction clutches and a safety is provided which prevents throwing in the fast traverse and the feed mechanism at the same time.

The motor for operating the rail is situated at the top of the upright. This motor is connected at all times to the elevating screws and is stopped, started and reversed electrically.

Finished pads over the V and flat ways are to carry the heads for truing up the ways when worn out of alignment. The method is as follows:

The table is raised say ¼ in. above the ways and supported in this position on sliding blocks fitting the inner small auxiliary shears, which are used only for this purpose. The truing heads being fastened to the end of the table, the ways are trued up from the center to the end. The heads are then placed on the opposite end of the table and the remainder of the ways finished. Near the center of the bed there are pockets in the ways in which these same truing heads are placed and the table is in its turn then planed up in the same manner. The accuracy, of course, of the finished work is dependent entirely upon the accuracy of the small auxiliary ways, and these are finished and erected with great accuracy.

The elevating screws for cross slide are firmly held top and bottom and the nut in the cross slide sets into a shouldered end in square pocket. It is expected that this will take care of the slotter bar thrust satisfactorily, but if any loosening or trouble is experienced, arrangements have been made so that the slide can be firmly braced to the uprights.

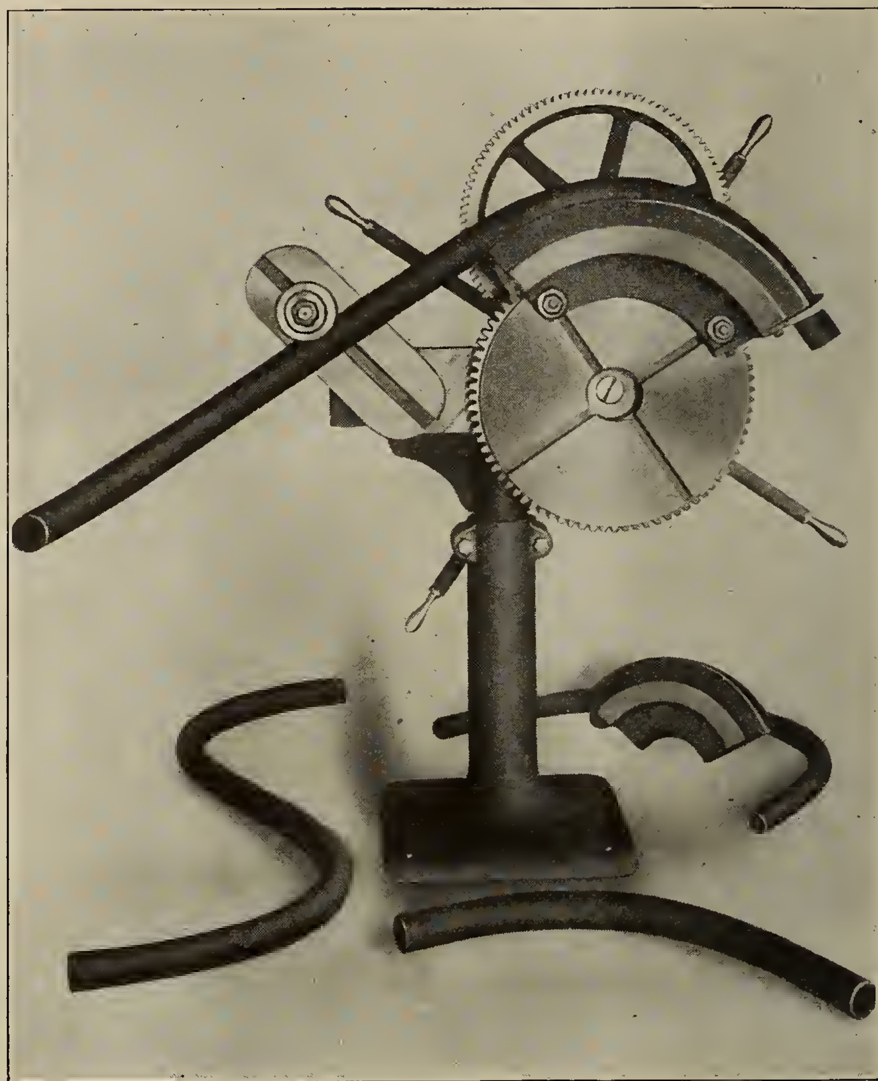
The accompanying illustration shows the operating side of the completed machine with the driving motor and air compressor, gearing and feed works. Cylinders for pneumatic feeds, the upper one for the cross head feeds, and the lower one in front of the upright for the table feeds are clearly shown as well as the pneumatic clutch for main drive.

Pipe Bending Machine

The accompanying half-tone engraving illustrates a pipe bending machine which embodies a number of desirable features. It will bend an infinite variety of shapes without leaving any mark or disfigurement on the work operated upon. Piping of steel, iron, brass, copper and other material can be bent cold up to and including sizes 2 ins. in diameter. The machine is also adaptable by means of special formers for bending light angles, flats and tee bars. Pipes coated by the Sabin process, galvanized, tinned, etc., may be bent to any desired shape without breaking the coating in any way.

The machine is well constructed and is of sufficient strength to withstand great stress, the gears, body of machine and stand having been carefully proportioned. The base of the stand on which the machine is erected is 18 ins. square; the width of the machine is 4 ft. 7 ins. and height 5 ft. The weight complete is 750 pounds.

The gears are all cut and of heavy pitch, a powerful leverage being provided by gearing having a ratio of 25 to 1. The quadrants or formers are located on a face plate which has a continuous rotary movement. The face plate is provided with four "T" slots upon which any style or shape former or quadrant can be attached. The resistance stud is located on a movable arm provided with a "T" slot, permitting the stud to be placed anywhere within the radius of the arm, a feature which provides adaptability for any sort of pipe bending.



SMITH PIPE BENDING MACHINE.

The quadrants accompanying the machine are for 1 inch pipe, with a radius of 6 inches; 1¼ inch pipe, with a radius of 9 inches; 1½ inch pipe with a radius of 12 inches; 2 inch pipe, with a radius of 14 inches. While these four sizes accompany the machine, the fact that the smaller sizes of pipe can be bent in the larger quadrants makes changing the quadrants unnecessary, unless a shorter radius is desired than that given by the larger quadrant.

The machine is designed to be easily portable and is provided with a telescopic stand which can be raised or lowered to suitable heights. When the base is secured rigidly, the upper portion swivels.

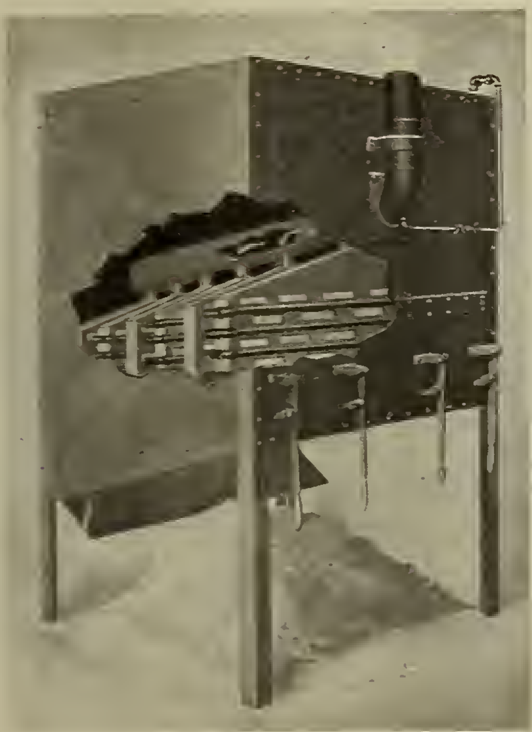
This pipe bending machine is manufactured by Charles A. Smith, successor to Pedrick & Smith, Germantown, Pa.

Howe Steam Sand Dryer

At this time when all items of expense concerned with locomotive maintenance and operation are being so carefully critcised, means by which each item may be handled more economically are sure to receive close consideration. The method of preparing sand for locomotive service has heretofore usually included drying the sand by passing it through a hopper surrounding a stove. Recently a number of roads are utilizing exhaust steam for drying sand, thus making use of the heat in steam which might otherwise go to waste. The steam sand dryer is reported to be giving very satisfactory results and the extent to which it has been introduced covers wide area in both the East and West.

A drying device which has attracted much favorable attention is known as the Howe steam sand dryer. This device consists of a series of pipes carrying live or exhaust steam, with vapor boxes arranged vertically between the steam pipes. It is particularly adapted to the drying of sand for motive power use, and is a radical departure from the old stove and hopper combination

The sand to be dried is dumped into the hopper or bin surmounting the dryer, and passes down between the steam pipes and vapor boxes. As the moisture in the sand is vaporized it is drawn through numerous apertures into the vapor boxes and out of the body of hot sand through the main exhaust pipe, the dry sand falling through the adjustable openings from the bottom of the dryer. It is designed and built on economical and scientific principles. There are practically no repairs. It works constantly and is self-operating after the hopper is once filled. It is easy of application to railroad coal trestles, car barns, roundhouses, etc.



HOWE SAND DRYER.

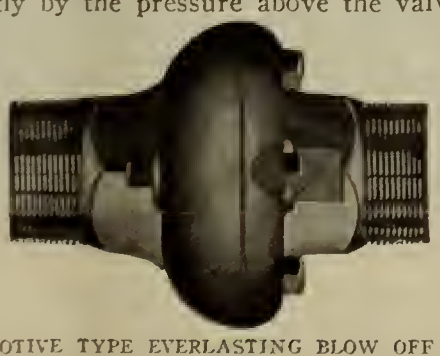
A standard steam railway dryer of 10 tons daily capacity is 6 ft. 9 ins. high, 5 ft. long and 4 ft. 1 in. wide. A dryer of larger size is built for a capacity of 20 tons per day.

The Howe steam sand dryer is marketed by C. F. Towne, exclusive sales agent for the United States and Canada, at Binghampton, N. Y.

Everlasting Blow-Off Valve

Among the recent interesting engineering specialties is a unique blow-off valve manufactured by the Patterson-Allen Engineering Company of New York City, and known as the "Everlasting" blow-off valve. Its general appearance, operation and construction are evident from the accompanying illustrations.

The valve is composed of two bonnets set together upon a high pressure gasket with tap bolts. The valve face is on the lower bonnet and is raised above the face of the joint. The valve is in the form of a disc and when closed rests upon this raised seat, being held tightly by the pressure above the valve. The disc is

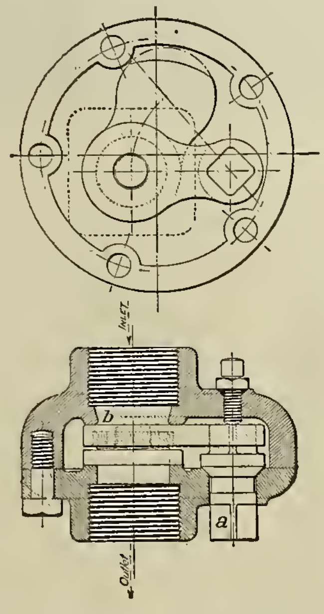


LOCOMOTIVE TYPE EVERLASTING BLOW OFF VALVE.

of such shape and size as to embrace an operating post about which it turns when the valve is opened and closed, the valve proper sliding over its seat. The inner and outer heads of the operating post are square and the post being turned by a wrench applied to the outer head actuates the valve. The operating post is set tight upon a ground tapered, joint against which it is held by a set screw and jam nut, thus doing away with a stuffing box and packing of any kind. The design of the valve then is such as to make it lever operated and it is so balanced as to be easy of operation, the manufacturers claiming that an effort of only 25 pounds upon an 8-inch lever is required to open and close it against 200 pounds boiler pressure.

The construction of the blow-off valve which permits easy access to the inside, and the elevation of the valve seat above the face of the joint, makes it very easy to reface the seat by the use of a file and the disc may be resurfaced in the same manner. The clearance spaces within the valve are ample to avoid the possibility of clogging and the action of the valve in sliding over the seat when being closed is to wipe the seat clean and eliminate the chance of any part of the deposit from the discharge being interposed between the surfaces when the valve is closed.

When the valve is open, the discharge opening is round, of the same diameter as the discharge pipe, the discharge and inlet nipples being arranged so close together that the discharge pipe might be considered continuous and uninterrupted. The inner-



DETAILS OF EVERLASTING BLOW OFF VALVE.

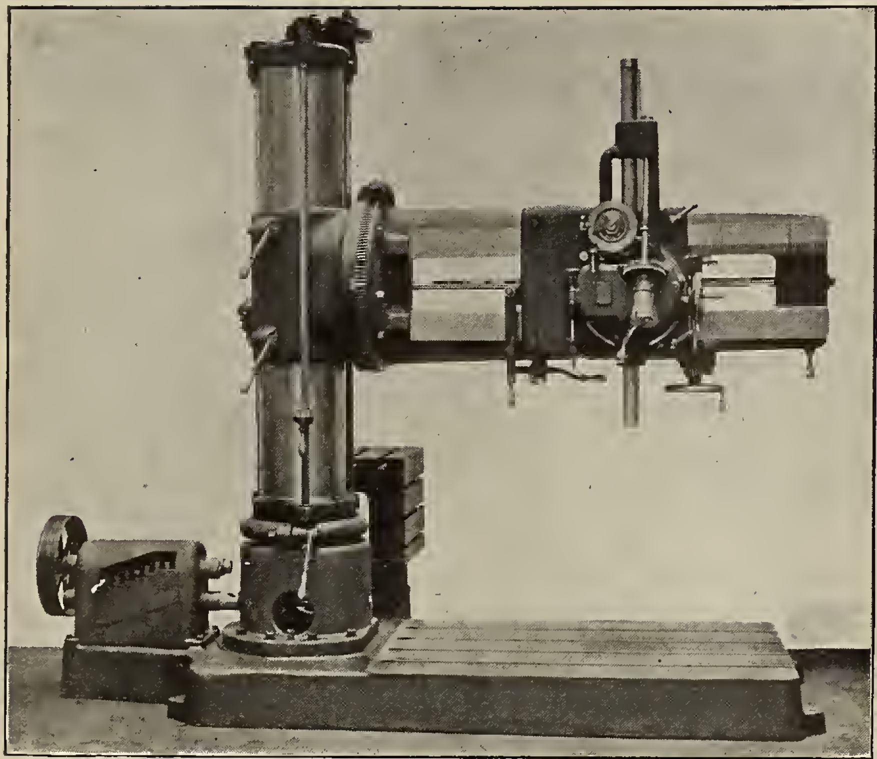
most facing of the inlet orifice is slightly choked, insuring the delivery of sediment laden discharge into the outlet orifice with a minimum infringement upon any of the steamtight members of the valve.

The Scully Steel and Iron Company of Chicago are exclusive agents for this valve in Chicago and the west.

New Universal Radial Drill

In the accompanying illustration is shown a new type of universal radial drills which the Bickford Drill & Tool Co., Cincinnati, Ohio, is just placing on the market. The chief characteristic claimed for the machine by its makers lies in the design of the arm which they say offers far greater resistance to the combined stresses of twisting and bending than is attained with any other style of arm they have hitherto been able to evolve. It is also claimed that this feature, combined with the exceptional facilities which the open form of arm offers for the introduction of a driving mechanism commensurate with the strength, power and durability obtainable in the balance of the parts, marks a most noteworthy advance in universal radial drill construction—obtaining, for the first time in its history, a degree of efficiency equal to that of a plain machine.

The sleeve is mounted on a stationary stump which extends up to and has a bearing at the top of the machine. This is equivalent to a double column and affords that stiffness which is so essential to true work. The arm may be rotated through a complete circle on its girdle and the head through a complete circle on its saddle which permits drilling at all angles radiating from the center of a sphere. The back gears, which are located back of the saddle and may be engaged or disengaged from the front of



NEW UNIVERSAL RADIAL DRILL.

the machine while running, furnish three changes of speed, each of which exerts at the spindle more than two and one-half times the pulling power of the next faster one. The spindle has fifteen changes of speed with the cone drive and twenty-four with the gear drive, and is provided with both hand and power feed, quick advance and return, safety stop, automatic trip, dial depth gauge and hand lever reverse. An engraved plate attached to the speed box shows how to obtain the proper speeds for different diameters of drills.

The depth gauge answers a double purpose. Besides enabling the operator to read all depths from zero, which does away with the usual delays concomitant to scaling and calipering, it supplies a convenient means for setting the automatic trip, the graduations showing exactly where each dog should be located in order to disengage the feed at the desired points. The automatic trip operates at as many different points as there are depths to be drilled at one setting of the work and, in addition, it leaves the spindle free, after any intermediate tripping, to be advanced or raised and advanced, or traversed its full lngth, without disturbing the setting of the dogs. It also throws out the feed when the spindle reaches its limit of movement.

The feeding mechanism furnishes eight rates of feed, ranging in geometrical progression from .007 inches to .064 inches per revolution of spindle, each of which is instantly available, eliminating all loss of time incident to shifting a belt or to operating under a feed of unnecessary fineness. An engraved plate attached to the head shows the operator how to obtain each of the feeds.

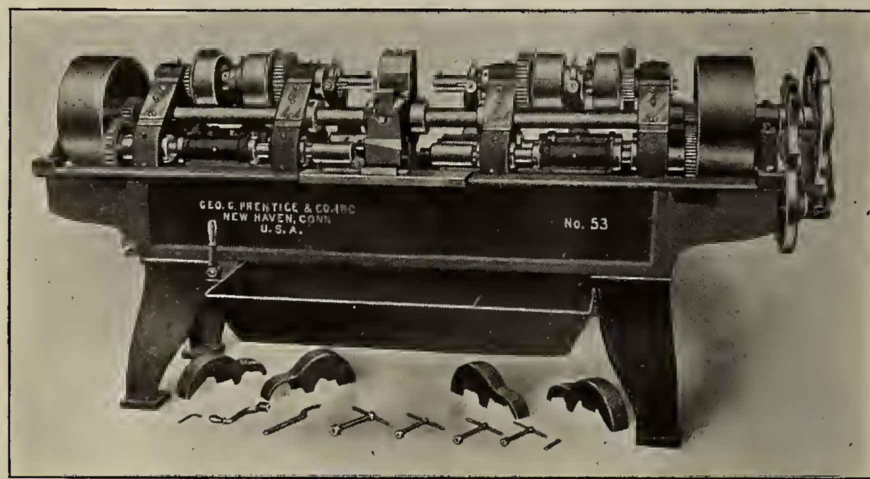
The tapping mechanism is located on the head and permits the backing out of taps at any speed with which the machine is provided, regardless of the speed used in driving them in. It is fitted with a friction clutch operated by a lever, the handle of which extends around under the arm within convenient reach of the operator.

The driving mechanism is incased in a box made fast to the base of the machine and consists essentially of a pulley, a cone of seven gears, a ratchet, ratchet gear and operating lever, the mere shifting of which from one notch to another furnishes any one of eight speeds. This box, taken in connection with the back gears on the head, gives the operator a choice of twenty-four carefully selected speeds, each of which is instantly available. The machine is furnished as either a half or full universal, each of which styles is made in three sizes, 4, 5 and 6 feet.

Double Head Multiple-Spindle Automatic Turret Machines

The double-head multiple spindle automatic turret machines, here illustrated, will perform boring, facing, drilling, turning, threading and other operations on both ends of a piece at one setting in the chuck. The standard machine has three spindles in each end between which is a chuck having four sections or sets of chuck jaws. The spindles, carrying the tools, are in line with the different sections of the chuck, except the upper section, where the operator removes finished work and inserts an unfinished piece while the machine operates constantly on a piece of work in each of the other sections of the chuck.

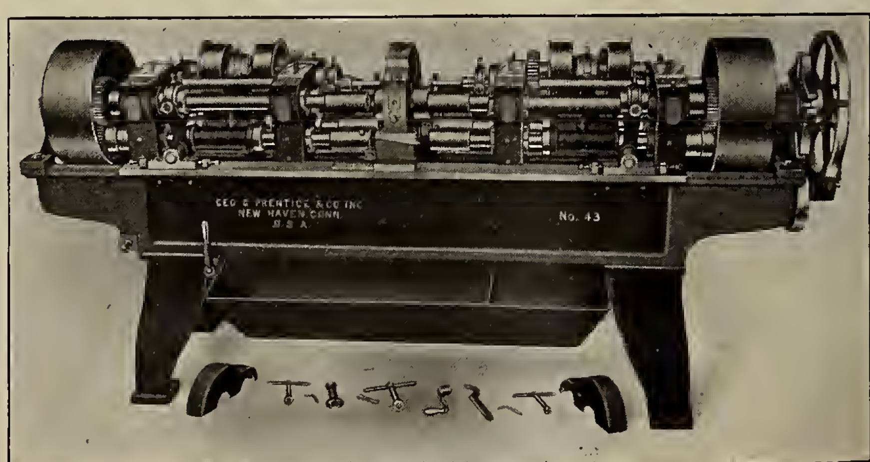
The spindles revolve and are fed up to the work by means of yoke and lever connection with cams on drums inside of the bed on cam shaft extending the entire length of machine. The



STANDARD SIX-SPINDLE DOUBLE HEAD AUTOMATIC TURRET MACHINE.

forward-feed cams are set at the proper angle to give the required advance or cutting feed to the tools onto the work, and the reverse cams draw the tools back from the work when the operations are completed. While the tools are backing off from the work, the chuck is automatically indexing around so that each piece of work is brought in line with the spindles which perform the next succeeding operations.

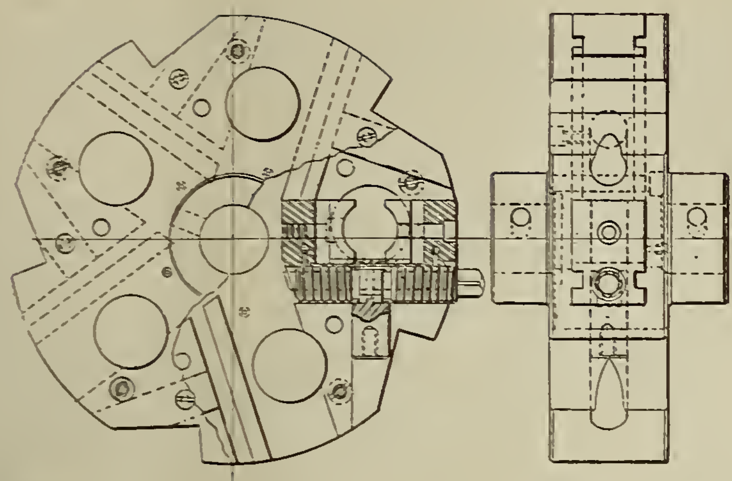
The whole operation of the machine is automatic and is timed so that the indexing occurs as soon as the longest single operation on any piece of work is completed. All the shorter operations are completed within this time, hence the time of finishing a piece of work on both ends is the elapsed time of the longest single operation plus a few seconds taken by the chuck in indexing and advancing of the tools. These machines are finishing



STANDARD EIGHT-SPINDLE DOUBLE HEAD AUTOMATIC TURRET MACHINE.

work in less than half the time required by turret, chucking and hand screw machines.

As the chuck indexes towards the front of machine, the first or roughing spindles are at the front, and the finishing and threading spindles follow. The threading mechanism consists of sliding tap or die holder with fork lever connecting with cam to start the lead of the thread. The driving mechanism consists of



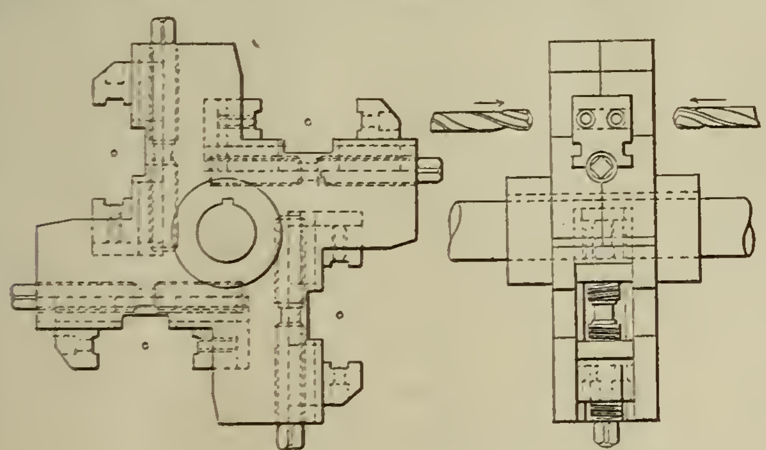
DETAILS OF CHUCK FOR EIGHT-SPINDLE TURRET MACHINE.

forward and reverse friction pulleys with expanding rings. The tap is driven the required number of turns into the work, then the reverse is automatically engaged and the tap withdrawn.

The proper cutting feed for different kinds of metal is obtained by change gears, worm and worm gear connecting with main feed shaft on which all cam drums are placed. The spindles are back geared and have ample driving power for all work within the rated capacity of the machine.

The three sizes of six-spindle machines, manufactured by the Geo. G. Prentice & Co., New Haven, Conn., are designated as follows: No. 52, for light work; No. 53, for ¾-in. pipe size threads and smaller, and No. 54, for 2-in. down to ¾-in. pipe threads. The net weights of these machines are 2,300 lbs., 4,400 lbs. and 7,500 lbs., respectively.

The same design of chuck is also made with four spindles in each head and a five section chuck. These are known as sizes Nos. 42, 43 and 44 and correspond in threading capacity and weight to the No. 52, 53 and 54 machines respectively. This



DETAILS OF CHUCK FOR SIX-SPINDLE TURRET MACHINE.

style of machine is better adapted for the bicycle hub and gas electric fixture work.

Special attention is called to the fact that the spindles which carry the tools that take the heavy cuts are rigidly yoked together and that they are fed up to the work by a cam roll and cam setting very close to the yoke so that the feed is very powerful and rigid.

These machines have the same chuck steady bracket feature as the single head machines. This is shown in the front ledge of bed. The selling agents are Messrs. Manning, Maxwell & Moore.

Technical Publications

Proceedings of the fifteenth annual convention of the International Railroad Master Blacksmiths' Association, held at Montreal, Canada, August 21-23, 1907. A. L. Woodworth, Secretary, Lima, Ohio.

The proceedings of the fifteenth annual convention of this association reflects the continued growth and importance of the organization. Among the principal subjects reported upon and discussed are: tools and formers for bulldozers and steam hammers; forging machine and bulldozer work; discipline and classification of work; flue welding; case hardening; best fuel for use in smith shop; frame making; thermit, and piece work.

Catalogue No. 45, Newton Machine Tool Works, Philadelphia, Pa.

This catalogue is so well prepared, so thoroughly illustrated and the text so comprehensive as to make it fairly equal to a text book on machine tools. This catalogue supersedes all previous issues, briefly describes the general line of machine tools manufactured by the issuing company and calls attention to the fact that many of the machines illustrated are at present being redesigned and the entire line constantly improved. The information contained relates to boring machines, chord horizontal, chord vertical, cylinder, floor, horizontal, locomotive rod, miscellaneous, portable and railway motor; cold saw cutting off machines, bar, combination, I-beam, crankshaft, steel foundry, miscellaneous; crank planers; drilling machines, multiple, portable, radial, rail; gear cutting machines; milling machines, duplex, horizontal, keyseat, portable, vertical, vertical spindle; nut machines; rotary planing machines; shaping machines, steel foundry, transverse head, crank and geared, portable; also a line of miscellaneous tools.

Notes of the Month

O. M. Edwards Company, Syracuse, N. Y., the well known manufacturer of window fixtures, extension platform trap doors, etc., has recently received orders for equipping a large number of cars with its window devices. This includes 50 cars for the Central Railroad of New Jersey, being built by the Harlan & Hollingsworth Corporation; 50 cars for the Long Island Railroad, now building at the Berwick plant of the American Car & Foundry Company; 90 cars for the Pennsylvania Railroad, being built by the Pressed Steel Car Company, and 75 cars for the same road now being built at Berwick.

Owing to the great increase during the past year in the sale of Thor pneumatic tools and appliances on the Pacific coast, it has been found necessary to move the office and storeroom of the Independent Pneumatic Tool Company from 11 Front street, San Francisco, California, to much larger quarters at 61 Fremont street, at which place a complete line of air tools and spare parts will be carried in stock. The new location is right in the heart of the machinery district.

Mr. S. W. Midgley, heretofore general sales representative of the National Car Coupler Company, has resigned his former position to accept that of western representative of the Curtain Supply Company, of Chicago, with headquarters at the general offices of the company, at 85-93 Ohio street, Chicago, Ill.

Carey's Coverings is the title of an attractive catalogue issued by the Philip Carey Manufacturing Co., of Cincinnati, Ohio, illustrating and describing the products of this company and many of the uses to which they are put. The large number of illustrations included in the catalogue are carefully selected and prepared and the text provides a thorough idea of the various coverings, their form and application. The Carey company has made extensive additions to its plants and is now well prepared to meet a heavy demand for high grade material.

The Westinghouse companies have just received from the printers in Chicago, an advance shipment of a new storage battery catalogue for the machine company, entitled "Westinghouse Storage Battery for Portable Use," While the Westinghouse Machine Company has been in the storage battery business for several years, all the literature issued up to the present time has been devoted to stationary storage batteries. This is their initial publication devoted exclusively to storage batteries for portable use.

The A. Gilbert & Sons Brass Foundry Co., St. Louis, Mo., has just completed its new factory building at 4015-17-19 Forrest Park boulevard, St. Louis. This company is well known to the railroads as manufacturers of car and engine brasses, having built up a large business in this field on its specialties. They are also manufacturers of other brass, bronze and aluminum goods, babbitt metal, etc. The new factory is modern and up-to-date in every respect. The building is of one-story construction, 75x180 feet, and has 26,000 sq. ft. of skylight of the saw tooth pattern. The furnaces, core ovens, in fact all of the melting devices, use oil instead of coke for fuel. In operating the overhead track system is used throughout so that raw material taken in at the receiving door leaves the shipping department completely finished and is handled with the utmost economy—both as regards time and labor. A fireproof pattern room is one of the special features of the new factory. Besides this are the locker rooms and shower baths. The office is on the second floor front. The new foundry is one of the most modern and complete of its kind and greatly increases the company's output. The officers of the firm are as follows: Chas. F. Gilbert, president and treasurer; Geo. W. Gilbert, vice-president, and J. A. Gilbert, secretary.

The Pittsburgh Automatic Vise & Tool Co., general offices, Pittsburg, Pa., has completed a large shipment of vises consigned to the Brazilian government, Rio Janeiro. The order is an outcome of inspection at the recent exhibit of the company at the Jamestown exposition. The shipment consisted of vises of both the double and single swivel type.

Capital Lock-Nut & Washer Company, Columbus, O., has completed work on a large number of. bolts and nuts which it has been manufacturing for the isthmian canal commission. These are to be used on the dump cars which are being built by the W. J. Oliver Manufacturing Company, of Knoxville, Tenn.

Philadelphia Turntable Company, Philadelphia, Pa., has removed its offices to the eighth floor of the Pennsylvania building, where larger offices have been provided. The company is designer and builder of standard steel turntables.

Falls Hollow Staybolt Company, Cuyahoga Falls, O., is making tests of Swedish iron and arrangements are being made for regular supplies which will result in the use of Swedish iron exclusively for its hollow staybolts. It is claimed that this iron is so pure that it can be heated to high temperature without burning, and in other tests it is found to be very tough, resisting breakage by sledge hammer blows after being nicked all around.

Farlow Draft Gear Company, Baltimore, Md., will remove its offices on December 20 from its present quarters in the Continental Trust building to the Keyser building, where more commodious offices have been secured to meet the increased demand of its business. John H. Farlow, the inventor of the Farlow draft gear, has severed his connection with the South Baltimore Steel Car & Foundry Company and has been engaged by the Farlow Draft Gear Company as general manager.

E. B. Boye has been appointed western representative of the Warner & Swasey Company, Cleveland, O., with headquarters at 605 Commercial National Bank building. Mr. Boye was formerly manager of the Cleveland office of Manning, Maxwell & Moore, Incorporated.

To meet the constantly growing demand for high grade valves suitable for extra heavy pressures, Jenkins Bros., New York City, are now prepared to furnish both brass and iron body valves suitable for working steam pressures up to 300 lbs. Their extra heavy brass globe and angle valves, placed on the market several years ago met with such favor in the hands of users of high pressure steam that the firm was induced to make further additions to this class, with the result that they have designed a line of extra heavy iron body valves. As with all Jenkins Bros. specialties, these valves are absolutely guaranteed for the service for which they are designed, and are stamped with their trade mark.

Schoen Steel Wheel Company, Pittsburg, Pa., is constructing a structural steel building, 217 by 240 feet, at its plant at McKees Rocks, Pa. This building, which will contain four 30-ton open-hearth steel furnaces, designed by the Schoen company's consulting engineer, the Garrett-Cromwell Engineering Company of Cleveland, O., will be built by the Riter-Conley Manufacturing Company, Pittsburg. The latter company also has the contract for a steel addition, 83 by 115 feet, to the No. 2 mill building. The open-hearth plant will be served by one 50-ton and one 10-ton Shaw electric traveling crane, with 46-foot 6-inch span. The scrap yard will have two 5-ton cranes of the same manufacture and type. The plant will be equipped with the most approved type of electric machinery for the economical and satisfactory handling of all products of the furnaces. The boiler capacity will be increased with Babcock & Wilcox Company A & T type of boilers. The open-hearth gas supply will be secured from 12 Foster-Miller gas producers, 15 of which will then be in continuous operation at the Schoen plant. At the present time the output is from 375 to 450 wheels a day, but after the improvements we have outlined are made and the contemplated slabbing mill is in operation, the capacity will be 1,000 Schoen steel wheels each day.

Combined Liquid Tank & Freight Car Company, 80 Dearborn street, Chicago, will build car building shops and a power plant east of Gary, in section 18, Lake county, Indiana. Two shops will be erected, 80 by 150 feet and 80 by 200 feet, one dry kiln, one story high and 60 by 100 feet, and an engine house and boiler house. Brick, with structural iron, concrete foundations, galvanized iron skylights, composition roofing, electric wiring and cement floors will be used in the construction. Frederick Lindquist, 90 Washington, street, Chicago, will prepare the plans. The construction work will probably be done by the day. J. H. Bruce is president of the company.

F. T. Sloan, for a number of years connected with the insurance department of the United States Steel Corporation; and for the past four years insurance engineer of the Brooklyn Rapid Transit Company, has associated himself with S. F. Bowser & Co., Ft. Wayne, Ind., as special representative. During his connection with the Brooklyn Rapid Transit Company Mr. Sloan spent most of his time on the installation of fire-fighting apparatus and systems, fire alarm stations, sprinkling devices, etc., as well as the organization of fire brigades. That this work has proven thorough and effective is apparent from the fact that during Mr. Sloan's incumbency the insurance claimed has been relatively small. He will assume his new duties January 1, with headquarters at Ft. Wayne.

The Hartford Blower Company has just completed installing the largest dust collector for shavings, saw-dust, etc., ever built. This was installed for a large concern in the southern part of the state of Connecticut, and was built of sheet steel one-eighth of an inch thick. This company, which makes a specialty of installing blower systems of all kinds, as well as doing general machine and sheet iron metal work, have also just completed a large contract, including two 60-inch Hartford exhaust fans for Cheney Brothers at South Manchester, and have a large number of contracts at present for manufacturing concerns, and the company is exceptionally busy and has been obliged to increase its facilities for manufacturing.

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CONTENTS

The General Foremen's Association

FROM the preliminary announcements it would appear that the annual meeting of the International Railway General Foremen's Association, to be held at the Lexington Hotel, Chicago, May 25 to 29, 1908, is likely to prove the most interesting and important since its organization. Delegates are expected from every section of the country and the speakers and members of the various committees assigned to subjects will be from the ranks of foremost railway shop foremen.

A request is to be made upon the superintendents of motive power of the various railways in the United States and Canada to allow their men to attend the convention without loss of salary during their attendance and to arrange to meet the necessary expenses incurred during the trip. If such an arrangement could be made by the heads of the motive power departments it would have great influence in developing the association and in producing fruitful results.

There are many common problems of administration and shop management even where the matters of local interest are so widely diversified as they naturally are among the various railways which constitute the traffic highways of a country so large as ours. As a rule foremen and general foremen are chosen from the ranks of men in the company which they serve and their training has been influenced by the individual peculiarities of the railway systems with which they have been associated. In view of this a conference among men similarly situated, yet with varying experiences, cannot help being valuable.

The railroads of the country have shops varying in degree of development. Some of them were built years ago for the repairs of a small number of engines and they are still in operation. Others, again, are modern in every particular, as regards both arrangement and equipment, as well as construction. For this reason the idea of conferences among railway shop superintendents and foremen is one which deserves every encouragement. The facilities for transportation are such that the matter of distance from the place of meeting should not deter motive power officials from sending their foremen for the interchange of opinion and the broadening of views.

The proposed program for the meeting next May involves a number of interesting subjects well worthy of investigation and discussion. Quite properly the apprentice question will receive careful consideration and such topics as securing the proper material for apprentices, methods orf keeping apprentices interested in their work and the advantages of night schools maintained at company's expense, will be read and discussed. Reports and papers are to be presented on modern shop construction; location of lavatories; care of shop order material and convenience of storage; also on locomotive mileage; its relation to cost of shop and running repairs, etc. Not the least important question to be discussed is, Which is the cheaper to maintain, piston or slide valves? Engine inspection and methods of reporting work will be thoroughly discussed and several other interesting topics will be given consideration.

Altogether there is a great deal to commend in the work of this association and there is every reason to believe that favorable action upon the request to be made to the heads of motive power departments, will react to the advantage and improvement of railway shop conditions at large.

Diagonal Locomotive Erecting Pits

THE criticism has been offered that a locomotive erecting floor arranged as in the Silvis shop of the Chicago, Rock Island & Pacific Railway, does not require a pit for each locomotive undergoing repairs.

In this shop the working pits are neither transverse nor longitudinal, but are diagonal. The principle on which the pits are laid out provides for the angle of location to be determined by an average length locomotive suspended from two cranes about to approach each other. The pits are arranged in two rows and midway between is a track extending the full length of the shop. At each end of the shop and beyond the area occupied by the diagonal pits, this track includes a pit 132 feet long. At the end of the shop at which locomotives enter, are two additional pits of the same length, parallel with the longitudinal track and spaced 24 feet between centers, these three pits affording sufficient space for stripping and preliminary work. At the other end of the shop are two longitudinal pits of the same length similarly arranged.

Locomotives entering the shop are unwheeled and stripped on the longitudinal pits. They are then transferred by the cranes to the diagonal pits where repairs are made and are finally rewheeled on the longitudinal pits at the end of the shop opposite to that at which they entered.

The criticism that pits are unnecessary under the diagonal working stalls seems to originate in a belief that as the engines are unwheeled and wheeled over pits, the remaining work of repair can be done conveniently on an erecting floor with no depression in the space beneath the dismantled locomotive. Advocates of such a method of procedure would then seem to commend a mere allotment of space for each engine after it had been unwheeled.

There are a number of reasons why it would be impractical to attempt locomotive repairs without a deep working space beneath the locomotive and beyond the provision for economy in the first cost of construction there is no apparent reason for dispensing with the pits. The pits are so disposed as to offer no impediment to foot or truck traffic about the floor; distribution of material is equally convenient either longitudinally or transversely. With no depressed working space beneath each locomotive, it would be necessary to block the locomotive at a greater height above the floor than is customary. Blocking at such height as to facilitate work beneath a locomotive, would require men to work on scaffolds while doing jobs which could otherwise be done from the floor. Such additional blocking and scaffolding naturally offers greater impediment to movement about the engine and is inconvenient at best. More or less boiler washing is necessary during the time that a locomotive is in the back shop and the absence of a pit by which to dispose of the water would cause considerable inconvenience and delay. Water used in testing boilers must be disposed of also. The nature of the work, both boiler washing and general repair, requires such disposition that progress shall not be interrupted and an attempt to wash boilers on the limited longitudinal pit space at one end of the shop would cause delay and congestion.

Shop Extension

THE remarkable growth of traffic on the railroads of this country has made it necessary to improve and enlarge repair shop facilities for both locomotives and cars. Naturally the extension of repair shops should be in proportion to the demands of traffic and it is manifestly good management to provide repair facilities when the conditions demand them.

There are two methods of taking care of an increasing volume of repairs. First, by building new shops or, second, by increasing the efficiency and output of existing shops by the introduction of improved facilities and methods. The first plan naturally suggests itself as being the more logical. Enlarged facilities are generally considered to mean increased output. Since it would be an admission of bad management to concede that existing shops are not working up to their maximum output, it has generally followed that old shops have been enlarged or new shops built to meet the conditions arising during the last few years.

An investigation of conditions, however, shows that in some cases, shop extension and new construction have not been warranted. New shops are expensive and represent an investment that does not possess any direct earning capacity. If the same results can be obtained from existing shops with a smaller expenditure of money than it would cost to construct new shops, it must be admitted that the amount expended on new construction would be a dead loss.

The efficiency of existing shops of a road should be accurately determined before new shops are built. When the efficiency is low on account of poor management and lack of facilities, the output can be increased to the maximum by adopting up to date methods. In many cases the increase in output resulting from a change in operation will be ample to take care of the increased volume of repairs and at a much more economical rate than a new and expensive plant. Unless a modern shop is constantly operated at its maximum, the cost per unit of work done is high and the economical value of the plant is more than offset by the high surcharge costs of production, due to an expensive plant and machinery. This is sometimes lost sight of and not properly charged up to operating costs, but the fact remains that many of the older shops, well managed and equipped with modern appliances, have not only responded to the demands of increased output but have also shown a superior economy in the cost of production over the larger and newer plants. It would seem that the status of the existing shops in regard to a possible increase in output should be carefully determined before the construction of new shops is decided upon.

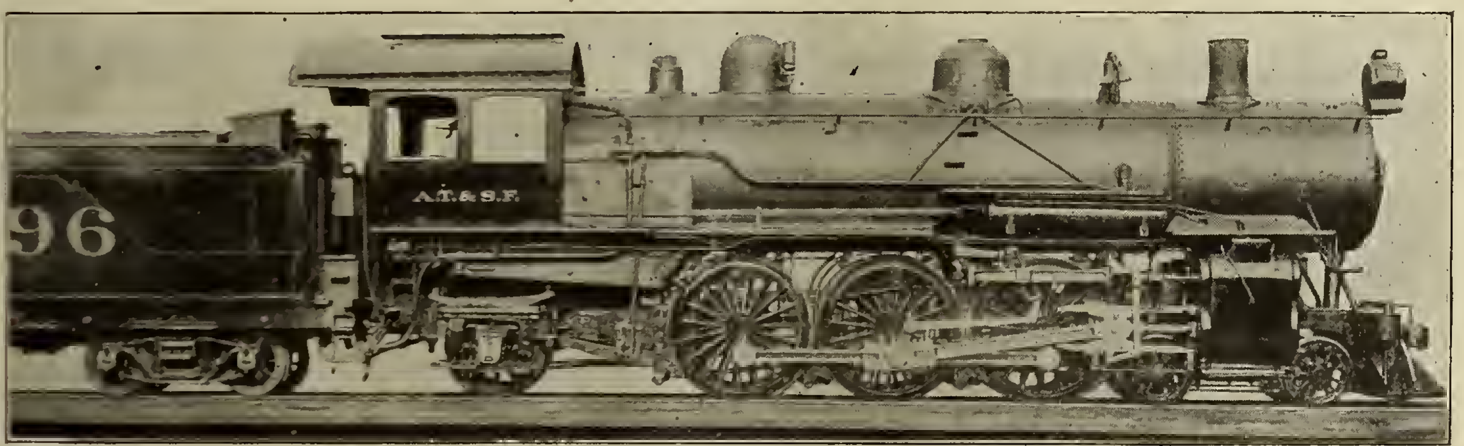
New Locomotives for the Atchison, Topeka & Santa Fe Railway

THE Baldwin Locomotive Works have recently completed an order for 49 locomotives for the Atchison, Topeka & Santa Fe Railway. Seven of these engines are of the Pacific type for passenger service, and 42 are of the consolidation type for freight service. All are equipped with single expansion cylinders, piston valves, Walschaerts valve motion and smoke box superheaters. Ten of the Consolidation type locomotives are equipped for coal burning while the remainder, including the Pacific type engines, are arranged for burning oil.

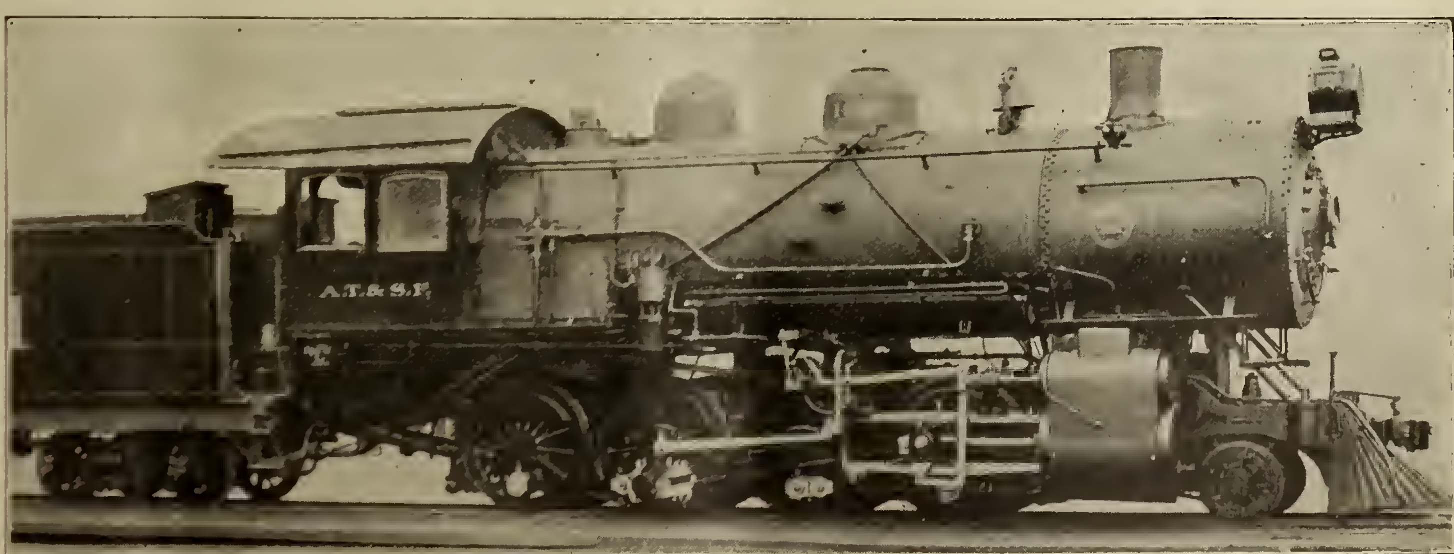
The Atchison, Topeka & Santa Fe Railway has for some time been operating a ten-coupled locomotive with a smoke box superheater, and the successful performance of this locomotive has resulted in the adoption of superheated steam at comparatively low pressure on the engines now under notice.

The Pacific type locomotives have 25x28-inch cylinders and driving wheels 73 inches in diameter, and as the safety valves are set at 160 pounds, the tractive force is 32,600 pounds. The boiler is straight topped, with sloping throat and back head, and tubes 20 feet in length. The barrel is built up of four rings, which have "Diamond" butt jointed seams on the top center line. The firebox is radially stayed, and the front end of the crown is supported by two I-irons. All firebox rivets are countersunk on the inside. Washout plugs are liberally provided in the front tube sheet, back head and water legs; also on the lower center line of the barrel, along the water level, and in the outside sheet just below the fire box crown.

The superheater is of the smoke box type, as developed by the Baldwin Locomotive Works The final passage of the steam is made through the tubes at



PACIFIC TYPE LOCOMOTIVE FOR THE A. T. & S. F. RY.



CONSOLIDATION TYPE LOCOMOTIVE FOR THE A. T. & S. F. RY.

the back of the smoke box, where the gases are hottest. The joints between the tube plates and drums are made tight with copper gaskets.

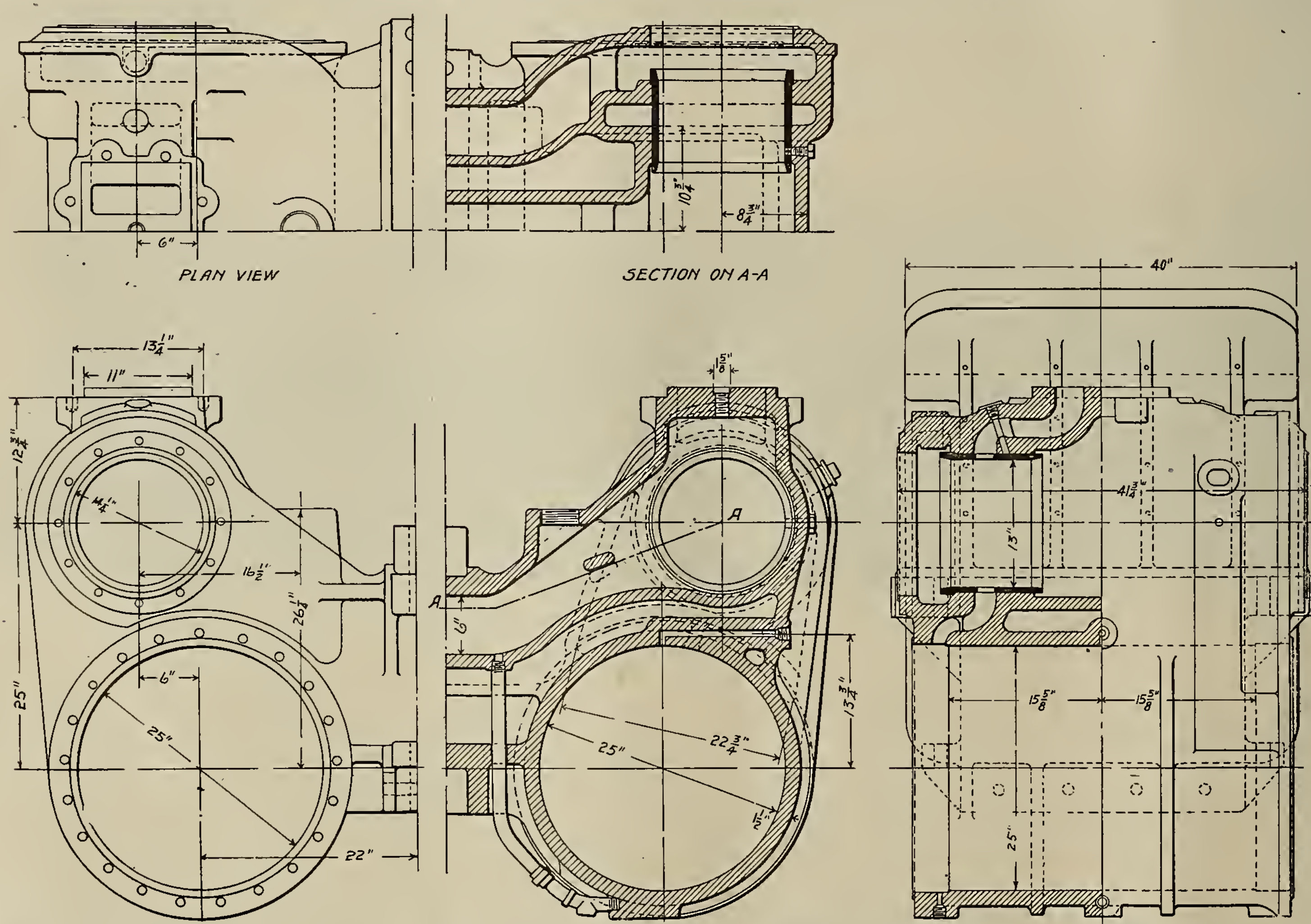
The cylinders are designed for double front rails, and are equipped with inside admission piston valves 13 inches in diameter. The steam chest center lines are placed 6 inches outside the cylinder center lines. The valves have a steam lap of 1⅛ ins. and an exhaust clearance of ⅛ in. They are set with a constant lead of ¼ in. and have a maximum travel of 6¼ ins. The relief valves are of the style used by the Pennsylvania R. R. on its piston valve locomotives. The live steam ports are extended up to a horizontal face placed above the steam chest. The ports are covered by a plate, which, when the throttle is open, is held on its seat by steam pressure acting on its upper surface. Should the pressure underneath become excessive, the plate is lifted from its seat, and communication thus established between the two ends of the cylinder.

The location of the steam chests makes it possible to use a direct form of valve motion with all parts placed in practically the same vertical plane. Each link is supported by two cast steel bearers which are bolted, in front, to the guide yoke, and at the back to a suitable support. The valve rod is carried on a bearer bolted to the top guide, and is rectangular in section.

The front truck is of the swing bolster type, with cast steel saddle and three point suspension links. The rear truck is of the Rushton pattern with outside journals. The engine truck and tender wheels are steel tired with cast steel spoke centers, and were manufactured by the Standard Steel Works.

The tender frame is built of 12-in steel channels with wood bumpers, and the trucks have arch bar frames, cast steel bolsters and triple elliptic springs. The tank has a water bottom.

The Consolidation type locomotives have cylinders 24 inches in diameter by 32-in. stroke, and this, with 57-in. driving-wheels and a steam pressure of 160 lbs., gives them a tractive force of 43,970 lbs. The details are in many respects similar to those of the Pacific type locomotives. This is especially true of the cylinders, with their piston and relief valves, the valve motion details, and many of the smaller fittings. The link bearings on the Consolidation engines are bolted to the guide yoke, which also serves as a support for the reverse shaft bearings. The cast steel details for both types include such features as frames, wheel centers, driving boxes and spring saddles, cylinder heads, crossheads and foot plates. The tenders for both the passenger and freight locomotives are similar throughout.



DETAILS OF CYLINDER SHOWING PISTON VALVE RELEASE ARRANGEMENT—NEW LOCOMOTIVES OF THE A. T. & S. F. RY.

The principal dimensions appear in the following table:

	Pacific.	Consolidation.
Type of engine	4-6-2	2-8-0
Service	Pass.	Freight
Fuel	Oil	Oil
Tractive force	32,600	43,970
Gauge	4 ft. 8½ in.	4 ft. 8½ in.
Cylinders	25x28	24x32
Valve gear, type	Walschaerts	Walschaerts
Valves, size and kind	Bal. Piston	Bal. Piston
Valves, steam lap	1⅛ in.	1⅛ in.
Valves, exhaust clearance	⅛ in.	⅛ in.
Valve travel, in full gear	6¼ in.	6¼ in.

Ratios.		
Weight on drivers÷tractive force....	4.3	4.1
Tractive force×diameter drivers÷heating surface....................	701.6	855.3
Total heating surface÷grate area...	68.5	61.8
Tube heating surface÷firebox heating surface	16.8	17.6
Weight on drivers÷total heating surface	41.3	62.5
Volume of cylinders, cu. ft.........	17.74	15.9
Total heating surface÷volume of cylinders	202.6	184.2
Grate area÷volume of cylinders.....	2.9	2.9
Boiler.		
Type	Straight	Straight
Working pressure	160 lbs.	160 lbs.
Diameter first ring................:	72 in.	78¾ in.
Material	Steel	Steel
Staying	Radial	Radial
Firebox.		
Material	Steel	Steel
Length	107 1/16 in.	95½ in.
Width	66 in.	71¼ in.
Depth, front	75⅞ in.	73⅛ in.
Depth, back	67⅜ in.	62⅛ in.
Thickness of sheets, sides..........	⅜ in.	⅜ in.
Thickness of sheets, back..........	⅜ in.	⅜ in.
Thickness of sheets, crown.........	⅜ in.	⅜ in.
Thickness of sheets, tube..........	9/16 in.	½ in.
Water space, front................	4½ in.	4½ in.
Water space, sides................	5 in.	4 in.
Water space, back.................	4 in.	4 in.
Tubes.		
Material	Iron	Iron
Wire gauge	No. 11	No. 11
Number	273	355
Diameter	2¼ in.	2 in.
Length	20 ft.	15 ft.
Heating Surface.		
Firebox	190 sq. ft.	157 sq. ft.
Tubes	3,202 sq. ft.	2,773 sq. ft.
Total	3,392 sq. ft.	2,930 sq. ft.
Grate area	49.5 sq. ft.	47.4 sq. ft.
Driving Wheels.		
Diameter, over tires...............	73 in.	57 in.
Diameter, wheel centers............	66 in.	50 in.
Journals, main, diameter and length.	10x12 in.	10x12 in.
Journals, others, diameter and length	9x12 in.	9x12 in.
Engine Truck Wheels.		
Diameter, engine truck.............	34¼ in.	29¼ in.
Journals, engine truck, diam. and lgt.	6x10 in.	6½x10½ in.
Diameter, trailing truck...........	50 in	....
Journals, trailing truck, diameter and length	8x14 in.	....
Wheel Base.		
Driving	12 ft. 8 in.	15 ft. 6 in.
Total engine	34 ft. 5 in.	24 ft. 6 in.
Total engine and tender............	65 ft.	58 ft. 3 in.
Weight.		
On driving wheels.................	140,400 lbs.	183,200 lbs.
On engine truck...................	54,950 lbs.	29,200 lbs.
On trailing truck.................	37,400 lbs.	....
Total engine	232,750 lbs.	212,400 lbs.
Total engine and tender, about.....	395,000 lbs.	375,000 lbs.
Tender.		
Style	Water bottom	Water bottom
Wheels, diameter	34¼ in.	34¼ in.
Journals, diameter and length.......	5½x10 in.	5½x10 in.
Water, ...	8,500 gals.	8,500 gals.
Oil, capacity	3,300 gals.	3,300 gals.

COMMUNICATION

The Young Engineer in the School of Experience

Editor, Railway Master Mechanic:

I want to take occasion to say that I think the editorial appearing in the January issue of your journal on the young engineer is first class. It would seem to me that the young engineer who has not fired a locomotive in frieght service for some time would be glad of an opportunity to fire freight for a while again. In many instances, since some young engineers have left freight service, the engines they used to fire have been replacd with larger ones and the general machinery has become more complicated. The wide and shallow firebox as against the narrow and deep one requires a different method of firing and without knowledge of this difference the chances would be good for an engine failure if an inexperienced engineer was put out on the road with a new fireman. Then as the engines are larger, trains longer and tonnage greater, good judgment is required to handle such trains to make an ordinary run and keep from pulling out drawbars or otherwise causing damage.

Several instances have recently come under my observation which might be held up as examples. For instance, one man who has fired about six years, practically all on passenger, and who has run a switch engine for two years, was sent out on the road recently and it took him more than 24 hours to make less than 100 miles. He pulled out drawbars by the bunches, doubled the hills, layed out nearly every other train on the division until finally the trainmaster went out to meet him and helped him into the terminal. This young engineer was put back to firing and as he was entitled to it, took a passenger engine in spite of the fact that the traveling engineer requested him to take freight for a while merely for the sake of experience. He absolutely refused the request of the traveling engineer and became very angry because such a proposition was made to him. This young man happened to ask me what I thought of such a request and I told him very candidly that I thought he should be glad of the opportunity of gaining experience; but he could not be persuaded to see it that way. He is now running a switch engine, which likely is all he will ever get.

A number of other cases equally bad have come under my notice from time to time and the utter incapacity shown by some young engineers would surely seem to convince the average fireman of the necessity for taking the "hard knocks" of experience. The greatest inducement I can see to become a successful engineer is a man's own ambition, to be ever ready and willing to do his full part, never to shirk when the runs are hard and ever willing to go where duty calls.

There are young men of the type that I described above on every road in the country who are always looking for something easy, who, when they are called upon and put to the test, are found lacking. Because there are such men I wish every fireman could read your article.

Yours truly,

An Engineer.

Adjustable Scaffolds for Car Paint Shops

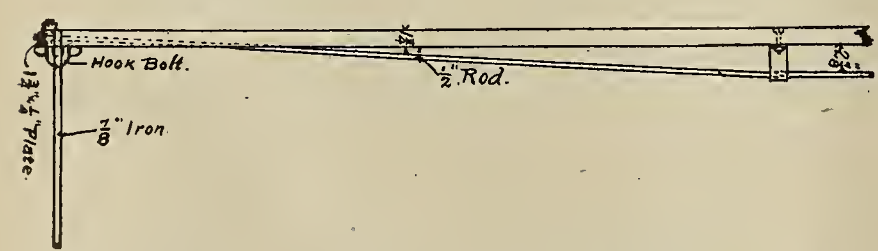
IN the January issue of the Railway Master Mechanic the designs of scaffold used in several different railroad car paint shops were illustrated and described. The designs of a number of other scaffolds equally interesting are presented herewith.

CANADIAN PACIFIC RAILWAY.

The adjustable scaffold in the car shops of the Canadian Pacific Ry. at Montreal presents another design of wooden construction. The platforms are attached to wooden posts and slide on ways supported from the cross timbers. A rope running from the adjustable posts over a sheave is used to raise and lower the platforms.

The accompanying sketch gives a clear idea of the construction of this scaffold. The posts are set 19 ft. 5 in. apart and those at the sides of the shops are 4 ft. 2 in. from the wall, to which they are braced. The guide post is suspended from a cross timber and braced to the wall or shop columns. It consists of a wooden back of 1¼-in. material 12½ in. wide with two 3⅝-in. guide strips attached to each edge and a 2½-in. post with ½ by ¾-in. guide strips fastened to the center. This forms a box guide for the adjustable posts. These posts are 11 ft. 10½ in. long of 3½-in. square section and grooved in one face ¾ in. wide and ¾ in. deep are made to move up and down freely in the guides.

The platforms are 20 ft. long, 10 in. wide and 1¾ in. thick with ½-in. truss rod, and are supported on brackets made of ⅞-in. round iron. The upper end of the bracket



PLATFORM OF SCAFFOLD IN COACH PAINT SHOP OF CANADIAN PACIFIC RY. AT ANGUS.

encloses the post with a band connection while the lower end rests in a socket set in the post. The bracket has two adjustments on the post, one 2 ft. 2¾ in. above the floor and the other 4 ft. 1¾ in. above the floor, in addition to the adjustments of the posts themselves.

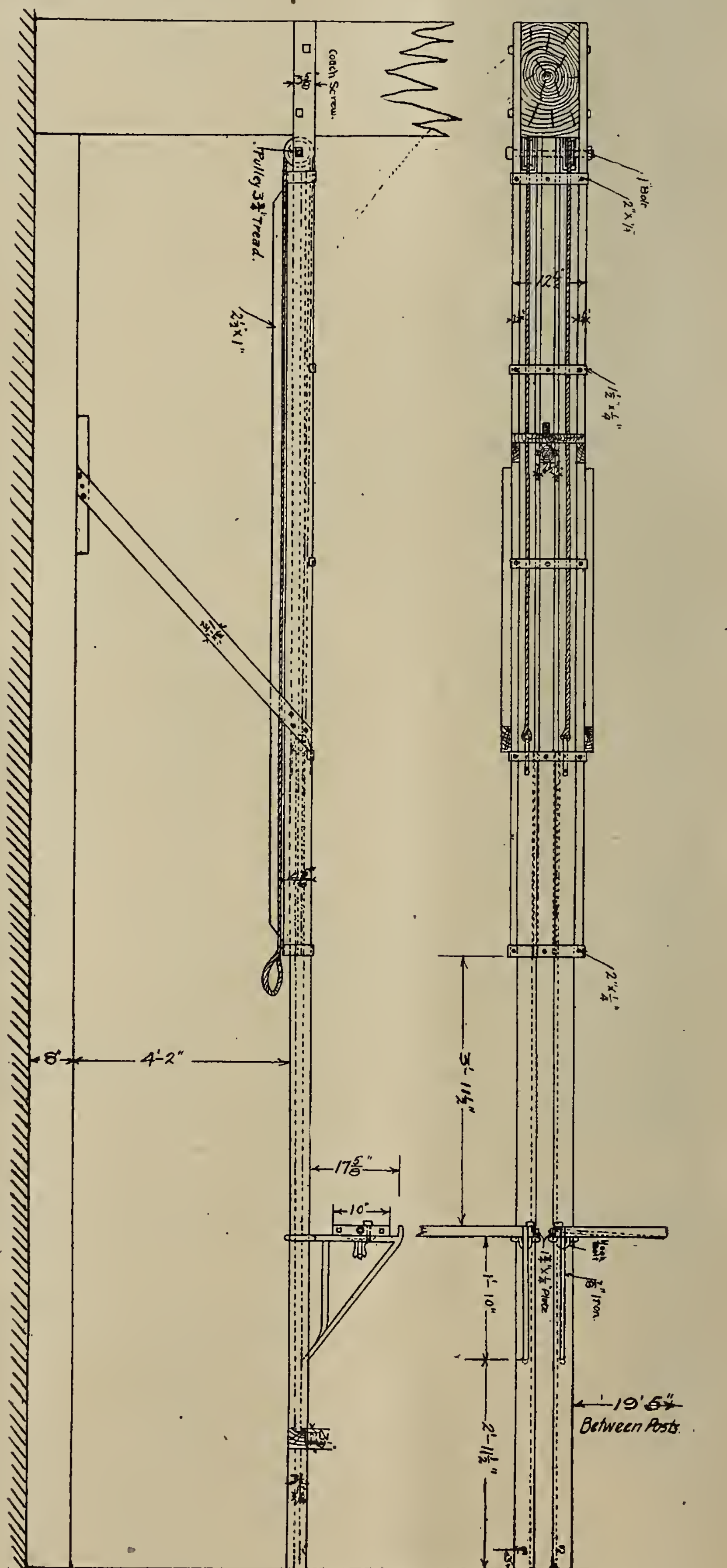
At the upper end of the post is attached an eye to which the operating rope is fastened. The rope runs over an iron sheave just below the cross timber and down behind the post within easy reach of the operator. The platform is adjusted in different positions by manipulating the rope. The extreme adjustments are from 2 ft. 2¾ in. to 8 ft. 10¾ in. above the floor. It will be noticed that this design is original and presents a number of features entirely different from those previously described.

NEW YORK, NEW HAVEN AND HARTFORD RAILROAD.

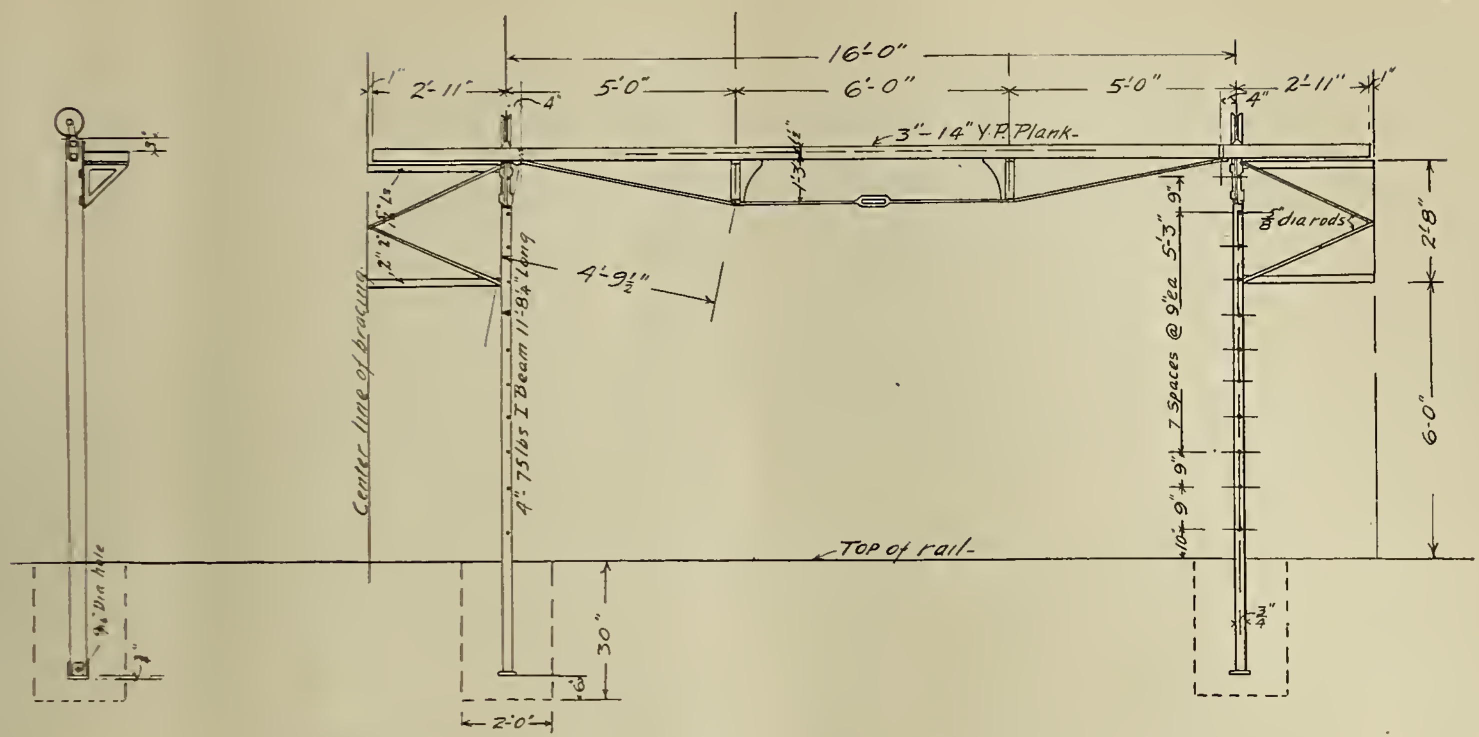
In the Readville shops of the N. Y., N. H. & H. Railroad a steel scaffold with some unusual features is in use. The scaffold is noteworthy on account of the unusual length of platform and lightness of construction. The platforms are counterweighed and move easily up and down the face of the column. A lock which is closed by a spring will stop the platform at any point and hold it there, while the lock is set.

As shown by the illustration the columns are 3 ins. I beams 12 ft. long set in a concrete foundation to a depth of 12 ins. They are spaced 9 ft. 3 in. apart and are braced at the upper end by two sets of ½ by 1½ in. tie rods connected to the shop posts and opposite columns.

The platform is made of spruce and southern pine and



SCAFFOLD IN COACH PAINT SHOP OF CANADIAN PACIFIC RY. AT ANGUS.



SSCAFFOLD IN COACH PAINT SHOP OF D. L. & W. R. R. AT KINGSLAND.

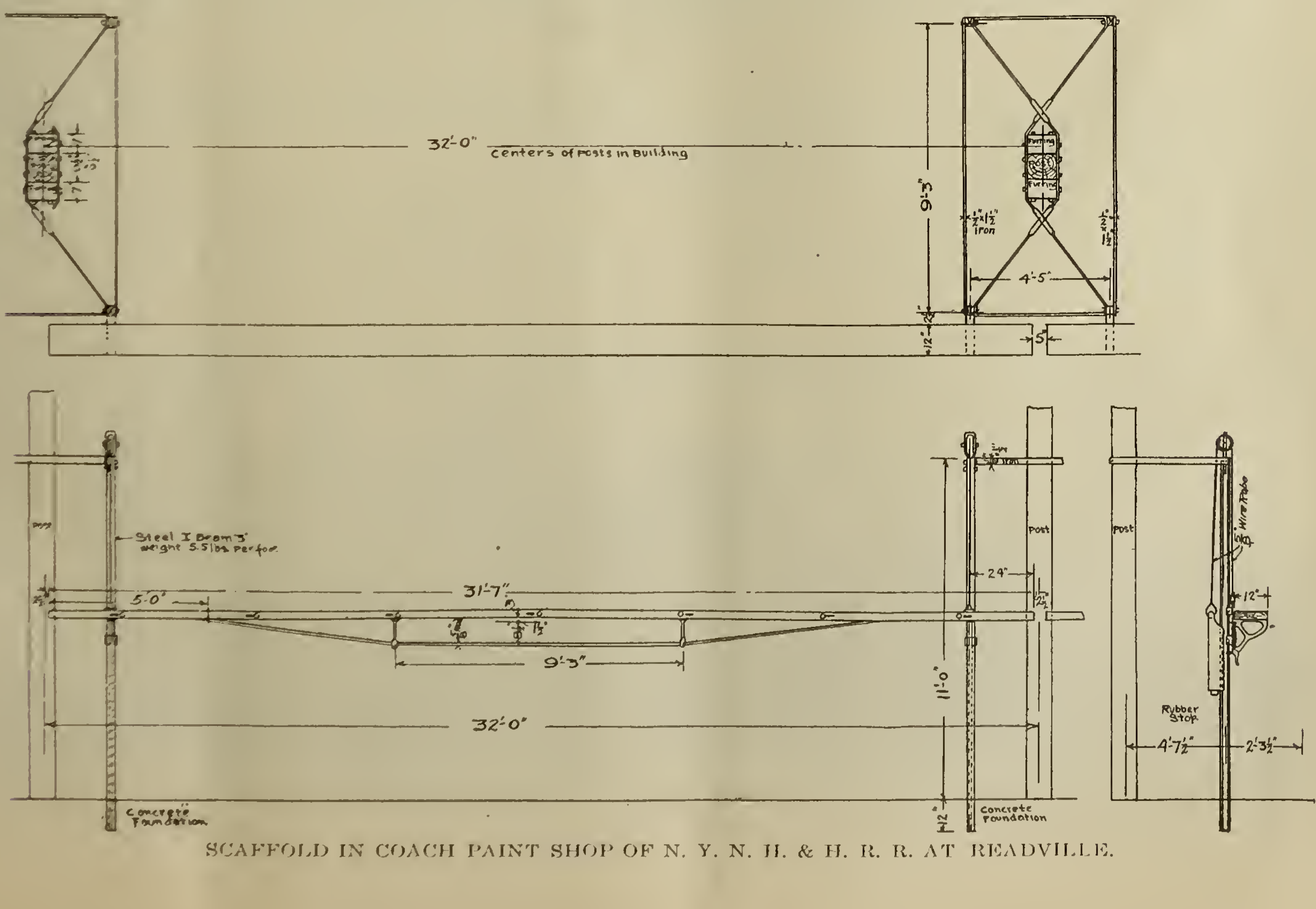
is 31 ft. 7 in. long, 12 in. wide, 3 in. deep and trussed with two ⅝-in. rods. The bracket is malleable iron and designed to obtain strength with lightness. It is grooved at the back to slide on the flanged face of the column. At the lower end of the bracket a spring lock is placed which controls the movement of the platform. The lock is kept closed by the coiled spring and can be released without leaving the platform by operating a small lever at bottom of bracket, allowing the platform to move up or down on the column. The platform can be stopped at any point and held without danger of slipping.

The platform is balanced by a counterweight with which it is connected by a ⅝-in. durable wire rope running over a sheave at the top of the column. This counterweight is recessed to receive the column which forms a guide for it during movement.

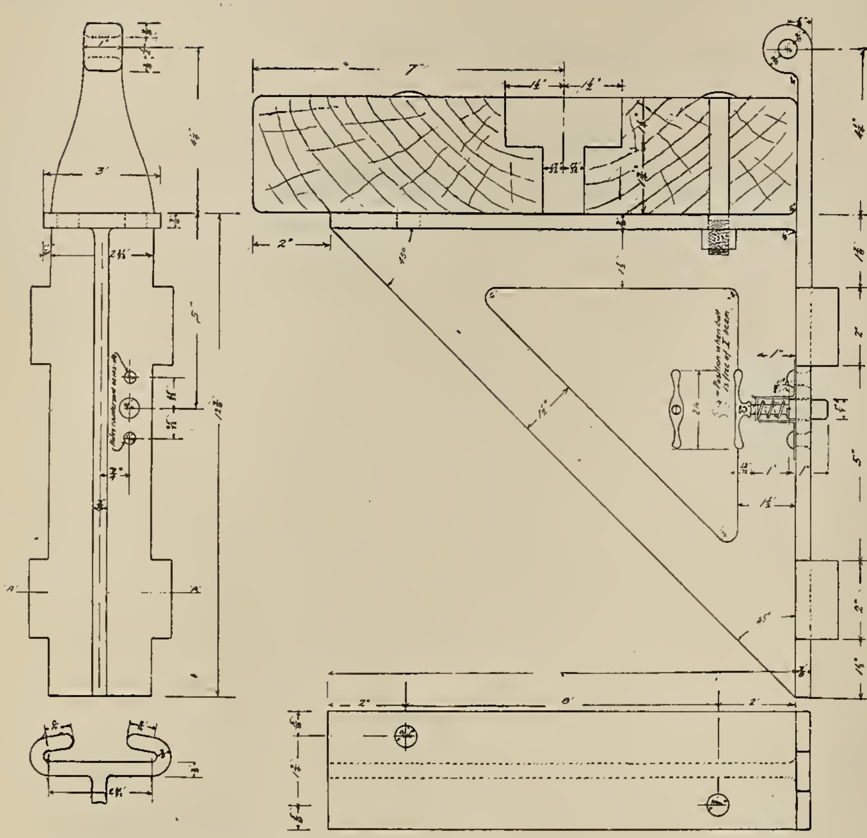
Th scaffold presents a number of novel features and shows evidence of careful design in regard to construction of parts and convenience of operation.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD.

The scaffold in the Kingsland shop of the D., L. & W. R. R., presents a number of practical features of interest. The columns of this scaffold are 4-in. I-beams and are arranged in a row on each side every line of track in the shop. The platforms are carried on brackets which slide upon the face of the I-beam. Each bracket is connected with a counterweight by a rope running over a sheave on the top of the column. The platform is adjusted in position by means of a stop pin



SCAFFOLD IN COACH PAINT SHOP OF N. Y. N. H. & H. R. R. AT READVILLE.



PLATFORM BRACKET FOR SCAFFOLD IN COACH PAINT SHOP OF D. L. & W. R. R. AT KINSLAND.

which engages a series of holes in the I-beam, at different heights above the floor.

The columns are 4-in., 7½-pound I-beams, 11 ft. 8¼ in. long, imbedded 2 ft. 6 in. in concrete, and stand 9 ft. 3 in. above the floor. The columns supporting each platform are placed 16 ft. apart and are not braced laterally, but each set is connected by 2-in. angle irons and two ⅝-in. round cross rods. This gives a very strong longitudinal bracing. Through the outer flange of each column are drilled eleven 9-16 in. holes, 9 in. apart, for receiving the stop pin of the bracket. The platform can be adjusted in successive position 9 in. apart and up to a point 9 ft. above the floor.

The platforms are 21 ft. 10 in. long, 14 in. wide and 3 in. thick and are trussed with ⅝-in. rods. The brackets forming the support of the platform are made of malleable iron 12 in. deep and 3 in. wide with an eye cast in upper end for attaching counterweight rope. On the back of the bracket two sets of lips are made to clasp the flange of the column to act as guides. Near one edge of the bracket, and 5 in. from the top is located the stop pin which is ½ in. in diameter, fitted with a handle and coil spring for forcing it into the holes in the column.

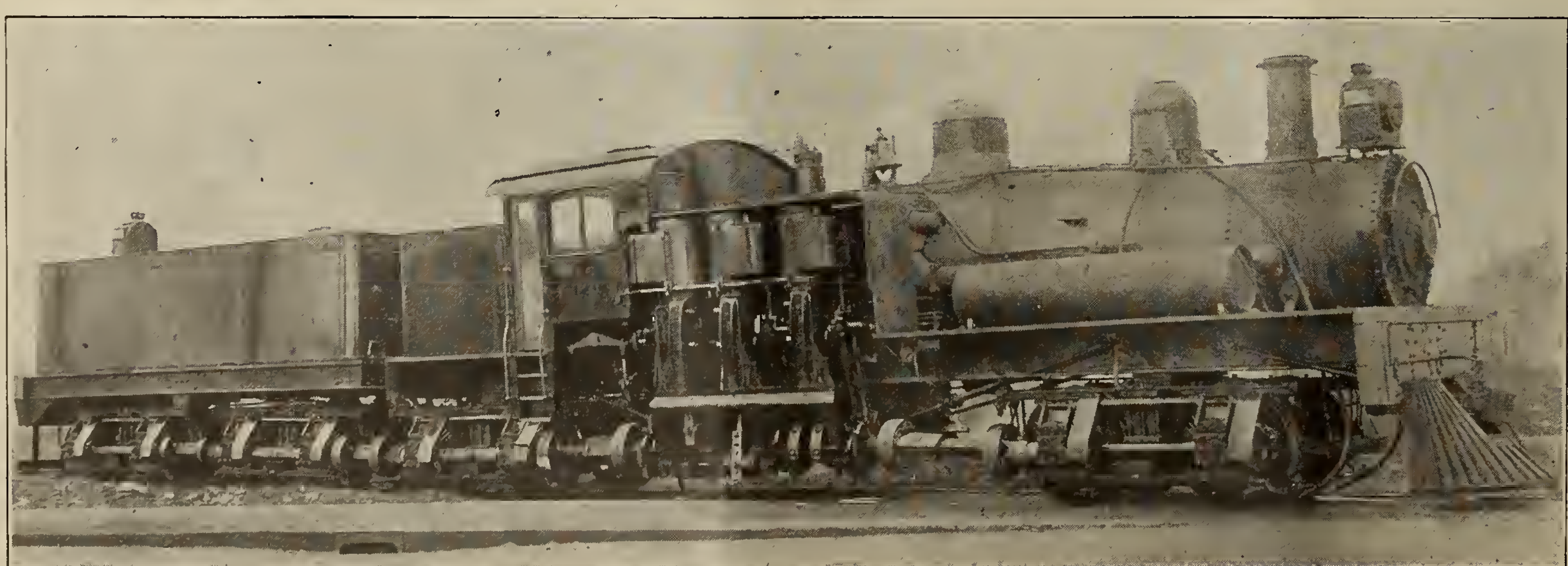
At the top end of each column is placed a 7-in. phosphor bronze, self-lubricating sheave over which runs a ¼-in. steel rope connecting the platform with the counterweight. When the stop pins are pulled out of the holes in the two columns the platform can be moved freely in either direction. The coiled spring will force the stop pin into the next hole and stop the movement of the platform unless held out by the operator, so there is no danger of the platform falling any great distance. A smaller size of the scaffold of the same type with a platform 14 ft. 10 in. long, is also in use at this shop.

Shay Geared Locomotive

Southern Railway

THE Lima Locomotive & Machine Company is turning out locomotives of the Shay type in such large sizes that they are capable of handling trains which are much heavier than those handled by locomotives of the ordinary type on steep grades. The Shay locomotive is capable of producing a remarkably high tractive power in view of its comparatively light weight and it is capable of taking unusually sharp curves.

On account of these special features the Shay geared locomotive is particularly adapted to the heavy grades and sharp curves common to branch coal roads



SHAY GEARED LOCOMOTIVE—SOUTHERN RAILWAY.

in mountainous districts. In operating on heavy grades a considerable saving is reported as compared with the cost of operating a direct connected locomotive in the same class of service.

Several railways, principally among the Southern states, have placed a number of locomotives of this type in service for duty on heavy grades. Among these are six on the Chesapeake & Ohio Ry.; two on the Southern Railway; one on the Norfolk & Western Ry.; one on the Manufacturers' Ry. of St. Louis, and one on the Lake Superior & Ishpeming Ry.

The accompanying halftone engraving illustrates a Shay geared locomotive recently built for the Southern Railway. As shown by the illustration every wheel is a driver, all wheels being connected by a shaft extending the entire length of the engine and tender and operating in connection with bevel gears.

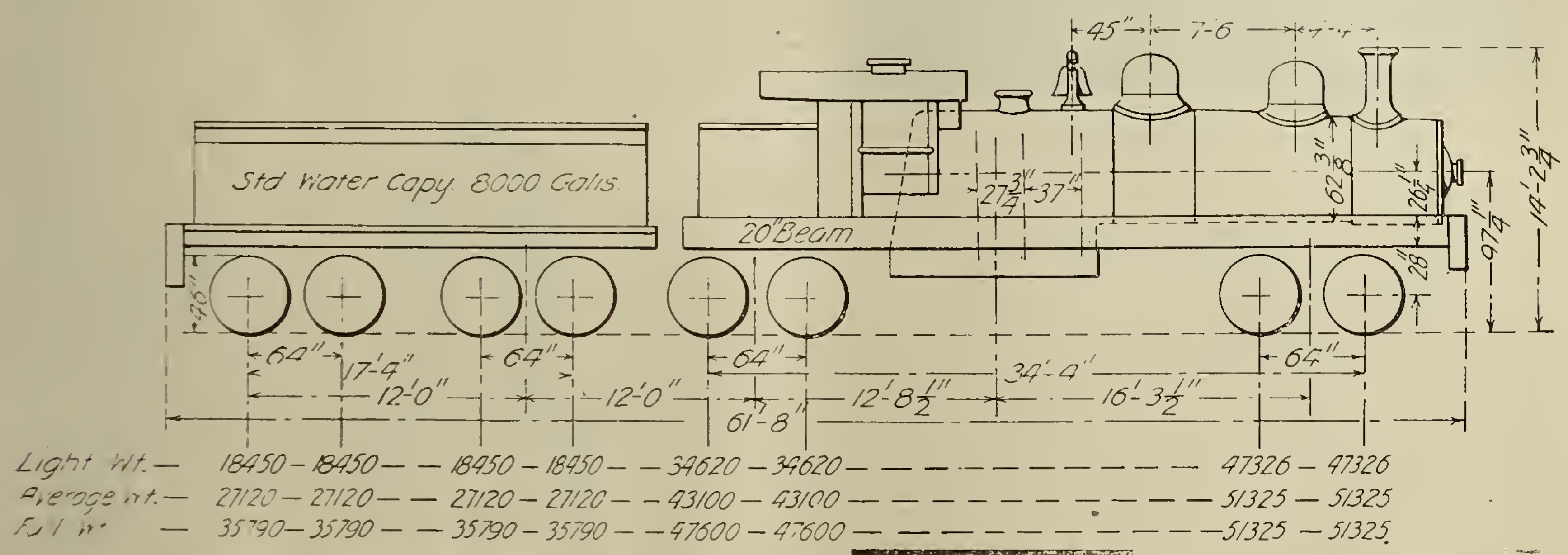


DIAGRAM OF SHAY GEARED LOCOMOTIVE—SOUTHERN RAILWAY.

The shaft is driven by three vertical cylinders and the weight of engine and tender are carried by four large trucks.

The cylinders are 17 inches in diameter, having a stroke of 18 inches. The driving wheels are 46 inches in diameter; the driving wheel base is 59 feet 4 inches, and the rigid wheel base is 5 feet 4 inches. The weight in working order is 300,000 lbs., which with a tractive power of 53,000 lbs. gives a factor of adhesion of 5.6. The boiler is of the extended wagon top type with radial crown staying. The outside diameter of first ring of boiler is 62⅜ inches; the firebox is 114 by 61¼ inches and the working pressure is 200 lbs. There are 316 tubes 2 inches in diameter, 13 feet 6 inches long. The grate area is 48.5 square feet and the total heating surface is 2,378 square feet, with 2,235 square feet in the tubes and 143 square feet in the firebox. The capacity of the tender is 8,000 gallons of water and 9 tons of coal. The driving wheel journals are 7 inches in diameter by 8 inches long and the crank pins are 7¼ by 7 inches. The engine is equipped with a Westinghouse E-T brake and the Session friction draft gear.

Railway Storekeepers' Association

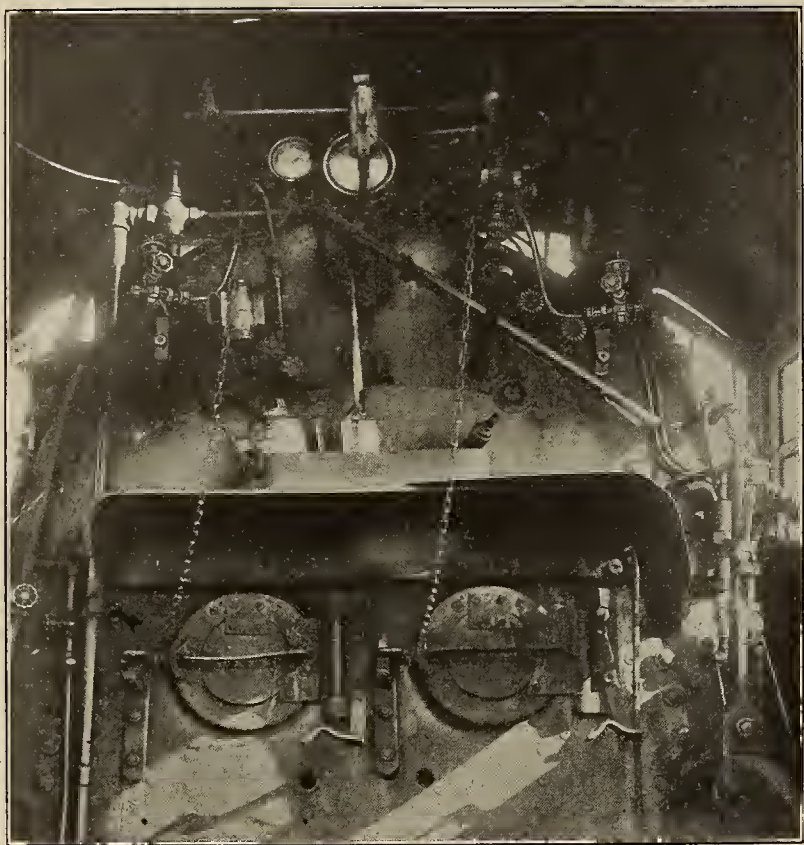
THE fifth annual convention of the Railway Storekeepers' Association will be held at the Auditorium Hotel, Chicago, May 25, 26 and 27, 1908. A very interesting program has been arranged and present indications point to this meeting as one of the most successful in the history of the association. While the organization is comparatively young it has already assumed a place among the most important associations of railway officials and it has won the distinction of forming itself on a firm foundation in a surprisingly short time. After the first two or three meetings, its success seemed assured and the association has progressed without the struggle for life that has characterized the early years of some other railway associations.

Future Developments in Transportation

AN article of particular interest to railroad men appears in the February number of Appleton's Magazine. It is written by Earl Mayo and bears the title "Taking the Railway to the People." The keynote of the article is furnished by the opening sentences: "For fifty years the efforts of American transportation men have been devoted to bringing people to the railway. For the next fifty years their problem will be that of devising effective ways and means of taking the railway to the people."

Mr. Mayo describes at some length the developments which the New Haven system is putting into effect in New England in the use of electric roads as feeders, in the establishment of an interchangeable steam and electric service over the same tracks, in the substitution of the trolley express for the way freight hauled by steam in handling certain classes of business and particularly its experiments in New Haven with the trackless trolley.

"The trackless trolley in appearance," says Mr. Mayo, 'is a combination of a motor truck and a trolley car. It has wheels the tread of which is unusually



HAND OILER IN CAB OF CONSOLIDATION LOCOMOTIVE OF MICHIGAN CENTRAL RALROAD.

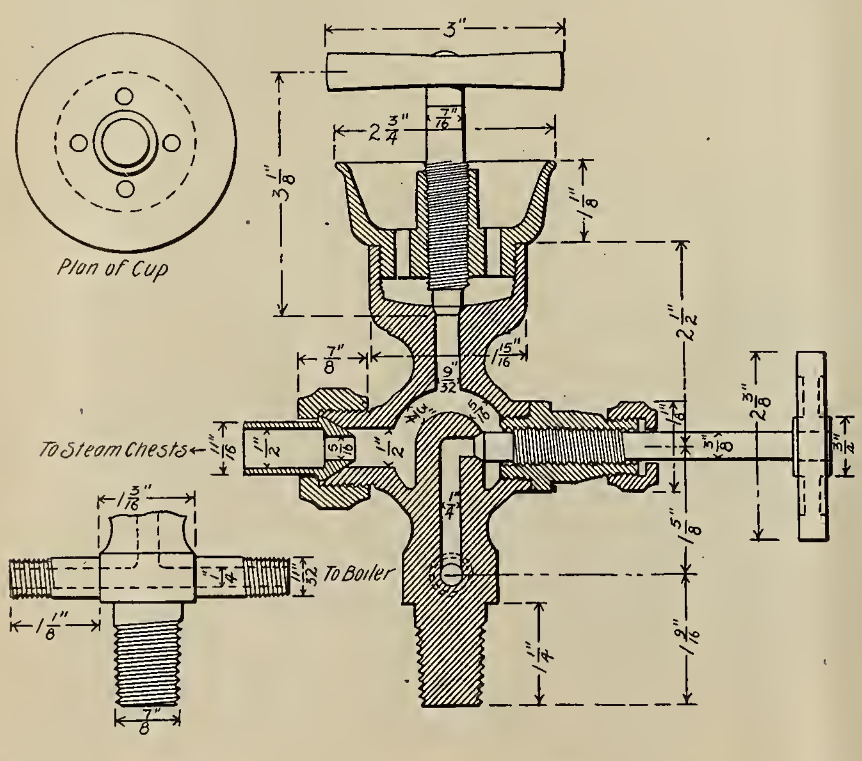
wide and with just sufficient concavity to hold them on the rails, so that while they can be operated on the ordinary track they can be run also on pavements or improved highways without injury. The trackless trolley car possesses the advantage of being able to run out along the tracks in any industrial community, gathering power into its storage batteries from the feed wire as it runs, and at any point it can turn off into the highway to run alongside the loading platform of a manufacturing plant or down an alley to collect freight direct from the doors of a warehouse, returning in the same way to the central freight station. The storage batteries, when fully charged, will carry the car twenty-five miles, so that it can cover a considerable range of territory independently of tracks and wires."

Other features of transportation development in densely populated territory are outlined in the Appleton article, all tending as the author says "toward an ideal that will be realized only when transportation facilities are placed practically at every man's door."

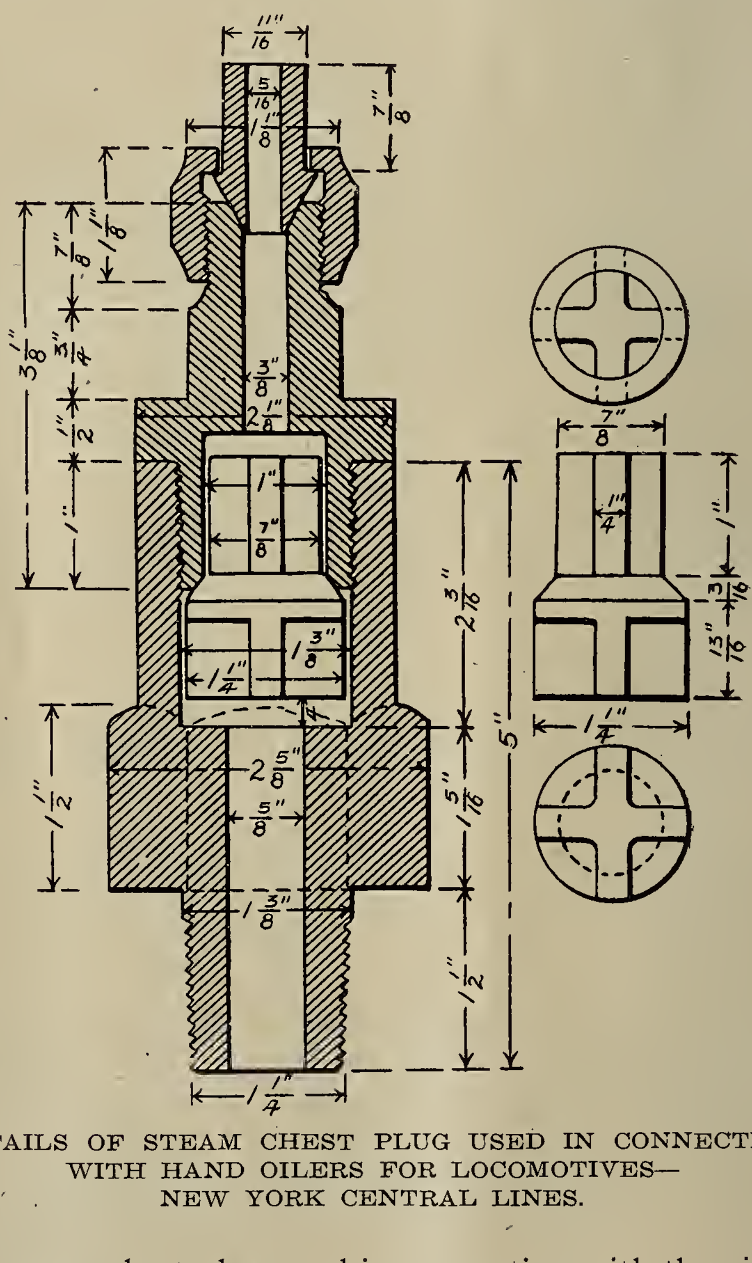
Hand Oiler for Locomotives

New York Central Lines

To provide a means of successfully oiling valves and cylinders in the event of accident to the locomotive lubricator or its connections, as well as in case of other emergencies, a hand oiler has been devised by Mr. D. R. MacBain, assistant superintendent of motive power of the Michigan Central Railroad, which is used principally on locomotives operating in a bad water district. The details of the hand oiler and of the steam chest plug used in connection with the oiler, are illustrated by the accompanying line drawings and a view of two hand oilers applied to the back head of a consolidation locomotive is shown by the halftone engraving.



DETAILS OF HAND OILER FOR LOCOMOTIVE—NEW YORK CENTRAL LINES.



DETAILS OF STEAM CHEST PLUG USED IN CONNECTION WITH HAND OILERS FOR LOCOMOTIVES—NEW YORK CENTRAL LINES.

Two hand oilers are secured to the back head of a boiler, one on each side of the cab, in such position that they may be filled easily from an oil can. They are supplied with steam by copper pipes leading to the fountain. Individual pipes and steam chest plugs are applied in connection with the hand oilers, which in no way interfere with the lubricator pipes and connections.

On a division of the Michigan Central Railroad considerable difficulty has been experienced in oiling valves and cylinders successfully as a result of boilers foaming and the application of hand oilers, which enables enginemen to deliver oil direct to the parts needing it, has been productive of very beneficial results.

There are several advantages to be gained by applying hand oilers to modern locomotives, especially to the heavy power now so generally in service. In case of an entire lubricator failure or in the event of one side failing to feed, no time is necessarily lost nor any inconvenience experienced, as the lubricator can be shut off and the engine oiled by hand without trouble. Another beneficial feature of the hand oiler is that in the event of an engine becoming dry on the road from any cause, it is unnecessary for it to run in that condition as the valves can be oiled without loss of time.

*Arrangement of Railroad Shops**

By George A. Damon

THE original cost of an average modern locomotive may vary from $14,000 to $17,000. The actual expense for labor and material to maintain this locomotive in first-class condition will range from $1,500 to $3,000 per year, each road, of course, having its own individual conditions that influence this cost, and which make it impossible to establish an absolutely definite figure. For our present purposes, however, it may be said that a locomotive costing $15,000 will involve a maintenance cost of about $2,250 per annum, and this expenditure should go far toward overcoming the natural depreciation of and wear on the equipment, and thus keep the locomotive in first-class running order.

The records of the Arnold Company show that locomotive repair shops which are laid out on a basis of the number of pits required equal to six per cent of the number of locomotives served can be built and equipped complete for an expenditure ranging between $50,000 and $65,000 per pit. If one pit will serve sixteen and two-thirds engines per year, the cost of repair facilities will fall some place between the limits of from $3,000 to $4,000 per locomotive. An investment amounting to the lower limit is absolutely necessary if the engines are to be kept on the road. Just how much more than the lower limit should be spent in order to secure the minimum cost of locomotive maintenance, including all the items of not only actual repair expenses, labor and material, but also interest, depreciation, insurance and taxes upon the plant provided, is a question that should have the most careful consideration.

The following analysis of the total cost will serve to indicate the relative importance of the decisions that must be reached in order to give each dollar expended a maximum earning capacity. The sum total of the "low" and of the "high" figures shown will result in grand totals which will show a wider range than the 33 1-3 per cent variation indicated by the unit figures of $3,000 to $4,000 per locomotive, but as it is improbable that any shop would be built using either the lowest or the highest estimate for every one of its parts it will be found that only in exceptional cases will the actual total cost fall outside of the limits first given.

TABLE OF COST LIMITS FOR LOCOMOTIVE REPAIR SHOPS ON THE BASIS OF TWENTY-FIVE ERECTING PITS.

DIVISIONS.	Limits of Cost Per Pit "Low."	"High."	Approx. Proportion of Tot. Cost.
SHOP YARDS.			
Tracks, Crane Runways, Transfer or Turn Tables	$ 1,400	$ 3,000	4%
Water and Sewer Systems	1,000	1,800	2%
Piping and Wiring Tunnels and Tunnel Piping	500	1,000	1%
BUILDING.			
Machine and Erecting Shop	8,000	12,000	17%
Boiler and Tank Shop	3,000	5,000	7%
Forge Shop	1,500	2,400	4%
Storehouse and Offices	1,000	2,500	3%
Locomotive Carpenter Shop	500	1,000	1%
Power House	1,200	2,400	3%
Oil House and Equipment	400	600	1%
Miscellaneous buildings:			
Scrap Bins, Material Sheds, Fences	500	1,000	1%
GENERAL EQUIPMENT FOR ALL DEPARTMENTS.			
Power House Equipment	5,000	8,000	11%
Traveling Cranes	1,500	3,000	4%
Tool Equipment	10,000	15,000	22%
Heating System	1,200	2,500	3%
Power and Lighting Systems, including yard wiring and lighting	1,500	4,500	5%
Plumbing and Lockers	300	1,000	1%
Air, Water, Steam and Oil Piping in Building	600	1,200	2%
Incidentals, Organization and Engineering	2,000	7,000	8%
			100%

Note:—These figures do not include items for Real Estate and Preparation of the Shop Site, which cost necessarily varies between wide limits.

The Foundry building and equipment are not included in these figures.

The history of "modern" locomotive repair shops

*Abstract of paper presented before the January, 1908, meeting of the Canadian Railway Club.

may be considered as beginning with the use of what has been called "the electric drive." The use of the electric motor makes possible (a) the arrangement of departments independent of the line shaft requirements; (b) the use of electric cranes; and (c) the construction of all power producing equipment in one central power plant from which may be distributed heat, water, compressed air, light, and power.

One of the first shops to make use of the electric motor for both individual machines and groups of tools, as well as the electric crane and the central power plant, was the Oelwein, Iowa, shops of the Chicago Great Western Railway, which were put in commission in 1900.

Since that date there have been over seventy shops either built entirely new or modernized from previously existing plants. It is safe to say that more than $80,000,000 has been expended upon railroad repair shops and their equipment within the last ten years.

The advance that has been made in the art during this period can best be illustrated by a comparison of the cross section of the Oelwein machine and erecting shop and the cross section of a shop for a similar purpose which is now under consideration as shown by Figures 1 and 2. The Oelwein erecting shop was equipped with one 80-ton crane and one 15-ton crane, both upon the same runway over the erecting pits. The second and more recent example has one 120-ton crane operating over the erecting pits on a runway above the two 10-ton messenger cranes, while the machine shop is supplied with two 10-ton cranes over the heavy tools, and an additional crane is provided over the covered yard.

Some of the first shops designed to use a central electric power plant were handicapped by the use of the 220-volt direct current electric system, which made it desirable to limit the radius of distribution to about 1,000 feet from the generating plant. The development of the induction motor and the alternating system soon removed this limitation, but as it was still necessary to use the direct current motor to obtain satisfactory electric speed control on many of the independently motor driven tools, a mixed electric system was adopted by many shops. It is still the practice in a number of recent installations to provide both direct and alternating current throughout the shop—using direct current for the cranes, variable speed motors, and perhaps the mercury vapor lamps, and alternating current for the constant speed motors, incandescent lights, and the yard lighting systems. The recent improvements in mechanical speed changing devices; the development of the alternating current crane, and the reduction in cost of the induction motor are creating a decided tendency toward the elimination of the direct current system. By these improvements it is possible to distribute power from a central plant over a larger area and also remove the old limitations of the amount of ground covered by the shop plant.

The size of a locomotive repair shop will depend primarily upon the number of locomotives to be repaired each year, and the number of days each locomotive under repair must occupy an erecting shop pit. To the pits required for "heavy" repairs must be added a number of pits for "light" repairs, for emergency work, and for future growth. The ratio of the number of pits to the number of locomotives will vary with the assumption as follows:

Pits Required in Erecting Shop.

Let A = Number of locomotives served by shop.
Let B = Percentage of locomotives to undergo "heavy" repairs each year.
Let C = Average number of days each locomotive occupies an erecting shop pit.
Let D = Number of working days each year.
Let P = Number of pits required for "heavy" repairs.
Let P′ = Number of pits required for "light" repairs.
Let P″ = Total number of pits required.
Then

$$P = \frac{A \times B \times C}{D} \text{ and}$$

$$P'' = P' + P$$

The effect of the different assumptions as to the per cent of the total number of locomotives to be repaired each year and the length of time on a pit for a shop serving 400 locomotives at present, with a probable increase to 500 within the next five years is to cause the number of pits to vary from five per cent to seven per cent of the total number of locomotives, which variation corresponds with actual practice.

The size of the machine shop space per pit depends largely upon the methods adopted for operating the shop. The work on the pit can be crowded, and the erecting output under normal conditions can be doubled during rush periods, but the output of the machine tools can not be increased in the same ratio. The tendency at present is to favor the amount of floor space allowed for machine tools. On the other hand, the use of high speed tools is rapidly increasing the output of each machine, and this development is contributing to the output efficiency of each foot of machine tool space. The space per pit for machine tools varies from 1,500 to 2,500 square feet. This result is often largely influenced by the demands made upon this space for manufacturing new work, or for supplying repair parts to other shops.

An average rule for the size of the boiler shop is to allow one-third as much space for this department as is allotted to the machine and erecting shop, but this rule is affected by the character of boiler repairs to be made. The kind of coal, the conditions of the water supply, and whether or not new boilers are to be constructed must be known before a final decision can be reached.

The blacksmith shop is ordinarily one-third the size of the machine and erecting shop, but local conditions must again be carefully considered before reaching conclusions. The safest way for all shops is to canvas the requirements for output and the capacity and floor space required of each machine, and then design the shop to fit the machines, rather than crowd or spread out the machines into a space the size of which has been too hurriedly determined.

The preliminary considerations which must have attention before the problems of relative arrangement of the buildings can be approached involve so much of the "personal equation" that only tendencies of recent practice can be noted, and no hard and fast rules can be established.

The question of "transverse shop versus longitudinal shop" for the erecting bay must be settled before much progress can be made. The tendency appears to be in favor of the transverse shop, but the writer must admit that his own personal equation enters into this conclusion.

Whether or not the boiler shop shall be under the same roof with the machine and erecting shop is a question that is usually settled by the experience and preferences of those who are to operate the shop.

The use of a transfer table or a turntable as a means of getting locomotives into the shop is a subject upon which volumes have been and can be written.

FIG. 1: SECTION OF LOCOMOTIVE SHOP AT OELWEIN—C. G. W. RY.

The use of yard cranes, telphers, or locomotive cranes for handling materials outside of the buildings is being given more careful attention than formerly, with the result that these auxiliary transportation systems are having a marked influence upon the arrangement of shops. There is a tendency to cover a portion of the yard with a crane, and locate the lye vats and tire furnaces in this covered yard.

The location of the store house and the oil house will depend upon their individual use, whether it is the intention for them to serve the entire system or not.

Whether to locate the car repair department contiguous to the locomotive repair department is a question of policy. The location of the car repair tracks, the desirability of having the common power house near the planing mill to burn refuse, and the location of the forge shop convenient to both departments has a marked influence on the general arrangement of the shops.

Certain fundamental principles should be recognized before attempting a railroad shop arrangement:

(1) Liberal space (say 100%) should be allowed for the extension of each department.

(2) The store house (with administrative offices in one of the upper floors) should be central, convenient to all departments and easy of access on two tracks from the main line service track.

(3) The forge shop should be convenient to both the locomotive and car repair departments.

(4) The power house should be central and near the planing mill and repair tracks in order to burn refuse.

(5) Yard cranes should be arranged to serve between the store house platforms and all departments.

(6) The round house should be very near the shop, or located far enough away to justify a separate machine shop for light repairs.

(7) Tracks, cranes, telphers and storage spaces should be arranged to insure the movement of materials with the greatest economy of time and labor.

(8) Some consideration should be given to the appearance of the shops and accessory storage facilities, lumber yards, etc., from the main line.

(9) The advantages of a short tunnel of ample cross section for the use of the various steam, air, and water piping systems should not be forgotten.

(10) The possibilities of the adoption of longer and heavier engines similar to the Consolidation or Articulated types should be considered, and some provision made for present or future repair facilities for these larger engines.

(11) The cost of the shops should be consistent with not only the actual necessities, but in propor-

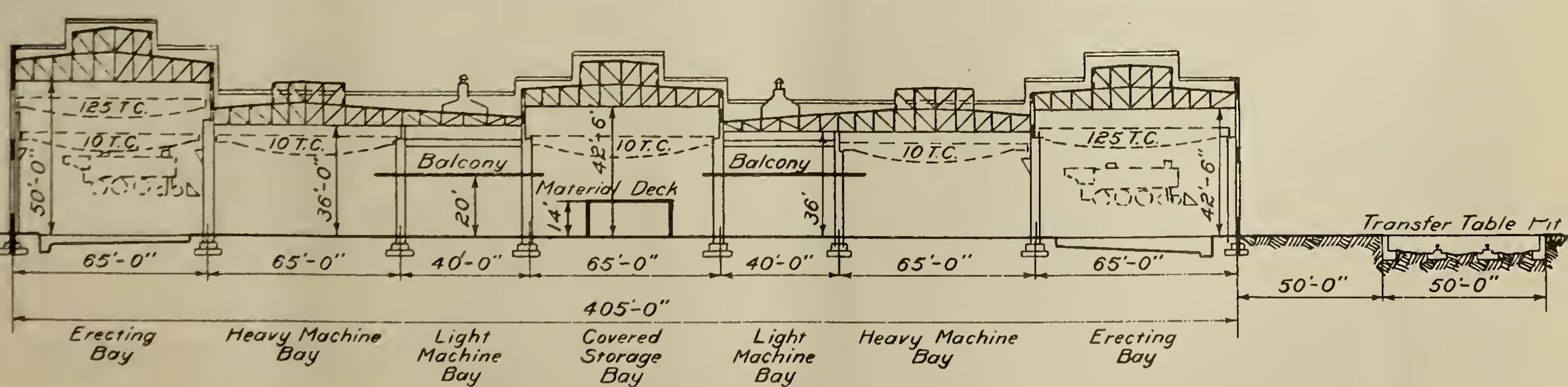


FIG. 2: SECTION OF PROPOSED LOCOMOTIVE SHOP.

tion to the refinements which the road can afford. All expenditures over and above those required for actual needs should be capitalized and made to show a satisfactory return on the investment.

The layout of shops indicated in Fig. 3 is now under consideration and provides for a complete locomotive repair shop combined with a proposed terminal car repair plant. The main car department is located elsewhere.

This plan shows a crane served covered yard extending through the center of the main shop. This yard is not to be heated, and besides furnished storage facilities for material, it will provide a convenient location for fan rooms, toilet rooms, locker and wash rooms, which often occupy valuable room inside the shop.

The outside storage yard is served by a locomotive crane instead of an overhead crane, and this same locomotive crane can be used at all other points in the yard where it can be worked to advantage.

The transfer table serves one side of the machine and erecting shops, as in several of the other plans, two cross tracks being provided to transfer engines in and out of the erecting bay on the further side.

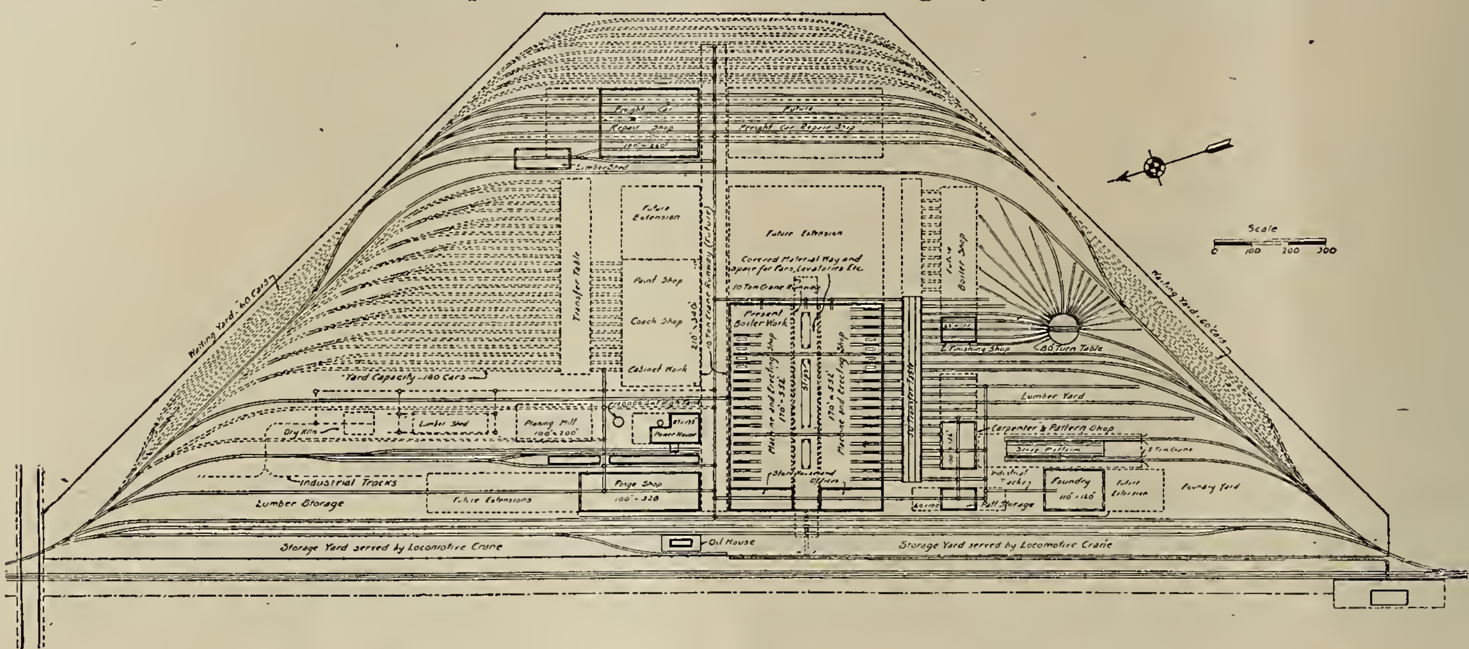


FIG. 3: LAYOUT OF RAILWAY SHOP PLANT UNDER CONSTRUCTION.

As the main shop becomes crowded, it is possible to erect a separate boiler and tank shop along the transfer table as shown, but for the present all locomotive repair departments will be under one roof.

The usual precautions have been taken to locate the blacksmith shop and the power house convenient to all departments.

The cross section of the main shop, indicated in Fig. 2, shows the covered yard between the two shops as well as the transfer table serving one side of the building.

Freight Locomotive

St. Louis & San Francisco Railway

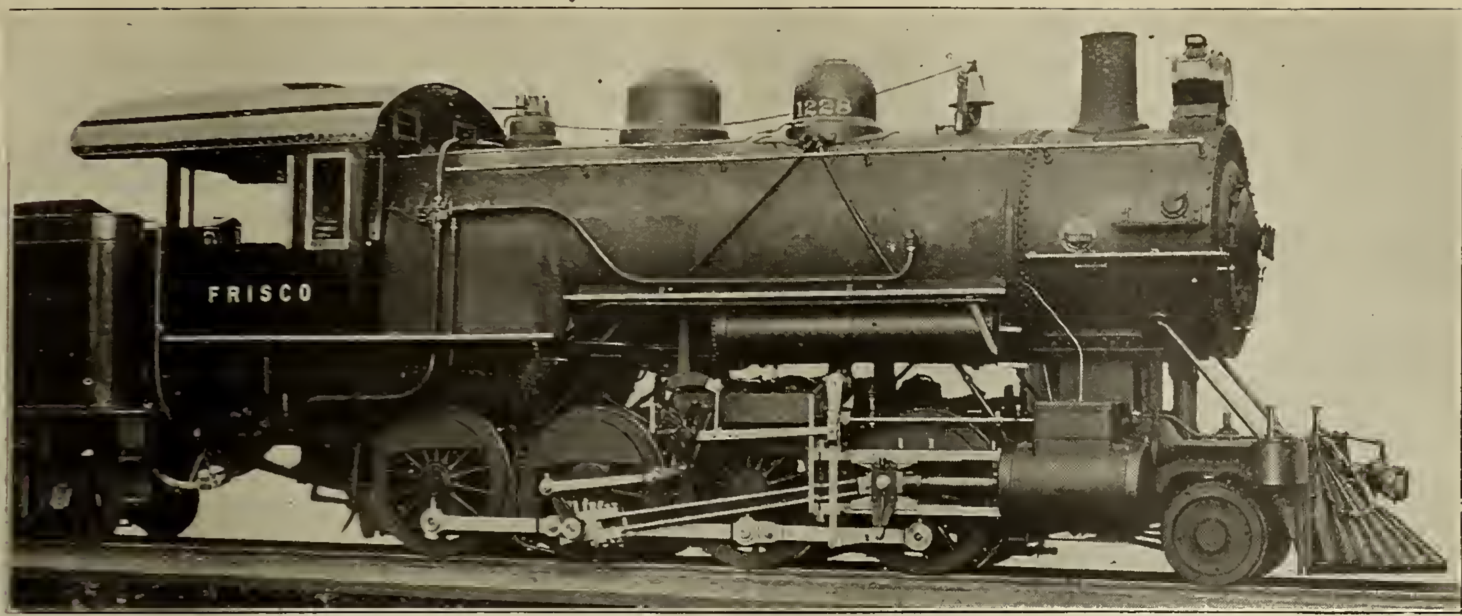
THE St. Louis and San Francisco Railroad has received from the Baldwin Locomotive Works 25 consolidation type locomotives for heavy freight service. Each of these engines can exert a tractive force of 43,300 lbs., and as the weight on the driving-wheels is 181,750 lbs., the factor of adhesion is 4.2.

The cylinders are single expansion equipped with balanced slide valves which are driven by the Walschaerts motion. The links are of the built-up type, with double-trunions. The link bearings are each made in one piece, and are supported on a suitable crosstie which is braced to the guide yoke, thus giving a rigid construction. Rock shafts are necessarily used in this design, and they are supported on the guide yoke. With this arrangement the combining levers follow the crossheads, and the valve rods are of sufficient length to avoid the use of knuckle joints or rock shaft crossheads. A single reverse shaft is used in this dsign, and the reach rod is made of 2½-in. pipe. The valves are set with a maximum travel of 6 ins. and a constant lead of ¼ in. They have an outside lap of 1 in. while the inside lap is zero.

The cylinders are double bolted to the smoke box and also in the vertical flanges. Among the details made of cast steel may be mentioned the main frames, driving wheel centers, driving boxes and steam chests. The driving wheel centers are fitted with bronze hub liners, and all the driving tires are flanged. The frames have double front rails of wrought iron. The top rails are hooked to the main frames without keys, while the bottom rails are double keyed. The frames are keyed to the cylinders at the front only.

The boiler is of the straight top type, with wide firebox. The barrel is built of two rings, with diamond seams placed on the top center line. The dome is placed on the second ring, which has the seam welded throughout its length on either side of the opening. On the first ring the seam is welded at the ends only. The firebox has wide water spaces all around, and is supported on buckle plates at each end. It is radially stayed with one T iron supporting the front end of the crown.

The tender frame is built of 13-in. steel channels, and the tank is arranged with sloping sides and bot-



FREIGHT LOCOMOTIVE FOR THE ST. L. & S. F. RY.

tom in the fuel space. The trucks are of the arch bar type, with cast steel bolsters. The engine and tender truck wheels are of solid forged steel, made by the Standard Steel Works.

Following are a few of the leading dimensions:

Cylinders .... 22 by 30 ins.
Boiler pressure .... 200 lbs.
Drivers .... 57 ins.
Tube heating surface .... 2922 sq. ft.
Total heating surface .... 3100 sq. ft.
Grate area .... 51 sq. ft.
Weight on drivers .... 181,780 lbs.
Total weight .... 201,500 lbs.

*The Draft Gear**

By A. Stucki, Mechanical Engineer

THERE is no other detail on a car in which the opinions of the railroad men differ as much as they do in regard to the draft gear. As yet by far the largest proportion use spring gears of various designs, while others would not consider anything but a friction gear, and even here the opinions differ widely as to the construction and requirements. Bearing also in mind that fully 75 per cent of all the wooden cars on the repair tracks have to undergo work on their draft gears or attachments, too much consideration cannot be given this subject.

The following table will show the momentum in foot pounds stored up in loaded cars, moving at different speeds:

Speed. Miles per hour.	60,000 lbs. Capacity Cars. Total Wt. 100.000 lbs.	80,000 lbs. Capacity Cars. Total Wt. 125,000 lbs.	100,000 lbs. Capacity Cars. Total Wt. 150,000 lbs.
1	3,314	4,142	4,971
2	13,256	16,568	19,884
3	29,826	37,278	44,709
4	53,024	68,272	79,536
5	82,850	103,550	124,275
6	119,304	149,112	178,956
7	162,386	202,958	243,579
8	212,096	265,088	318,144
9	268,434	334,702	402,651
10	331,400	414,200	497,100
11	400,994	501,182	601,491
12	477,216	596,448	715,824
16	848,390	1,060,487	1,272,584
20	1,325,621	1,657,026	1,988,431

(Figured as $W \times V^2 \div 2G$, W being weight, V= speed in feed per second, and G being 32.16.)

The momentum increases in direct proportion to the weight of the car, which explains why draft gears on high capacity cars, if run in solid trains, are subject to greater strains. Of course, one heavy car amongst light equipment will not suffer heavier blows than its neighbors of less capacity, while a light car between heavy equipment gets the full benefit of the momentum. This fact is only too often demonstrated, whenever light and weak wooden cars are carried between loaded steel cars of high capacity. In this sense, the draft gears are independent of the carrying capacity or the weight of the respective cars. The speed affects the momentum very much, it being increased as the square of the velocity. This fact undoubtedly helps to explain why the conditions of today are much harder on the draft gears than years ago when comparatively slow speeds were considered adequate.

Since automatic couplers and steel cars are so much used, the train men do not think it necessary to handle the trains with quite as much care, at least judging from the Gatling gun like noise, following the stopping of a train in a classification yard.

*Abstract of a paper presented before the December, 1907, meeting of the Railway Club of Pittsburg .

Some of our railroad friends claim that the gravity yard will destroy a great many draft gears; which is undoubtedly true, if the brakes do not hold. On the other hand, it must be conceded that these "humps" do away with a great deal of tugging, buffing and racking, which, beyond doubt, is much harder on the cars and engines than the regular service.

If two trains, both running at four miles per hour, meet, the effect is the same as if one standing gets run into by an eight-mile train. The first two cars meeting always get the greatest blow. If a loaded 100,000-lbs. capacity car runs into a bumping post at a speed of eight miles per hour, the momentum destroyed must be 318,144 foot pounds. (See preceeding table.) If this car strikes another loaded car standing still, the shock (considering the inelastic body) is only half as great and the two cars will proceed at half the speed. If the car runs into a loaded train standing still, the blow between the first two cars is just the same, after which they will proceed at half the speed to hit the third car, etc.

Of course, the blow is always somewhat lessened by the amount the two adjoining gears transform into a gradual push. This holds good for spring as well as friction gears. The only difference between the two is that the spring gears, after the main shock has passed, will open up again and cause a back lash, while the friction gears are prevented from opening with the same force as what they receive in closing. As far as the car is concerned, there is never any energy absorbel, but as far as the gear in itself is concerned, part of the work it takes to close it is absorbed by abrasion on the bearing surfaces and part of it is transformed into heat, just the same as in grinding, or machining anything else.

By actual tests made by the L. S. & M. S. Ry. in 1902, it was found that an engine in coupling exerted from 65,000 to 142,000 lbs. The tensile forces for skilled, ordinary and rough handling of trains were found to be 50,000, 80,000 and 100,000 lbs. respectively; the buffing forces 80,000, 150,000 and 200,000 to 300,000 lbs.; 30 loaded cars running into 10 loaded cars at 6½ miles per hour registered a final blow of 346,492 lbs.

Care should be taken that an easy motion at the beginning of the friction gear stroke is secured. This is necessary to absorb the small oscillations and lurching, constantly taking place during transit, which will rack the car eventually if ignored. The closing pressure of these gears varies possibly more than anything else, being from 60,000 to 230,000 lbs. In spring gears, we are very much limited in this respect, although besides twin and tandem springs, triple and quadruple springs have been used. The higher the closing pressure, the larger will be the energy transformed during closing, which is of course of great importance in reducing the final blow.

The length of stroke is the other factor in this task; the longer it is the more effective the gear, but unless the method of carrying the coupler is improved, it would not be practicable to go beyond the present standard. The element "Time" sometimes mentioned in this connection is identical with the length of the stroke, and if you have a gear, which transmits a certain amount of energy in a period twice as long as another gear, then its stroke must be practically twice as great also.

The recoil should be small, so as to reduce the back lashing after the blow has been delivered. None the less, the greatest care must be taken that this recoil is sufficient to open the gear under any and all conditions, else you might just as well have a solid block in place of a draft gear.

Now, coming back to our 100,000-lbs. car, loaded and running at 8 miles per hour into another car of equal load, but standing still, the result would be as follows, provided the cars were equipped successively with the four typical friction gears. Half of the energy of the moving car, of course, is transmitted to the standing car, and in doing so each of the meeting gears and car ends perform half of this work, hence:

	Gear 1—1	Gear 2—2	Gear 6—1	Gear 7—7
Total energy transmitted per car in ft. lbs.	79,536	79,536	79,536	79,536
Energy transformed by 1 draft gear in ft. lbs.	18,399	14,100	13,800	5,987
Energy left for car to take direct, ft. lbs.	61,137	65,436	65,736	73,549
Percentage of energy transformed by 1 gear, ft. lbs.	23.2	17.6	17.3	7.5
Recoil in ft. lbs.	1,733	2,200	2,400	5,987
Difference between energy transformed and recoil, ft. lbs.	16,666	11,900	11,400	0
Percentage of elasticity of gear	9.4	15.6	17.4	100

This shows that even at this slow speed, and even under the assumption that both of the meeting gears are alike, most of the blow is taken by the car directly. At higher speeds, the percentage of the work done by the gear is still less, and if the car runs into a post, or other unyielding obstacle, indeed looks almost insignificant. The following figures will make this clear:

Car running into another car at speed of:

	8 Miles.	12 Miles.	16 Miles.	20 Miles.
Gear 1—1	23.2%	10.3%	5.8%	3.7%
" 2—2	17.6%	7.8%	4.4%	2.8%
" 6—1	17.3%	7.7%	4.3%	2.7%
" 7—7	7.5%	3.3%	1.9%	1.2%

Car running into an unyielding obstacle:

	8 Miles.	12 Miles.	16 Miles.	20 Miles.
Gear 1—1	5.8%	2.6%	1.4%	.92%
" 2—2	4.4%	1.9%	1.1%	.70%
" 6—1	4.3%	1.9%	1.1%	.69%
" 7—7	1.9%	0.8%	0.5%	.30%

The question is often asked, "Do the results on the testing machine represent what takes place, if two cars strike each other at considerable speed?" For all practical purposes it does, inasmuch as the weight of the draft rigging is very small in comparison with that of the car, and if the weight of the gear could be reduced to zero, the two results would be exactly identical.

The drop test, on the contrary, does not represent actual conditions. Here the weight of the draft gear is very great compared with the striking weight (1640 lbs.), and even if you had a drop of 16,400 lbs., the dynamic effect would be entirely different from what you have on the car.

The collision test, now often spoken of, consists in dropping a car down an incline against a dynamometer. A great deal of information can undoubtedly be obtained by this course; however, great care must be exercised thereby, else the results will be misleading. For instance, our car with gear 1—1, striking as above, would transform 5.8 per cent of the whole energy into a gradually increasing push on the car, and the remaining 94.2 per cent is left for the car to take care of directly (assuming that the dynamometer does not yield).

If the car is stiff, the final blow or pressure registered will be very high; but if the car is yielding, it will be comparatively low, even if equipped with a low capacity draft gear. Likewise will the recoil of the car itself, the kick, depend on whether we have a solid or a springy frame construction. In fact, it will depend on this item very much more than on the type of the draft gear.

The next step is to look into the different methods or principles underlying the different gears.

Not mentioning the somewhat ancient rubber cushions and disregarding the volute springs, which are so much used in Europe, the ordinary helical spring forms the basis of nearly every gear in existence. The plain spring gears are arranged as twin, tandem, triples, or sometimes quadruple springs. The last two have also been arranged so as to have more resistance in compression than in tension. Of late heavier springs, the M. C. B. class 5 with a closing pressure of 30,000 lbs. each, are often used.

Most of the friction draft gears can be classified into two large groups. The first group, or Class P, as we will hereafter call it (P was chosen to indicate Parallel friction surfaces), gets its high resistance principally by pressing laterally on two or more friction pieces, which in moving in and out are rubbing against parallel surfaces, thus causing friction and retardation in whatever direction the gear happens to move.

One peculiarity, or rather drawback, to this arrangement is the fact that it takes a great deal of pressure to produce sufficient friction for retarding the motion, and to overcome this, various means are being used. The friction pieces can be made in form of flat plates which are sandwiched between each other so that you multiply the friction for every pair of plates; in other words, you have the same effect as if you would insert separately a number of leaves into a book, then close it and try to pull them out. This same arrangement is often attempted by arranging the plates in a circle, such as split pipes.

Of course, all these arrangements suffer under the fact that the final resistance changes in direct proportion to the coefficient of friction. If you get oil on the surfaces and reduce the friction to, say, one-half, a gear originally closing at 200,000 lbs. will now close at 100,000 lbs. The same may be said if the bearing surfaces get polished by the service, while corrosion works as effectively in the other direction and may cause the gear to stick. To overcome this feature as much as possible the friction surfaces are sometimes machined.

The lateral pressure is sometimes obtained by one follower plate acting on cams, which have a tendency to spread the friction pieces. Sometimes a similar effect is obtained by placing the draft spring in a diagonal position. It is interesting to note that in a draft gear of this class a lateral spring cannot be employed, inasmuch as there would be no possibility of increasing and decreasing the pressure as the gear may close or open.

In most cases a cone, or wedge, is employed to spread the friction pieces. It is self-evident that the gear in closing compresses the spring gradually and proportionately increases the lateral pressure of the friction pieces by the angle of the spreader. The steeper this angle the greater the pressure.

The only trouble is that beyond a certain limit the spreader will not relieve itself and the gear will stick. The writer knows of several cases where gears were tried on the testing machine and after being compressed once simply remained solid. Even in actual service there is considerable trouble experienced on this line. In repairing such gears great care should be taken that inexperienced laborers do not get hurt by unexpected "openings."

One remedy against "sticking" is to use antifriction rollers between the spreaders and the friction pieces, and another is to use a separate spring. This spring may be located on the outside or the inside of the friction casing. Even such a release spring is not always able to prevent sticking, and to help matters along the friction surfaces may be machined to a very slight taper longitudinally. Sometimes they are also made of different lengths so as to assist the release spring in starting them backward.

Here we come to the second class of friction gears referred to as Class A (A stands for Angular friction), where the blow is acting on friction pieces whose motion is not only resisted by the friction on the gliding surfaces, but also by the angularity of the same; the blunter the angle the greater the resistance. The spreading of the friction pieces is very often accomplished by the use of springs. Of course, any yieldable device may be used, but it will be noticed that the lateral motion is always quite considerable, which in the Class P gears is never the case.

As said before, the blunter the angle the greater the resistance. This has its advantages and also its disadvantages. While it increases the closing pressure of the gear, it also causes an abrupt and stiff motion in the beginning of the stroke. This is objectionable and it has sometimes been overcome by using two sets of friction pieces in tandem, provided with different angles, so that one set would assist in getting an easy motion in the beginning of the stroke, while the other would insure a high resistance later on. This is very important, as there are even now lots of cases where the draft gear does not protect the car against the small vibrations and oscillations constantly occurring during transit, and although these oscillations will not break a car they will eventually rack it.

Another way to get an easy starting motion is to use a preliminary spring. Its function is to compress under a light load and in advance of the friction pieces.

There is a third class of friction draft gears which may be called friction spring gears for the reason that the gear really consists of coil springs which are merely dampened or stiffened by frictional contacts so as to have a high resistance in closing and not over the original capacity when opening.

Different constructions are followed in this direction, but, whatever it may be, one of the springs will have to be made out of round, else it could not yield laterally. The bearing surfaces in these cases are sometimes very small, consisting of mere lines instead of broad surfaces. To overcome this objection the bars are sometimes made of square or other similar sections, which make it possible to have flat bearing surfaces. Another way is to use a volute spring with conical sides which, in closing, will slide on the adjoining turns, thereby causing friction. In this case, the whole gear consists of one single spring.

Under the fourth class of friction draft gears we may place all those which in course of compression compel some parts to rotate and, by so doing, engage in frictional contact with other parts not rotating. For convenience sake, we may call them torsion gears.

Other gears use leaf springs and in so doing make use of the friction between each individual leaf, which you will find in any other leaf spring, and gears based on the principle of such a spring may be called leaf spring gears.

On steel cars, which, as known, are of a comparatively recent build and which are usually equipped with a friction, or improved spring gear, the repairs on draft gears is not so excessive, but on the wooden equipment, as stated in the beginning of this paper, fully 75 per cent of all the cars shopped have to undergo repairs on the draft gears. It is true, often repairs are charged to the draft gears which are made on the attachments, such as yokes, followers, draft lugs, etc., for which the gear is often not at all responsible, and the same can be said of the draft sills themselves. To reduce these repairs as much as possible, it is absolutely necessary to design on proper principles, and to make gear and attachment strong enough to meet the severe conditions always surrounding them.

Some manufacturers deserve a good deal of credit for trying to improve the attachments, realizing undoubtedly that all the shocks, before and after the gears are closed, will pass through them. Some unite the front and back lugs into one, thereby not only strengthening the fastening but also stiffening the draft sills in themselves. Others try to do away with the draft lugs and follower plates, using keys instead; in fact, they extend the use of keys for fastening the yoke to the coupler, thus doing away with two coupler rivets. There is no doubt that these rivets are fully adequate in most cases. However, under compression in tandem gears, stresses may come upon them which are unsafe.

Of late sufficient lateral motion for the coupler is considered absolutely necessary to relieve the cars of lateral strains on curves. (Some tests by the C. & N. W. and other railroads found these even to exceed 50,000 lbs. at the carry iron.) The coupler and knuckle from being pried and broken, means fewer derailments, less end wear in the brasses, and less flange wear on the wheels. The latter follows from the fact that through experiments (L. S. & M. S. R. R. and others), it was found that an engine can pull more cars, if they are equipped with lateral motion at the coupler. As to what clearance should be allowed per side is still an open question; undoubtedly, the more the better, since a device for bringing the coupler back into central position should be used anyhow as soon as we exceed about 1 in. per side.

Of the different centering devices now used, the simplest is undoubtedly the best. No delicate arrangement will be found to stand the service at this place. By allowing such lateral movement, we introduce new conditions for the coupler rivets which, in the present form, they cannot meet. For this reason a better fastening between yoke and coupler is bound to follow. The attachment should, by all means, be arranged to permit the proper inspection of the gear in the shop as well as on the road. The writer was forcibly impressed with this the other day when he heard a repair foreman denounce a certain gear as "the worst one on the road because it cannot be inspected properly."

Unfortunately, a continuous bottom follower guide is almost imperative to stiffen the draft sills, and this very guide makes inspection quite a task. Twin springs, however, are not as bad in this respect as longer draft gears. But twin spring gears have a comparatively long space left between the rear follower plate and the body bolster, and this has always proven to be a weak spot, unless a substantial bottom cover plate is made to extend the whole length. I know of a case where many thousand dollars were spent in changing a draft gear on a lot of cars because they showed a weakness at this very place.

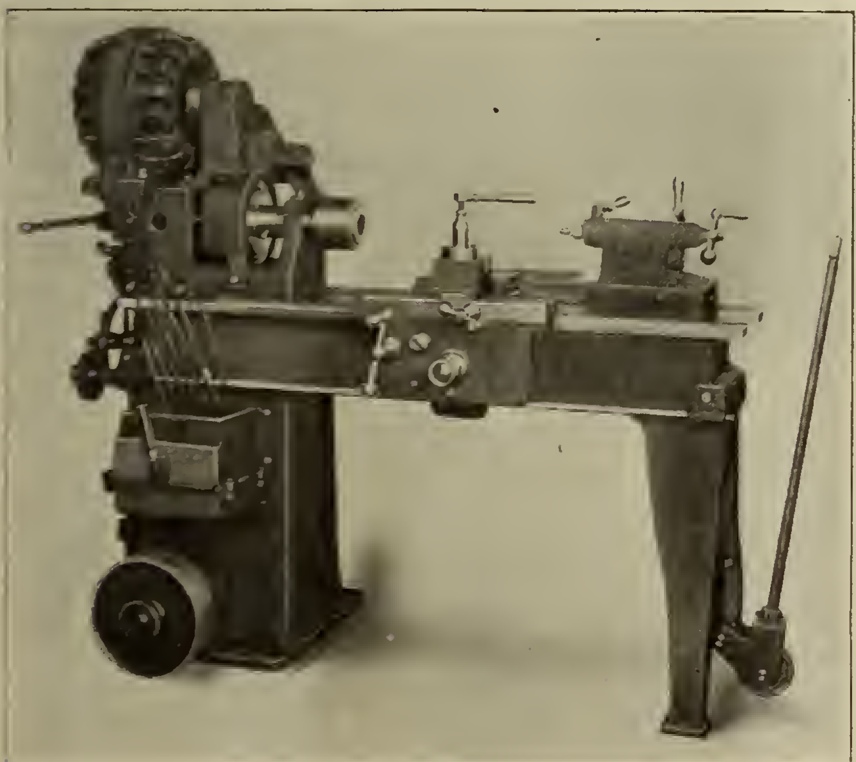
Any shop record would disclose that the largest proportion of repairs is done on draft sills equipped with short draft gears. Tandem springs are far superior in this respect and the friction gears as a rule are nearly as long.

Let us remember that simplicity is one of the most important principles in car construction, and this indeed applies to a draft gear with equal force. If we had to choose between two gears, one consisting of say 5, the other of 20 pieces, everything being equal, there should be no question as to choice.

Looking at it from the storekeeper's and stock clerk's standpoint, a small number of pieces suggest itself with equal force. It is true that some gears are furnished assembled and complete, which leaves the storekeeper in good shape. But in repairing such a gear you will either have to take it apart or else pay for a whole new gear every time one of the parts gets worn or broken.

Motor Driven Portable Lathe for Locomotive Repair Shop

THE flexibility of electric motor drive has brought into use several types of convenient and labor saving portable machines. A notable example is the portable bolt-turning lathe designed for use in locomotive repair shops. The illustration shows a lathe made for this purpose by the Williams & Wilson Company, of Montreal, Canada, equipped with a Westinghouse motor. The unit is compact in design and is mounted on wheels. It can be lifted by a crane and placed beside an erecting pit, and then shifted as desired by hand. When in working position the machine rests on the two rear wheels and the front legs. To move it, the legs are lifted from the floor, and the front wheel is brought in contact with it by simply lowering the handle, which acts as a lever.



MOTOR DRIVEN PORTABLE LATHE FOR LOCOMOTIVE REPAIR SHOP.

The motor which operates the machine in the illustration is of the well known Westinghouse induction type, 2 H. P., 1,700 R. P. M. It is connected through a friction clutch providing for either 200 or 400 R. P. M. of the spindle. Direct current motor applications are equally successful.

The current supply is afforded by flexible cable connection to plugs located at convenient intervals. A simple and convenient connecting plug is made for the purpose. The advantage of using a machine of this type in work requiring the turning of each individual bolt to the proper size is readily apparent. It both obviates the necessity of innumerable trips to and from the machine shop and the consequent loss of time, and permits the mechanic to carry on his work without interruption.

When not in use the machine can be moved to a point in the shop where it will be out of the way of the workmen. When not in use for the purpose designed it becomes a valuable and convenient auxiliary to the machine shop equipment.

A Fallacy of Machinery Driving

CERTAIN users of machine tools conduct their works on the theory that the most economical practice is to push machinery to the extreme limit of production. They shorten its life, but get a great deal out of it in the briefer period of its usefulness. Among other manufacturing establishments a number of railroad shops are operated on this basis, their managers constantly seeking the opportunity to set a faster pace for each piece of machinery. They follow in the shop a railroad theory that rolling stock, especially a locomotive, should be forced to do its maximum of work during a few years rather than to attempt to lengthen its useful existence by more careful operation, avoiding the repair shop except when it is absolutely necessary that parts be renewed or renovated. The theory of this procedure is that, granting a machine a given amount of productive usefulness, it is cheaper to consume this energy in a limited period than to prolong the process by more conservative methods. However excellent a theory this may be in the traffic department of a railroad, its economy in industrial works is disputed by most experts in machine shop practice, except where it is very strictly safeguarded by the application to each individual machine of an exact cost system, which is not always available.

In practical every-day work nearly every machine tool has a limit at which it can be economically operated. Exceptions are to be found among the heavier tools which are built to do work up to the strength of the high speed steels, but even these, though able to stand up under severest strains, sometimes have a tendency to develop weaknesses when their maximum capacity is adopted as the standard for every-day work, necessitating their laying up for repairs. Below each class of rapid reduction machines are others of the same type, ranging down through the scale in degree of capacity and corresponding lightness of construction. Each is designed to do work up to its individual limit, and when that limit is passed an overstrain is imposed and the wear must necessarily be great and repairs frequent. And, as in the case of the heavier tools, constant service under maximum duty conditions, even as intended by the designer, is apt to develop weak spots in mechanisms, requiring the machine to be laid off for a time.

Production experts are tempted to set too high a required capacity on a machine tool in the endeavor to reduce time of manufacture. If they have a corrective system which will soon discover the error of excessive load, their efforts should be fruitful of economies. Otherwise, what appears to be reduction in cost may prove to be added expense, or a failure to secure a saving which would have followed a less ambitious effort with the same machine, as experience has demonstrated in the relations of machine tool builders with their customers. On its face, the general proposition seems sound that if a machine will accomplish in 40 min. a task that has been taking 60 min. to perform, there is a saving of 33 1-3 per cent in labor, and as the machine is producing a correspondingly greater amount of work each hour its items of cost other than labor, such as investment and share in overhead cost, are more widely distributed over its product. The life of the tool may be reduced, the time of its replacement may be brought much nearer, yet reckoning into account the saving in labor and the increased production there is a theoretical economy. This is the basis of the practice of extreme production.

But there is a well defined limit beyond which it does not pay to go. No machine should be given a service so severe that its days of idleness, due to breakdown, are materially increased. If in the case already cited, where 20 min. were saved on each piece by speeding up a machine, frequent breakdowns should follow as a result of the increased strain, the days of nonproduction would soon eat into the saving until it ceased to exist or until the apparent economy became a loss. This is the weak side of forced production. A superficial estimate may indicate a large increase in product, but, reckoning in the cost of repairs and the loss through idleness, all gain may be nullified. No one day's or one week's production tells the story; a protracted period of time must be taken to show up the actual condition. The factor of interference with shop routine by frequent repairs must also be taken into account in considering the question, for demoralization is always costly. In certain shops the number of high class tools out of commission is frequently noticeable, and the condition usually accompanies the efforts of a too ambitious production department.

According to the experience of a large manufacturer of heavy machine tools, the efforts of the production department require the corrective influence of a consistently maintained machinery record. The life of each machine tool should be closely followed from the day of its installation to its going out of commission for good, and each incident of its history entered upon its record. A card system accomplishes this end, constituting an adjunct of the regular cost system. In the works of this manufacturer each repair job on a tool, with the nature of the accident, is reported to him on the day it begins, the job card being placed on his desk, and when the work is completed he receives the record of the time and cost. The items are entered on the card of the machine, together with the number of days of idleness. Weak parts are soon brought to light; several repair jobs on the same member of a machine tell the story. Such instances are carefully investigated. Sometimes the trouble lies with the machine itself, but in other cases the cause is the nature of the work imposed upon it, the task being beyond the intentions of the designer. It may readily be seen that a production department could learn much of the success or nonsuccess of its efforts by the use of this system. In one case in these shops the cost of production on a milling machine job was reduced from 5 to 3 cents by speeding up the work. Breakdowns followed, however, until the personal attention of the manager was called to the matter, and his investigation revealed the fact that the work was actually costing more under the increased rate of production. The solution was an easy one; a machine of greater capacity was purchased and the cut in cost was accomplished. That is a typical instance, and serves to establish the fact that the correct practice is either to give a machine a load it can stand, or else replace it with one heavy and powerful enough to bear the heavier strains. Specialization enters into the subject of rapid production quite as largely as in any other branch of machine shop practice.—The Iron Age.

Terry Grease Plug Fastener

THE frequency with which grease plugs are lost from locomotive main and side rods adds considerably to the expense of maintaining grease appliances. The motion of the rods when an engine is in operation tends to loosen the plugs and throw them out of position Unless the plug is screwed into the cup a sufficient distance to engage at least several threads and the jam nut properly tightened, the plug will soon be thrown out of place. Even when these precautions are observed, the plugs sometimes get loose.

With the idea in view of providing a positive lock which might be depended upon to hold a grease plug against the tendency to turn, Mr. O. N. Terry of Lincoln, Neb., has devised and patented a grease cup fastener. The original form of this fastener is illustrated by Fig. 1. As the spring, used according to this design, broke in service a more positive locking device was decided upon and the fastener shown by Fig. 2 was devised.

According to the arrangement shown by Fig. 2, a plunger actuated by a spring under compression, is encased in a small cylinder carried on a bracket at-

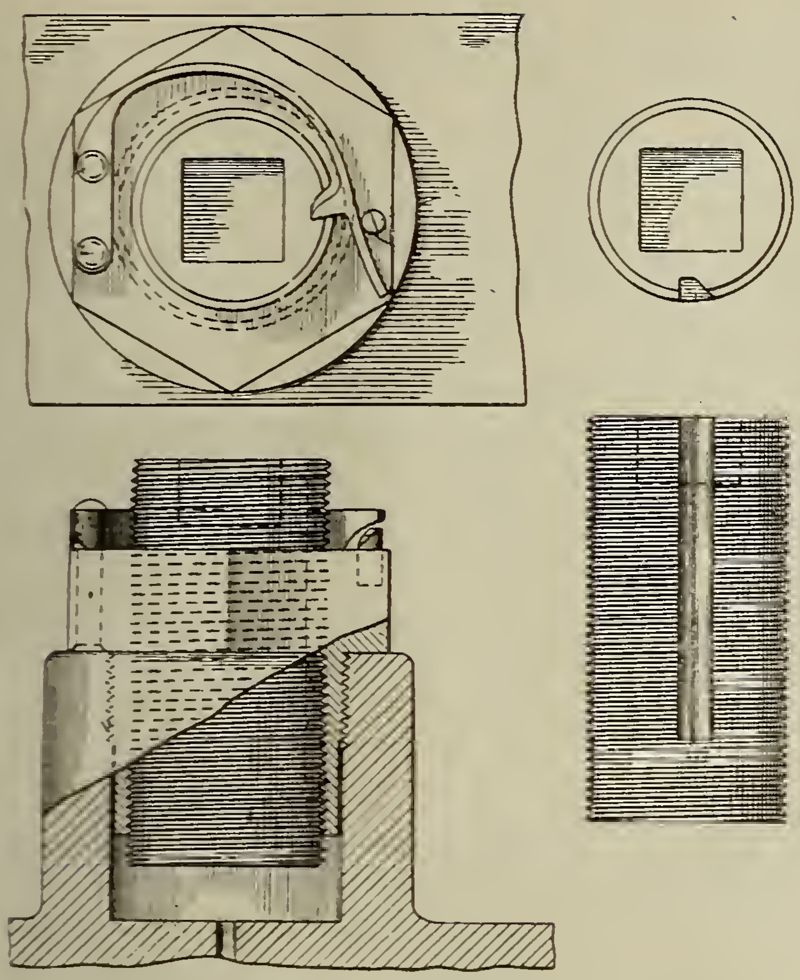


FIG. 1: TERRY GREASE PLUG FASTENER.

tached to the grease cup. A vertical groove in the grease plug engages the tip of the plunger when the plug has been screwed into position and the plug is held securely until the plunger is withdrawn. The plunger may be withdrawn by pulling on a cross piece fitting in a slot through the end of the plunger. When the tip of the plunger engages the groove of the plug,

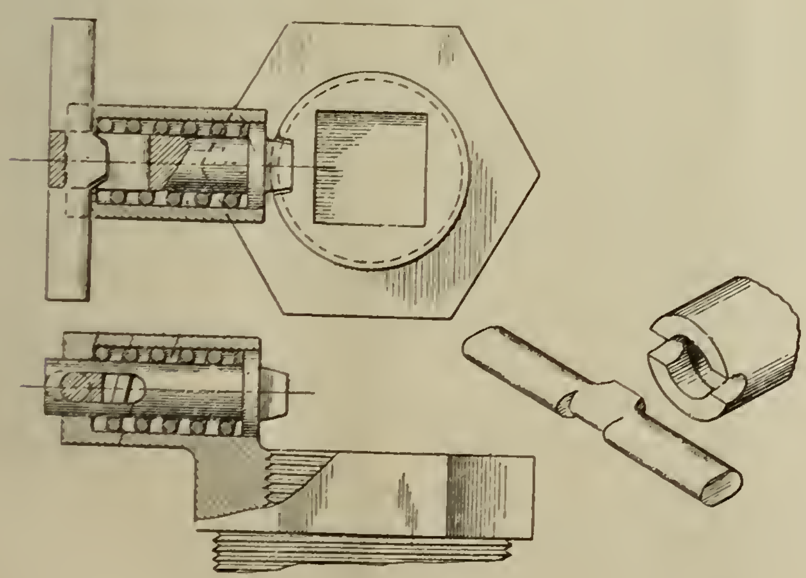


FIG. 2: TERRY GREASE PLUG FASTENER.

the cross piece engages a groove back of the cylinder. By withdrawing the plunger and giving the cross piece a slight turn, the plunger is held securely and the plug is free to turn.

Stewart Special Oven Furnace

THE great advantage of high speed steel over ordinary carbon steel can only be fully realized with proper hardening. Of the methods of hardening the gas blast furnace gives excellent results. When properly designed, a perfect combustion, under absolute control can be easily maintained. If a comparison be made between a tool heated in a gas blast furnace and one heated in a coal fire, it discloses the fact that the tool heated in the furnace will perform twice as much work as the one heated in the open hearth.

The furnace here illustrated has been found very satisfactory for heating high speed steels. It is known on the market as the Stewart Special No. 1 Oven Furnace and is manufactured by the Chicago Flexible Shaft Co., Chicago.

A small positive pressure blower, attached to the back on the cast iron base supporting the furnace,

STEWART SPECIAL OVEN FURNACE.

supplies the air blast, which is conducted by a pipe at the rear to the furnace. The interior of this base is hollow and used as an air reservoir, which magazines the air and lets it out under uniform pressure. The inlet connection for fuel gas supply is at the globe valve on the pipe at the right which extends to the mixer, where the air and gas meet and united pass into the burners. The air supply is under control in the same manner as the gas. The combustion is projected under a slab and the flame forced by the air pressure travels in the heating chamber centrifugally, thus insuring an absolutely uniform temperature. The furnace is lined extra heavy and provision is made to prevent radiation. A heat up to 2,500 degrees

Fahrenheit can be obtained and kept under the control of the operator for any length of time. The heating space is 12 ins. x 13 ins. x 7 ins. with an opening of 9 ins. x 6 ins. The furnace weighs approximately 1,000 lbs.

Personal Mention

Mr. C. J. Morrison has been appointed standardizing engineer of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan.

Mr. G. S. McKinnon has been appointed assistant master mechanic of the Canadian Northern at Winnipeg, Man.

Mr. E. G. Courtney has been appointed master mechanic of the Arkansas, Louisiana & Gulf, with headquarters at Monroe, La.

Mr. James L. Stark has been appointed general inspector of the car department of the Hocking Valley, with headquarters at Columbus, O.

Mr. M. Marea, road foreman of engines of the Toledo, St. Louis & Western, has been appointed master mechanic of that road.

Mr. N. L. Smith has been appointed master mechanic of the Texas Midland, with headquarters at Terrell, Tex., succeeding Mr. O. W. Lewis, resigned.

Mr. K. L. Dresser has been appointed master mechanic of the Chicago, Cincinnati & Louisville, with headquarters at Peru, Ind., to succeed Mr. George Dickson, resigned.

Mr. H. R. Brigham has been appointed road foreman of engines of the Chautauqua division of the Pennsylvania Railroad at Oil City, Pa., to succeed Mr. C. F. Bishop, promoted.

Mr. C. H. Seabrook has been appointed master mechanic of the Houston Belt and Terminal Company at Houston, Texas.

Mr. J. L. Butler has been appointed master mechanic of the Missouri Pacific at Atchison, Kan., succeeding Mr. J. L. Mills, resigned.

Mr. T. L. Kenney has been appointed road foreman of engines in the west district of the Cleveland, Cincinnati, Chicago & St. Louis Railway in place of Mr. George T. Duane.

Effective January 1, inspection of coal on the Chicago, Burlington & Quincy, has been placed in charge of Mr. J. G. Cranford, fuel engineer, with headquarters at Chicago.

Mr. R. A. Watson has been appointed storekeeper of the New York, New Haven & Hartford, at New Haven, Conn., vice Mr. I. Prescott, resigned.

Mr. J. F. Enright, heretofore master mechanic of the Mobile & Ohio at Whistler, Ala., has been appointed master mechanic of the International & Great Northern at Palestine, Tex.

Mr. W. F. Buck, heretofore mechanical superintendent of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed superintendent of motive power of the entire system, with headquarters at Chicago.

Mr. J. H. McGoff, heretofore master mechanic of the Atchison, Topeka & Santa Fe at Fort Madison, Ia., has been appointed mechanical superintendent, with headquarters at Topeka, Kan., to succeed Mr. W. F. Buck, promoted.

Mr. E. G. Brooks has been appointed master mechanic of the Mobile division of the Mobile & Ohio and the Southern Railway in Mississippi, with office at Whistler, Ala., succeeding Mr. J. F. Enright, resigned.

Mr. T. L. Burton has been appointed general inspector in charge of air brake, steam heat and car lighting equipment of the Central of New Jersey, with headquarters at Jersey City, N. J.

Mr. C. L. Bundy, general superintendent of the car department of the Hicks Locomotive & Car Works, has been appointed general foreman of the shops of the Delaware, Lackawanna & Western at Scranton, Pa.

Mr. John Kelker, for 27 years and until his retirement three years ago, master mechanic of the Denver & Rio Grande at Denver, Colo., died at his home in Los Angeles, Cal., Dec. 18, aged 81 years.

Mr. J. D. O'Connor, of El Paso, Tex., has been appointed foreman of the car department of the Mexican Central at Torreon, in place of Mr. J. B. Farrabes, who has accepted a position with the Southern Pacific at Los Angeles, Cal.

Mr. William Percy, master mechanic of the Wisconsin Central at Fond du Lac, Wis., has resigned to take up other business. Mr. Harvey Halverson, foreman of the coach department at Fond du Lac, succeeds to the position.

Mr. W. P. Chrysler, heretofore master mechanic of the Chicago Great Western at Oelwein, Ia., has been appointed superintendent of motive power, with headquarters at Oelwein, Ia., to succeed Mr. J. E. Chisholm, whose title was general master mechanic.

Mr. C. H. Osborn, division foreman of the Chicago & Northwestern at Fond du Lac, Wis., has been appointed master mechanic of the Madison division, with headquarters at Baraboo, Wis. He succeeds Mr. W. H. Huffman who was retired under the pension rules of that system on November 1.

Mr. Charles E. Fuller, superintendent of motive power of the Chicago & Alton, has resigned, effective January 1, when the jurisdiction of Mr. Peter Maher, superintendent of motive power for the Toledo, St. Louis & Western was extended to cover the Alton. Mr. Fuller has been appointed assistant superintendent of motive power and machinery of the Union Pacific with headquarters at Omaha, Neb.

Mr. Joseph W. C. Cyr, heretofore assistant master mechanic of the Chicago, Burlington & Quincy, at Hannibal, Mo., has been appointed master mechanic at that point, succeeding Mr. I. N. Wilbur, who has retired after 50 years of continuous service with the Burlington system.

Mr. W. Kennedy, heretofore master mechanic of the Grand Trunk at Toronto, Ont., has been appointed superintendent of the motive power and car department of the Central Vermont, with headquarters at St. Albans, Vt., succeeding Mr. James Coleman, resigned.

Mr. E. A. Walton, division superintendent of motive power of the New York Central & Hudson River at Oswego, N. Y., has been transferred to West Albany, N. Y., in a similar capacity, succeeding Mr. G. H. Haselton, who has been appointed assistant to Mr. John Howard, superintendent of motive power, with headquarters at New York.

Mr. Grant Hall, heretofore assistant superintendent of motive power of the western lines of the Canadian Pacific, has been appointed superintendent of motive power of those lines, with headquarters at Winnipeg, Man. He assumes the duties heretofore performed by Mr. William Cross, whose title was assistant to the second vice-president and who had charge of mechanical matters west of Fort William, Ont.

Mr. William McWood, superintendent of the car department of the Grand Trunk, has been retired under the pension rules recently adopted by that company. He has been in the service of the Grand Trunk since 1855, having been assistant mechanical superintendent and superintendent of the car department since 1873. Mr. James Coleman, heretofore master car builder of the Central Vermont, succeeds Mr. McWood, with headquarters at Montreal.

Mr. R. N. Millice, acting master mechanic of the Mexican Central at Guadalajara, Mex., has been appointed division master mechanic at Aguascalientes, Mex., succeeding Mr. R. D. Gibbons who has been transferred to Saltillo, Mex., as general foreman, in place of Mr. J. G. Smith. Mr. L. G. Wallace has been appointed acting master mechanic at Guadalajara, Mex., in place of Mr. Millice. Mr. W. J. Dempster has been appointed division master mechanic at Monterey, Mex., to succeed Mr. J. A. Lewis, transferred.

Mr. F. J. Cole, heretofore mechanical engineer of the American Locomotive Co., has been appointed consulting engineer with headquarters at Schenectady, N. Y. The office of mechanical engineer has been abolished and the duties heretofore performed by this officer will be included in the jurisdiction of Mr. Wm. Dalton, chief engineer, with headquarters at Schenectady. Mr. Carl J. Mellin, heretofore designing engineer, has been appointed consulting engineer, with headquarters at Schenectady.

Garland Car Ventilator

The ventilation of passenger and refrigerator cars is one of exceptionel interest and many experiments have been made from time to time to produce a satisfactory ventilator. Various methods of ventilation have been attempted and the problem of determining a satisfactory method has always been difficult because of the various conditions involved.

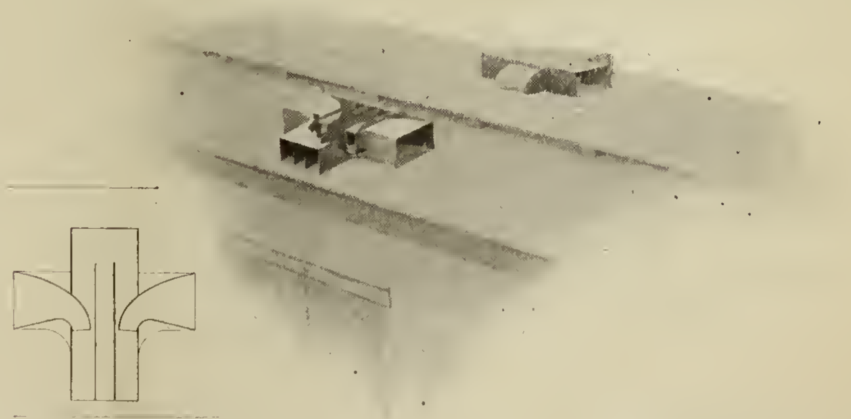
The presence of warm air and gases in the upper portion of the interior of a refrigerator car causes fruit and other perishable material loaded in this part of the car to deteriorate when shipped over long distances. This difficulty has caused considerable trouble to shippers and has occasioned losses amounting to many thousands of dollars as a result of the necessity of throwing away damaged fruit or selling it without profit.

Observation of such conditions and due realization of the benefit to be derived from removing the warm air and gases as fast as they arise during transportation, led to the design of a simple and effective ventilating device by Mr. T. H. Garland, who has had supervision over the refrigerator traffic of the Chicago, Burlington & Quincy railroad during the past eight years. This

APPLICATION OF GARLAND CAR VENTILATOR TO PASSENGER COACH.

ventilating device has been developed by an extended series of tests made on various roads in different parts of the country and at different seasons of the year.

The ventilator is constructed upon the aspirator principle and exhausts or draws out the impure air from a car to which it is attached, the design and construction of the ventilator being such that dirt, smoke, cinders, rain or snow can not enter the car through the ventilators. As the ventilation of cars is accomplished by drawing out impure air, no drafts are produced and the air in the car is being constantly changed, so that in the case



APPLICATION OF GARLAND CAR VENTILATOR TO REFRIGERATOR CAR.

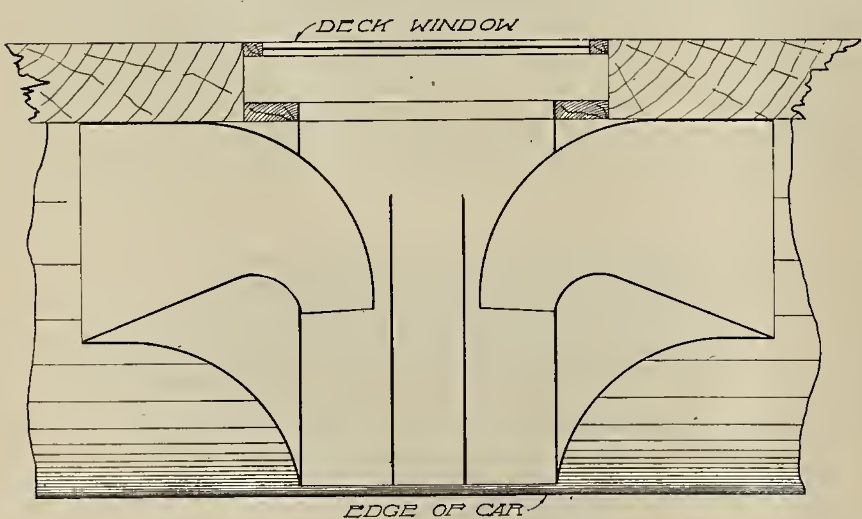
of ventilating passenger cars the air is changed without discomfort to passengers. While this ventilator had its origin in providing for the requirements of refrigerator cars, it is equally applicable to passenger and sleeping cars and a large number have been applied to passenger equipment, especially to cars of the Pullman company.

The accompanying half tone engravings illustrate the general appearance of the ventilators and their application to both passenger and refrigerator cars, while the line drawings illustrate in detail the principle by which they operate. By referring to these illustrations it will be seen that each ventilator has two air intakes and three exit vents or exhaust tubes, the latter connecting with the opening through the roof or through the deck of the car. The air intake openings face in opposite directions toward the ends of the car so that the ventilator will operate qually well with the car going in either direction. The action of the air passing through the intake ducts causes a large amount of impure air to be drawn out of the car through the exhaust vents.

The air forced into the funnel shaped duct by the motion of the car is partly compressed and flows with considerable force out of the vent. The opposite duct will likewise create an outgoing current from the several vents when the car is running in the opposite direction. The swift passage of the air through and at the mouth of the exhaust tubes produces a suction that draws out the air from the top of the car. The velocity of the air currents in the ducts and vents, and the force of the suction and consequent quantity of air exhausted from the car from the action of this apparatus, is directly proportional to the speed of the car.

According to the claims of the inventor, anemometer tests have shown that when refrigerator cars are running at a speed of thirty miles per hour, each ventilator of the size shown in the illustration is capable of exhausting 10,000 cubic feet of air per hour from the car. As the refrigerator cars thus far equipped have each two of these ventilators, it follows that the total exhaust may be 20,000 cubic feet per hour. If it is assumed that the car body contains 2,000 cubic feet of air, which is approximately correct, this would mean that all the air in the car would be exhausted ten times per hour or once every six minutes. A damper or regulator is provided at the inner end of the opening into the car, so that the ventilation of the car can be regulated according to the requirements of the load.

The exhaustion of air from the car must mean the inlet of an equivalent amount of fresh air. No air can enter through the vents, as the current is entirely outward. Neither could warm air find entrance through the vents when the car is not in motion so long as the air within the car is colder and therefore denser than the outside air. But while the car is in motion the air is replenished, it is stated, by removing one or more of the covers



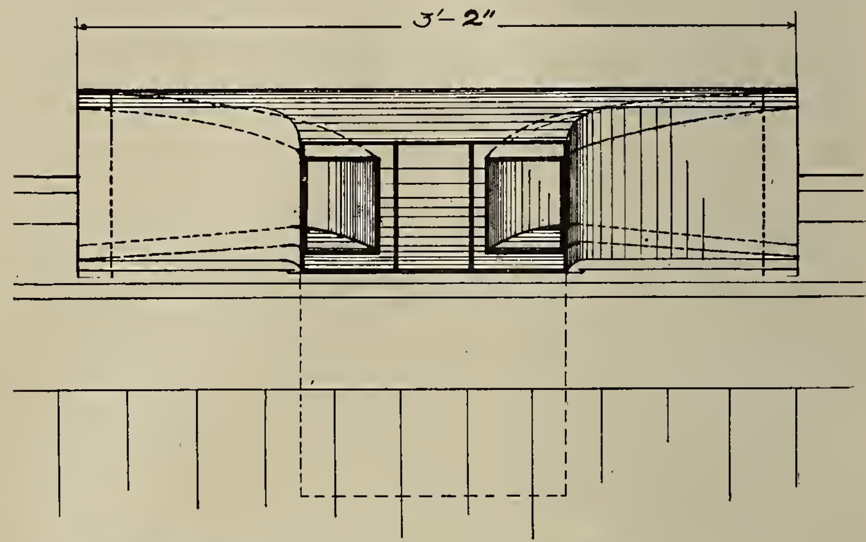
PLAN OF GARLAND CAR VENTILATOR.

to the drain pipes or by partially opening one of the hatches at the rear end of the car. The admission of fresh air is then through the ice boxes, and so long as there is ice in the ice bunkers the air will be cooled ere it enters the car.

In a general way it is stated that cars on which tests were made were iced about the same as cars without the ventilator attachment, and came through with about the same amount of ice remaining in the bunkers. Further experimenting and more careful tests will throw more light on the value of this simple attachment for refrigerator cars. It certainly possesses the merit of being inexpensive and requiring almost no attention whatever. Furthermore, if the results shown in the tests thus far made prove to be generally applicable it will be possible to load considerably more perishable produce in the car thus equipped as practically all the space can be occupied where now only about two-thirds and sometimes but one-half of the space between floor and ceiling is filled. This would greatly reduce the number of refrigerator cars necessary to transport a given supply.

As heretofore explained, the use of the ventilator is not confined to the refrigerator car. It operates quite as effectively on passenger cars and the Pullman company, it is stated, has adopted it for their sleepers. At the present time over 2,000 Pullman cars have been fitted with this apparatus, the exhaust vents following the curve of the roof at a right angle with the length of the car. Usually ten such ventilators are placed on a car.

Tests made with the anemometer, it is stated, show that when a car thus equipped is running at a speed of forty miles an hour, each ventilator exhausts about 20,000 cubic feet of air per hour, or with ten on a coach a total exhaust of 200,000 cubic feet



SIDE ELEVATION OF GARLAND VENTILATOR FOR REFRIGERATOR CARS.

per hour of continuous travel at the speed named, which is equivalent to changing the air in the car completely every two or three minutes.

The feature that especially recommends the use of this ventilator on passenger coaches and sleeping cars is the fact that there are no inward drafts of air through the ventilators, neither can smoke, cinders, dust, rain or snow enter through them, as the currents of air are always outward, nor yet can the heat and the carbonic acid in the exhalations of the passengers remain in the car. It is stated that repeated tests made in Pullman cars equipped with this ventilator, when running over the hot and dusty plains, have shown that the temperature in such cars was from five to ten degrees lower than it was in cars not thus equipped. There is no apparent necessity for providing inlets for fresh air as the leakage through windows and doors, frequently opened, is sufficient. But the circulation of air thus maintained adds materially to the comfort of the passengers, even though they are as a rule absolutely unconscious of any ventilation being provided.

The M. M. & M. C. B. Conventions

Under date of January 8, 1908, "Official Circular Number One" has been sent from the office of the president of the Railway Supply Manufacturers' Association. The circular signed by Earl G. Smith, secretary, is as follows:

"The next annual convention of the Master Car Builders' Association will be held in Atlantic City, June 17, 18 and 19, 1908. The next annual convention of the American Railway Master Mechanics' Association will be held in the same place, June 22, 23 and 24, 1908. The meetings of the railway men will be held in the Meeting Hall, on Young's Million Dollar Pier. The offices of the Railway Supply Manufacturers' Association and the exhibits will also be upon the said pier, with the exception of the track exhibits, which will be located upon the tracks of the Philadelphia & Reading Railway, on Mississippi avenue, 600 feet from the pier and immediately adjoining the Boardwalk, a very desirable location for track exhibits.

Membership dues of the Railway Supply Manufacturers' Association are $25 per year and carry with them one badge. The following are extracts from a resolution adopted by the present executive committee:

Additional official badges may be obtained by members for representatives and ladies who may be in actual attendance at the convention for the sum of $5 each.

Any abuse of the privilege of receiving badges on the part of members or representatives, will be duly reported to the executive committee, and by them reported in writing to the company represented, with the request that such person be not allowed to attend the next convention.

Lost badges cannot be replaced, and any found should be returned to the enrollment committee.

Children under 15 years of age, accompanied by their parents or guardians, will be admitted without badges.

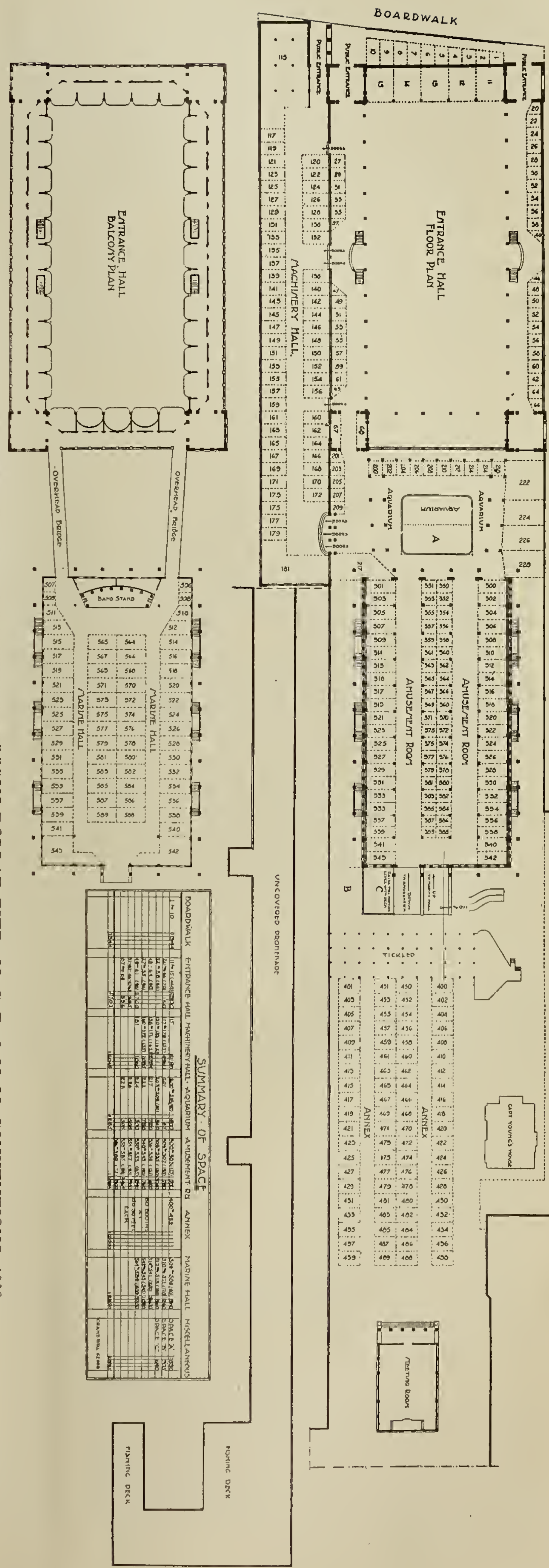
The principal hotels have made reservation and rates for the conventions. The Marlborough-Blenheim has been designated as headquarters. A partial list of the hotels who have entered into the arrangements for entertaining our conventions, together with their detailed rates, is printed on the last page of this circular. We particularly desire and recommend that our members patronize the hotels that are listed, for the reason that they have contributed largely to provide various important items for our use. For the convenience of members located at some distance from the pier there will be established in the vicinity of the Chalfonte Hotel a roller chair station in addition to the station at the pier.

The Atlantic City Hotel Men's Association has offered to our association without charge the use of their entire plant of exhibit structures and materials as it may be found in storage at the time it is needed for our conventions. We have arranged with a reliable contractor for the erection and removal of the plant, and also for the supplying of various items, such as Crex matting for floor covering on every booth and aisle, a harmonious burlap background in every space where such is in the opinion of your committee desirable, a telephone between every two exhibitors and the standard white enamel signs. All of these items are included in the charge for the erection and use of structures and incidentals. The arrangement which we have made with the contractor for the major part of this work is that it shall be done with a guarantee that his total shall not exceed a certain limit. This guarantee is such that the total expense will not exceed forty cents per square foot. After all expenses are paid the balance in the hands of the committee will be returned to the exhibitors pro rata.

The use of these structures and the harmonious scheme of floor covering, backgrounds and signs will create a general decorative scheme and make a harmonious setting for the exhibits. Their erection by our association prior to your arrival will save a great deal of care and responsibility and prove to be a great convenience to exhibitors. A very large proportion of all of the exhibit spaces will be in permanent buildings. Such space as is in temporary buildings will be well protected from wind and weather. Some space will be reserved in outside locations on which there will be no structures. Exhibitors having large booths which they would like to place upon this space may do so. In such case our association will not furnish any of the items mentioned above and there will consequently be no charge for them.

Because of the nature of the buildings and the pier and their relation to each other, it will be necessary to create a certain number of large spaces of irregular shape. These will be allotted by the exhibit committee to exhibitors whose requirements they will suitably fulfill. The balance of the exhibits will be classified as heavy, light and working exhibits, and space allotted

FLOOR PLAN OF EXHIBIT SPACES ON YOUNG'S MILLION-DOLLAR PIER—M. C. B. & M. M. CONVENTIONS, 1908.



to each class by the committee in accordance with its best judgment. After this the assignment of space among the various exhibitors in each class will be by lot.

The spaces available for exhibits will be principally as follows:

Area Sq. ft.	Frontage (approximate) Ft.	Depth (approximate) Ft.
	LIGHT EXHIBITS.	
90	10	9
150	10	15
200	10	20
	WORKING EXHIBITS.	
90	9	10
155	9	17
	HEAVY EXHIBITS.	
85	9	10
88	9	10
155	9	17
162	9	18
175	9	19
180	9	20

In the majority of cases as many units as may be desired can be provided together. There are irregular spaces as follows: Light exhibits, 120, 180 and 545 square feet; working exhibits, 500, 505, 720 and 730 square feet; heavy exhibits, 640, 705, 720, 1050, 1060 and 2190 square feet.

The same arrangements as last year have been made with the Eldredge Express Company for trucking and with J. L. Shoemaker & Company for furniture. Exhibitors should make their arrangements direct with these concerns.

The Eldredge Express Company of Atlantic City is to handle the exhibits at the following rates:

For taking machinery, castings and cases weighing over 300 lbs. from the railroad stations to the exhibit space on the Million Dollar Pier and return, per ton........$5.00

For taking consignments weighing less than 300 lbs. each for the round trip as described above, per case........ 1.00

For one way, per case.................................... .50

In sending your exhibit to Atlantic City it must be plainly addressed to your company and your space number, care the Million Dollar Pier, care Eldredge Express Company, Atlantic City, New Jersey.

No roll top desks will be allowed. J. L. Shoemaker & Company, 926 Arch street, Philadelphia, will supply furniture at the following rates:

Flat top desks	$5.00
Table, 6 ft. long	5.00
Table, 4 ft. long	2.00
Common table	1.00
Revolving chair	2.00
Arm chair	2.00
Oak side chair	1.00

Express packages should be marked with space number and sent prepaid to the exhibitor, care Young's Million Dollar Pier, Atlantic City, New Jersey.

If it is your intention to exhibit at the 1908 convention, we would like to have your application made out in accordance with and upon the enclosed form and mailed to the secretary, 241 Railway Exchange Bldg., Chicago, so as to reach his office not later than February 15, 1908. Applications received after that date will be assigned such space as remains available. No application will be considered unless accompanied by draft fully covering space desired and covering also membership dues, if these have not already been paid."

Shown herewith is a floor plan of exhibit spaces on Young's Million Dollar Pier. The secretary of the association states positively that no choice of space will be allowed. The location of each exhibit will be determined by the committee in charge, thus doing away with the immense amount of detail work with which former secretaries have been burdened.

The floor plan would indicate an ideal layout of spaces and everything would point to a larger and more successful exhibit than ever before. While ample room has been provided, exhibitors should not delay sending in their applications for space. All information regarding space, hotels, rates, etc., may be obtained by addressing Earl G. Smith, secretary Railway Supply Manufacturers' Association, 241 Railway Exchange, Chicago.

Technical Publications

Procedings of the Fifteenth Annual Convention of the Traveling Engineers' Association, held at Chicago, September 3rd to 6th, 1907. W. O. Thompson, Secretary, Buffalo, N. Y.

The proceedings of the fifteenth annual convention of the Traveling Engineers' Association is representative of the usual high class information provided by this organization. The reports and papers presented, as well as the supplementary discussions, constitute a fund of information well adapted to maintain the motto of the association, to improve the locomotive engine service on American railroads. The principal subjects considered in the proceedings are: how best to locate the fault of an engine not steaming without removing draft appliances; advantages of hot water in washing out and filling boilers; best method of eliminating the smoke nuisance on soft coal burning engines; what is required of the air brake to properly control the trains of to-day, and what has been done by railroads and manufacturers to meet these requirements; superheated steam and the best methods of getting good results when engines are in service on trains; waste of energy in railroad operation; lubrication of cylinders and valves of locomotives using saturated and superheated steam; reduction in coal consumed and increased efficiency of men and locomotives; road foreman of engines and his relations to indifferent enginemen, and the pooling of locomotives in general; advantages of the automatic stoker as compared with hand firing.

Proceedings of the Thirty-eighth Annual Convention of the Master Car and Locomotive Painters' Association held at St. Paul, Minn., September 10th to 13th, 1907. A. P. Dane, Secretary, Reading, Mass.

The proceedings of the thirty-eighth annual convention of the Master Car and Locomotive Painters' Association contain a number of very interesting and instructive papers and reports concerning the paint department of railways and include discussions that add materially to the information presented by the original reports and papers. Among the principal subjects may be mentioned: the painting of steel car equipment; plainness, problems, etc.; disinfecting passenger cars at terminals; cleaning, coloring and lacquering metal trimmings; painting locomotives and tenders; linseed oil substitutes and drying oils; and queries on: material that will resist rust; denatured alcohol; advisability of applying three coats of color to a car if two will cover; improvement of freight car stencil paints; durability of pressed fibre compared with three ply wood veneer; nature of detergent for railway paint shop use.

An Introduction to the Study of Electrical Engineering. By Henry H. Norris, M. E., 404 pages, 179 figures. Published by John Wiley and Sons, New York. Cloth bound. Price, $2.50.

It is important that the student of electrical engineering in approaching the subject should have personal knowledge of the things and phenomena involved before any reasons can be ascribed to them. Observation and memory must supply the raw materials from which deductions are to be made. We must proceed from the familiar to the new and unknown. Hence the plan of this introductory work is to take the every-day experience of the student as the basis of a general survey of electrical applications. Every one rides on electric cars, uses telephones and electric lights, and in other ways comes into more or less intimate contact with electrical phenomena. By combining with this experience the lessons taught by scientific research, a clear conception of electrical laws should result. These laws may then be used to explain the operation of the numerous devices used in electrical practice.

The study based upon this course is intended to lay a foundation for further analytical work by those who desire it. In combination with practical experience or with laboratory exercises it should be sufficient to enable the student to intelligently select, install, and operate electrical machinery.

There are chapters on: Historical Development of Electrical Engineering; Fundamental Electrical and Magnetic Quantities; Materials of Electrical Engineering; Electric Circuits; Magnetic Circuits; Construction of Electric Circuits; Operation of Electric Generators; Transformers and Their Applications; Construction and Operation of Power Stations; Electric Motors and Their Applications; Electric Lighting and Heating; Electrical Measurements; The Transmission of Intelligence.

How to Burn Illinois Coal Without Smoke. By L. P. Breckenridge. Bulletin No. 15 of the Engineering Experiment Station of the University of Illinois. Published by the University.

A few pages of this bulletin are devoted to the principles of combustion and the losses due to smoking chimneys, but the larger part of the bulletin relates to the constructive features of those boiler settings and furnaces that have been found practically smokeless in operation at the power plant and in the experiment station at the University of Illinois. The leading dimensions of the settings and furnaces are given, and sectioned cuts show the general character of the settings. With each cut is given a statement as to the range of capacity of each setting for smokeless operation. Especial emphasis is given to the importance of knowing the rate at which the coal is to be burned on each square foot of grate surface, together with the percentage of volatile combustible which the coal contains, and for which a suitable combustion space or chamber must be provided. Some interesting illustrations show clearly the significance of the numbers used in describing smoke densities, and there is also a chart devised for making graphic records of smoke observations. Five tables of tests are given showing the conditions of operation of a smokeless furnace under changes of boiler capacity varying from 50 to 150 per cent. There are no illustrations showing approved settings for the horizontal fire-tube boiler, but suggestions are given as to methods of hand firing which will tend to reduce smoke production.

While this bulletin discusses the smokeless burning of Illinois coals, the principles and methods explained apply equally well to the burning of all kinds of soft coal. Copies of this bulletin may be had free by writing to the Director, Engineering Experiment Station, Urbana, Ill.

The Engineering Digest. A magazine of Technical Information for Engineers, Designers and Constructors. Published every month by the Technical Literature Company, New York.

A more or less general misapprehension by technical readers as to the nature of the contents of Technical Literature as described by that title, has made a change of name advisable. The magazine is an engineering publication—an epitome or compendium of published information on technical subjects—it deals with the subjects of current interest, not merely with the literature of these subjects, as might be erroneously assumed from the words "technical literature." A magazine of this kind is essentially an "engineering digest," and after careful consideration this title has been adopted as most clearly defining the nature of the publication. One other change—the "Index," now known as the Index to Technical Articles in Current Periodical Publications," will be called the "Technical Press Index," and will be increased considerably in scope to include more of the foreign publications and society transactions. The policy of the magazine will not be altered. It will continue to publish the widest possible range of technical information and the publishers will continue their efforts toward constant improvement with the object of making The Engineering Digest the most useful engineering publication in the English language, and an invaluable companion to technical men in all parts of the world.

Notes of the Month

C. W. Martin, assistant general manager of Jenkins Brothers, New York, died on December 31 of pneumonia. Mr. Martin was 37 years old. He has been with Jenkins Brothers for a number of years and in 1905 was chairman of the executive committee of the Railway Supply Men's Association.

The 1908 catalogue of the Washburn Steel Castings & Coupler Company thoroughly illustrates and describes the large and varied line of devices being placed on the market by this company. Among the new devices placed on the market and worthy of particular mention is the Washburn car replacer which seems to include many features of merit.

New York & New Jersey Lubricant Company, 14 Church street, New York City, announces the connection of Mr. Charles F. Pierce with the company. Mr. Pierce, who is well known in the railway supply trade, was formerly connected with the railway department of the Goodwin Car Company and prior to that time with the Lindenthal Truck Company and American Palace Car Company.

A plan has been made public looking to the termination of the receivership of the Westinghouse Machine Co., Pittsburg, Pa. It includes the issue of $7,200,000 three-year 6 per cent notes secured by about $8,500,000 in bonds of the company. Claims of less than $1,000 are to be paid in cash and the others in notes. No dividends are to be paid until provision has been made for retiring the outstanding notes.

J. S. Beckwith, formerly secretary and treasurer of the Industrial Iron Works, Pittsburg, has opened an office at 1806 Machesney building, Pittsburg, as representative of the Mead, Morrison Mfg. Co. and the Scottdale Foundry & Machine Co. Mr. Beckwith has also succeeded Arthur Metzger as Pittsburg representative of the Parker Boiler Co.

The Rust Boiler Company, of Pittsburg, Pa., has issued an interesting and instructive pamphlet descriptive of the Rust water tube boiler and including the results of tests made by Professor William Kent to determine the capacity and economy of a Rust water tube boiler in service. The tests prove a boiler of this type to be capable of high efficiency and give every reason to believe that the high results obtained during the tests can be duplicated at any time when the same conditions prevail as those under which these tests were made.

E. H. Symington, western manager of sales of the T. H. Symington Company at Chicago, returned on December 20 from a trip around the world, including visits to Japan, China, India and other oriental countries. It will be remembered that last May Mr. Symington sustained serious injuries from being thrown from his horse while riding in Lincoln park and has for the last four months been touring the continent to regain his strength. After an extended visit in the east Mr. Symington will again resume his duties at the Chicago office.

George Callahan & Co., Santos building, Front street, New York City, manufacturers of the Callahan steam joint iron cement, have received a tabulated statement from the Delaware, Lackawanna & Western Railway which shows that the joints to which their cement was applied over a year ago on a number of locomotives, are in good condition and no trouble has been experienced since it was first put on. This cement has been used on the Pennsylvania Railroad for over twenty years and is now used extensively on prominent railroads throughout the United States and Canada.

Milwaukee Locomotive Manufacturing Company, Milwaukee, Wis., has leased a factory at North Milwaukee, and is equipping it with modern machinery for the manufacture of gasoline and alcohol locomotives for industrial purposes. The locomotives will be built both narrow and standard gauge, suitable for heavy or light work. Locomotives for passenger service on railways will also be built, one of which is now under construction. The company is incorporated with a capital stock of $50,000. F. P. Cook is secretary. The stockholders of the company are all prominent citizens of Milwaukee.

Twin City Equipment Company, Minneapolis, Minn., has purchased two acres of land midway between Minneapolis and St. Paul, and will build shops there which will give employment to steam engineers when idle or passing through and temporarily delayed. Construction work will not be started until spring. The company will repair steam shovels and locomotives, mining and lumbermen's equipment and manufacture frogs and switches. The plant will consist of a 10-stall roundhouse and a machine and blacksmith shop. The company is capitalizing for $200,000, and the shares, which are $50 each, are only sold to steam shovel engineers. P. W. Jones is president and manager.

Mr. A. E. Robbins has resigned from the Gold Car Heating & Lighting Company to take a prominent position with the Ward Equipment Company. Mr. Robbins is well and favorably known to a very large number of railway officials and supply men throughout the United States and Canada. He has been remarkably successful and every indication points to his continued and still greater success with the Ward Equipment Company.

Rostand Manufacturing Company, Milford, Conn., the well-known manufacturer of the McCarthy rack, has put on the market a new alloy known as McCarthy's manganese bearing metal. The anti-friction properties contained in this metal are claimed to have many advantages over existing anti-friction metals, the principal benefit being that in case of emergency it will run without oil and not heat. The metal melting at a high degree casts sharply with practically no shrinkage and will stand a compression strain of 30 tons to the inch, thus it is well adapted to large bearings requiring strength. The company is willing to furnish to interested parties a liberal quantity of this bearing metal for test purposes. Brass, bronze and aluminum castings are also a part of the products of this company.

The Rock Island Tool Company has issued a complete catalogue illustrating and describing the line of vises marketed by this company. Particular attention is called to the company's automatic self-locking swivel vises. They are locked automatically by tightening on the jaws. No pins, levers or screws to be turned or pulled; no complicated mechanism. No more parts than the ordinary stationary vise.

The Rock Island Tool Company operates its own foundry and does not depend on outside foundries for its castings. Its alloy mixture gives a very tough and strong vise casting. The screw of the vise, as well as the knob and head and the handle, are cold rolled steel. The jaws are of a fine grade of crucible steel. The vises are not guaranteed not to break, but the manufacturer does guarantee to replace the broken parts free of charge.

Foos Gas Engine Company, of Springfield, Ohio, has purchased the business of the Marinette Gas Engine Company, which comprises the line of Walrath multiple cylinder engines for electric and power work, from 20 to 500 horsepower. This engine has been on the market for over 10 years, is highly recommended by practically all of its present users, and as manufactured under the excellent factory system of the Foos interests, is one of the best engines of its type. This complete line of vertical engines with the line of horizontal engines from 2 to 90 horsepower, with their various equipments, which have been on the market for 20 years, makes the Foos line very comprehensive. The Foos Gas Engine Company operates the largest plant devoted exclusively to gas engine manufacture, and the business is being extended very rapidly.

Change to Net Weight Packages

Leading paint color and white lead manufacturers have changed all packages of their products sold by the pound from gross weight to net weight. This change went into effect January 1, 1908. Heretofore it has been the custom of the trade to put up all past form goods in gross weight packages, although liquid goods have been sold by all reputable manufacturers for some years full U. S. standard measure. This is a step in the right direction because it fixes a definite standard regardless of the shape or weight of the package in which the goods are sold and enables the consumer to know how much material he is buying. A number of paints and colors are already on the market bearing net weight on the labels. All reputable lines of this character will be effected as soon as the various makers can carry out the necessary changes.

"Girls of Old Mexico" Calendar

The National Lines of Mexico have issued an unusually attractive and distinctively unique calendar for 1908, known as the "Girls of Old Mexico" calendar. This skillful reproduction of an artist's work seems to meet admirably the general desire for and need of an intimacy with Mexican life and color that the unprismed camera plate has not afforded. Those who know Mexico broadly will welcome this innovation. Undeniably the blanketed and sandaled peon contributes generally to the picturesqueness of the country, but his amiability in the presence of the kodak ranger has resulted in a most exaggerated prominence pictorially, and fostered an entirely erroneous foreign belief that he alone is typical.

The six types represented by the reproductions on the calendar have not been as common among photographers' collections as peon types have been. Yet they are genuine and representative. Cecil Grylls painted them not from posed models, but from the unposed life studied unceasingly through long months of preparatory travel throughout the country. The artist labored not to produce a calendar but to reproduce a people. Appropriation to the present use was possible only after the work had become another's property by purchase.

"Girls of Old Mexico" calendars may now be obtained from representatives named below on receipt of twenty-five cents, which includes the cost of both packing and mailing:

New York City, rooms 1201-1202 Bowling Green bldg., 11 Broadway, W. F. Paton, general eastern agent; Chicago, Ill., 1400 American Trust bldg., G. R. Hackley, general western agent; Cincinnati, Ohio, room 1301 Union Trust bldg., C. R. Hogle, commercial agent; Laredo, Tex., C. M. Fish, commercial agent; New Orleans, La., 708 Common street, G. Filleue, commercial agent; Pittsburg, Pa., room 603 Bessemer bldg., H. J. Falkenbach, commercial agent; St. Louis, Mo., room 209 Houser bldg., Frank L. Moe, commercial agent; San Antonio, Tex., 122 Alamo Plaza (adjoining Menger Hotel), E. Muenzenberger, general agent.

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In remitting, make all checks payable to the Crandall Publishing Company.

Papers should reach subscribers by the first of the month at the latest. Kindly notify us at once of any delay or failure to receive any issue and another copy will be very gladly sent.

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CONTENTS

The Bright Side of Railroading

THERE is a bright side to railroad work, as there is to any work in which a man puts his confidence, interest and enthusiasm. Sometimes the brighter features of the railway environment fail to make themselves evident at the moment. However, men will look back when in a reminiscent mood and find that experiences which, when they occurred, seemed rough and rugged, have features that call forth many pleasant recollections.

That railway life has a bright side, or even several bright sides, was well brought out by Mr. C. E. Lee, general superintendent of the Boston & Maine Railroad, in a clever and interesting paper entitled "The Bright Side of Railroading," recently presented before the New England Railroad Club. Mr. Lee explained that even in the awful tragedies of railroading there is some times a touch of comedy, and in the impractical suggestions for improving railway service made by well-meaning and friendly persons, there is often the source of much amusement. The railway supply man, he says, is a large and increasing factor to the bright side of railroading. With his cheery greeting and pleasant smile the supply man some times prevents the railway man from doing what he wants to do, yet he is equally potent in giving the railroader a pleasant excuse for postponing things that he does not want to do.

Remodeling an Old Shop

IN remodeling an old shop, complications that do not enter into consideration when building an entirely new shop plant, are frequently encountered. The size and limitations of the property on which the original shop stands, impose the greatest impediment, especially so in case the land occupied by the shop is entirely or nearly covered by shop buildings.

Under such conditions it is impractical to suspend entirely the operation of the original shop. Yet when the work of remodeling and rebuilding has been begun, it is the desire of all concerned to bring the construction work to completion as soon as possible. Naturally, more or less delay results from the impediment imposed by the old buildings and the fact that a clean sweep can not be made to clear the path for new work. Therefore the determination of a practical method whereby an old shop may be replaced by a new one, without materially interfering with its operation, is a difficult problem. Its solution requires familiarity with the routine of the shop operation and clever engineering ability to remove and replace equipment so that no department is unnecessarily hampered.

The work of improving and extending the West Springfield shop of the Boston & Albany Railroad presented just such a situation. On the site of the original shop plant new buildings have been erected to house the erecting, boiler and tank shops, power house and storehouse and office building. The structural steel for this work was received late in October, 1907, and by the first of January, 1908, locomotives were being turned out of the new shop. During the remodeling and improvement period the shop continued its output of about eighteen engines per month.

This shop was remodeled and rebuilt by Westinghouse, Church, Kerr and Company and an account of this work appearing on another page of this issue, describes a number of very interesting features of shop construction and improvement.

Reporting Injector Failures

WHEN a foreman gets up into the cab and tries the injectors after a report that "injectors won't work" some engineers seem to regard the action as indicating a disbelief of their statement. In reality the foreman is seeking to locate the seat of the trouble rather than to dispute the statement of the report, for the average roundhouse man knows that as a general thing an engineer is capable of nursing an injector to work where others will fail. The injector is one of the most vital adjuncts of a locomotive and an engineer usually informs himself thoroughly on every method by which to keep an injector going.

The report to repair an injector is apt to include more than mere actual work on the device itself. It covers work upon all connections and accessories from the tank to the boiler check. When an intelligent man starts to make repairs he naturally seeks at once for the seat of the trouble in order to save time on the job. By attempting to work the injector he is likely to determine whether there is too much water through the overflow, whether there is a leak in the suction line, and etc. If the trouble is in the cones there is no use taking the time to disconnect the hose; while if the hose is responsible it is a waste of time to remove the injector.

Too much depends upon the positive working of an injector for a roundhouse man to assume the responsibility of declaring an injector in good condition just because he was able to make it prime after it had been reported as failing on the road. If an injector really fails, the seat of the trouble should be located, for if overlooked the trouble is apt to recur and under most unfortunate conditions. While it is the repair man's duty to do his part, it is equally the duty of the engineer to so word his report as to give every possible indication of the cause of failure.

Railway Safety Devices

THE tone sometimes used by the daily press concerning railway safety devices would lead an average layman not familiar with railway equipment to believe that the railways are carelessly overlooking necessary precautions to protect the life of trainmen. On the contrary the fact is that the railway companies are ever alert to obtain safety appliances to protect train crews and many experiments are made quietly which are prompted merely by a desire to provide every precaution, even where not required by law. Those people not familiar with the operation of railway cars fail to realize the difficulty of immediately locating defects as soon as they develop. By virtue of his training a car inspector is quick to locate a defect, but it is possible for a defect to develop a short time after the car has been inspected, and between that time and the next inspection it is possible for an accident to occur which could not be anticipated or provided against.

The railway companies maintain a large force of men just for the purpose of inspecting defects and failures and for making quick repairs. Unless a car is switched to the repair track and properly protected by flags and a locked switch at each end of the track, a man making repairs would be subjected to greater danger than a member of the train crew in his ordinary duties. This side of the question seems to be entirely overlooked by writers in the daily press, though it is a fact that an attempt to make immediate repairs before a car can be placed on the repair track would subject a greater number of men to danger of accidents to life and limb, and no company can consistently place their employees in such positions.

Requirements in Steel Car Repairs

STEEL cars are being introduced into railway service in greater numbers and naturally all roads must expect to make various repairs to steel car equipment belonging to foreign roads. With the more general use of steel cars comes the question of liberality among the different railway companies as to requirements in making repairs.

The principal requirement of repairs is to obtain sufficient strength of parts to provide safety to the car. If a damaged car can be put in serviceable condition without scrapping a number of parts that are slightly bent or disfigured, repairs can be made at a reasonable figure. However, if a number of parts slightly bent or bulged must be cut out, straightened and replaced, for the mere sake of appearance and when the strength or safety of the car is not really improved thereby, the cost of repairs will be out of proportion to the actual requirements. Some parts may be repaired and straightened without being removed from a car, by heating the bent places and hammering them into shape. Such a practice will not impair the strength of the car, but the car will not present the same pleasing appearance that it did before being damaged.

Metal parts can not readily be straightened without leaving some evidence of the work having been done. This is particularly so in the event of repairs being made without removing the parts from the car. The question is, then, should damaged parts be removed entirely for the purpose of making repairs and thereby obtain a neat appearance, or is it proper to make repairs without removing the parts, provided the strength and safety of the car are not impaired?

It seems hardly practical for a railway company to attempt to demand that repairs to steel cars shall be so carefully made that the parts shall present the same smooth surface and accurate shape that they had when the cars were first built or when the parts had just passed through the rolls or presses.

On this account it would seem that there is room for the exhibition of a liberal spirit among railway companies in their requirements of repairs to steel cars. The subject is an important one and calls for a general understanding among the railways.

Remodeling the West Springfield Shops

Boston & Albany Railroad

LOCATION OF PLANT.

AMONG the improvements of the Boston & Albany Railroad, undertaken by the management of the New York Central Lines, the extension and remodeling of the repair shops at West Springfield form quite an important part.

The shops are located on the west side of the Connecticut River on the north side of the Boston & Albany tracks, about a mile west of Springfield, Mass.

GENERAL LAYOUT.

The size of the property owned by the railroad company is so limited that in remodeling the shops, part of the original plant had to be torn down to make way for the new buildings. The tearing down had to be carried out in a very carefully planned sequence, so that the working of the shops was interfered with as little as possible.

As an illustration it may be mentioned that at the beginning of the work, the old engine room had to be dismantled and three small engines were installed to operate the shops temporarily. Next the old boiler room, with its brick stack, were enveloped by the new erecting and tank shops. They remained in operation until the buildings were enclosed and the boilers of the new power house were put in commission.

The new buildings that have been erected are: An erecting shop 480 ft. long by 100 ft. wide; a tank shop 240 ft. long by 90 ft. wide; a boiler shop 84 ft. long by 90 ft. wide; a power house 135 ft. long by about 46 ft. wide, and a store house and office building 210 ft. long by 48 ft. wide.

BUILDINGS.

The erecting shop is a steel frame building divided into two bays about 72 ft. and 28 ft. wide respectively. The heavy steel columns carrying the crane girders and steel roof trusses are spaced about twenty feet longitudinally. The curtain walls are made of steel studs and cement plaster on metal lath.

The tank shop, which on one side communicates with the erecting shop, is constructed in the same way as the latter. The roofs of both buildings are of 2-inch plank with tar and slag roofing.

The carrying capacity of the soil supporting the buildings is small and therefore special care had to be exercised wherever concentrated loads had to be carried by the foundations. To obtain the necessary distribution of load, concrete foundations, re-inforced by rails, have been built.

The curtain walls are built of brick to a height of six feet above the floor. The brick work is capped by a concrete water table cast in place, which also forms a sill for the windows. Above the water table the walls are constructed of 2½-inch cement plaster on metal lath attached to one inch channel studs placed sixteen inches apart and supported on steel girths. The studs immediately above the water table were put in place before the water table was cast and their lower ends projected into the form, thus making, when the concrete had set, a very neat and simple attachment. The cement plaster was first applied on the outside and afterwards the space between the studs was filled in with plaster from the inside, making a solid cement wall about 2½ ins. thick. This makes a very strong, light wall.

The boiler shop has brick walls with wooden roof trusses, and columns. The roof is of the same construction as that of the erecting shop.

The power house is a brick structure with steel roof trusses and roof of re-inforced concrete with tar and slag roofing. The lintels are of re-inforced concrete and the sills and coping of concrete. The former were formed in place upon the walls and the latter cast in wooden forms and set in the same manner as stonework.

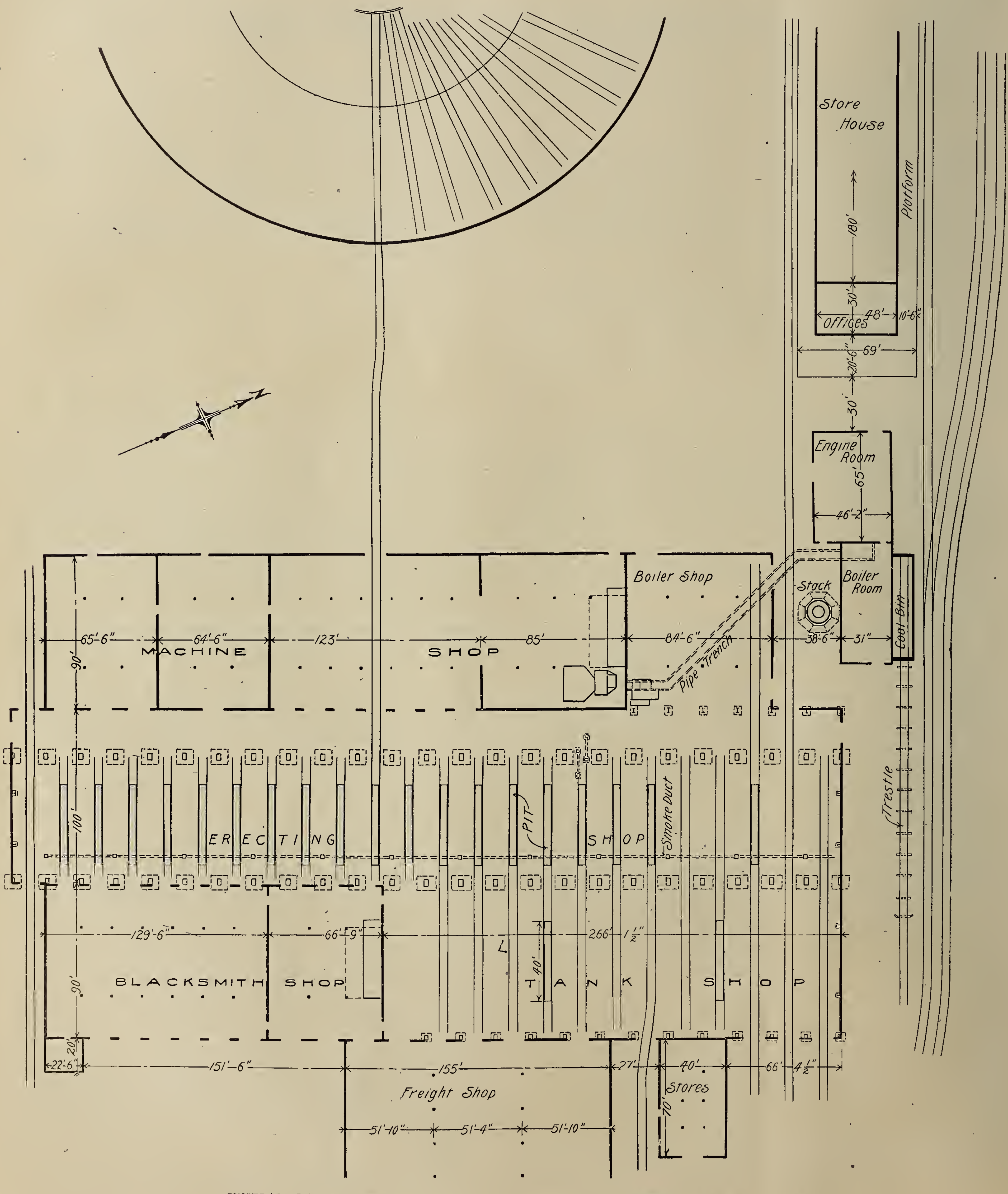
The store house and office building are of wooden stud construction covered on the outside with an asbestos paper to make the walls to a certain extent fire resisting.

The doors and sash in all the buildings are of wood, the latter being glazed with plain glass.

POWER AND LIGHTING PLANT.

The new power house, which is located at the northwest corner of the erecting shop, is a brick building, the exterior of which conforms to the design of the shops. It is divided into an engine room 65 ft. long by 46 ft. wide and a boiler room 70 ft. long by 31 ft. wide.

Coal is supplied to the boiler room from an elevated track that runs the full length of the room outside the north wall. The coal cars dump their load into a storage bin under the track and directly in front of the boiler furnaces on the opposite side of the firing floor. The elevated track is built on concrete piers and heavy tim-



GENERAL LAYOUT OF THE WEST SPRINGFIELD SHOPS—BOSTON & ALBANY RAILROAD.

ber stringers sloping up on a five per cent grade from one of the shop tracks to the top of the storage bin.

At one end of the boiler room a tower has been built containing an overhead bin for ashes. A portable ash bucket on wheels has been provided to be filled with ashes at the ash pits of the boilers. When filled, the bucket is pushed to a hoist directly under the ash bin. It is then attached to the hoist and is run up into the bin and its contents automatically dumped. The hoist then returns the bucket to the boiler room floor when it is ready to be again filled with ashes. A chute provided with a gate projects from the ash bin wall over the coal trestle so that empty coal cars can be filled with ashes as required.

The boiler room equipment consists of four water tube boilers, each of 300 horse power capacity, arranged in two batteries. A plate flue with connections to all four boilers is located above the rear end of the boilers and passes through the south wall of the building to a steel stack immediately outside. The stack, which is 150 ft. high and lined to a height of 50 ft., is supported by a concrete foundation of sufficient depth to withstand any overturning effect due to wind pressure.

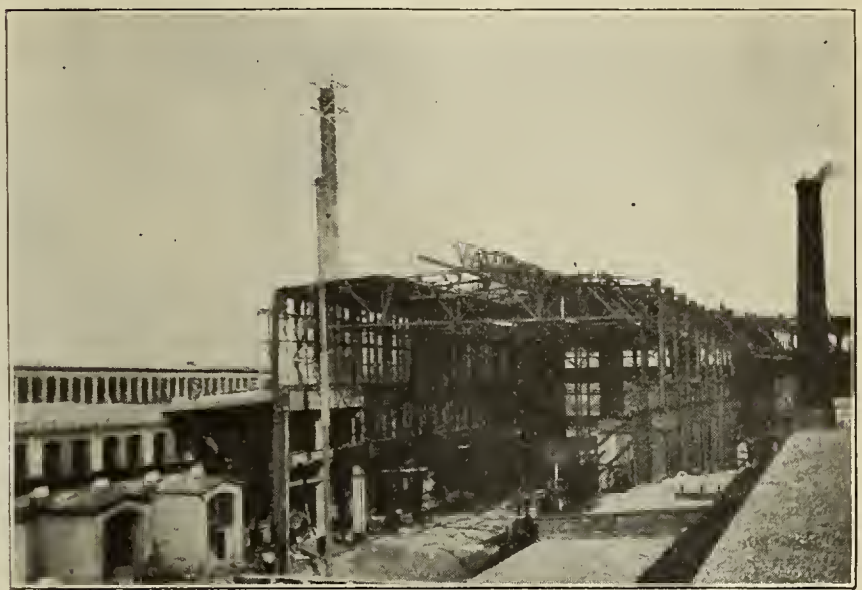
In the boiler room are also located two boiler feed pumps, each capable of supplying the boilers with feed water, and an open feed water heater for heating the feed water. The exhaust steam from the engines, after passing through an oil separator, is used in winter for heating the different shops. The returns from the heating system are collected in a sump and are then returned to the feed water heater by a small pump. In summer the engines exhaust to the atmosphere, the heater taking all the steam that the feed water can condense.

In the engine room the equipment consists of two 18-in. single acting compound engines, each direct-connected to a 250-kilowatt alternating current generator; one 13-in. single acting, compound engine, direct-connected to a 125-kilowatt alternating current generator; one 100-kilowatt motor generator set; two 35-kilowatt exciter units, one steam and one motor driven; and one air compressor.

OLD BOILER HOUSE AND STACK ENVELOPED BY NEW ERECTING AND TANK SHOPS—WEST SPRINGFIELD SHOPS, BOSTON & ALBANY RAILROAD.

The alternating current generators supply the necessary current for lighting the shops and round house, and also the current for the different alternating current motors.

Provision has also been made for supplying through two step-up transformers and a 2200-volt transmission line, the current for lighting the station and office buildings at Springfield.



NORTH END OF ERECTING SHOP UNDER CONSTRUCTION. STACK OF ORIGINAL POWER HOUSE IS SHOWN AT RIGHT AND NEW STACK IS SHOWN NEAR CENTER OF ILLUSTRATION—WEST SPRINGFIELD SHOPS, BOSTON & ALBANY RAILROAD.

Alternating current motors are used throughout the shops with the exception of the motors for such machine tools as require variable speed. For these latter tools, direct current motors are provided and the necessary current is supplied by the motor generator set which was installed expressly for this purpose.

The engine room is served by an overhead hand power crane of 7½-tons capacity.

LIGHTING.

The lighting current for the shops, round house, and power house is supplied from the alternating current bus bars. Both incandescent and arc lamps are in service throughout the shops, the latter being used for general lighting.

HEATING SYSTEM.

The buildings, with the exception of the office building, are heated by the indirect system. Two heating units with fans respectively 240 ins. and 200 ins. in size, take care of the heating of the erecting shop, boiler shop and tank shop, with a connection to the old heating system in the blacksmith shop. The larger fan distributes the hot air through a system of galvanized iron ducts running overhead. The smaller fan, on the other hand, distributes the hot air through brick ducts underground. A smaller unit with an 80-in. fan provides for the heating of the store house. The office is heated by direct radiation.

GENERAL WATER SERVICE AND SEWER SYSTEM.

A complete system of cast iron water pipe has been installed throughout the shops for supplying city water for general service and fire protection. The remodelling of the plant has also entailed a new sewer system.

ERECTING SHOP.

This building occupies the space previously taken up by the transfer table and its pit. In fact the tank shop and half of the erecting shop had to be completed and equipped before the transfer table could be removed and the other half of the erecting shop built.

Each bay in the shop has a very efficient crane service. In the larger, or main bay, there are two electric travelling cranes supported by two sets of crane runways, one above the other. On the upper runway there is a 120-ton crane for lifting locomotives and transporting them from the tracks entering the shop at either end, to the pits where they are to be overhauled, and for lifting and moving them as required while repairs are being made. The crane is high enough above the floor to permit lifting a locomotive over any other standing on the floor. On the lower run a ten-ton crane is in service to handle the different parts of the locomotives when dismantling, erecting, etc.

EXTERIOR OF POWER HOUSE, SHOWING ASH TOWER AND PORTION OF STACK—WEST SPRINGFIELD SHOPS, BOSTON & ALBANY RAILROAD.

The smaller, or side bay, is served by an electric overhead crane of ten tons capacity. The heavy machine tools originally located in the old machine shop, have been placed in this bay and to these have been added a number of new tools.

A complete system of piping for compressed air is installed throughout the shop to supply the pneumatic tools for chipping, caulking, drilling, reaming, etc., and also to supply the different air hoists.

There is also a line of live steam piping installed for testing the locomotive boilers. This line also supplies steam to the steam hammers in the adjoining blacksmith shop and also steam to the old heating system in the planing mill and freight car repair shop.

There are nineteen pits, each 40 ft. long, in the erecting shop as against six in the old plant and beyond these pits 80 ft. at the north end of both main and side bays are at present used as part of the boiler shop.

TANK SHOP.

To the east of the north half of the erecting shop the new tank shop is located, the columns on the east side of the former being common to both shops. The shop is served by an electric overhead traveling crane of 20 tons capacity so that the same ample crane facilities are provided here as those that obtain in the erecting shop.

In this shop all the repairs of the locomotive tanks, with their frames and trucks, are taken care of. A system of piping for compressed air is installed for supplying pneumatic tools in the same way as in the erecting shop.

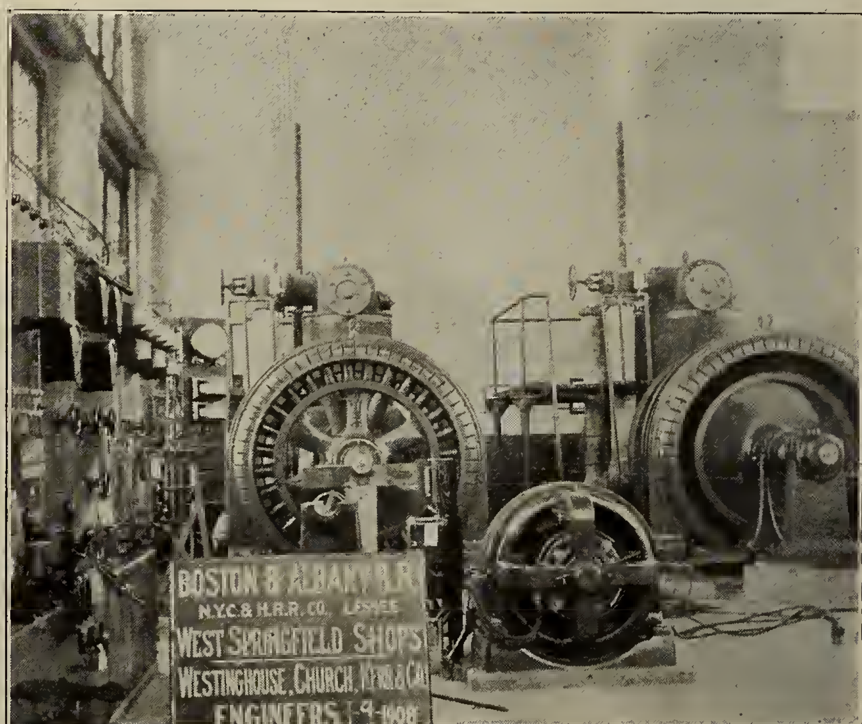
A Ryerson flue cleaning machine has been erected in this shop for cleaning locomotive boiler tubes.

BOILER SHOP.

On the opposite side of the erecting shop to the tank shop and north of the machine shop, the new boiler shop is located. It connects to the erecting shop in the same manner as the tank shop. Into this shop there have been moved all the tools used in the old boiler shop and in addition a large punch, a large shear and a twelve foot plate bending roll, have been installed. Each of these machines is equipped with an individual motor drive.

STOREHOUSE AND OFFICE BUILDING.

The new store house and office building is located to the west of the power house, the office being at the east end of the building. In the office portion there are two floors providing offices for the master mechanic and his clerical force. The store room provides ample space for all the different stores necessary in a repair shop of this size. Outside the store house there are large platforms for receiving and storing material and platforms are served by tracks on both sides of the building.



INTERIOR OF ENGINE ROOM—WEST SPRINGFIELD SHOPS, BOSTON & ALBANY RAILROAD.

MACHINE SHOP.

In the machine shop, which comprises the building that formerly contained the boiler, machine and erecting shops, a very complete line of new machine tools has been added. All the tools are now motor-driven in groups through the necessary countershafting, or by individual motors. Among the new tools installed is a driving wheel lathe of the latest design, which will do more than three times the work performed by the older machine which it supersedes.

An interesting labor saving device that has been installed in the machine shop, is a furnace for fusing the driving wheel brasses in their boxes. This not only reduces the labor of repairing, but also insures that the brasses will stay in position until worn out.

Besides the new tools, another improvement has been added in the shape of a good toilet and locker room for the employees.

BLACKSMITH SHOP.

The building that was formerly used partly as erecting and partly as tank shop, has been transformed into an up-to-date blacksmith shop. McCaslin forges have been installed on both sides of the building, allowing for the light work to be carried on near the walls and the heavy work toward the centre of the building. In addition to the hammer from the old blacksmith shop, two new steam hammers have been installed, one 5,000-lb. double frame and one 3,000-lb. single frame.

A 4-inch. Acme upsetting and forging machine has also been installed, doing away with a large amount of hand forging. A Bradley belt hammer and a Baudry power have also been added.

To complete the equipment of the shop, a modern toilet and locker room has been installed.

GENERAL.

It may be interesting to note that the structural steel work was received late in October, 1907, and on January 1st, 1908, locomotives were being turned out of the new shops.

It will be seen from the above description that a very thorough and comprehensive remodeling of the shops has taken place and when the plant is completed it will have a capacity sufficient to take care of the repairs of at least 300 locomotives.

The work has been designed and constructed by Westinghouse, Church, Kerr & Company, Engineers, with the co-operation of the engineering and mechanical departments of the railroad company, under the supervision of Mr. J. F. Deems, general superintendent motive power, rolling stock and machinery; Mr. John Howard, superintendent motive power; Mr. R. D. Smith, assistant superintendent motive power, and Mr. R. T. Shea, general inspector tools and machinery of the New York Central Lines, and Mr. Walter Shepard, chief engineer of the Boston & Albany Railroad.

The Cast Iron Car Wheel

MR. S. P. BUSH'S paper, The Car Wheel and Its Relation to the Rail and Car, presented at the January meeting of the Western Railway Club, excited much interest among railway men generally and car wheel manufacturers, as well as among the members of the club. The subject of this paper was considered so important and so worthy of thorough investigation that the discussion was continued to the February meeting. At this meeting President C. A. Seley briefly reviewed the salient features of the former discussion in order to show the trend of opinions expressed and it is believed that his further remarks in defense of the cast iron wheel voiced the sentiment of many railway officials. Mr. Seley said:

The record of the last meeting shows that the discussion on the paper, "The Car Wheel and Its Relation to the Rail and Car," was carried over to this meeting.

For the information of the few present who were not at that meeting and to refresh the memories of those who were, it may be best to review the salient points of the discussion. The paper has been extensively copied and commented on in the technical press, and it is unnecessary to repeat any of it. The discussion was mainly with reference to the wheel, itself, composition, design and performance.

Mr. Garstang, Chairman of the M. C. B. Committee on Tests of Cast Iron Wheels, and also a member of the American Railway Association Committee on Standard Wheel and Rail Section contributes a formal explanation and defense of the M. C. B. wheel, principally with reference to the coning and throat radius. strains.

Mr. Manchester deprecated the idea that the cast iron wheel was past its usefulness even under cars of 50 tons capacity and expressed a belief on possibilities of improvement of the wheel as regards material and design.

Mr. Barnum presented some statistics in corroboration of the paper and spoke of provisions in the car and truck design which would reduce flange friction and relieve strains.

Mr. Schroyer emphasized the increased duty on wheels due to weight of modern equipment, and while not alarmed as to cost of maintenance believes the flange question worthy of most serious study and consideration for improvement. He does not apparently place much value on frictionless center plates, etc., as a cure for sharp flanges. Doubtless this point may be enlarged upon this evening.

Mr. G. L. Fowler reviewed the cast iron wheel question and apparently believes them not strong enough for service under fifty ton cars. Not only that, but the heavier braking service on high capacity cars is a contributing cause to failure. He laid stress on the internal strains existing in a cast wheel and the addition to these strains by the heating of the wheels in braking. Some tests had shown that very great lateral strains were thrown on the wheel flanges by nosing of the car on tangents, the amounts exceeding lateral strains noted on curves. An instance of curing this tendency by making the wheels cylindrical seems to prove the contention of the author of this paper.

The value of devices to assist the truck in squaring itself was touched upon and excessive side bearing clearance was condemned.

Attention was called to the impact load on wheels when heavily loaded and running at considerable speed. A comparison was made as to the relative tensile strength of steel and cast iron as materials for wheels and their behavior also as to their ultimate relative economy and safety.

Mr. T. A. Griffin gave an account of some of the difficulties in making good cast iron wheels, claiming that experience, correct foundry practice and handling from the time the iron is put into the cupola and the sand into the mold until the wheel is finally delivered from the pits can produce satisfactory results. He stated that it was not so much a matter of materials as it was of manipulation and that there is no reliable information outside of such experience in wheel making. He, therefore, believes that the railroads have no knowledge or information on the subject by which they can make exact specifications, and believes they should confine themselves to getting the results and performance of their different makes of wheels, judging from that and from the general business standard of various makers as to their reliability as wheel makers. He takes exception to the claimed advantage of the thicker flange of the late M. C. B. standard and urges a more general and widespread study and interest on the part of railroad men in the wheel question.

Mr. Hennessey gave the wheel makers credit for great advance in their art and claimed that there was a less percentage of flange failures at present than when cars were lighter. Some causes for sharp flanges were mentioned and anti-friction bolster bearings were recommended.

Mr. De Voy spoke of the effect of additional coupler clearance as affecting flange wear and taking a position at variance with the generally received opinion.

Mr. Bush in closing covered the entire range of the discussion and I must refer you to the printed proceedings for this as well as for more complete statement of what was said by various speakers.

We are now to undertake a further discussion of this very interesting subject, and prior to doing so I wish to speak on one phase of the question. The wheel, itself, has been quite thoroughly discussed and we have much food for study and consideration. I do not say that further discussion of the wheel will not be advisable, but doubtless the effect of various modifications of the car body and truck on the wheel could be gone into further with interest and profit. This will necessarily take us into the realm of patented devices. Outside of any business considerations we have to discuss the mechanical features of these devices in our offices and I believe we can with equal propriety discuss these points on this floor without necessarily involving patent or business considerations Unless, therefore, there is objection from the floor I shall recognize anyone who has something to offer in this connection, trusting that they will not abuse the privilege of the floor by introducing objectionable personalities.

The value of papers and discussions finally registers in the recommendations and practice of railway officers who are guided by the experience, either of their own or of their neighbors. It is necessary, therefore, on getting your neighbors' experience that it be reported correctly, and in this connection I wish to take issue with the editorial utterance in the Railroad Gazette of Feb. 14th, page 205, second column, reading as follows:

"Again, in January, at the Western Railway Club, a paper was presented in which the causes of failure of the cast iron wheel were set forth with great elaboration. No excuses were offered, and the case was clearly and definitely stated. In the discussion that followed there was at least one vigorous attack upon the use of the wheel under high capacity cars, followed substantially by a corroboration, or at least, by no refutation of the arguments offered to show that the wheel was not safe. These straws are certainly very indicative of the opinions of men who know; for in both cases, if railroad officers present had held any opinions contrary to those expressed, or if the wheel makers had any figures or arguments to offer to contradict or meet the opinions set forth, these opinions and arguments would undoubtedly have been brought to light."

From this one would infer that no railway officer present at the last meeting had anything to say in defense of the cast iron wheel under high capacity cars.

This is not correct, and it is a fact as shown by the record that no railway officer who spoke on this floor at the last meeting conceded the extreme position which would be the logical conclusion were we convinced of the truth of the premises advanced by the steel wheel people. It is true and speakers have admitted that modern car and traffic conditions require an improvement in the wheel as to design and material and also the need of considering such modifications of the car body and the truck as will favor instead of add to the shocks and stresses now conveyed to the wheel.

The necessity for more study and attention, the collection of data and experiments was voiced by several speakers and I am sure we are not ready to admit that we are at the end of our resources and "resignedly accept" the present cast iron wheel situation as final.

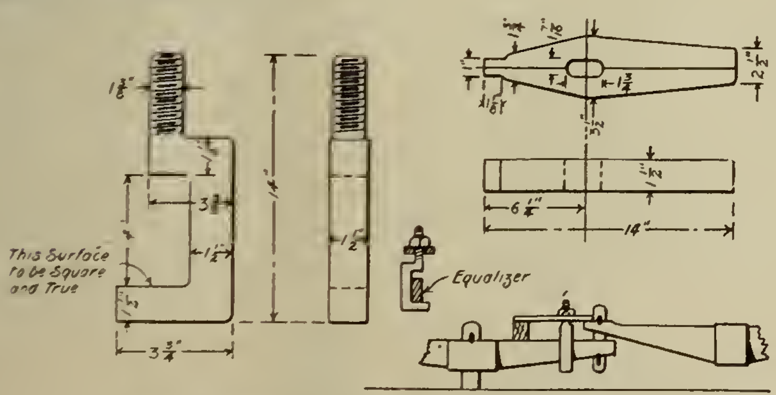
It is a fact that most of the railroads actively represented in this club are not mountain roads and the fifty ton car is not preponderating in our equipment and we have not experienced the acute conditions which some of the roads in other sections have to meet. Otherwise, we would have waked up sooner perhaps. In any event, the general situation is not as bad as this editorial, (of which I have quoted but one paragraph) would lead us to believe. The eloquent advocate for the steel wheel is not entirely disinterested, and we must admit that one prominent steel wheel maker knows the value of printers' ink and the editorial in question plainly misstates the situation.

All I ask, gentlemen, is a clear field and fair play. The steel wheel is a good thing and as such will find its field. It is even badly needed under high capacity cars on certain roads having acute conditions of heavy grades, congested traffic and good net earnings.

We want steel wheels for heavy tenders and engine trucks, for first class passenger equipment, but I hope, as a result of the discussion on this floor of this admirable paper, that the correct status of the cast iron wheel may be established and ways and means suggested that will improve what is in general a very safe and gratifying performance of the humble cast iron wheel.

Some Practical Roundhouse Tools

RUNNING repair work required frequently by the spring rigging of locomotives is often very inconvenient to handle unless the roundhouse equipment includes tools and devices provided especially for such work. The accompanying line drawing of a spring puller illustrates a device which is applicable to certain classes of spring rigging and which has been used to good advantage in the Rangley Division roundhouse of the Maine Central Railroad.

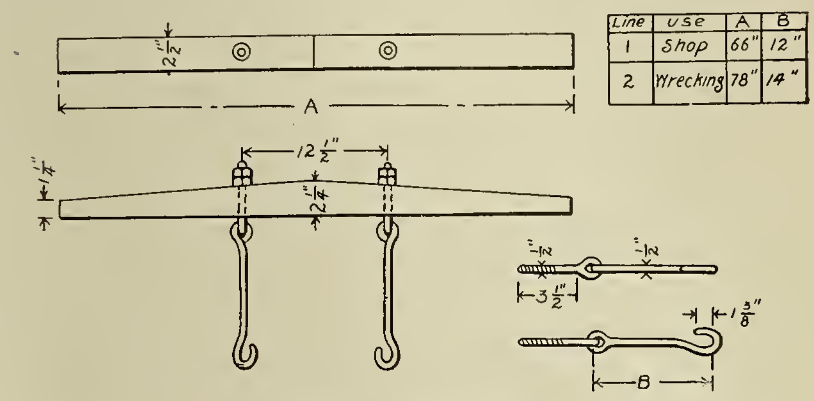


SPRING PULLER—MAINE CENTRAL RAILROAD.

The spring puller has been so designed as to hook under the equalizer while the end of the adjoining spring is clamped and drawn down by operating the nut on the puller. This puller has found its greatest usefulness in connection with the work of replacing spring hangers. With it a spring hanger or spring hanger gib may be removed and replaced in a very short time.

It is very essential that the surface of the puller which engages the under surface of the equalizer shall be square and true as it is this part of the puller that clings to the equalizer.

The jack carrier illustrated by a second accompanying line drawing is another useful device originated at the same place. In some roundhouses it is difficult to wheel a truck and in others it is often difficult to get a truck just when one is needed. To facilitate the transportation of jacks this carrier has been devised and it has proved effective. The jack is supported by two hangers depend-



JACK CARRIER—MAINE CENTRAL RAILROAD.

ing from a bar carried on the shoulders of two men. This carrier has been found useful not only at roundhouses but also at wrecks, as it is a very practical means of carrying jacks over rough ground.

Both the spring puller and the jack carrier were designed by Mr. Urban A. Towle of the Maine Central Railroad at Rumford Falls, Maine, to whom we are indebted for the information and sketches.

Machinery Club of New York

THE Machinery Club of the city of New York expects to occupy its new quarters on the twentieth and twenty-first floors of the Fulton Terminal building, not later than May 1. The rooms were originally intended for office purposes, but have been entirely rearranged and refitted, and will be adequate to give appropriate accommodations for the new purpose. The furnishings will be designed for elegance and comfort and it is claimed will be of unusual originality. The main dining room on the first floor will be 50x150 ft., the reception room 26x63 ft. and the grill room 38x54 ft. The upper floor will be given up largely to kitchen arrangements, and a series of private dining rooms, the largest of which will be 15x16 ft. The smoking room, on this floor, will be irregular in shape, practically forming two rooms, 16x18 ft. and 22x29 ft. The club was formed in April of last year in response to a movement originated by F. H. Stillman, president of the Watson-Stillman Co., who is now president of the club. The other officers of the organization are: Vice-president, R. C. McKinney, president of Niles-Bement-Pond Co.; treasurer, Walter L. Pierce, secretary of the Lidgerwood Mfg. Co.; secretary, Theodore Waters. Temporary offices of the club are now at 26 Cortlandt street, New York.

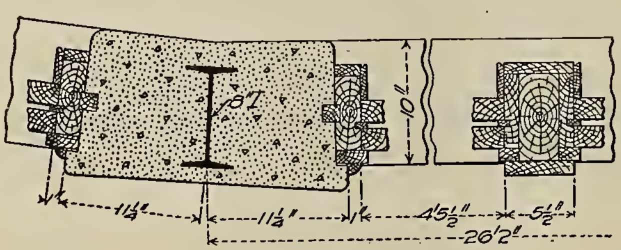
Structural Features of Roundhouse

Lehigh & Hudson River Railway

A ROUNDHOUSE has been built recently at Warwick, N. Y., on the Lehigh and Hudson River Railway, which includes a novel and interesting feature of construction. This is a special combination of steel, concrete and wood in the frame work of the structure.

The general design and arrangement of the roundhouse is not unusual. The cross section of the house, type of smoke jack, design and location of monitors, etc., is very similar to the standard roundhouse of the Erie Railroad. The roof has a gradual slope from the door columns to the outer wall, being supported by three rows of intermediate columns. Beyond the outer wall the roof is 19 ft. 6 in. above the rail and beyond the inner wall it is 25 ft. 5¼ ins., so that all water accumulating on the roof will be naturally shed toward the outer wall.

Natural light is admitted through large windows in the outer wall which occupy over 50 per cent of the wall area and through window spaces above the doors. Large windows are included in the radial walls also. The heating system is that of the Buffalo Forge Company, and hot air is distributed by a 78 in. fan, situated



WALL COLUMN AND PIER-ROUNDHOUSE OF LEHIGH & HUDSON RIVER RAILWAY.

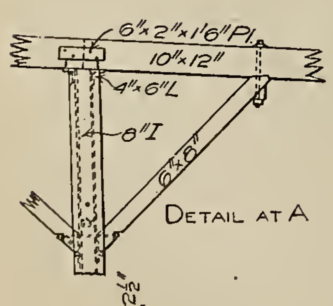
in an annex building, through a system of underground ducts. In each alternate panel between the pits is a 20-inch tile pipe leading from the main duct and furnished with two 12-in. outlets communicating with each pit. Usual steam, water, and electric light installations are provided.

As originally built the roundhouse includes 10 pits, two of which are equipped with drop pits for driving wheels and one for engine truck wheels. One radial wall is of wooden construction and may be removed quickly when future extension is required. The span from outer face of outer wall to center line of door posts is 95 ft. and the distance from center line of door posts to center of table is 105 ft. 11 ins. The tracks are arranged on an angle of 7 degrees 28 minutes and the house is served by an 80-ft. turntable.

The novel feature of the roundhouse is the construction of the columns and the method of connection with wooden framework of the roof. Each column is made up of an 8-in. I beam enclosed in a solid rectangular mass of concrete with round corners in which is embedded a reinforcement of four ½ in. round rods hooped with wire. Pairs of horizontal cap and base angles are riveted to the web and flanges of the I beam. The columns have concrete foundation piers carried down to a depth of about 4 ft., the columns in the outer wall being seated on the continuous footing of the wall. The columns are knee braced in four directions to the wooden rafters and purlins with 6 by 8-in. struts, having both ends beveled and secured by tie bolts. The lower end engages an angle iron seat riveted to the I beam in the column and the upper end is toed into the rafter.

The rafters are 10 by 12-in. and have butt joints on the center lines of the columns to which they are secured with lag screws through the cap angles. The rafters are spliced with 6 by 2-in. fish plates and carry 4 by 12-in. purlins, about 4 ft. apart, making butt joints on their center line. The purlins are covered with 2 by 6-in. boards, water-proofed with asbestos roofing, laid by the Franklin Manufacturing Company.

The temporary radial wall is made with a framework of 4 by 6-in. vertical wooden studs, about 30 ins. apart, on centers, secured at the feet to a 4 by 10-in. sill, bolted to a concrete footing wall and covered with ordinary sheathing plank and siding. The permanent radial wall is of expanded metal-concrete construction 2½ ins. thick on structural metal frame. All the metal is encased in concrete so as not to be affected by smoke and gas. All of the other walls are of solid concrete 10 ins. thick above the water table and are made without reinforcement. Below the water table, which is 15 ins. above the top of rail, the thickness of the wall is 12 ins., down to the concrete footing. This is 20 ins. wide and 12 ins. deep, with its upper surface 3 ft. below the top of rail.



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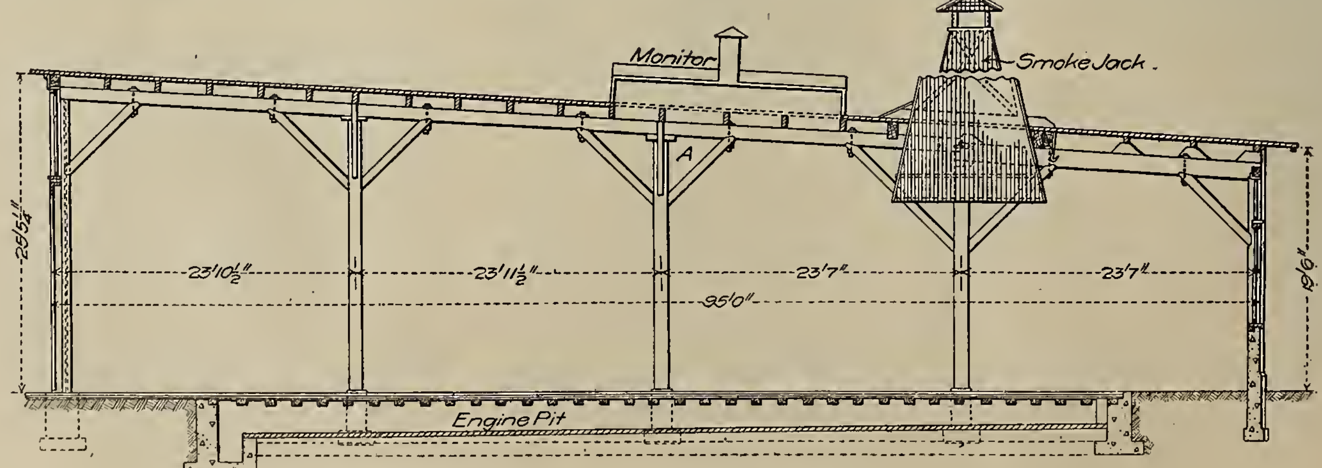


CROSS SECTION OF ROUNDHOUSE—LEHIGH & HUDSON RIVER RAILWAY.

The door openings are 12 ft. 4 ins. wide and 17 ft. high. The doors are of usual wooden construction, swung on hinges, bolted to the columns. The interior of the smoke jacks are painted with "Muralo" fireproof paint and thoroughly sanded. All other interior wood work, except window frames, is painted with fireproof paint. All exterior wood work and window frames inside are given three coats of Chilton dark green paint, trimmed with Indian red, the successive coats differing slightly in color. All concrete surfaces are left natural and unpainted.

The building was designed and specified by Mr. Mason R. Strong, consulting engineer, New York City, and the general contract was executed by Welch Brothers, Warwick, N. Y. All foundation and pit work to the floor line was done by the railway company's forces under the supervision of Mr. J. E. Barrett, superintendent of tracks, bridges and buildings.

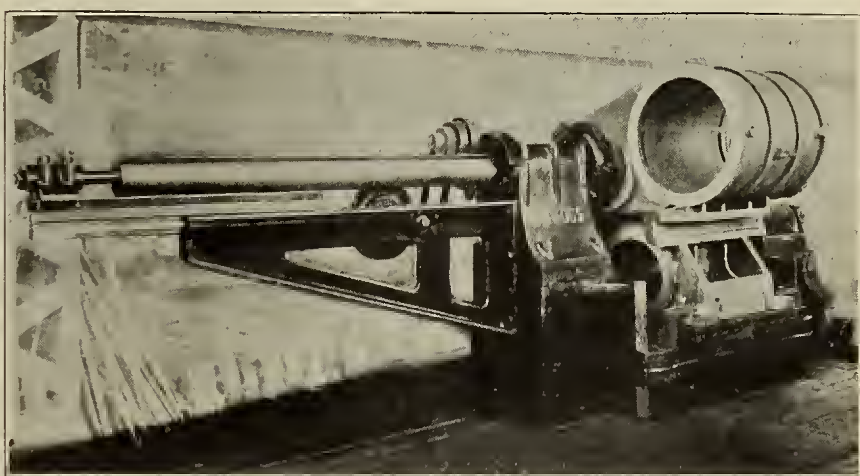
Boring Multiple Cylinders

By E. J. McKernan, Tool Expert, A. T. & S. F. Ry.

THE usual locomotive cylinder boring machine consists of a horizontal spindle and table permitting of no adjustment at all or only lateral adjustment. With these machines of the old design much time is consumed in properly setting the cylinder so that the boring bar will strike the true center; and high speeds and rapid cutting are not obtained. These disadvantages are, of course, magnified when cylinder castings having two or more cylindrical chambers are to be bored and faced, because the work has to be set twice, and the cylinders and valve chambers (where piston valves are used) must be truly parallel with each other. If the cylinders should be out of parallel the working of the engine will throw great strain upon the guides with consequent detrimental effect on the locomotive machinery, causing undue wear, strain and trouble.

The machines of the old single bar type, designed when simple slide valve cylinders of not more than 18 or 20 inches in diameter were the prevailing type on locomotives, were adapted for use with the slow speed carbon steel which was the most efficient material for making cutting tools at that time. The mechanism of these old machines was simple, but the driving and feed gears were weak cast iron affairs which drove the tools along at an unprofitably slow speed. Later as the art of cutting materials was on a more scientific basis, and tool steels of greater cutting capacity and speed were introduced in shop practices, attempts to work these new cutting tools to their proper limits in boring machines of this class, would result in stripping the gears, or other injury to the machine.

With the later developments in high speed cutting tools of great capacity, and in locomotive construction, with engines having piston valves and often compound cylinders on the Vauclain principle or on the four cylinder balanced compound principle, a machine capable of the most effective service under the latter conditions make a shop necessity. In order to meet this demand, one manufacturer produced a three spindle machine which would require but one setting of the work and which would insure the parallel boring of all cylinders and chambers. While this type of machine possesses a number of advantages for certain classes of work, the single bar machine has been found superior for general railroad practice. A comparison of the two types of machines shows that the single bar has less gearing and is the simpler machine of the two and is consequently much easier maintained. On account of the lesser number of parts, the single bar machine is the most economical to drive, hence the power required can be obtained from a small motor. Where there are some advantages in boring three chambers at once it has been found in practice that chatter in one tool is transmitted to the other tools causing a rough finish in all bores. It is apparent that this is entirely obviated in the single bar machine. From experience in the ordinary railroad shop it has been found that the single bar machine is best suited to locomotive work. It is economical in operation, in power consumed and in adjustments and owing to the less machinery involved, the single bar machine is the most economical to buy.



NEW CYLINDER BORING MACHINE.

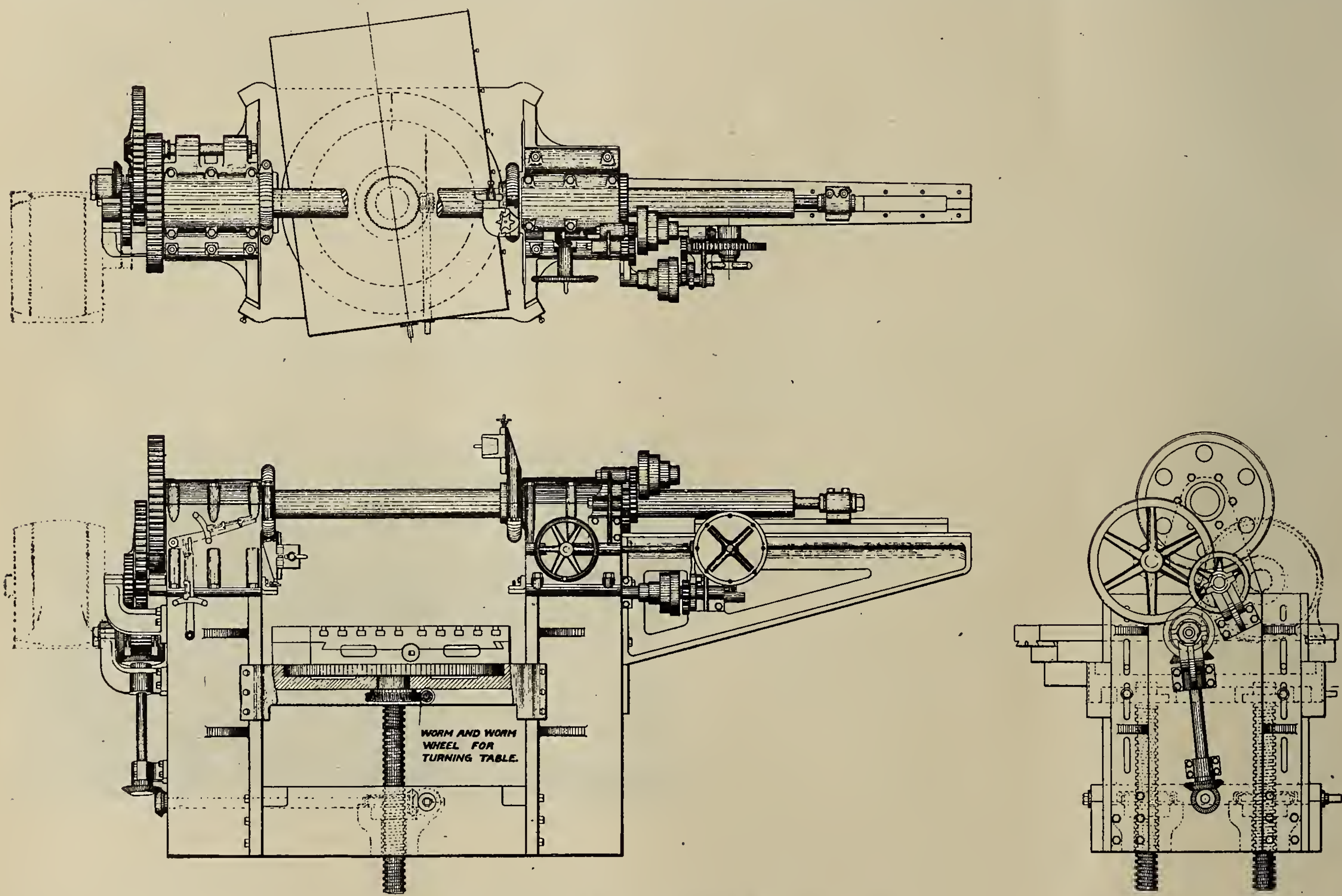
Recently there have been built several heavy and solid single bar machines, with the boring bars capable of the heaviest strains, and of such a design as to insure working the cutting tools to the very highest capacity. The accurate setting of the work, especially in connection with multiple cylinders, is brought about by the application of a table having both lateral and vertical motion, and these machines produce very excellent work. But the examples of them thus far constructed are heavy ponderous affairs, costing a great deal for the weight of metal in them alone, and they do not have the universally wide range for accommodating all classes of locomotive cylinder boring that should be a requisite in modern machines for this purpose. Their first cost is high, and the best results are not always obtained from them, not to speak of the relative large amount of shop room required.

At the Topeka shops of the Santa Fe there has been built a cylinder boring mill which will answer all requirements in regard to the boring of cylinders for all classes of compound engines. This machine is also adapted to bore cylinders on engines which have one cylinder or chamber at an angle to the others. All cylinders or chambers may be bored at one clamping of the cylinder, by the mere raising or lowering of the table. This table has an elevating movement of 37 inches; also has a cross travel of 35 inches. The table which makes it very rigid in operation and gives a very smooth bore.

One of the facing heads on the machine is made so that it will move along on the bar and is driven by means of a 1 inch key and set screw, and will pull any kind of a cut that is put on the machine.

The facing heads are fed by means of a star feed attachment. The screws that elevate the table are made from soft steel and are 5½ inches in diameter and are ⅜ pitch, the screws set at right angles to the boring bar, making everything rigid. The total weight is about 15 tons, and the machine takes up floor space of 223 sq. ft., having an extreme length of 21 feet and an overall range in width of 14 feet.

This machine is capable of boring a three chamber compound cylinder in 15 hours, or in a year of 3,000 working hours, 200 three chamber compound cylinders

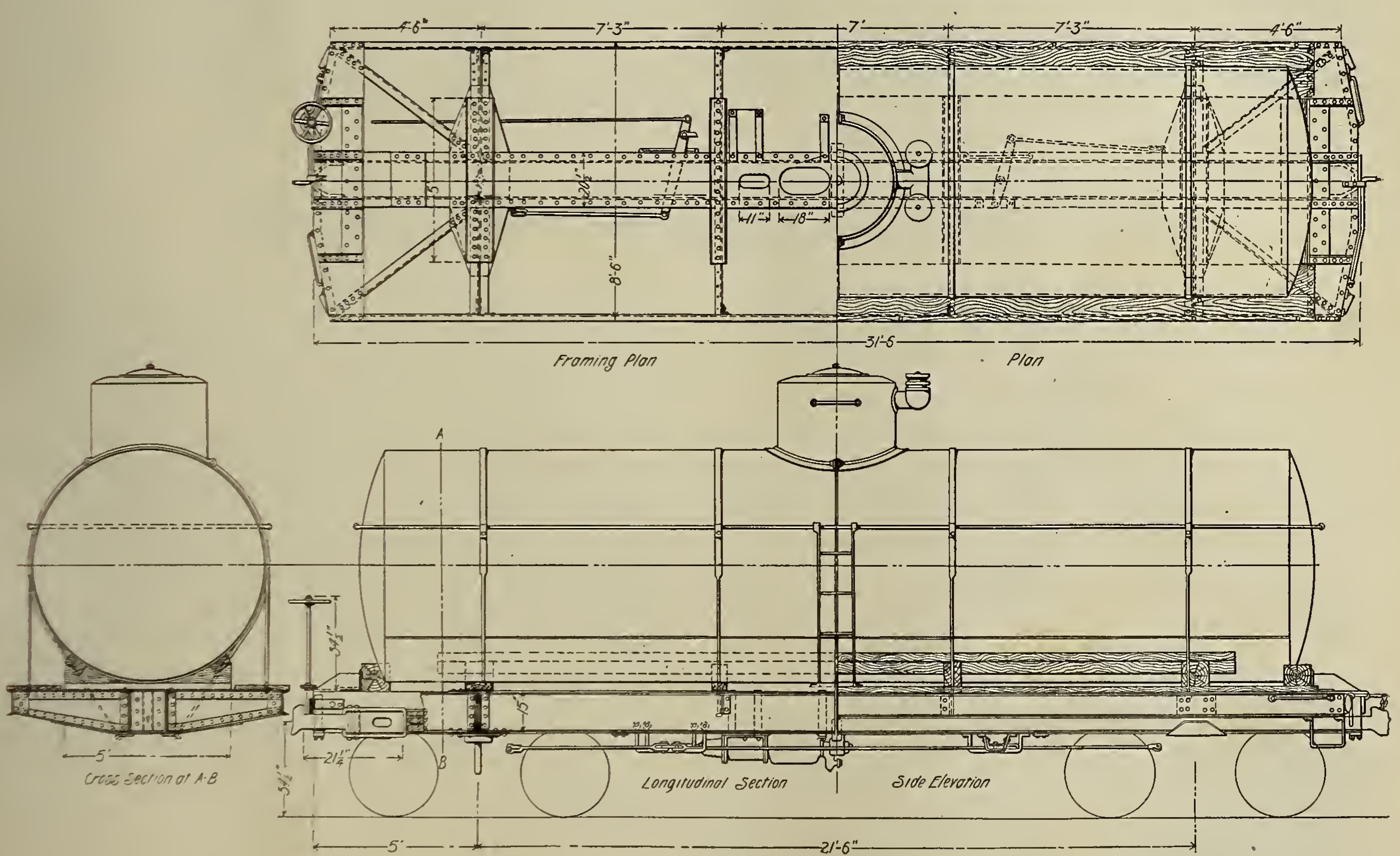


DETAILS OF NEW CYLINDER BORING MACHINE.

which has the cross travel movement has also a swiveling motion by which a range of 15 degrees incline may be had.

This new boring mill is direct motor driven. The table is raised or lowered by power connection with the main motor through beveled gears and clutches, handled from the operator's side of the machine. All the mechanism is of the latest design, and is strong and durable, all gears being made from good gray iron, all bushings of phosphor bronze; the boring bar is 7 inches in diameter and is made from open hearth steel, and is fed through the cylinder by means of a spur gear and rack can be bored. Also, it is possible to bore a simple cylinder in three hours or 1,000 in a year of 3,000 working hours.

On the old style boring mill it has taken from 26 to 28 hours to bore a three chamber compound cylinder. It will be noted that by the use of a modern boring mill of this kind 11 hours can be saved on each three chamber compound cylinder, where it used to take from 8 to 10 hours to bore a simple cylinder. One of these cylinders can now be bored in three hours on this machine, thus making a saving of 5 hours on each simple cylinder bored, or over $1,500 per year in operator's the center sills, as well as providing a means of anchoring the bottom of the dome strap which prevents the tank from turning on the frame. The end sill is made of 9-in. channels, with an 18-in. steel plate riveted to the top. To this plate, the side sills, center sills and diagonal braces are secured. The head block construction and bracing is most substantial, having a 10-in. by 10-in. oak block butt against an 8 by 8 by ½-in. angle riveted crosswise to the platform cover plate and center sills. Directly over the center sills and at the end of each angle is a 6 by 3½ by ⅜-in. angle riveted to the same with the ends machined to fit the head block angle. The are used so as to make a perfect fit for the center plates to hold the bolster in line. Center plates are of M. C. B. design and are of malleable iron. The tension or top member of the bolster is further re-enforced by means of a 10-in., 15-lb. channel, inverted and riveted to the bolster. This channel forms a holder for the 10 by 10-in. oak tank saddle. The intermediate cross bearers are built-up in a very similar manner, using an 8-in., 11¼-lb. channel, riveted to side and center sills by means of connection angles. The top of this is further re-enforced with 6-in., 8-lb. channel inverted to receive the 6 by 8-in. oak intermediate saddles. The side sills are of 9-in.,



DETAILS OF STANDARD 8,000 GALLON TANK CAR.

head block is bolted to the center sills with four ⅞-in. machine bolts, and to the head block angle with four ¾-in. horizontal carriage bolts. The head blocks are fitted individually to each tank so as to insure a perfect fit. The end sill is re-enforced at the coupler opening with a 6 by ¾ in. face or striking plate with a 4 by 1-in. "U" shaped butting stirrup to prevent damage to the end sill when the draft gear receives an excess shock, such shock being frequent in tank car service. The center sills are further tied together with a 12 by ¼-in. plate, riveted to the top between the head block angle and the bolster top cover plate and at the bottom, underneath the draft gear, is an 8 by 5-16-in. steel separator.

The bolster is built-up of 5-16-in. web plate, using four 3 by 3 by ¼-in. top and bottom flange angles to make this of an "I" section. The top cover plate is 16 by ¼-in. steel plate, and the bottom cover plate is 22 by ¼ in. Between center sills two 7-16-in. pressed steel diaphragms 13¼-lb. channels, running from end sill to end sill, and secured to the car as shown in the line drawing.

The car is equipped with malleable iron push pole pockets on each corner. The tank is secured to the car as per the recommendations of the Pennsylvania Railroad Company and the Master Car Builders' requirements. The tank rests upon a cradle built-up of four saddles, and two 5 by 7 in. long leaf yellow pine longitudinal sills. The sills are milled so as to fit the curvature of the tank in order to insure all possible friction, thus successfully eliminating the greater portion of the shock which ordinarily comes on the head blocks. The head blocks are 10 by 10-in. oak well secured.

The running boards are in one continuous length so that no ends will project at the middle of the car and provide the cause of personal injury due to trainmen stumbling.

The tank is 84 inches in diameter inside of the smallest ring, and 27 ft. 1½ ins. over the bottom plate. The bottom plate is 6 ft. wide, ⅜ in. thick in one continuous length. The heads are of 7-16-in. steel. The shell of the tank is ¼ in. steel. The dome is of ¼ in. steel, 42 ins. in diameter and 23 ins. high, flanged on the bottom. All longitudinal and head seams are double riveted. The remainder are single riveted. The tanks are tested to a pressure of 60 lbs. per square inch, and designed to stand a bursting pressure of not less than 240 lbs. per square inch. This tank is also equipped with steam coils, consisting of eight lengths of 2-in. pipe, with malleable iron fittings. The inlet and outlet of the pipe have a cast iron cover. The dome is also to be equipped with double safety valves to meet the requirements of the Pennsylvania Railroad Company and the Master Car Builders' Association.

On the whole, this car seems to be of simple yet practical design, and seems to have no part that cannot be repaired on an ordinary blacksmith's hand fire. Every member is built up of standard structural sheets. Complicated castings and pressed shapes are practically eliminated throughout. The hand rail extends continuously around the car. The ladder is fastened to the hand rail and to the running board on one side of the car, giving free access to the dome and unloading operating mechanism.

The car is carried on arch bar trucks, equipped with Symington journal boxes of semi-cast steel, for 5½ by 10 journals. Brake beams are of the Monarch I beam type, having malleable iron Christy brake shoe heads. The draft rigging includes the Cardwell friction draft gear, type D, having Monarch steel couplers with buffers suitable to this rigging.

Motor Drives for Lathes and Milling Machines

AMONG the most interesting machine tools and devices recently developed is the motor drive of the R. K. LeBlond Machine Tool Company, Cincinnati, O. The features embodied in this method of motor drive result from several years of experience as well as from efforts to provide motor driven tools with every device that can increase their efficiency and ease in handling.

The accompanying illustrations show the methods of motor driving and their applications to lathes and

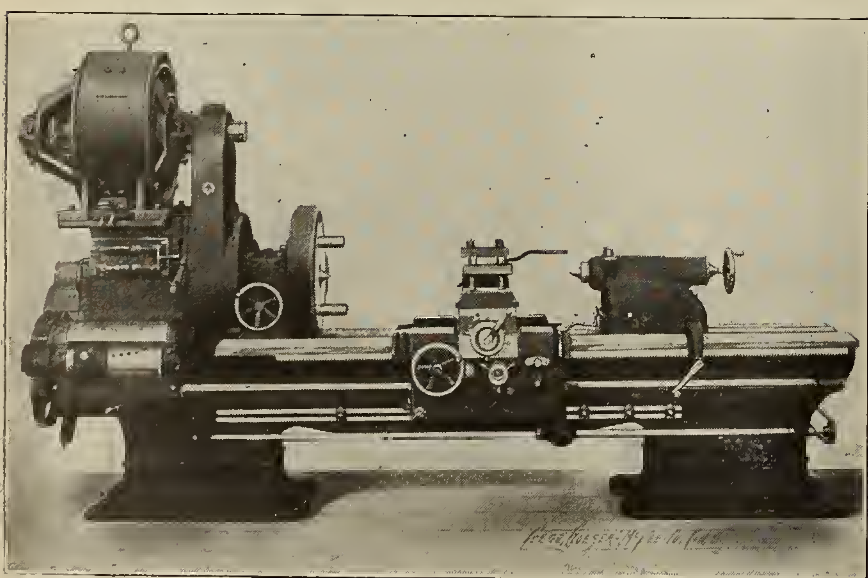


FIG. 1—24-INCH HIGH SPEED ENGINE LATHE.

milling machines. Considering first the construction and arrangement of gearing employed on machine tools with variable speed drive, Fig. 3 shows the arrangement of gearing applied to lathes having a swing up to and including 22 inches, while the arrangement applied to larger lathes is shown by Fig. 5.

To provide for the motor connection, the headstock has pads cast on the side which are planed to receive the motor housing or frame that supports the motor; a plate is inserted between the motor and the housing which is made to fit the motor feet on the one side and the housing on the other. By this means a motor of any make may be applied to the tools, rigidly and in a neat and workmanlike manner.

The spindle drive is through a clutch pinion on the motor shaft and a rawhide intermediate gear which drives a sleeve gear mounted on the spindle. The sleeve gear can be locked to the face gear for direct speeds, or the drive can be had through the double friction back gears. This arrangement gives three mechanical changes to the tool, independent of the motor. All gears are protected by covers in such a manner as to allow easy access for cleaning, inspecting, etc., and the whole arrangement does not in any way interfere with the easy adjustment of the spindle and boxes.

The drive from the motor is through a friction clutch operated by a lever close to the operator, for quick starting and stopping the lathe, independent of the motor. This arrangement where frequent stopping and starting is required is more rapid than stop-

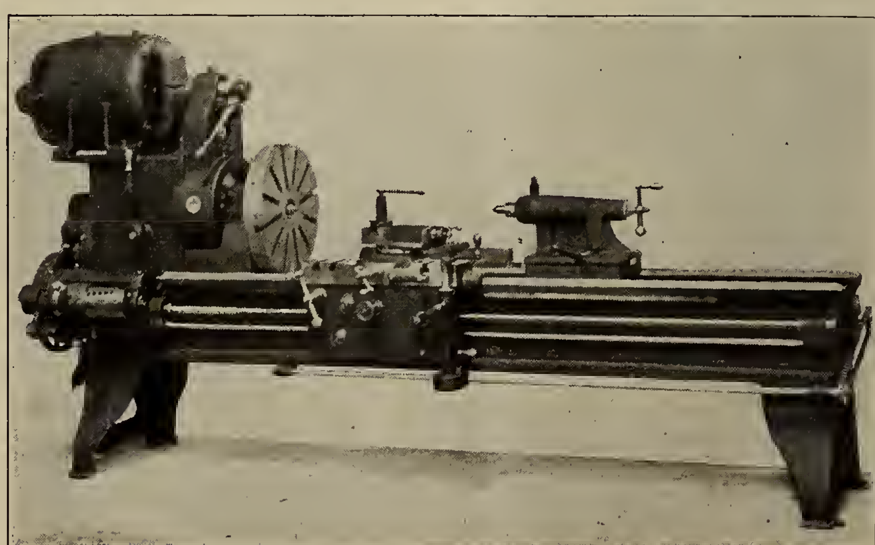


FIG. 2—20-INCH LATHE WITH VARIABLE SPEED MOTOR.

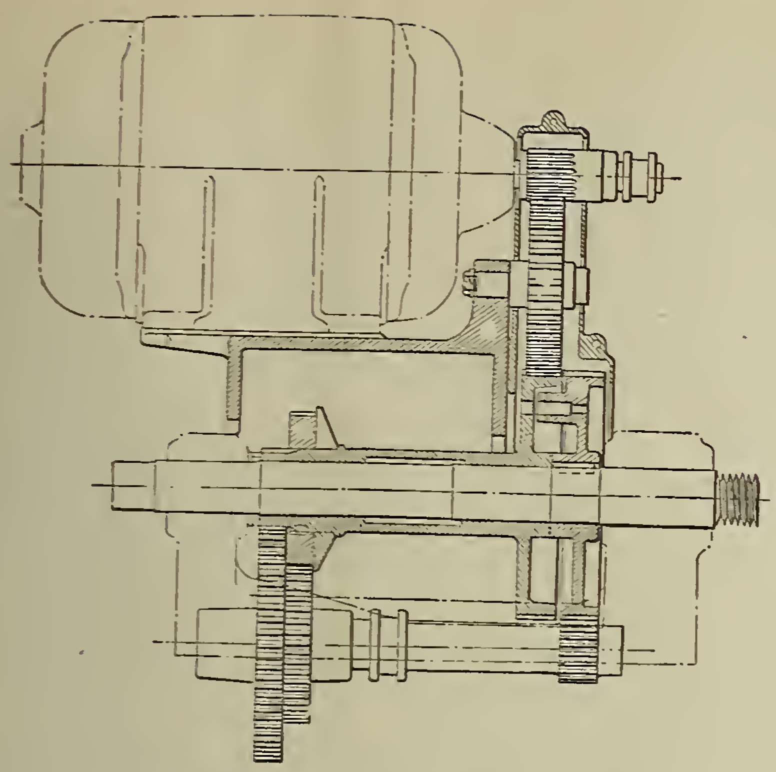


FIG. 3—DIAGRAM OF DRIVE APPLIED TO LATHES FROM 12 TO 20-INCH SWING.

ping with the motor, as the momentum of the heavy armature has to be overcome. The friction is very simple, and consists of a bronze ring which is expanded in the periphery of the pinion by a taper wedge or key. The friction is entirely automatic in its adjustment.

A double friction back gear is applied to all motor driven high speed lathes and milling machines built by the Le Blond Company. It gives with lever instant speed changes, from high to low back gear without changing a gear and while the tool is running. The efficiency of this device on a motor driven tool consists in giving a range of 40 speeds, varying from the smallest increment to the ratio of 1 to 9, without stopping the tool or changing any gears, pins, etc. It gives a continuous speed range with a 3 to 1 motor, and if the motor is operated on the multiple voltage system, the lower voltages are not required, resulting in a more powerful drive or permitting the use of a much smaller motor.

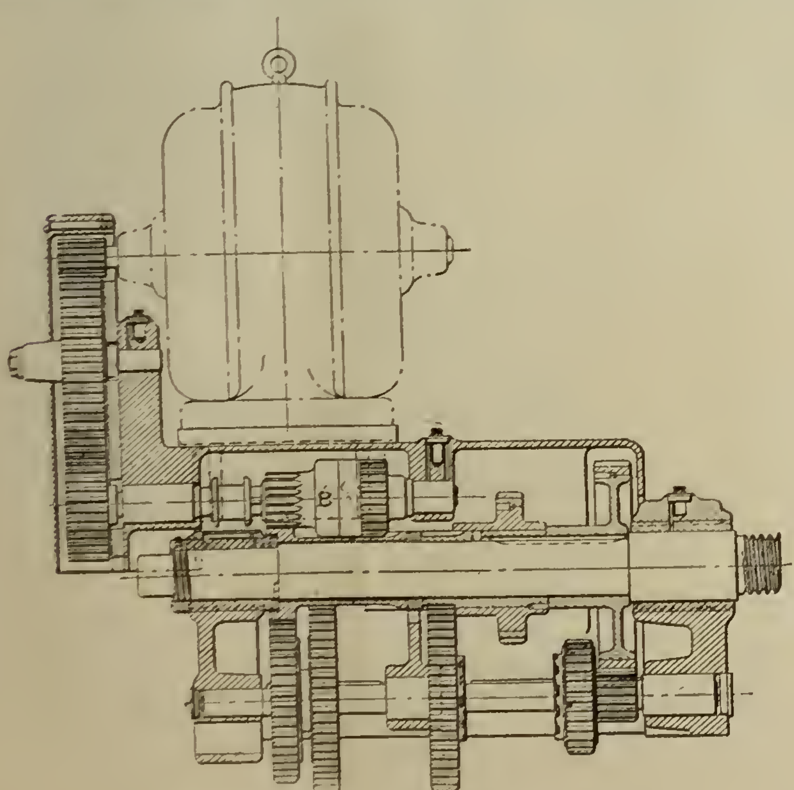


FIG. 4—DIAGRAM OF CONSTANT SPEED DRIVE.

In the arrangement of gearing for application to large lathes, which require a greater speed range, the construction is somewhat modified, as shown in Fig. 5. In this case the rawhide gear drives a double friction shaft mounted in the motor housing above the spindle. This gives all the features heretofore described and, in addition, four mechanical changes of speed.

The drive for milling machines is of the same general arrangement as that described, except that a Morse silent chain is used to drive from the motor, because of the interference offered by the over-arm of the machine.

The 24-inch high speed engine lathe illustrated by Fig. 1, is extra heavy and is built for working high speed steel to its maximum capacity. The spindle has a 2 3-16 inch hole and runs in genuine Babbitt metal, front journal is 5⅜ inches in diameter by 9½ inches long.

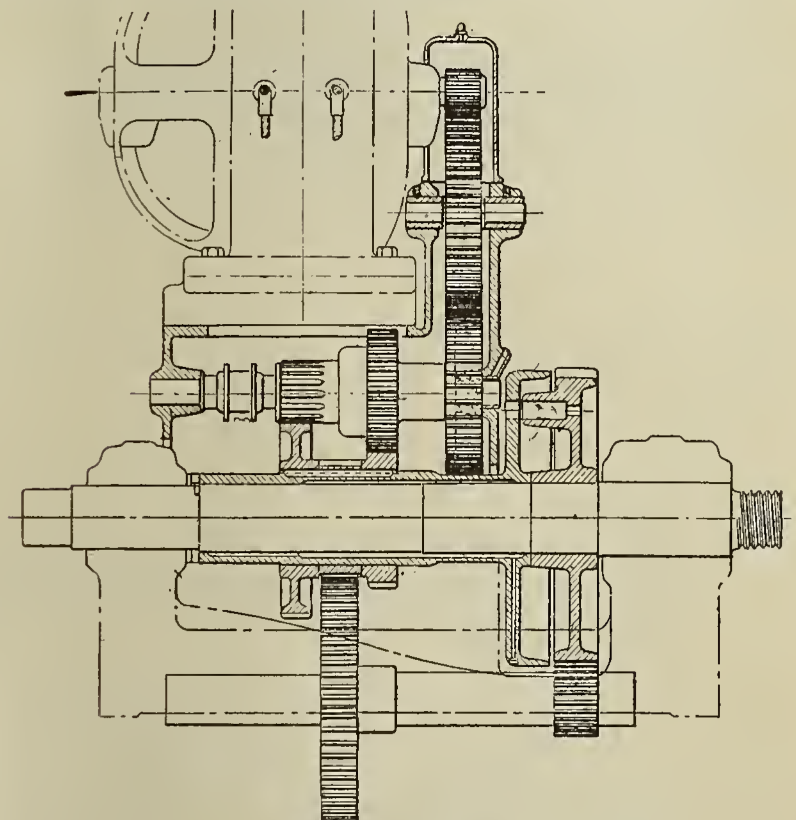


FIG. 5—DIAGRAM OF VARIABLE SPEED DRIVE FOR LARGER LATHES.

The lathe has changes of speed from 7.6 to 250. The motor drive is through a rawhide intermediate gear. The lathe has four mechanical changes of speed and is quadruple back geared.

The tailstock is of improved design, the front end of barrel being reinforced to withstand heavy strain, and it has an improved method of clamping both the spindle and to the bed. The spindle has No. 6 Morse taper and set-over is graduated. The apron on this lathe has steel gears throughout and is of semi-box construction. All shafts and studs are supported at both ends, the rear-bearing acting as a rib to connect the ends of the apron. Feeds and screw cutting are obtained by a quick change device, which gives 33 threads and feeds, including 11½ inch pipe thread,

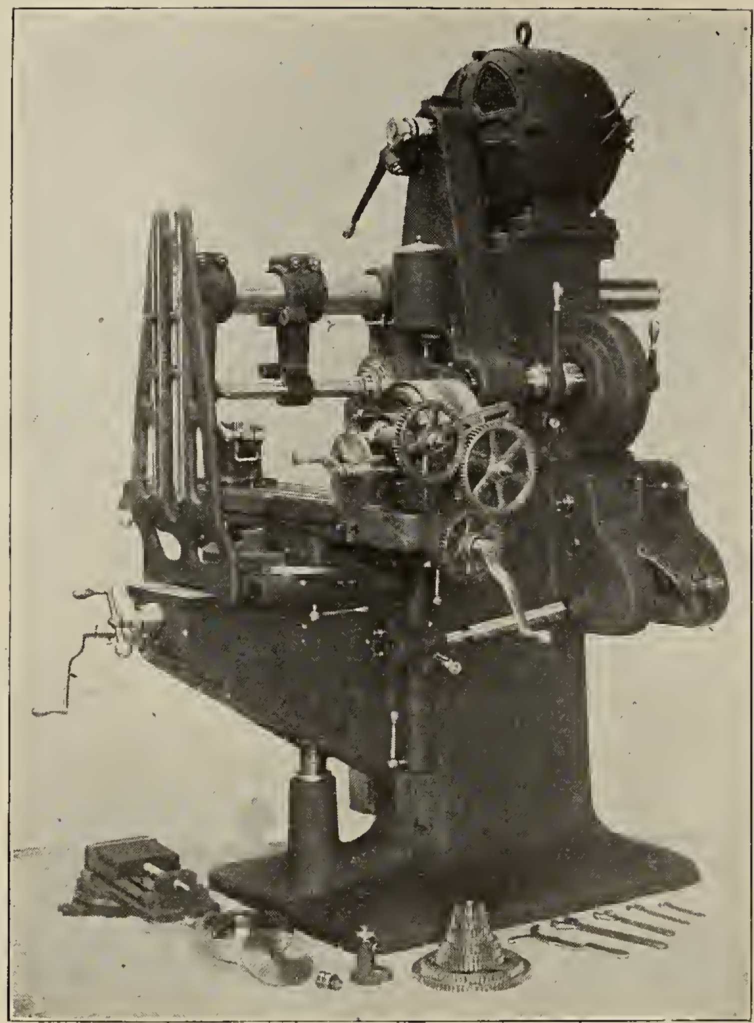


FIG. 6—MILLING MACHINE WITH VARIABLE SPEED DRIVE.

without removing a gear. Range of threads is from 1 to 24, and feeds are four times threads. Chasing dial for catching threads is provided.

A lever for controlling the motor is located on the carriage and a graduated index dial is on the vertical shaft. Connection with controller is made by a chain and sprocket on the end of the spliced shaft. The lathe can be operated entirely from this shaft.

For constant speed drive, such as the alternating current motor, which runs at fixed speed only, the LeBlond Company provides machines and drives. Fig. 4 is a diagram of the head for constant speed drive as applied to lathes. The motor is mounted on the headstock and the drive is through a rawhide intermediate gear to the shaft on which the double friction gears are mounted. These frictions are automatic in adjustment and are operated by a lever conveniently located. This gives two changes of speed as well as means for quickly starting and stopping independent of the motor. The lower shaft contains a set of sliding cone gears which multiply the speeds, giving a total of 12 changes. A speed plate attached to the motor gives the number and ranges of speed obtained, also position of lever for each speed. The speeds increase in geometric progression by 35 per cent and range from 10 to 270 revolutions per minute.

The lathe has no back gears or locknuts to be engaged and the entire range of speed can be obtained while the lathe is running. All gears are made of steel, the teeth having beveled edges and being hardened. Those running at high periphery speed are engaged with a clutch. The arrangement throughout is very substantial and compact and the gearing is calculated for hard, continuous service.

The arrangement of gearing for constant speed drive for milling machines is essentially the same as for lathes, but modified in detail. The motor is mounted on a bracket bolted to the base of the column of the milling machine. The drive is through a rawhide gear to the shaft on which double friction gears are mounted. These are operated by two levers, one on each side of the machine, and give two changes of speed, as well as means for starting and stopping

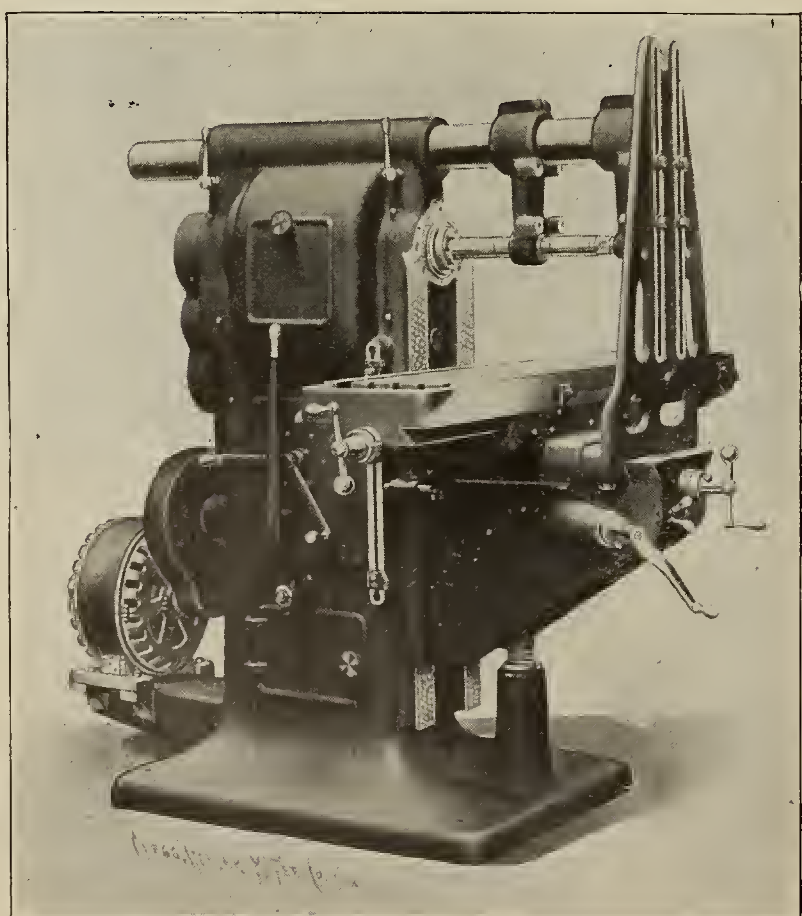


FIG. 7—MILLING MACHINE WITH CONSTANT SPEED DRIVE.

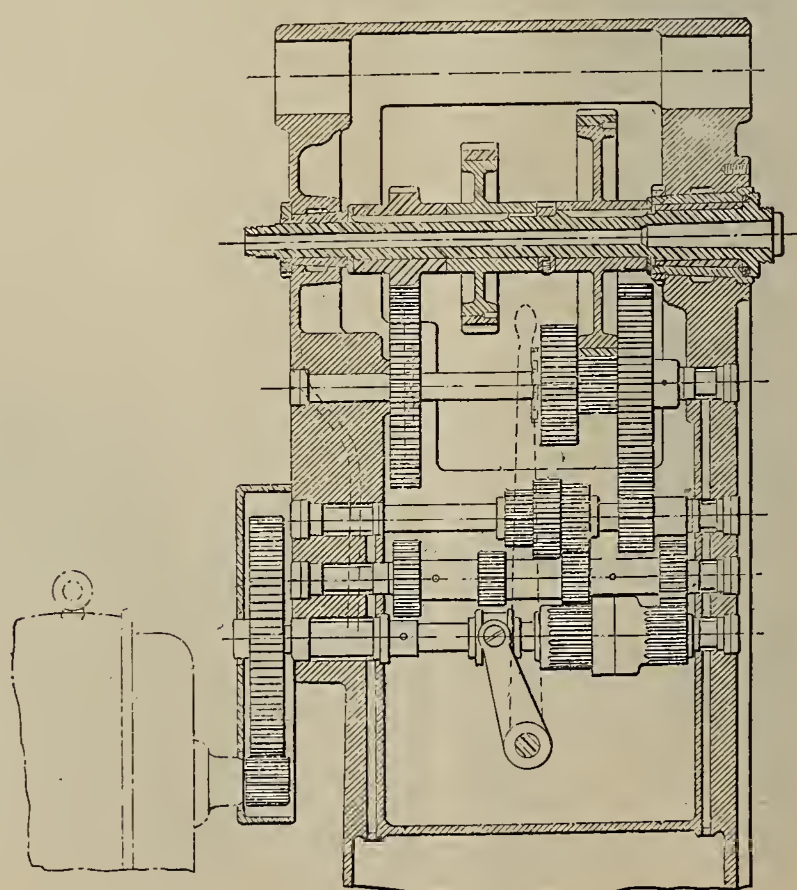


FIG. 8—DIAGRAM OF CONSTANT SPEED DRIVE FOR MILLING MACHINE.

quickly, independent of the motor. The intermediate shafts carry two sets of sliding cone gears, which multiply the speeds, giving a total of eighteen changes obtained within the machine itself.

The R. K. Le Blond Machine Tool Company is preparing a comprehensive pamphlet descriptive of its method of motor drive and present indications point to the fact that this pamphlet will be a valuable addition to present literature on motor driving for machine tools.

Gas-Electric Car for Railway Service

THE accompanying engravings illustrate a gas-electric car which has been designed by the General Electric Company of Schenectady, N. Y., to meet railway service conditions.

The car is of the combination type, and comprises one ordinary passenger compartment, a smoking room, baggage room, engine room, toilet and observation compartment. The car is single ended, having the controlling apparatus situated in the engine room.

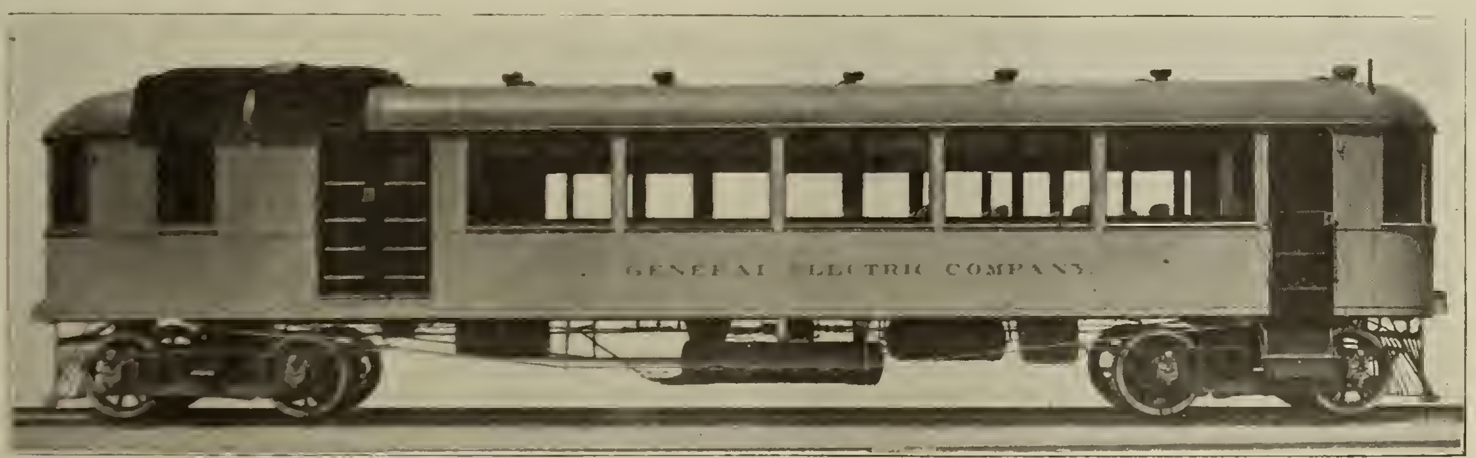
The principal dimensions are as follows: Length over all, 50 ft.; length of engine room, 9 ft. 6 ins.; length of baggage room, 5 ft. 8 ins.; length of smoker, 7 ft. 11 ins.; length of passenger compartment, 18 ft. 6 ins.; width over all, 8 ft. 8 ins.; height over all 12 ft. 10½ ins.; seating capacity, 44; total weight of car and trucks fully equipped, 31 tons.

This car was designed throughout with special reference to the service required, the main object in view being to secure the maximum carrying capacity, with a minimum weight, and at the same time to have a car of great strength. The shape of the ends is parabolic in order to reduce the air resistance to a minimum when travelling at high speed. The frame work of the roof and sides is made of T irons bent to the required shape and braced diagonally. The exterior of the car is of steel plate, while the interior is finished with selected Mexican mahogany. No wood is used in the engine compartments The floors of the passenger and baggage compartments consist of two layers of wood with paper between armoured on the under side with steel plates. The roof which is fire proof is of a plain oval shape; the monitor construction was not employed as it would have added needlessly to the weight. Special attention has been paid to ventilation; twelve ventilators of the globe suction pattern are furnished in the roof. The under framing is of a very rigid construction. The center sills consist of 6-inch I-beams, and the outside sills are 6-inch channels, and these are braced diagonally to lend greater rigidity.

The seats are handsomely upholstered in green leather. The interior is lighted with individual lamps, there being one light for each seat in addition to those in the vestibule, toilet, and engine room, while a head light is also provided. The steps are arranged in such a manner that the bottom one folds up automatically as the vestibule door is closed.

The car body was built by the Wason Manufacturing Company, Springfield, Mass., in accordance with the designs of the General Electric Company.

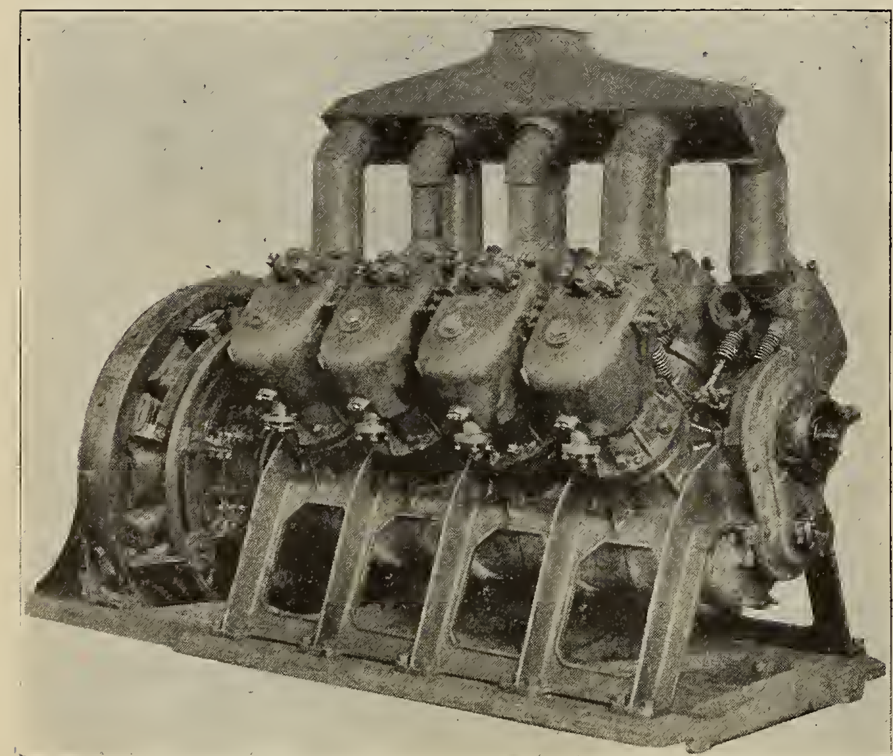
The gasoline engine is direct coupled to a 90-kilowatt direct-current generator, which furnishes current at a variable potential. This current is fed to the motors through the medium of the control system by which the voltage of the generator may be governed according to the requirements. The two motors are of the GE-72-A type, each rated at 60 horse power.



GAS-ELECTRIC CAR FOR RAILWAY SERVICE.

The engine was designed and built by the General Electric Company with special reference to the requirements peculiar to gasoline electric cars. Very special attention has been paid to the simplification of the engine; the number of parts and weight have been reduced to a minimum.

When running at 550 revolutions per minute the engine develops 100 horse power and has a greater capacity at increased speeds. There are eight cylinders each of which is 8 inches in diameter and has a stroke of 7 inches. The cylinders are placed at 90 degrees to one another, or at an angle of 45 degrees with the vertical. Each cylinder is composed of one piece, being a casting of very soft fine grain cast iron. Each casting is self-contained and includes the water jacket; it is worthy of note that special attention was paid to provide an extra large cooling surface around the valves to eliminate any excessive temperature at the valve seats. There is one admission and one exhaust valve for each cylinder, which are arranged in such a manner as to permit the inspection of both valves by the removal of two nuts. The pistons are of the trunk type; they are made of cast iron and are rendered gas tight in the cylinders by the provision of three split piston rings. The connecting rods which are made of chrome nickel steel are connected to the pistons by means of hollow pins shrunk into the body of the connecting rods. The crank shaft is made in one forging of 0.40 carbon steel; it is a four-throw crank having an angle of 180 degrees. All of the crank pins lie in the same plane,



ENGINE AND GENERATOR—GAS-ELECTRIC CAR FOR RAILWAY SERVICE.

the two center pins occupying the same angular position while the two outside crank pins are set at 180 degrees to the center crank pins. This arrangement of cranks with cylinders set at 90 degrees to one another gives a very satisfactory system for balancing purposes. Two connecting rods are coupled to each crank pin.

Each cylinder is fastened to the engine base by means of six bolts. The engine base proper is made of one casting of Parsons manganese bronze. The crank casing, which is made oil tight, is of aluminum.

All of the valves, both admission and exhaust, are actuated by one cam shaft which is driven from the main engine shaft by two gear wheels with the customary 2 to 1 reduction. This cam shaft is entirely enclosed in a circular tunnel which runs the entire length of the engine base; the tunnel is formed in the main casting. The fact that the valve rods are all operated from this one shaft has greatly simplified the design of the engine.

There are two carburetors of the float feed type. The ignition system is of the high tension type; a separate coil is provided for each cylinder. These coils are energized by means of a small accumulator. The sparking at the correct instant in each cylinder is effected by means of a roller commutator.

Considerable difficulty has been experienced in starting gasoline engines of this size heretofore, but in the present instance a special breech block mechanism has been provided which fires a charge of black powder into one of the cylinders, and this has proved a most effectual way of overcoming these difficulties.

The cooling system for the cylinders operates on a thermo-siphon principal. The radiator which is situated on the roof of the car is divided into four separate nests of radiating tubes, these, being of the spiral-finn pattern, gives a maximum cooling area per unit length.

The total cooling surface amounts to approximately 1,300 square feet. Each pair of engine cylinders is connected to one nest of tubes and the four nests are in turn connected by means of three copper pipes. The water jackets are connected to the radiator by means of pipes running vertically from the engine; these pipes pass through the roof and the circuit is completed by means of other pipes leading from the radiator to the cylinder jackets. This system forms a simple cooling arrangement as it entirely eliminates the necessity of using pumps or cooling fans, and it has the further advantage of being easily drained and of being filled from the side of the car.

Gasoline is stored beneath the car in a large steel tank having a capacity of 90 gallons, and is raised to a small auxiliary tank in the cab by means of a diaphragm pump. The gasoline is filtered in transit from the tank to the pump. The auxiliary tank is provided with a float to register the height of the gasoline, and a glass tube somewhat similar to a sight feed lubricator is provided so that the operator can see if the diaphragm pump is working. The gasoline is fed by gravity to the carburetor.

Forced lubrication is used and for this purpose there is a nest of pumps operated from the main shaft. One pump is provided for each of the main bearings and another oils the cams and cam mechanisms, the duty of this latter pump being to keep the cam shaft tunnel filled with oil; the oil on leaving the tunnel flows over the reduction gears and thence to the crank chamber. All of the oil used for lubrication purposes similarly flows to the crank chamber from whence it can be drained. The big ends of the connecting rods are lubricated by scoops which dip into the oil in the bottom of the crank chamber, the oil being forced to the crank pin as the crank shaft revolves.

The generator is a General Electric 90 kilowatt 8-pole separately excited unit, specially designed with a view to procuring the lightest possible machine for the necessary output, and at the same time, keeping the temperature rise to within a reasonable figure. It is provided with commutating poles, which, in conjunction with the potential type of control, gives a great flexibility of current output.

The normal pressure when running at 550 revolutions per minute is 250 volts, at which time the current will amount to 360 amperes, but at starting a current of 800 amperes can be secured at a corresponding decrease in voltage. It would be impossible to commutate so large a current in a machine with so great a kilowatt capacity per pound without the use of commutating poles.

The total weight of the generator including exciter is only 2,740 pounds, while a standard machine of this output weighs 8,800 pounds. As is only natural in a machine where the weight has been so materially reduced, the temperature rise is higher and the efficiency lower than in standard apparatus of the same output. The higher temperatures are fully provided for by the type of insulation employed, there is no paper or muslin used anywhere in the machine. The armature coils are insulated with mica, the interpolated pole coils with asbestos and the field coils are wound with enamelled wire. The armature leads to the commutator are riveted as well as soldered although the precaution has been taken to use pure tin for soldering, which has a melting point of over 200 degrees centigrade. Air ducts of ample dimensions are provided to insure a large volume of air being circulated through the core. The efficiency is 88 per cent, being only about 3 per cent lower than a standard machine having a temperature rise of 35 degrees centigrade.

The exciter is a 3 kilowatt 70-volt, shunt-wound machine with its armature mounted directly on the armature shaft of the main generator and its field yoke supported by the bearing brackets, enabling it to fit under the back ends of the generator armature windings.

The speed of the motors is governed by a potential control, the generator being separately excited and the terminal voltage of the motors being varied by means of a rheostat in series with the exciting circuit. The simplest explanation of the controlling system is arrived at by considering the circuits separately. The armature circuit of the main generator comprises the armature, fuse, two contactors in series, reverser, and the two motors. The motors are connected in series or in parallel, according to the position of the controller handle, and they are grounded to the truck frame-work, while the solenoid coils for operating the contactors are energized by a storage battery floating across the field circuit. The reverser is operated as usual by a separate reversed handle on the controller.

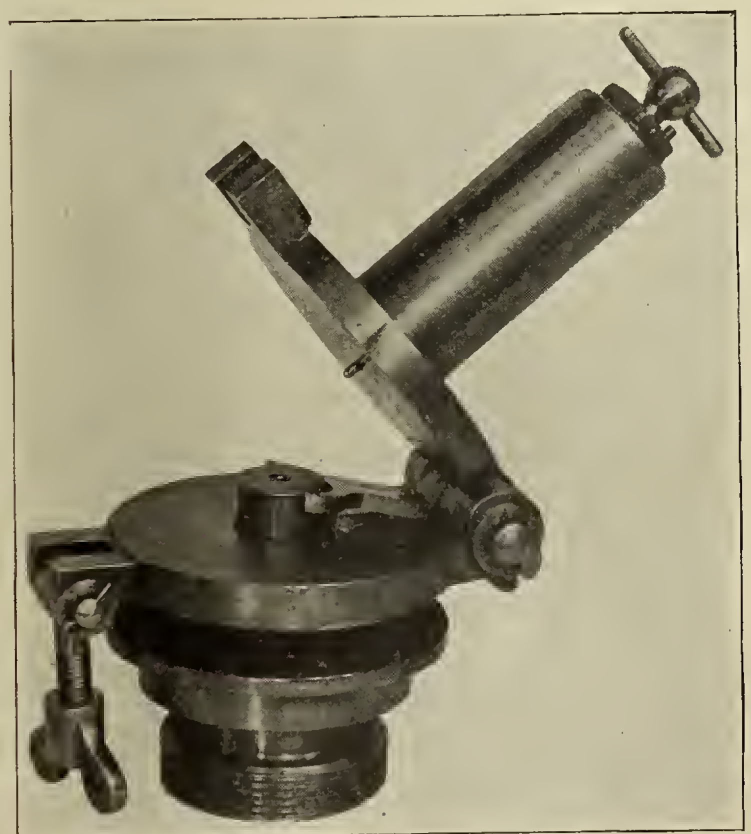
The current from the excited passes around the field of the main generator and through the rheostat, the function of the controller being to cut in and out this rheostat as occasion demands.

A storage battery which floats on the exciter circuit is used for supplying the lighting circuits and its charging and discharging is controlled by means of a reverse current relay which permits the lights being supplied directly from the exciting circuit or from the storage battery according to the voltage of the exciter circuit. A Tirrill regulator is employed for regulating the voltage on the lighting circuit. These arrangements enable the car lights being used when the engine is at rest.

The master controller which has some unique features is of type C-44 and gives seven steps with the two motors connected in series and eight steps with the two motors connected in parallel. It is provided with four handles, three of which are mounted one above the other on concentric shafts. The function of the top handle is to advance and retard the ignition of the engine, the second controls the throttle of the engine, while the third handle controls the generator field resistances and the contactors, which establish the circuit for the motors, besides transposing the motor connections from series to parallel. The fourth handle operates the reversing switch and controls the direction of rotation of the motors.

The car is heated by passing part of the exhaust gases through pipes suitably located in the car body.

The car is provided with a straight air brake equipment and the air is supplied by means of a compressor which is direct connected to the engine. The working pressure is 60 pounds per sq. inch and this is kept constant in the storage tank by a mechanical governor. Hand brakes are also provided.



BREECH BLOCK FOR STARTING-GAS-ELECTRIC CAR FOR RAILWAY SERVICE.

The trucks were constructed by the American Locomotive Company. They are of the swing bolster type, and have wheels 36 inches in diameter. One motor is mounted on each truck. The journals are of the M. C. B. standard pattern.

The interior of cars can be designed to suit any requirements or service. Cars of this type are available for use as private cars, with sleeping and dining accommodation, as inspection cars, wrecking cars, and baggage cars, etc.

Personal Mention

Mr. E. F. Fay has been appointed superintendent of shops of the Union Pacific at Cheyenne, Wyo.

The office of general master mechanic of the International & Great Northern, heretofore held by Mr. G. S. Hunter, has been abolished.

Mr. J. F. Marshall has been appointed general store keeper of the Wabash Railroad at Canton, O.

Mr. James McDonough has been appointed general foreman of the Trinity & Brazos Valley at Galveston, Tex.

Mr. W. E. New has been appointed master mechanic of the Kansas City Belt, with headquarters at Kansas City, Mo., to succeed Mr. G. T. Neubert, resigned.

Mr. M. Flanagan has been appointed division master mechanic of the Great Northern at Havre, Mont., succeeding Mr. K. A. Froberg, who has been transferred to Superior, Wis.

The office of Mr. J. S. Chambers, superintendent of motive power of the Atlantic Coast Line, has been changed from Wilmington, N. C., to South Rocky Mount, N. C.

Mr. C. H. Kessler has been appointed mechanical engineer of the El Paso & Southwestern system, with headquarters at El Paso, Tex.

Mr. Silas Zwight, road foreman of engines of the Northern Pacific at Fargo, N. D., has been appointed master mechanic of the St. Paul division at Minneapolis, Minn.

Mr. J. B. Gannon, division master mechanic of the New York, New Haven & Hartford at New London, Conn., has been transferred to Hartford, Conn., as master mechanic of the Midland division.

Mr. G. J. DeVilbiss, superintendent of motive power of the Toledo & Ohio Central, has had his jurisdiction extended to include the Marietta, Columbus & Cleveland.

Mr. C. T. Hessmer, road foreman of engines of the Northern Pacific at St. Paul, Minn., has been appointed master mechanic of the Minnesota division at Staples, Minn., vice Mr. W. Lincoln, resigned.

Mr. J. F. Sheahan, master mechanic of the Southern at Atlanta, Ga., has been transferred to Knoxville, Tenn., as master mechanic, succeeding Mr. J. B. Michael, who has been appointed master mechanic at Selma, Ala.

Mr. G. Akans, master mechanic of the Southern at Selma, Ala., has been transferred to Birmingham, Ala., in a similar capacity, in place of Mr. N. N. Boyden, who has been appointed master mechanic at Atlanta, Ga., succeeding Mr. J. F. Sheahan, transferred.

Mr. J. B. Mitchell, master mechanic of the Knoxville-Chattanooga division of the Southern Railway, has been transferred to Selma, Ala., after serving 22 years at the Knoxville shops. The Southern recently adopted a rule requiring all master mechanics to change their stations every two years.

The New York, New Haven & Hartford has transferred master mechanics as a result of the rearrangement of divisions. The appointments and headquarters now are as follows: New York division, J. M. Collins at Harlem River; the Shore Line, P. C. Zang, at New Haven; the Providence, G. A. Moriarity, at Providence; the Boston, J. Hocking, at South Boston; Old Colony, D. R. Killinger, at Taunton; the Midland, J. B. Gannon, at East Hartford; the Western, H. C. Oviatt, at New Haven. J. McCabe, heretofore engine foreman at the Harlem River terminal, has been appointed general road foreman of engines, with headquarters at New Haven.

Mr. J. P. McCuen, superitnendent of motive power of the Cincinnati, New Orleans & Texas Pacific, has resigned that position, effective on March 1, when he will take the rest to which he is entitled after long years of service. Mr. McCuen entered the employ of the Queen & Crescent Route as road foreman on March 1, 1882. He served as division master mechanic at Chattanooga, Tenn., during 1886 and 1887, and was promoted to the position of division master mechanic at Monroe, La., in 1887, serving four years at that point. He was then division master mechanic at Birmingham, Ala., from 1892 to 1894, and after faithfully serving the company for 12 years a well-deserved promotion was given him on Jan. 1, 1895, as superintendent of motive power, with headquarters at Ludlow, Ky., which position he has held up to the present time. Mr. McCuen retires on the twenty-sixth anniversary of his connection with the system, in whose interests he has worked so hard and faithfully.

Mr. T. S. Reilly has been appointed superintendent of the mechanical department of the Canton & Hankow Railway at Canton, China. Mr. Reilly, who is 37 years of age, graduated in civil engineering from the Pennsylvania Military College in 1890. He was a machinist before entering that institution, and on leaving it took service with the San Antonio & Aransas Pass Ry. He was with this road three years, succeessively as machinist, fireman, draughtsman, roundhouse foreman, and for the last 14 months as general foreman, at San Antonio, Tex. After a six months' course in electrical engineering with the Westinghouse Electric & Mfg. Co., Mr. Reilly returned to the southwest and for a period of three years served in Mexico, notably as master mechanic with the Mexican Central. Returning to the United States, he was with the Atchison, Topeka & Santa Fe 18 months as electrician in charge of development of electric train lighting, being at Topeka, Kan., and Denver, Colo., and for the final year, in 1899, in Chicago. At this time he entered the service of the Railway and Engineering Review, and since that date has been on that journal during a total of five years. During an interval he held a position with the Westinghouse Air Brake Co. as mechanical expert in charge of dynamometer work and other duties of a special nature, and with the St. Louis & San Francisco as master mechanic in charge of Oklahoma and Indian Territory districts. He went to Cuba as mechanical expert for the Galena-Signal Oil Co., and leaving the island in 1905, returned to the Railway Review.

Technical Publications

Proceedings of the 40th Annual Convention of the American Railway Master Mechanics' Association, held at Atlantic City, N. J., June 12, 13 and 14, 1907, J. W. Taylor, Secretary, Old Colony Building, Chicago, Illinois.

The volume contains all committee reports and papers presented at the 1907 convention, together with full discussion of the same. It includes reports on auditing; blank form for history of locomotive movements at terminals; blanks for reporting work on engines undergoing repairs; correspondence and resolutions; development of motor cars for light passenger service; fire shrinkage and design of wheel centers; locomotive lubrication; mechanical stokers; proper spacing of flues in high pressure boilers; proper width of track on curves to secure best results with engines of different lengths of rigid wheel base; results of use of different valve gears on locomotives; subjects; and superheating.

Proceedings of the 41st Annual Convention of the Master Car Builders' Association, held at Atlantic City, N. J., June 17, 18 and 19, 1907, J. W. Taylor, Secretary, Old Colony Building, Chicago, Illinois.

The volume contains all committee reports and papers presented at the 1907 convention together with full discussions of the same, as well as the revised rules and correct standards and recommended practice of the Association. It includes reports on air brake hose specifications; arbitration; arch bars for 80,000 lbs. capacity cars; automatic connectors; brake shoe tests; cast-iron wheels; chemical analyses of air-brake hose; clearances for electrical equipment; correspondence and resolutions; height of brake staff; high-speed air brakes; revision of standards and recommended practice; revision of rules of interchange; rules for loading long materials; subjects; tank cars; tests of M. C. B. couplers; triple valve tests and wheel stresses.

A fine specimen of color printing is to be found in a pamphlet on "Railroad Signaling, Union Pacific R. R.," published and copyrighted by Mr. E. L. Lomax, general passenger agent of the Union Pacific R. R., at Omaha, Neb. The book describes the systems of signaling on that road, and alternating with the reading pages are full-page photographic illustrations, in colors, of signal installations at various points. The descriptive matter explains the functions of the various types of signals and interlocking, and the signal indications. The matter is technically accurate and might well serve as a primer on railroad signaling.

The bureau of statistics of the Department of Commerce and Labor has prepared a map entitled "Principal Transportation Routes of the World," designed to show at a glance the principal land and water transportation routes of the world in conjunction. The map shows the distances from New York, New Orleans, San Francisco and Port Townsend to the principal ports of the world and from the chief cities of the United States to those four initial ports, thus making it feasible to determine the distance from any leading city of the United States to any leading port of the world. This table of distances by the various routes includes those via Panama and Tehuantepec and across the United States, as well as via Suez and around Cape Horn and the Cape of Good Hope. A small document entitled "Transportation Routes and Systems of the World," accompanying the maps, gives statistical information regarding the railroads of the world and their cost, the length of the railway lines in the United States and rates of transportation during a long term of years, the world's merchant marine and other data.

Notes of the Month

Enterprise Railway Equipment Company, Chicago, has moved its offices from the Old Colony building to 609 Rookery building.

Abrams Car Lock & Seal Company, Houston, Tex., has been incorporated with a capital stock of $10,000 by A. A. Martin, W. H. Abbey and Frederick Abrams.

J. L. Pilling, formerly of the Pilling Company, of Detroit, Mich., will place his goods under the incorporated name of J. L. Pilling Company, Chicago, Ill.

Jenkins Bros. have issued a supplement pamphlet superseding pages 70 and 71 of their 1907 catalogue, describing their extra heavy gate valves for 250 pounds working pressure and medium pressure gate valves for 150 pounds working pressure.

Hicks Car & Locomotive Works has moved its general sales offices to 410 Fisher building, Chicago. The purchasing and accounting departments are at the company's works at Chicago Heights.

Improved Automatic Air Brake Company has closed an option on some brick buildings at Elwood, Ind., and may install a plant to manufacture patented automatic air brakes. Charles St. Clair and James Schumaker of Indianapolis, Ind., are interested.

Robert W. Hunt & Co., Chicago, have established their St. Louis office, which is in charge of C. W. Gennet, Jr., at 1445 Syndicate Trust building. They have arranged to locate their chemical and cement laboratory in the same building.

Anderson-Lacy Electric Headlight Company, Houston, Tex., has shipped one of its headlights to the Union Pacific at Omaha, Neb. The company states that the Southern Pacific, which has been testing the headlight, is well pleased with the results. G. D. Kershaw, 800 Fisher building, Chicago, is general western agent for the company.

Milwaukee Car Manufacturing Company, Pabst building, Milwaukee, Wis., is a new corporation organized to build cars. The company has a plant at Gibson station, located at the junction of the Chicago, Milwaukee & St. Paul's Chestnut street line and the Port Washington road. Fred Pabst is president of the company, Robert Nunnemacher vice-president and T. F. Howe, secretary and general manager.

New Doty Manufacturing Company, Janesville, Wis., is building four punching and shearing machines for the St. Louis Car Company, St. Louis, Mo. Three of these machines will weigh about 35,000 pounds each and the other one about 40,000 pounds. The company is also building two 25,000-pound punching and shearing machines for the government to be installed at the Brooklyn navy yard.

A. T. Le Baron has joined forces with C. A. Ralston, under the firm name of Ralston & Le Baron, with offices at 702 Fisher building, Chicago. They will deal in locomotives, cars and contractors' equipment, and are agents for the Russell Car & Snow-Plow Company, Ridgway, Pa. Mr. Le Baron for two years past has been in charge of southern territory for the Fitz-Hugh Luther Company, Chicago, with headquarters at New Orleans, La.

The Safety Car Coupler Co. has been incorporated with $100,000 capital stock by A. W. Boyd, M. A. Brown, D. T. Saul and others, of Chattanooga, Tenn.

W. P. Cosper, Chicago, dealer in railroad specialties, has been appointed Central Western Agent for the Lord Electric Co., Boston, Mass.

The Detroit Seamless Steel Tubes Co., Detroit, Mich., is installing machinery to make larger sizes of cold-drawn seamless steel tubes. This increases materially the capacity of the plant.

The St. Paul, Minn., office of the Northern Electrical Manufacturing Co., Madison, Wis., has been moved from 21 East Fifth street to 516 Endicott building. T. E. Drohan, formerly Superintendent of the company's shops at Madison, is in charge of the new office.

Steel Car Forge Company, Frick building, Pittsburg, Pa., which for several years has confined its production exclusively to the manufacture of car forgings and special forgings, states that during the past year it has greatly enlarged its facilities and is now prepared to handle orders for all sizes of machine and carriage bolts, nuts and rivets.

J. F. Donahue, for five years secretary and manager of sales of the New Castle Forge & Bolt Company, has severed his connection with that concern to become western sales manager for the Russell, Burdsall & Ward Bolt & Nut Company of Port Chester. N. Y. Mr. Donahue's headquarters will be in the Commercial National Bank building, Chicago.

Zelnicker Crayon Works, St. Louis, Mo., has just put on the market a new crayon called the "Suremark." This name was adopted, the company states, because the new crayon makes a sure mark that will remain on any surface, particularly highy polished ones, such as tin, brass, glass, paper, etc. The yellow is particularly good for marking iron castings.

W. H. S. Wright Supply Company, St. Paul, Minn., has been incorporated to conduct the business established by the late W. H. S. Wright. The officers of the company are B. W. Parsons, president and treasurer, and Mrs. W. H. S. Wright, secretary. The new concern has retained all the accounts handled by Mr. Wright, among them the St. Paul representation of the Railway Steel-Spring Company of New York.

Ralph P. Zint, assistant manager of sales of the Pittsburg office of the Republic Iron & Steel Company, has been appointed manager of sales at the Chicago office in the First National Bank building. Mr. Zint succeeds J. E. Hubbert, who becomes manager of sales at St. Louis. Frank E. Phalen of the latter office goes to New York as manager of sales. George F. Alderdice of the Crucible Steel Company of America succeeds Mr. Zint in the Pittsburg office.

The G. Drouve Company, of Bridgeport, Conn., at the annual meeting of its directors, held Feb. 3, elected G. Drouve president and treasurer, and William V. Dee, secretary of the company. Mr. Dee, who recently resigned from the Railway Age to take an interest in the company, has been appointed general sales manager. The company manufactures the "Anti-Pluvius" skylight, of which 125,000 sq. ft. has been installed on the Hoboken terminal of the Delaware, Lackawanna & Western, and the Lovell window operating device now used in the shops of the New York Central at Harmon, N. Y., the Delaware, Lackawanna & Western at Scranton, Pa., and a number of others, also the Drouve ventilators, drying stoves, etc.

Mr. John H. Farlow, who for many years was general manager of the South Baltimore Steel Car & Foundry Co., and who was one of the patentees and promoters of the Farlow Draft Gear Co. of Baltimore, New York and Chicago, died of pleuro-pneumonia at his residence, 2015 Eutaw Place, Baltimore, Md., January 27. Mr. Farlow was born in Baltimore, Md. He had just been elected president of the Farlow Draft Gear Co., which company bears his name, and had resigned as general manager of the South Baltimore Steel Car & Foundry Co. to take up his new duties. Mr. Farlow was an energetic and ambitious young man and his various duties in connection with the car company and the draft gear company show results of great work on his part and no doubt caused his untimely end.

Standard Tool Company, Cleveland, O., in order to properly handle a rapidly growing business, has increased its capitalization from $750,000 to $1,000,000.

Robt. F. Carr and several of his associates in the Dearborn Drug & Chemical Works, have purchased the holdings of the estate of the late Wm. H. Edgar, who died two years ago, and at a meeting of the stockholders, followed by a meeting of the directors of the Company, the following officers were elected: Robt. F. Carr, president and general manager; George R. Carr, vice-president; Grant W. Spear, vice-president; Wm. B. McVicker, vice-president and eastern manager; J. D. Purcell, assistant general manager; W. A. Converse, assistant secretary and chemical director; R. R. Browning, assistant treasurer; A. E. Carpenter, superintendent.

Mr. C. M. Eddy's holdings were also taken over, he desiring to devote all of his time to his personal business interests.

The preparations manufactured by the Dearborn Company for the treatment of boiler waters, both in stationary and railroad service, are very generally used. The scientific methods originated by their laboratores, of treating each water individually, as per requirements, after analysis, has made it possible for Dearborn preparations to give high efficiency with all classes of boiler feed supplies.

"Lifting Magnets and Recent Improvements in Them" is the title of a little booklet just issued by the Cutler-Hammer Clutch Co., of Milwaukee, makers of lifting magnets and magnetic clutches. The subject matter of this booklet originally appeared in Cassier's Magazine for October, 1907, which is now out of print.

This little booklet, which is printed in the form of a miniature magazine, traces briefly the development of the lifting magnet, illustrates the different kinds of magnets used for handling pig iron, metal plates and other classes of material and explains, by an easily understood analogy, how the magnetic "lines of force" support weights ranging from and to ten tons. Copies may be had by addressing the Cutler Hammer Clutch Co., Milwaukee.

Raymond D. Carter, formerly managing editor of the Newark Morning Star, has been appointed general advertising agent of the Central Railroad of New Jersey and Editor of its monthly magazine, "The Suburbanite," with offices at 143 Liberty Street, New York.

Ward-Packer Supply Company, 1107 Fisher building, Chicago, has been organized to handle railway, mill and factory supplies by A. D. Ward and A. A. Packer.

Daniel C. Stover, president of the Stover Motor Car Company and head of several other large industries bearing his name, died at his home in Freeport on January 23 at the age of 69 years.

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CONTENTS

The Railway Storekeeper

WE have been favored with a copy of the initial number of "The Railway Storekeeper," a monthly journal devoted to the interests of the railway store department. The paper is published as an auxiliary to the Railway Storekeepers' Association, affording a medium through which storekeepers may interchange ideas. The office of publication is at Cleveland, O., where all communications should be directed.

As explained in an editorial setting forth the purpose of the publication, "every storekeeper should support the movement, as its sole purpose and object is to improve the present methods, to better the service and to more intelligently care for unapplied material. This journal is open to the free discussion of matters pertaining to the economical purchase, use and care of material on railroads, steam and electric, and such comments as may become these questions are earnestly solicited. Such communications should be so written as to create discussion. There is always something to learn from the ideas of others."

The information contained in the first issue concerns the following subjects: Value of pricing requisitions before purchase; concentration of material; the visiting storekeeper; handling locomotive supplies; and some subjects to be given consideration by committees of the Railway Storekeepers' Association.

There is every reason to believe that the energy characterizing the work of the Railway Storekeepers' Association will reflect itself in this publication and with the sympathy and support of railway storekeepers generally, the journal's scope should be large and its service fruitful.

Improved Sand Delivering Faciilties

AN estimate of the average number of tons of sand used by each locomotive of a railroad system or given division per year, taken into consideration with the number of locomotives handled at each of the principal terminals, will indicate to some extent the amount of sand handled for locomotive use. Delivering dry sand to the locomotives after it has been received at the terminal represents labor, in addition to the time consumed in the movement of locomotives to take sand. There are a number of systems in operation for receiving, drying and delivering sand and the point of delivery to locomotives is generally located in the line of movement which an engine follows when taking coal and water. Usually, however, an additional movement is required and each movement consumes so much time.

An innovation in the method of delivering sand to locomotives has been introduced at the Pittsburg, Kan., terminal of the Kansas City Southern Railway. Instead of the common system whereby sand is taken from a bin elevated immediately above the drying room, it is taken from elevated tanks situated at the cinder pits, where it is delivered through pipe lines. The sand tanks and penstocks are so situated that locomotive can take both sand and water at the same time that fires are being knocked and without additional movement of the locomotive. The details of this system are illustrated and described on another page of this issue.

In view of the requirement for rapid handling of locomotives at terminals, every arrangement of facilities whereby their movement is simplified and hastened, tends toward the increased efficiency of the terminal and a corresponding increase in the working hours of locomotives turned at the terminal.

Automatic Connectors for Air and Steam

THE fact that the Master Car Builders' Association has appointed committees to report at three consecutive conventions upon the subject of automatic connectors, may be taken as sufficient evidence that railway mechanical officials generally recognize the merit of automatic couplings between cars, for air and steam. In the May, 1907, issue of the Railway Master Mechanic, attention was called to the fact that action on the part of the Master Car Builders' Association in defining requirements would stimulate activity among the manufacturers of such connectors and would materially hasten the time when these devices may be generally applied.

The recent rulings of the Interstate Commerce Commission are bringing out strongly the need of an automatic arrangement to couple the air hose at the time cars are coupled. This ruling requires that the law with reference to the use of air brakes in freight trains, shall apply to transfer trains moving on the main line between different yards—particularly in large cities—as well as to road trains moving between terminals.

Switching service is expensive and is paid for by the hour instead of by the mile. Therefore delays which occur while one or two men of the crew are coupling up hose, run into a good deal of money. As switching crews usually break up their trains immediately upon arrival at the yard for which they are bound, another element of expense is introduced by cars being uncoupled and pulled apart without first disconnecting the hose, a practice which frequently results in damage to the hose.

It is to be hoped that the Master Car Builders' Association will be fully impressed with the conditions brought about by the government regulations referred to and will, at the coming convention in June, decide upon a type of automatic air hose coupling, in order that railroads may provide themselves with such appliances and thereby reduce delays as well as prevent the damage of hose referred to.

It would seem probable that when automatic connectors have been in use for a time, some form of flexible metallic pipe connection will be found practicable. In such an event, one of the weakest parts of the railroad equipment as it stands today, i. e., the rubber hose connections, will be eliminated. Then a source of constant expense for maintenance, as well as constant hazard of accident, will be removed.

In view of these considerations, it would seem that the subject is one of the utmost importance and one that should receive the prompt and energetic action that every question of importance has received heretofore at the hands of the Master Car Builders' Association.

The committee on automatic connectors this year is a particularly strong committee and we understand that it will have a report ready at the coming convention.

It is quite probable that the development of some of the details of the devices will be a matter of time, as was the case with the automatic car coupler. It would seem, however, that the essential points, such as the type, dimensions of couping surfaces and the requirements with reference to flexibility, manner of fastening to the car, emergency coupings, etc., might be decided upon at an early date, in order that the future details may be worked out from the standpoint of experience.

The Young Engineer in the School of Experience

AN editorial appearing in the January issue of the Railway Master Mechanic under the caption of "The Young Engineer in the School of Experience," was commented upon and its sentiment corroborated by a communication published in the February issue, under the same heading. Following the publication of these two articles, we received a criticism of present day engine crews, attempting to place upon them the responsibility of certain railway companies ruling for slower schedules for their fast trains. From the same source comes a query as to whether the locomotive engineer has developed in proportion to the development of the locomotive and the statement that "today, the engineer of the first class, must be an expert mechanic and a thorough master of engineering in every sense of the word."

While not attempting to explain the motive prompting certain railway companies to lengthen the schedule time of their fastest trains, we do feel safe in saying that it is not due to a dirth of material from which to obtain engine crews capable of handling the trains successfully. The schedule of a high speed train is expensive to maintain, not so much in the cost of operating the individual train, in the cost of fuel, water, oil, crews, etc., but rather on account of the influence exerted from end to end of the entire line over which the train operates. Other trains are placed on sidings far in advance of the time that these high speed trains are scheduled to occupy the track and no chances will be taken in rearranging meeting points that might delay such trains even for a minute. The trains of more normal speed do not require the same exacting conditions and the process of operating and dispatching may be adjusted more nearly to suit the operation of all trains over a given division or over the line as a whole.

That the large locomotive has approached the limit of human physical endurance to fire is but the indication of human physical limitations. It is therefore unfair to place the burden on any class of individuals and underrate the intelligence of present day firemen because they do not possess superhuman capacity. It would seen equally consistent to question the intelligence of locomotive designers for not having provided against just such an exigency with thoroughly developed locomotive mechanical stokers capable of performing the more arduous portion of a fireman's work under intelligent management.

The statement that an engineer must be an "expert mechanic and a thorough master of engineering" is not borne out by existing conditions. It is true that the competent engineer understands the principle of operation as well as the mechanism of the locomotive, but he is not expected to spend his time in making repairs or in figuring out designs.

Now, as formerly, engineers are recruited from the ranks of firemen and the railroads see to it carefully that firemen who are incapable of becoming successful engineers are weeded out, if employed at all. Progressive examinations are held at intervals to determine the familiarity of firemen with conditions surrounding their work and to test their mental capacity. Even after a man has been set up as an engineer, he has years of experience in which to increase his efficiency and to prove his ability before running in passenger service. Comparatively few men have been discharged for inefficiency after entering regular passenger service or have been barred from passenger runs. The few exceptions, however, prove that inefficiency and incapacity will not be tolerated in locomotive running and management whether they develop early or late in a man's career.

The Railway Blacksmith Shop

LOCATION.

THE location of the blacksmith shop is an essential feature, not only as influencing the design and arrangement of the building, and the layout of the tools, hammers, forges, etc., but also as affecting the output of the shop. The nature of the work and the conditions surrounding it, require the building to be in an isolated location in order to provide light and air on all sides. In repair work much material travels from the erecting and assembling shops to the blacksmith shop and back again, especially in locomotive work. A large proportion of the material passing between the locomotive and blacksmith shops is heavy and bulky. For this reason the blacksmith shop should be so situated in relation to the locomotive department as to provide for movement over the shortest and most direct route. Such material is usually transported on push cars and trucks so that distances are important in economizing time and increasing output.

With the increased use of forging machines and the general introduction of time and labor saving devices for rapidly forming parts entering into car construction, a large volume of material is delivered to the car department, especially where the construction of new cars is carried on. This material is principally in small pieces; but includes a large number of the same kind and methods of rapid production must be supplemented by efficient means of quick distribution.

From the standpoint of shop production the blacksmith shop is looked upon as a feeder for the other shops. Of prime importance then—though sometimes overlooked in preparing original plans—is the provision for feeding the blacksmith shop. The blacksmith shop at the principal shop plant of a large railway system turns out the forgings entering into the construction of new cars, the bulk of the car forgings required in keeping up the repairs of both freight and passenger car equipment on the line, as well as the forgings for locomotive repairs and on some systems a certain amount of switch and frog work, together with other repair work for the road department.

While in one building, it is very common practice to separate the work for the locomotive and car departments and place each under the jurisdiction of an individual foreman. As there is a difference in the nature of the work for the two departments, each occupies a section common to itself and the machines, forges and equipment are arranged accordingly. Naturally the equipment for each department is situated in that portion of the blacksmith shop building nearest to the principal shop which it serves.

LAYOUT.

A ground plan in the shape of an L is a convenient arrangement for the blacksmith shop accessible to both the locomotive and car departments, and such a form has been used in several places as at Angus, Collinwood and Burnside. Large hammers with their furnaces are located in the end of the building nearer the locomotive shop, while the open fires occupy convenient positions, and bolt headers, shears, upsetting and forging machines, etc., are placed to provide for rapid movement of finished material to the car department.

In shops of the ordinary rectangular form, the layout of equipment is arranged on the same principle. For instance at South Louisville, on the Louisville & Nashville Railroad, the blacksmith shop is parallel with and next to the locomotive shop. The yard crane passes one end of the shop and the freight car repair shop is parallel to this end, beyond the yard served by the crane. Here the equipment for car department work is in the end adjacent to the crane runway to provide for rapid intake and delivery, while the heavy hammers, etc., for locomotive work are at the other end of the shop and are accessible from the locomotive shop.

SIZE OF SHOP.

The many conditions affecting the demands upon the blacksmith shop and the difference in the dimensions of the shops on the various railway systems, render it impractical to attempt to give a definite proportion based upon any given unit. The introduction of cast steel in many details for which forgings were formerly used almost entirely, has affected the necessary size of the blacksmith shop so far as the locomotive department is concerned and the increased scope of forging machines, assisted by the extended use of formers and dies for rapidly duplicating standard parts of cars, has increased the possible output of car forgings without enlarging the area required by the shop building.

The dimensions of several prominent shops will in some measure serve as a guide for others where conditions may be expected to be somewhat similar. In this connection it is worthy of note that in several instances the building for the blacksmith shop is partially given over to some other work, in some cases for temporary work or until the enlargement of principal departments increases the demands on the blacksmith shop. At Silvis one end of the blacksmith shop is used as a brass foundry. At Collinwood a brass foundry and a bolt shop are included within the smith shop building. The spring shop frequently occupies a portion of the smith shop, though a small, individual building is sometimes built for this work exclusively.

For both car and locomotive work, the smith shop at Topeka, A., T. & S. F. Ry., is 400 feet by 100 feet, providing an area of 40,000 square feet. At Angus, Canadian Pacific Railway, where much freight car building is done in addition to locomotive repairs and the construction of new passenger cars, the area is approximately 84,200 square feet. One wing of the building is 303 feet by 146 feet and the other 303 feet by 130 feet. At Danville, C. & E. I. R. R., the smith shop is 136 feet by 100 feet, an area of 13,600 square feet. At Elizabethport, C. R. R. of N. J., the dimensions are 300 feet by 82 feet, an area of 24,600 square feet. At Silvis, C., R. I. & P. Ry., the building is 465 feet by 99 feet and with 85 feet used as a brass foundry, the area of the smith shop is approximately 33,000 square feet. At Collinwood, L. S. & M. S. Ry., the area of the smith shop proper is approximately 25,000 square feet. While not as large as the shop at Angus, yet greater than the average, the area at South Louisville, L. & N. R. R., is approximately 60,000 square feet. The blacksmith shop at McKees Rocks, P. & L. E. R. R., contains about 14,000 square feet.

CONSTRUCTION.

The construction of blacksmith shops on different railway systems varies principally in the span of roof trusses between side walls, the design of the roof structure and the form of the roof for the disposition of smoke. The walls are usually of brick, though at Elizabethport the walls are of concrete and at Topeka the ends of the building above the windows are enclosed with corrugated galvanized iron supported by steel framing.

A very general practice has been to span the entire floor without providing intermediate supports for the roof trusses and in a number of cases this distance equals 100 feet. The trusses are usually supported by the side walls which carry the weight of the roof structure and roof. At Topeka the steel skeleton is entirely independent and the roof structure is carried by built-up steel columns, to which the walls are secured to provide stability. The roof trusses span a distance of 100 feet.

The elimination of supporting columns and the long span of roof trusses without intermediate supports, allows a free scope in the distribution of equipment on the floor. The method of handling heavy work in the blacksmith shop by means of swinging jib cranes requires freedom of action for the crane arms and the absence of obstructions facilitates the arrangement of these cranes.

The long span of roof trusses, together with the requirement of a stiff frame construction to withstand the additional load imposed by supporting the upper ends of the crane columns, calls for heavy parts and careful design of the roof structure. The horizontal loads imposed by the swinging jib cranes require stiff lateral bracings. Good design to meet these requirements are particularly noticeable at Topeka and Collinwood.

In some shops of recent construction, and at others not yet completed, the shop is divided into three bays, or sections, by two rows of columns supporting the roof structure. Such an arrangement prevails at Angus, South Louisville and Beech Grove (Indianapolis, Big Four). The central bay is narrower than the other two.

DOORS FOR DISTRIBUTION OF MATERIAL.

A very essential feature in the construction of the blacksmith shop, especially where a large amount of work is done for freight car construction, is a provision for a large number of doors in the walls toward the storage yard, in addition to the usual doors for the delivery and distribution of material.

By providing such doors at intervals of a few yards raw material may be so stored that it will be easily accessible to the several machines through which it will pass in the process of manufacture. Through these doors it will travel over the shortest and most direct route and workmen consume minimum time in securing material for their work.

HEIGHT FROM FLOOR TO ROOF TRUSS.

While the distance from the floor to roof trusses at some of the older shops is about 20 feet, there is a decided tendency to increase this height, noticeable at the prominent shops of recent design and a height of 28 feet has been recommended. The actual dimensions of a number of shops are instructive. At Elizabethport, C. R. R. of N. J., the height of bottom of roof truss above floor of blacksmith shop is 20 feet; at Sedalia, Mo., M. P. Ry., this height is 22 feet; at Collinwood,

L. S. & M. S. Ry., 24 feet; at Danville, C. & E. I. R. R., 24 feet; at Silvis, C., R. I & P. Ry., 25 feet 6 inches; at McKees Rocks, P. & L. E. R. R., 25 feet 9⅜ inches; at Topeka, A., T. & S. F. Ry., 30 feet.

At South Louisville, L. & N. R. R., the bottom line of roof trusses is 35 feet 3 inches above the floor of the central bay, while this distance in the side bays is 20 feet. At Angus, C. P. Ry., this distance is 32 feet and 20 feet in the center and side bays, respectively. At Beech Grove the central bay has a clear height of 38 feet.

FLOOR.

Almost without exception, the floor of a blacksmith shop is of earth of some kind. This is frequently covered with a coating of cinders well tamped, or with clay.

CRANE SERVICE.

With few exceptions, crane service in blacksmith shops has been confined almost entirely to the use of swinging jib cranes. The impression has prevailed that there is not sufficient service for a traveling crane to justify the cost of its installation and maintenance and the amount of smoke and gas present in some blacksmith shops would make it very uncomfortable for an operator of an overhead crane.

In later years, however, the use of traveling cranes has gained in favor and improved ventilation has rendered it more practical. The entire floor of the blacksmith shop of the Philadelphia & Reading Railroad at Reading, is served by an overhead traveling crane and the central bay of the shop at South Louisville is served by one of ten tons' capacity. In order that the crane operator may suffer no discomfort from the effect of gases that might accumulate near the roof, the cage for the crane operator at South Louisville is only 10 feet above the floor. The central bay of the smith shop at Beech Grove also is served by a traveling crane of 10 tons' capacity.

VENTILATION AND LIGHT.

The ventilation necessary in a blacksmith shop and the amount of natural light needed, require a high, free space not only to allow the smoke and gas to rise away from the floor and forges, but to permit the wide diffusion of light from long windows. It is a very noticeable fact that the cleanest, brightest and most airy blacksmith shops are those with high walls. Without criticism of the appearance of other shops, the condition always to be found in the blacksmith shops of the New York Central at Depew and the P. & L. E. at McKees Rocks, is particularly commendable.

While the roof of the blacksmith shop is usually surmounted by a wide monitor extending nearly the entire length of the roof, this is provided for the sake of ventilation rather than to distribute light. The windows in the walls are depended upon principally for natural light and it is generally considered that the window area should equal at least sixty per cent of the wall area.

In order to offer least obstruction to the free circulation of air throughout the shop in warm weather and in warm climates, when it is desired to have the windows open, it is very common for at least some of the sashes in each window, usually at or near the top, to be hung on pivots. A greater opening is thus provided than by merely raising and lowering the sashes. At South Louisville all sashes of the windows in the side walls are hung on pivots.

At some shops the roof is built with a high pitch and a comparatively narrow monitor, while at others the roof is almost flat with a wide monitor. Where the building is divided into three sections by two rows of columns supporting the roof structure, the roof of the central section is higher than the roofs of the side sections and the higher roof is surmounted by a monitor of ample dimensions. Windows above the roofs of the side sections admit light to the central section and aid in ventilation.

An arrangement frequently followed in the construction of the monitor is to alternate the windows along the sides with spaces having wooden slats built in on an angle, thus permitting the circulation of air while excluding rain or snow. The entire length of both sides of the monitor is sometimes equipped with glass sashes. In some cases all of the sashes are hung on pivots and in others alternate sashes are permanent and those between are pivoted.

HAND FORGES.

Hand forges are usually arranged in a row along the wall, placed conveniently according to the class of work which they serve. The distance between centers of forges varies from 14 to 16 feet and 15 feet is a very common spacing. A spacing of 18 feet between centers of forges has been used successfully for heavy locomotive work, and it is believed that this distance will become more common in shops of the future. In the case of single forges a distance of 5 feet from wall to center line of forges is considered ample, with a free space of about 20 feet from the center line toward the interior of the shop for working room. This gives an area of about 375 square feet per forge.

The arrangement of the forges in the blacksmith shop of the P. & L. E. at McKees Rocks is a good example of the use of double forges. Here a row of double forges is situated on a center line 15 feet from the wall and each forge is placed at an angle of 54 degrees with this line. They are spaced 15 feet between centers and an area 20 feet wide from the center line of the forges toward the interior of the shop is allowed for working room. Such an arrangement provides a working area of 525 square feet for each double forge or about 262 feet for each fire. In addition to the floor space gained, this arrangement has the further advantage of reducing the number of stacks and holes in the roof by one-half, where hoods are used over the forges. Forges are arranged at uniform height, say about 24 inches and are usually of uniform shape and size.

Careful provision for tool racks is a necessary detail not to be overlooked, for while the care and maintenance of tools and equipment is the duty of the energetic foreman, it is within the province of the designer to prepare for maximum output by providing for such seemingly minor details as well as for the larger details.

The removal of smoke and gases from the forges is provided for by different methods. In some shops the air supply and exhaust are carried in underground ducts and placing the forges in groups of four simplifies the arrangement. Individual exhaust connections from the forges lead into a main duct and smoke and gases are discharged by fans through short stacks above the roof.

In other shops each forge is served by the ordinary hood with a stack extending through the roof, or one stack serves two forges placed back to back. It is not uncommon for blast pipes to be carried along the wall with individual leads between the main blast pipe and the several forges. The equipment, then, is all above ground and is accessible at all times.

At still other shops there are no hoods or stacks over the forges and all smoke and gas is expected to pass out of the building through windows in the sides of the monitors and through ventilators above the monitors. The experience at some shops, where great care was used in their design to provide for efficient ventilation, is said to have proved that smoke hoods are unnecessary and that the interior of the building is clear and free from smoke and gas at all times.

FUEL FOR FURNACES.

Oil is the most common fuel used in blacksmith shop furnaces. In later years it has rapidly displaced coal and coke, not only proving more satisfactory and economical as a fuel, but it improves the appearance of the shop by removing the necessity of unsightly coal and coke boxes about the shop. Comparative costs of coal and coke for fuel as against oil depends upon the locality in which the shop is situated. It has been demonstrated by practice that with oil as fuel it is possible to obtain a larger output, better grade of work, greater intensity of heat, as well as a more even heat, to eliminate the necessity of attending to fires, to shorten the time required to bring the furnace to the desired working temperature and to improve the conditions under which furnace men work.

It is worthy of note that at the Altoona and Juniata shops of the Pennsylvania Railroad, the furnaces for heavy work burn gas as fuel and a gas producer plant is operated in connection with the blacksmith department at each of these points.

FURNACE EQUIPMENT.

It is a noticeable fact that in a majority of the new shops particular attention has been paid to the furnace equipment, the design of the various furnaces for the various machines and their location in relation to the machines and movement of material.

No part of the general railroad repair plant has undergone a greater change during the past ten or fifteen years than the blacksmith shop, for the reason that, whereas, a few years ago a majority of the work passing through that shop was done on open fires and a large quantity of the new material was purchased from manufacturing concerns, today, due to the introduction of forging machinery, a majority of the work in the new shop is, or should be, machine work.

The output of the machines using heated material being primarily governed by the rapidity with which the material be heated in a nice soft, reducing heat, as excess scale or oxidation is detrimental to good die work signed oil furnaces occupy approximately 50 per cent less shop space than coal or coke furnaces, and, due to the absence of coal or coke bins, trucking of coal to or ashes from blacksmith shop, permit of almost ideal arrangement of the tools and furnaces, and a good economical movement of raw material to the machines and finished material to storeroom.

In machine blacksmithing it is very important that the material be heated in a nice soft, reducing heat, as excess scale or oxidation is detrimental to good die work and hard on the dies. Furnaces should be designed to meet the particular requirements of each class of machines, so that the maximum output may be obtained, the operation of the furnaces may be as economical as possible, and as nearly as possible ideal shop conditions for the machine operators prevail.

BLAST.

In connection with furnace equipment and open fires, particular attention should be paid to the layout of blast piping. Efficient blast is a very important consideration to the blacksmith shop, as it practically governs the heating capacity not only of the furnaces but of the open fires. Where blast is inefficient, not only are the fires and furnaces poor heaters, but combustion is poor, owing to the tendency of the men to crowd the fires and furnaces, and poor blast conditions make an expensive proposition generally. A majority of the new shops are furnishing blast to open fires and furnaces at a velocity equal to about 8 or 9 ozs.

In laying out blast lines, it is very important that main delivery pipe be of sufficient size not only to supply the required tuyere area, but also to take care of some future extensions. Otherwise it is necessary to resort to the expensive practice of speeding up the tan equipment. Bends in blast piping should be calculated so as to give the least frictional resistance. Several of the new shops have had considerable difficulty due to extreme frictional losses in their blast systems.

ARRANGEMENT OF EQUIPMENT.

Properly grouping machines and equipment minimize the expense of manufacture and repair by reducing the extent to which it is necessary to handle material. Bolt headers, forging machines, bolt cutters, are grouped near together and the punches and shears are situated conveniently to the headers as well as to the bulldozers and belt hammers. In locating machines care is required in providing ample space not only for working room about the individual machine, but also for tracks to provide for the movement and delivery of material.

The classes of work done in the blacksmith shop require the use of steam hammers varying in size from 800 pounds to 6,000 pounds. The equipment to serve each hammer depends on the class of work to which it is devoted and the extent to which it can be kept in continual service. In some instances a single large furnace will keep one heavy hammer busy almost continually. In others one steam hammer will serve two large forges and for some classes of work, one hammer will serve six forges.

The extent to which oil furnaces are used in blacksmith shops, allows many machines to be served by individual furnaces. The furnace and the machine are so close together that material is handled rapidly and in large quantity. By placing the machine and furnace near a door providing entrance from the storage yard material for a given class of work will be piled adjacent to the machine through which it passes and delivery from the yard is simplified. This provision is supplemented by convenient crane and track service. For instance, each bulldozer and the oil furnace adjacent to it are usually served by a swinging jib crane, so arranged as to cover the machine, furnace and an adjacent track.

Where a large amount of work of certain classes is to be done, provision for rapid movement and minimum handling reduces the cost of operation and increases the output. For instance, take the manufacture of truss rods. By placing two sets of machines of the same type in proper locations, rods may be passed from furnace to machines in such manner that both ends of the same rod are heated, upset and threaded without reversing the rod, opposite ends being worked in different furnaces and machines.

METHODS OF OPERATION.

The design, arrangement and layout of the shop are so dependent upon the class and amount of work to be turned out that it is interesting to study some of the methods introduced for rapid delivery in large bulk.

In ordering raw material for new rolling stock it is the practice of some shops to order iron cut to lengths for the various purposes required. For instance, in ordering arch bar iron, instead of calling for standard bars, the iron is ordered in pieces of required length. Such practice eliminates waste and the expense of frequent handling and allows material of a given class to be directly unloaded and piled together in locations convenient to the various machines and advances the interest of contract workers, but it increases the difficulty of checking deliveries.

At one large railway shop where twenty-eight or thirty new box cars are built per day, in addition to the passenger car and locomotive work, such large quantities of material are delivered that a system has been developed for checking the intake and output of the shop for certain orders by determining the amount of material used in each car and recording the iron used by a count of the cars built each day. The record of all material received is then checked according to the tally of material entering into the construction of the car.

To illustrate the magnitude of the problem in checking the intake of a blacksmith shop operated on a large scale and to give some idea of the large volume of iron to be delivered for car construction work alone, attention is called to the fact that in a thirty-ton box car there are about 5,600 pounds of wrought iron and mild steel and about 23,000 pounds in a standard coach or diner.

Some of the smaller pieces made in the blacksmith shop, such as nuts, bolts, etc., require so much handling during the process of manufacture, that unless transferred in bulk the cost of handling equals or exceeds the cost of forging. The necessity of cheap and rapid movement has developed methods whereby the pieces are not allowed to touch the floor. This includes the use of specially designed boxes, in some cases mounted on wheels, so that in passing through the several machines material passes from one box or wagon to another and all deliveries are made in bulk.

Traffic Club of Philadelphia

At a meeting held in the Bourse, Philadelphia, on December 17 last, the Traffic Club of Philadelphia was organized and committees were appointed to complete some of the details. A meeting of the club was held for the perfection of plans for future work on the evening of March 3 in the assembly room of the Bourse. A notice to that effect has been sent out by W. H. Heulings, Jr., secretary of the J. G. Brill Company, who is temporary chairman, and I. Elkin Nathans, special agent of the Pennsylvania Railroad, who is temporary secretary. The printed matter issued in behalf of the club shows a long list of Philadelphia manufacturing and commercial houses and local representatives of railroad companies participating in this organization. The nominations for permanent officers, all being residents of Philadelphia, are as follows:

President, Robert S. Perry, president Harrison Brothers & Co. Vice-presidents—J. W. Rawle, assistant general manager J. G. Brill Company; Powell Evans, president Merchant & Evans Company; F. A. Bedford, division traffic manager American Bridge Company; Edward Knight, member of Biddle Hardware Company; W. A. Sproull, freight agent Cambria Steel Company. Secretary, Henry C. Trumbower, treasurer John Wyeth & Brother. Treasurer, H. S. Bonner, general sales agent Haines, Jones & Cadbury Company. Historian, C. W. Summerfield, secretary Merchants' & Travelers' Association. Board of directors—N. B. Kelly, secretary Trades League (chairman); J. H. Sinex, president Garrett-Buchanan Company; Edwin F. Sellers, traffic manager Harrison Brothers & Co.; Theodore F. Sage, traffic manager Phœnix Iron & Bridge Company; Charles Bowden, traffic manager Pennsylvania Salt Mfg. Company; W. H. Wilshire, manager Consolidation Coal Company; W. L. Maize, purchasing agent Philadelphia Rapid Transit Company; George J. Lincoln, commercial agent Chicago, Milwaukee & St. Paul Railway; John B. DeFriest, general agent Union Pacific Railroad.

A Novel System for Delivering Engine Sand

Kansas City Southern Railway

THE system by which engine sand is stored and delivered at the locomotive terminal in connection with the Pittsburg, Kas., shops of the Kansas City Southern Railway, represents a novel innovation. The method of operation is unique and at the same time quite simple.

The general layout of the locomotive and car shops was presented on page 4 of the January, 1908, issue of the Railway Master Mechanic. This plan shows the location of cinder pits, etc., with relation to the roundhouse and other buildings of the shop plant. The accompanying line drawing, Figure 1, is a plan showing the location of the sand columns, sand storage, cinder pits, etc. Figure 2 illustrates the general construction of the columns, while Figure 3 is a half-tone engraving from a photograph taken at the cinder pits.

The principle on which the system is designed provides for locomotives standing over two cinder pits to be supplied with sand at the same time that fires are knocked. By delivering sand to the dome of a locomotive from a point at each cinder pit, sand may be taken without additional movement of the locomotive, an arrangement whereby much time is saved in handling engines at this terminal. Water columns are so situated that water may be taken at the same time and without additional movement of the locomotive.

Wet sand is stored in a building about 85 feet long by 21 feet wide. The building contains a storage room 57 feet long and a drying room 28 feet long. The drying room contains two sand stoves, a delivery drum and a coal bin. Dry sand is placed in the drum in the drying room and delivered by air through two 3-inch wrought iron pipe lines to two elevated drums at the cinder pits.

Each drum is supported upon a steel structure at a height of 24 ft. 6½ ins. above the rail. It is provided with two spouts in order to deliver sand to the dome of an engine standing on either one of two tracks between which the sand column is situated.

The shell of the drum is of ¼-inch tank steel and the drum is constructed to be air tight under 80 lbs. air pressure. It is 10 ft. long by 3 ft. inside diameter. Sand is delivered by the pipe line from the sand house to the top of the tank and it passes out at the bottom through a cast iron "y" connection to either of the spouts as required.

The structure on which the tank is carried is built up of two 10-inch 15-lb. channels, 33 ft. 2 ins. long, braced with 4 by 3 by 5-16 ins. angle bars. The structure is supported upon a foundation of concrete.

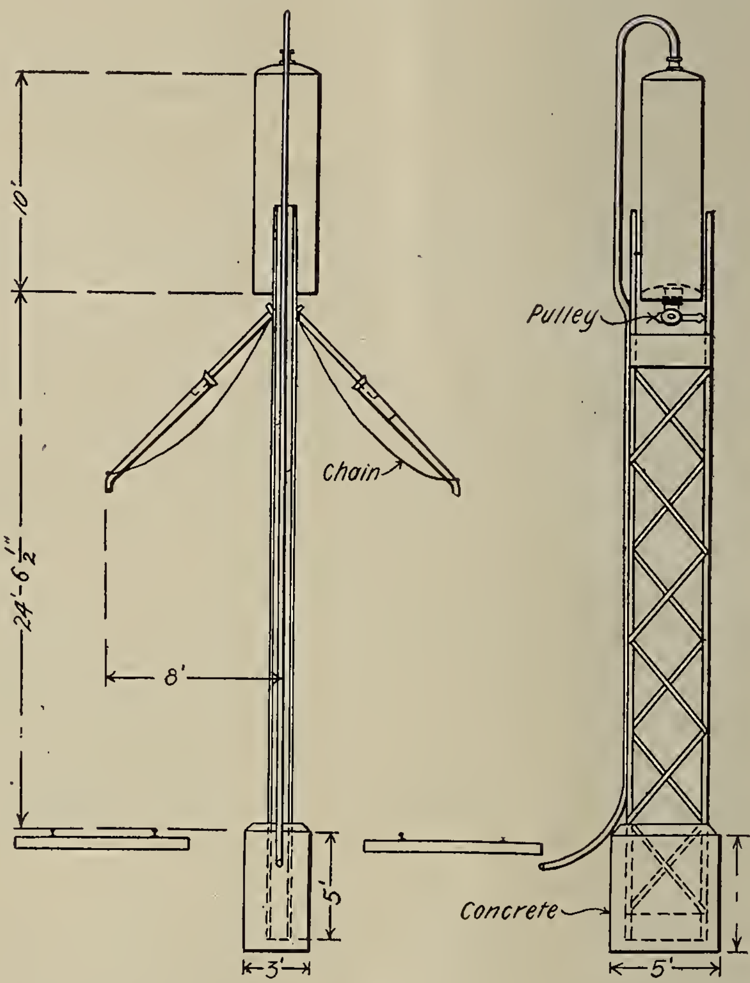

FIGURE 2.—SAND COLUMN AT CINDER PITS—KANSAS CITY SOUTHERN

Exhibition of Safety Appliances

OFFICIAL announcement has been made that an exposition lasting two months, will be held early in April in New York, under the auspices of the American Museum of Safety Devices and Industrial Hygiene, for showing the best methods of safeguarding workmen and protecting the general public. The exhibits will consist of safety devices, protected machinery in actual operation, models and photographs. During the exposi-

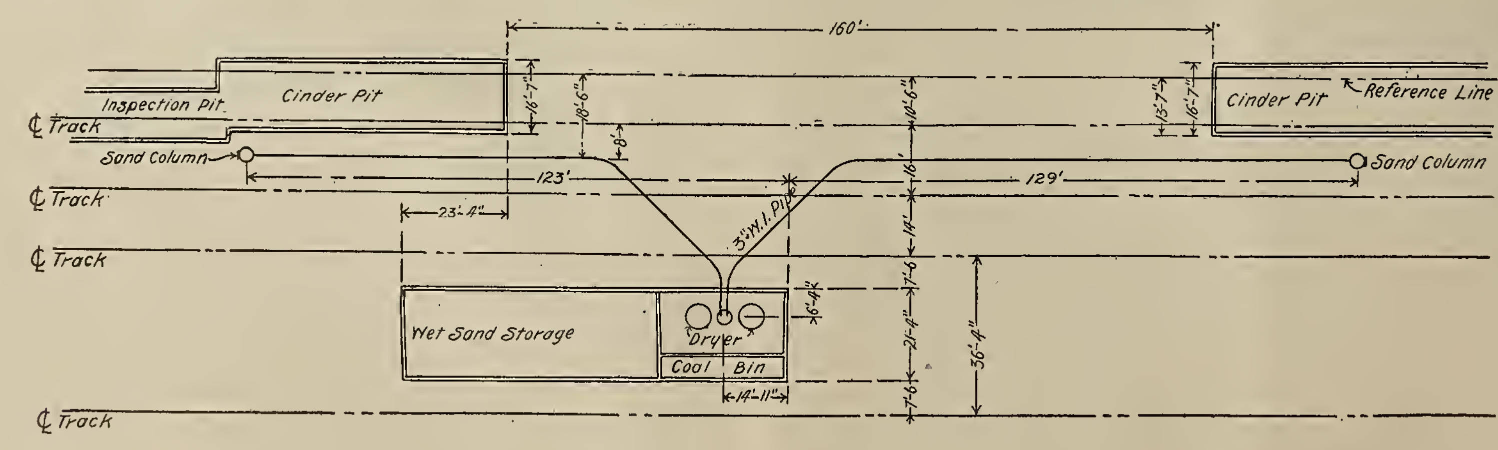

FIGURE 1.—PLAN OF SYSTEM FOR DELIVERING ENGINE SAND—KANSAS CITY SOUTHERN RAILWAY.

FIGURE 3.—VIEW OF SAND COLUMNS AT CINDER PITS—KANSAS CITY SOUTHERN RAILWAY.

tion illustrated lectures by engineers will explain industrial conditions and hazardous occupations, and the most approved methods of securing safety.

Believing that many accidents are preventable and to stimulate further invention of safety appliances, three solid gold medals are offered for the best safety device in the field of transportation, mining, motor vehicles and motor boats. Two prizes of $100 each, one for the best essay on "The Economic Waste Due to Accidents," the other on "The Economic Waste Due to Occupational Diseases," are offered.

The chairman of the committee of direction is Mr. Charles Kirchhoff, and of the committee of exhibits, Prof. F. R. Hutton. There will be no charge for space. All inquiries and applications for space should be made to Dr. W. H. Tolman, at the museum, 231 West 39th street, New York City.

Reunion of Railway Men.

A REUNION of "Old Time" Railway men is to be held in Des Moines Tuesday and Wednesday, May 26 and 27, 1908, under the auspices of the Iowa Railway Club. All persons who were connected with the railways of Iowa in any capacity twenty years ago, or previous to that time, are to be invited, whether identified with railways or not.

Realizing the difficulty in securing the names and addresses of all men to whom invitations should be sent, and not wishing to miss any, the club solicits assistance by requesting the names and addresses of every eligible man which includes men that were employed in any and every capacity, including the railway mail and express service. The club wants their names and addresses whether they intend to attend the meeting or not.

These lists should be in the hands of the Secretary not later than April 20th, and they should be plain and correct, as it is desired to have a correct roster if possible. All communications should be directed to W. H. Harrison, secretary of the Iowa Railway Cub, Des Moines, Ia.

An Apprentice Club, C. & N. W. Ry.

By John I. Dewar.

IT is a recognized fact and always will be that the man who can command a position of responsibility is the man who has a definite knowledge of his particular line of work. The indefinite, the half-toned individual is not desirable for promotion in any line of activity. And it is with this fact in view that the apprentices at the Chicago shops of the Chicago & Northwestern Railway Co. have organized a club through which they might gain a more definite, a more perfect knowledge of the task at hand—a clearer insight into their special line of work.

It is almost impossible for the apprentice in the shop to secure through the means of his manual labor alone the necessary training that will enable him to understand his work thoroughly and do his tasks to a better advantage for himself and for his employer.

It is also difficult to imbue the apprentice with ambition, ambition that will bring to the surface his latent powers, and intensify the fact that he is in the shop for business, something real, serious, and well worth the while, without some means to encourage him and point out to him the way. The Chicago & Northwestern Railway Apprentices' Club hopes to enliven the interest of the apprentice, to make him feel and recognize the fact that there is a future for him, the value of which will be in direct proportion to the quality and quantity of energy and grey matter he puts into his daily work.

The club meets twice a month in the railway Y. M. C. A. rooms. A subject is assigned to some particular individual who is instructed to write a paper on the same, and after such a paper has been read before the club, the matter is discussed among the members.

Those who have the club in hand feel that by giving a boy the opportunity of writing a paper, the results produced by the necessary study which it entails and the opportunity of endeavoring to set his ideas down in black and white will be of inestimable value to him.

The discussions that follow on the heels of these various subject papers will enable the boys to look at the matter at hand on all sides and the true gist of the subject will be arrived at.

The club is made up of regular machinist and special apprentices, and is under the direct supervision of Mr. H. D. Kelley, the shop demonstrator.

It is the hope of those in charge to extend the club to all the shops of the Northwestern Road and so enable all the apprentices to take advantage of the opportunities advanced by such a plan of procedure.

The following is an outline of the work scheduled through the month of May. February 11, "The Future of the Apprentice;" February 27, "The 'D' Slide Valve;" March 12, "Stevenson's Link Motion;" March 26, "Valve Setting;" April 9, "Walschaert's Valve Gear;" April 23, "Injector and Lubricator;" May 7, "Front End Theory of Combustion;" May 21, "The Indicator and Its Application."

The satisfactory treatment of these various subjects will be greatly augmented by black board illustrations and through the use of models.

It is the great and good fortune of the club to have the opportunity of listening to practical talks by some of the leading railway officials of the country who have kindly consented to address the boys at convenient dates.

Such an organization we feel will be of value not only to the individual but also to the road of which he is a part.

Design and Repair of Composite Construction Cars

At the March meeting of the Car Foremen's Association of Chicago, Mr. C. A. Seley, mechanical engineer of the Rock Island Railroad, gave an exceedingly interesting and instructive impromptu talk on the design and repairs of composite construction cars. His remarks referred particularly to the construction of box, furniture and other house cars, as such cars are the principal ones used in the western railroad business, the field with which his audience was most intimately concerned.

The matter of car construction differs some in different sections of the country. Mr. Seley set forth that material which brought about the freight car of the country, the wooden car, is still being used to a great extent in the west. For many years wood was used almost entirely for the construction of the car, iron and steel only being used for the fastenings and connections. A little later on iron commenced to creep in for bolsters in the trucks, and in the body, and as the steel industry finally crept up to and perhaps has got ahead of the iron industry and suitable iron for car construction has about disappeared, steel has practically taken its place, not only for axles, but for a very large proportion of the details of cars as they are built today. The wooden car of 15, 20 or 25 years ago is still with us in very large numbers, but they are not adequate for present railroad conditions and are rapidly being retired. Continuing, Mr. Seley said: I recall very well the older types of cars within the time that I have been designing, but it has been my pleasure in later years to get into the use of steel more extensively, perhaps, than some others in straight railroad construction—that is to say, where the railroad has designed and built the car themselves. The majority of all steel car construction has been developed and designed by car builders and the railroads have not been responsible for the design nearly to the extent that they had been before that time for their wooden cars and the steel car was put out as a business proposition and resulted in the building up of two or three great companies who have designed and built these cars and furnished them to the railroads, embodying, perhaps, some of the standards of these railroads, but in the main, so far as the members of the car itself are concerned, the designs of the builders.

My particular line of car design, at least that which I have been most interested in, has been in the use of standard sections of steel for the frame work of the car, and by that I mean the whole frame work. Personally I am not in favor of a steel underframe—mounting a wooden box on a steel frame which has very limited deflection. It seems to me to give a construction in which you lose a great amount of advantage. If you combine the steel work for the upper structure with the lower, you have a construction then which is stiff. It does not get loose and move around, warp and weave, requiring constant tightening up and renailing and all that sort of thing, which contributes to the number of cars on the repair track, but we have a structure which remains stiff throughout its life. Some railroads, in going to steel underframes, have thought best not to put on steel superstructures for reason of the additional parts to care for and the additional facilities required. I think this is a very great mistake, because if a proper amount of repair facilities for steel underframe is used this will certainly care for the small amount used in the superstructure. The use of steel also facilitates the building up of the end of the car which will stay in very much longer than can possibly be arranged for in wooden car construction. We can put up steel corner and intermediate end posts that are riveted to the lower and upper frame and properly tie them in and back them up and get a resistance against the shifting load that cannot be afforded by any construction I can conceive of in wood, and the shocks which are now imparted to cars in switching and extremely heavy train service call for an improvement in this direction and this improvement is best afforded, to my mind, by the composite car.

These remarks are more particularly with reference to construction of box and furniture and other house cars as being the principal cars used in our western railroad business. There are eastern roads which have a special line of traffic which require the use of gondolas and hoppers and it requires a close study of the conditions to know as to whether an all-steel car may or may not be better than the composite car for those types. Personally I am of the opinion that the composite car is a better car all around, for all types, save and except in traffic where hot metals or commodities of that kind are liable to be hauled and damage the cars. For box and stock, furniture and other house cars I believe it will not be very many years before we shall have to eliminate wooden members for sills and other heavy timbers almost entirely, but after we have done that, after the expensive lumber has been eliminated, that lumber which every mechanical engineer has trouble with the car builders on, and even though we specify certain grades, they will come back at you and say "Will you please permit us to use such and such lumber, we cannot get what we agreed to get." This has been the cry for the last several years, and after this expensive lumber is eliminated from car designs the forests of this country will produce any amount of lumber that can be used for the other portions—flooring, lining, roofing and anything else that may be required.

The use of steel for the upper structure permits a truss of such suitable depth and strength that it is a great advantage in lining the lower frame so as to make inspection very much easier. It makes a very neat and trim car and facilitates that feature very much. I recall some years ago a road with which I was connected, building some cars with 15-inch steel side sills—in fact four 15-inch channels for an underframe with a wooden box, wooden stakes. This design was followed some time after by a gondola in which I employed an 8-inch channel with a trussed side. I was always of the habit in going around among the men, hearing their comments and talking with them, getting pointers (the way I learned much of my business), and was struck by the favorable comments of this 8-inch side sill as contributing to the comfort and ease of inspection. It gave a car very much easier to get at than the ones with the deep side sills. Seventy-four per cent revenue load used to be the standing advertisement of a steel car building company for open cars, and I have demonstrated thoroughly that even greater percentage can be had and not have unduly light cars, so far as maintenance is concerned, by using the composite construction.

The use of steel in framing of house cars has been adopted to quite an extent the country over, and I believe that the steel superstructure in such cars has a great advantage as against the steel underframe car in preventing bulging. The posts and braces of the wooden superstructure on a steel underframe have only their inherent strength against bulging and it is the practice of some companies to introduce steel members in their framing to prevent bulging, these members not being made a part of the frame, but merely introduced into the frame. Now if you will consider a framing entirely of steel, then your tension members, the posts, are tension members in fact; they are riveted at the top and bottom and convey the stresses back to the bolster. Now the more your car is loaded the more these are stressed and give a resisting effect which prevents bulging. You reinforce the inherent strength which this section affords by a low string effect, as the more you pull the more strength it has to resist lateral bulging. This advantage, which taken with what I claimed before in regard to strengthening of the end, gives, to my mind, a very great advantage to the composite construction in addition to the general stiffening up of the body against weaving and warping.

The steel frame car is a telltale member in case of wrong usage. If they are cornered, or get an exceptionally heavy blow, or anything which distorts the car, it will stay bent and tell the tale. The wooden car will either break in two or spring back and conceal a whole lot of damage. You do not know how much damage it has sustained, but with the steel car it makes its own record. It is not necessary that a wrecked car has to be all cut apart and put together again simply because it is distorted, because most of this steel can be bent back without cutting apart—in fact the grade of steel used, medium steel has such a low per cent of carbon, the hardener, that it will permit the bending back without, in doing so, receiving stresses in the material which would be harmful. I would consider almost as a rule that such members can be bent back cold unless bent to a right angle. Anything less than that I would undertake to bend back cold and put it back into the car. I was connected with a road in the southeast, it was a mountain road with heavy grades and curvatures, and consequently heavy car repairs due to wreckage, and these composite cars used to come back looking pretty bad sometimes, but as a matter of fact, we found it easy to keep the full series of those cars on the road, that is to say, none of them were entirely destroyed. You cannot destroy this steel car, as a matter of fact.

Statistics which were taken at one time showed that two-thirds of the cost of heavy repairs to their composite cars was for labor, one-third for material. The ordinary run of heavy repairs of wooden cars on which you will pay two-thirds of the cost for material and one-third for labor is the reverse of the above proposition.

I think that the composite car is being approached with overmuch fear by roads which have been used to the repairs of wooden cars only with their ordinary car forces. It is a fact that it is a different thing to use a sledge and drive rivets and all that than it is for the ordinary wooden car work, but a road going into that thing comes at it gradually and you can work in among the men a feeling that the work belongs to the car department. It is not a boiler maker's job nor a blacksmith's job to repair the kind of a car which I have in mind, and none of the roads which I have acquaintance of in the east with a large proportion of steel or composite cars, have surrendered that work from the car department. The matter is one of very great interest and I think is only in its youthfulness at the present time.

There is a good deal to learn yet about what to do in the care of these cars as well as the design, but the number is constantly increasing and it behooves us to learn just exactly what can be done with steel because it is going to do away with wood just exactly in the same ratio that steel has been used for bridges instead of wood. Wood has almost disappeared now for railway bridges, or the important ones, at least, and it is only a question of time when there will be an equal proportion of cars which are made in the same way.

I have in mind one railroad that endeavored to strengthen some distorted steel cars by the introduction of wooden filling pieces—a lot of expensive woodwork that might have done if the cars had been of wood; but they failed to recognize that these were steel cars and their methods should be revised to suit the material. I have endeavored in all my car work to make the structure just as simple as could be. Make my connections as direct as possible, have everything figured out with a good factor of safety and then depend on proper material and proper handling to produce a car that would stay on the track as long as permitted to do so and do business, without the failures which fill our repair tracks so full of wooden cars. I have always been a firm believer in the rivet. I want to use a rivet wherever I can in place of a bolt, because a bolt, unless the nut is kept tight, may get out, but the rivet cannot come out unless the head drops off, and that is very improbable. The nearer we get down to one piece in these things, within reason, and what I mean by that is that it is not necessary to have the whole car in one piece, but to have it so made that it is practically in one piece that can be cut apart readily and repaired.

I know of one road that paid $2 a car on some new cars to have the sills spliced at the bolsters with the idea that when those sills became damaged they could be more readily cut out and replaced on account of the splicing. I do not believe they ever got their $2 back and would very much prefer to have sills run all the way through and not have them spliced for the very few cars which would require renewal beyond the bolster. With steel sills and proper draft attachments, securely riveted you do away with a vast amount of repairs on those cars used with the ordinary underhung draft timbers. You do away with the trouble of weak bolsters and all that train of faults by having a properly designed, built-in bolster in your construction. You do away with re-nailing by having a stiff superstructure and you do away with the loss of parts that are ordinarily attached or fastened on in some other way by using the rivet wherever possible in car construction.

FIGURE 1—BOILER IN WHICH CROWN SHEET WAS DROPPED, LOADED ON FLAT CAR AFTER EXPLOSION.

A Dropped Crown Sheet

REPRODUCTIONS from a set of photographs which are published herewith, represent the most complete illustration of a dropped crown sheet that has come within our notice. They tell a graphic story of what happened and why.

The boiler in which the explosion occurred was attached to a freight locomotive having cylinders 20x24 inches, driving wheels 64 inches in diameter and capable of exerting a tractive force of 25,500 lbs. The gauge was set for a working boiler pressure of 200 lbs. At the time of the explosion the locomotive was running at a speed of about 15 miles per hour, coupled to a freight train of the tonnage usually given this engine under favorable conditions. Prior to the explosion the engine had been working hard and the supposition is that the engineer had just shut off when the accident occurred.

Careful investigation of the boiler, sheets, crown bolts

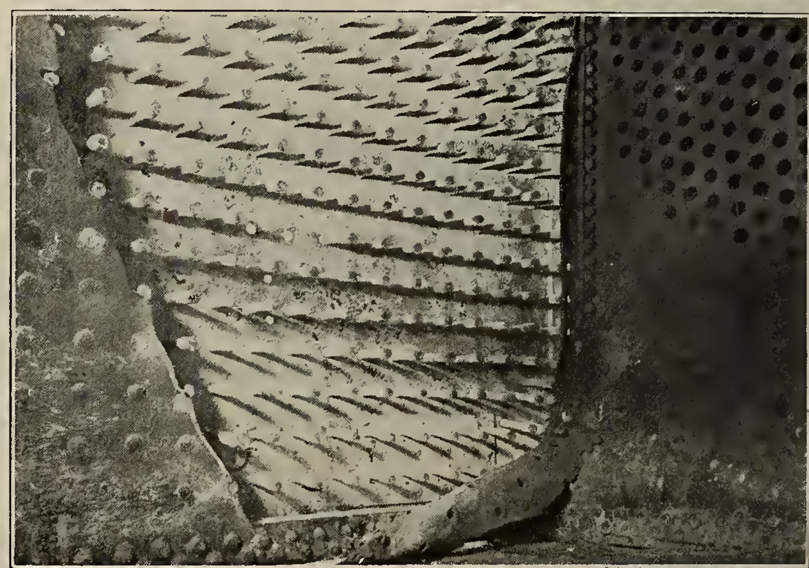

FIGURE 2—LOWER LEFT FORWARD CORNER OF FIREBOX—TWO VACANT STAYBOLT SPACES ARE FROM STAYBOLTS THAT WERE REMOVED FOR TEST PURPOSES, AFTER BOILER HAD BEEN INSPECTED. ALL STAYBOLTS ARE SHOWN IN PLACE IN FIGURE 4.

FIGURE 3—CROWN SHEET WITH PORTIONS OF DOOR AND SIDE SHEETS.

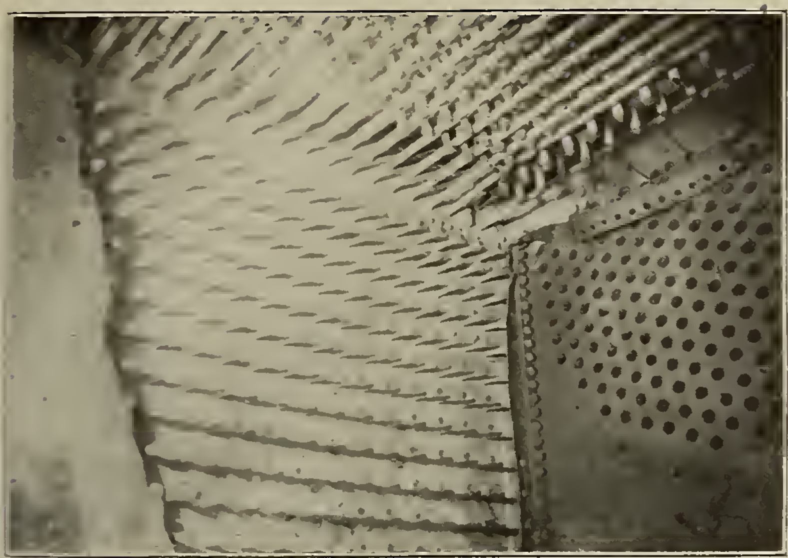

FIGURE 4—LEFT FORWARD CORNER OF FIREBOX.

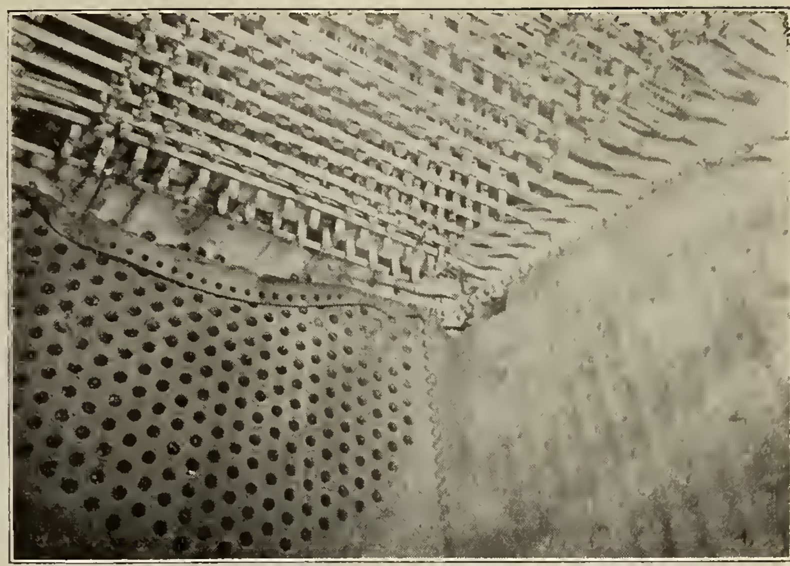

FIGURE 5—RIGHT FORWARD CORNER OF FIREBOX.

and staybolts, made after the explosion, indicated beyond a question of doubt, that the crown sheet was dropped as a result of low water. None of the crown bolts or staybolts was broken and the vacant staybolt spaces shown in Figure 2 are from two bolts which were removed for test purposes, after the boiler had been inspected. The appearance of all bolt heads showed that the sheets had been stripped away from the bolts by the force of the explosion, none of the heads having given away and none of the bolts having pulled through the outer sheet.

The accompanying illustration Figure 1 shows the boiler upon a flat car ready for transportation, where it had been placed by the wrecking crew. Figure 3 shows the crown sheet and portions of the door and side sheets. This piece, as it is here shown, was blown entirely from the remainder of the boiler except for a small space at the mudring shown in Figure 2. The boiler was blown from the running gear of the locomotive and came to earth in a field just beyond the right of way. The small portion of the sheet holding at the mudring was cut away after the boiler alighted. Figure 8 is a view looking upward at the crown stays, etc. Figures 4 and 5 illustrate the left and right forward cor-

FIGURE 6—RIGHT BACK CORNER OF FIREBOX.

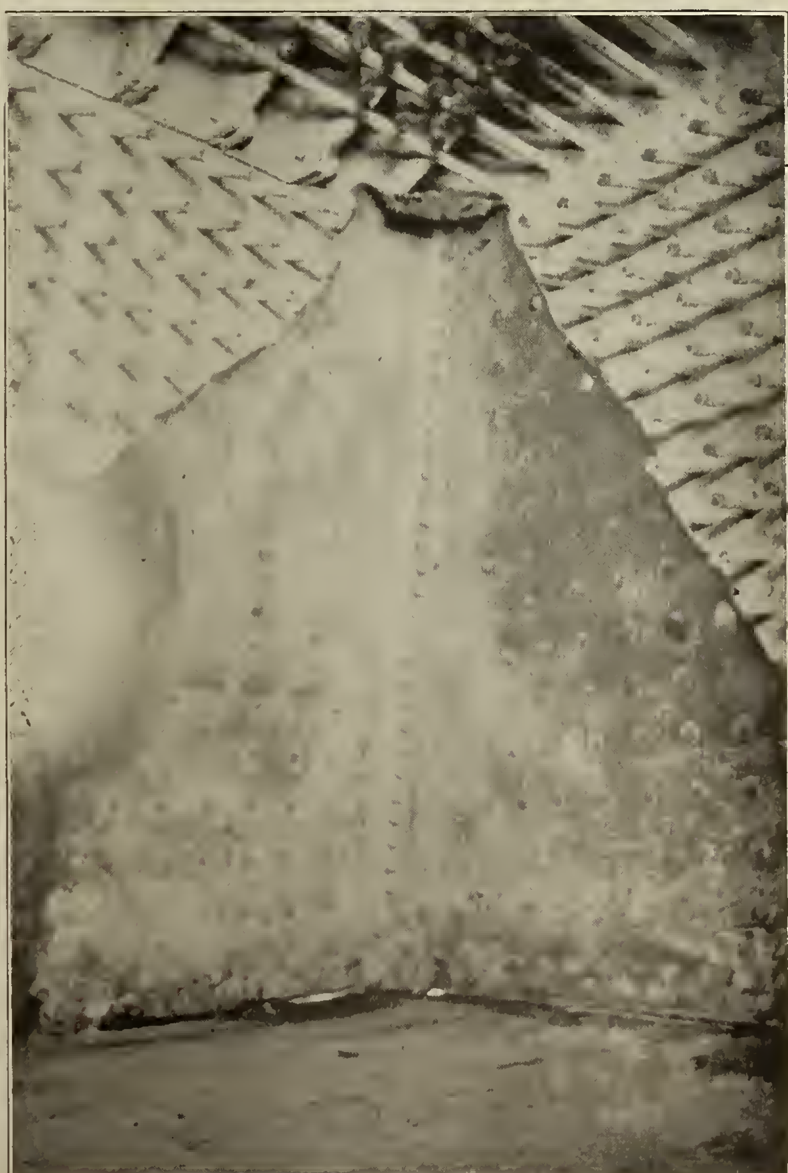

FIGURE 7—LEFT BACK CORNER OF FIREBOX.

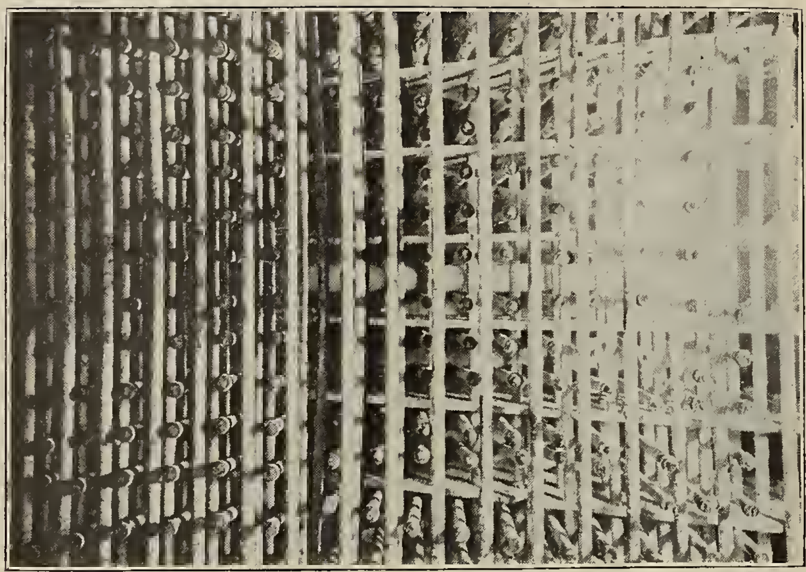

FIGURE 8—LOOKING UPWARD AT CROWN STAYS.

ners of the firebox, respectively. The appearance of a point on the flue sheet shows where the crown sheet gouged into the flue sheet and flue ends. Figure 2 shows the lower left forward corner of the firebox and Figures 6 and 7 show the right and left back corners, respectively, of the firebox.

The engravings evidence the violence of the explosion and will serve as a reminder of the extreme importance of attending carefully to the condition of gauge cocks and water glasses, keeping them clear and free from scale and other obstruction.

Glass in Brass Melting

BRASS manufacturers shun fluxes for the reason that they attack the crucible. It is one of the instances where a material is good in theory and not in practice. There is, says "The Brass World," no question about the value of a flux in melting metals. It serves to protect it from the action of the air and gases of the fire. When a flux is used, the loss of spelter in brass melting is less. It answers the two-fold purpose, then, of protecting the brass and reducing the spelter loss. By the use of a suitable flux (glass), brass rolling mill manufacturers have been able constantly to keep their spelter loss considerably below 1 per cent. Glass is an excellent flux in melting, for the reason that it does not become actually liquid at the temperature of melted brass, and, therefore, does not attack the crucible. It becomes pasty, and so covers the metal, and it is readily skimmed off, a difficult operation with a liquid flux. Assuming that a No. 60 crucible is used, a couple of pounds of broken glass are placed in the bottom before the metal is put in. When the melting begins, a handful of common salt is thrown in, as usual, and the melting allowed to continue. When the metal is ready to pour the glass will be found on the top of the metal in the form of a soft "pancake," which may be readily skimmed off. The crucible is not attacked. The cheapness of glass and the fact that the crucible is not attacked render its use attractive, and many manufacturers have been accustomed to employ it for a long time. Its good effect, however, is not generally known.

A Letter from Manchuria

Editor, Railway Master Mechanic:

Many readers of the Railway Master Mechanic, in the past year, have read much concerning the large orders placed in America by the Japanese for railway equipment to be used in Manchuria; and will wonder wherein such demand for equipment is necessary; those who have not been in Manchuria, perhaps, would not be able to form an opinion; but once on the ground they would be able to judge for themselves when they saw the advantages Tairen (Dalny) possessed as a seaboard city and the great riches of Manchuria. Some years from now it is certainly destined to become a great country and when all the resources are fully developed it will be rich and prosperous.

The resources are: great areas of coal, both hard and soft coal, iron ore, limestone, gold, silver, copper, cotton, asbestos, indigo and beans. The bean crop is one of the greatest products of the country at the present time. Oil is extracted from the beans, at large plants built for that purpose, and the pulp, or beancake, leaves Tairen in shiploads for Japan and other ports, where it is used as fertilizer; and the amount that is shipped from the port of Tairen is sufficient to keep ships in cargo for a good portion of the year. But great as this product is, it is only a small percentage of what the coal and minerals will be, and the wealth that they will contribute to the country and traffic they will afford the South Manchuria Railway Co., whose southern terminal and headquarters are located at Tairen. Large railway shops are contemplated and the material and machinery for same is now being received. When the railway lines are completed and the branch lines extended into the coal fields, and iron ore districts developed, there will be reason to believe that Tairen may become an industrial city of no mean magnitude; and, seemingly, all that is required for the full consummation of such an era now exists in the rich deposits of Manchuria. The capital and energy necessary to bring about such results seem now to be in the hands of the Japanese, who are carrying on great improvements in every direction. They do nothing in a cheap manner—everything has the appearance of soundness and well laid plans.

The gauge of the S. M. Ry., at present, is 43 inches, but thousands of tons of 85 lb. steel rails are now being laid to broad gauge (4 ft. 8½ ins.). The Tairen railway yard, or part of it, contained tracks of 42 ins. gauge. The yards have been changed to broad gauge, as well as the tracks between Tairen and Port Arthur, and standard American trains, drawn by locomotives built by the American Locomotive Company, are now operating between these towns. In the near future standard American trains will be running between Port Arthur, Tairen, north to Mukden and Harbin; where at the latter terminal they will connect with the Transiberian Railway.

Yours truly, W. T. RUPERT,
Tairen, Manchuria. Traveling Engineer,
American Locomotive Company.

Allowable Length of Flat Spots on Car and Locomotive Wheels

IN the absence of experimental data as to the impact to which rails are subjected because of flat spots on car and locomotive wheels, Mr. E. L. Hancock, of Purdue University, has made a theoretical analysis. This was presented in a paper before the Indiana Engineering Society, January 17, 1908, and the following is an abstract showing the development of a formula for the energy with which a flat wheel strikes the rail:

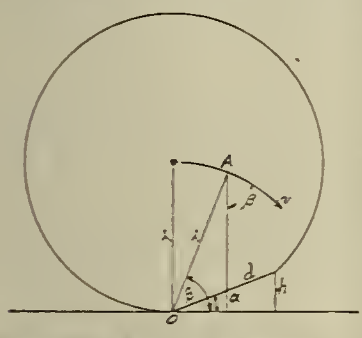

DIAGRAM FOR DETERMINING ALLOWABLE LENGTH OF FLAT SPOTS.

Let the diagram represent the wheel, of radius, r, having a flat of length d. Represent the velocity of the train by v. At any instant it may be considered that the kinectic energy of the wheel, with its weight, considered as rotating about the point, O, is the same as if the mass supported by the wheel be regarded as concentrated at its center, that is, its kinetic energy is $\frac{1}{2} Mv^2$, where M is the combined mass of the car and wheel and v is the velocity of train. When the flat spot is in contact with the track the center of the wheel is at the point A, distant below the original position approximately $\frac{1}{4}$ h, which is equal to $d^2 \div 4D$, where d is the length of the flat spot and D is the diameter of the wheel. At the point A the mass has a downward velocity equal to v cos β.

But cos β equals d ÷ D, so that the kinetic energy with which M strikes the rail is $\frac{1}{2} Mv^2 \cos^2 \beta = \frac{Mv^2d^2}{2D^2}$, where v is the velocity of train in feet per second, d the length of flat spot in feet and D the diameter of the wheel in feet.

It is assumed that the permissible kinetic energy of the blow caused by the flat spot should not exceed the kinetic energy with which the tup strikes a rail in the prescribed drop test. Hence the energy of the impact as deduced is equated to 380,000 foot-pounds, the energy of a 2,000-pound weight falling through 19 feet.

The weight upon a car wheel being assumed to be 10,000 pounds and the diameter of the wheel 33 inches, the formula becomes

$$d = \frac{29.4}{v} \quad \ldots\ldots\ldots\ldots (A)$$

While the energy of impact will be slightly increased by reason of the action of gravity increasing the velocity of the mass during the fall through the distance of A below the center, approximately $\frac{h}{4}$, it is found that this is so small as not appreciably to affect the results.

A formula corresponding to (A) for a 72-inch driving wheel, assuming a load of 25,000 pounds on the driver, is

$$d = \frac{40.6}{v} \quad \ldots\ldots\ldots\ldots (B)$$

The following table shows the values of d for various speeds:

Length of Flat Spot Permissible, d.

	33-inch wheel—Formula A.		72-inch wheel—Formula B.	
Speed v, in m. p. h.—	d in ft.	Factor of safety of 10, d in in.	d in ft.	Factor of safety of 10,d in in.
10......	2.90	3.48	4.06	4.87
20......	1.42	1.68	2.03	2.43
30......	0.96	1.15	1.35	1.62
40......	0.73	0.87	1.01	1.21
50......	0.59	0.70	0.81	0.97
60......	0.49	0.58	0.67	0.80
70......	0.42	0.50	0.58	0.69
80......	0.36	0.43	0.50	0.60
90......	0.32	0.38	0.45	0.54
100......	0.29	0.34	0.41	0.49

Four-Cylinder Simple Locomotives

AS a result of a two-years' trial of a four-cylinder, balanced, simple locomotive on the London & Southwestern Ry. of England, Dugald Drummond is putting into service as a standard for heavy passenger service, a number of ten-wheel locomotives of this type which have been designed and built by the railway. The boilers have 2,210 sq. ft. of tube heating surface, the firebox 160 sq. ft. of plate surface and 357 sq. ft. of additional firebox heating surface secured from cross water tubes. The grate area is 31.5 sq. ft. No injectors are used, these being replaced by two duplex feed pumps located under the barrel and handling water heated by the exhaust of the pumps. The cylinders are all 16.5 by 26 ins., the exterior coupling to the middle drivers and the interior to the forward drivers, after the De Glehn plan. The exterior valve motion is Walschaerts and the interior Stephenson, both handled together by a combined steam-hydraulic device. All cylinders exhaust through one pipe. The drivers are 72 ins. in diameter and the engines weigh 52 tons on drivers and 75 tons (long) complete.

Regularly Assigned Power

I HAVE in mind a road that regularly assigns the power. During the month of January, 1908, they ran 465 slow freight trains over a division 141 miles in length. The average time east was 9 hours, 45 minutes, and the average time west 9 hours, 22 minutes. The fast and manifest trains numbered 266, with an average of 6 hours 36 minutes east and 6 hours 18 minutes west. With the exception of a few days, summer tonnage was hauled. This, in my opinion, is a very remarkable performance and can only be brought about by regularly assigning the power and holding each engineman responsible for the condition of the locomotive as far as his responsiblity extends.—J. A. Talty, before Central Railway Club.

Opportunity

IN the first chapter of Genesis, 26th and 27th verses, we find, "And God said, 'Let us make man in our own image,' so God created man in his own image."

The Bible was written centuries ago. If it were to be written in our time there would undoubtedly be found something to the effect that Man was created a creature of circumstances, a soldier of fortune, a victim of environment and, as to what he actually is, practically without exception, the result of Opportunity. It would probably be said of him.

He comes into this world without his consent, and goes out against his will, and the trip between the two is exceedingly rocky. The rule of the contraries is one of the important features of the trip.

If he is poor, he is a bad manager. If he is rich, he is dishonest.

If he needs credit, he can't get it. If he is prosperous everyone wants to do him a favor.

If he's in politics, it's for pie. If he's out of politics, you can't place him, and he's no good for his country.

If he doesn't give to charity, he's a stingy cuss. If he does, it's for show.

If he is actively religious, he is a hypocrite. If he takes no interest in religion, he's a hardened sinner.

If he shows affection, he's a soft specimen. If he seems to care for no one, he is cold-blooded.

If he dies young, there was a great future ahead of him. If he lives to an old age, he has missed his calling.

But whichever way we turn, we finally come back to the crux of the situation, viz.: Opportunity, of which Ingals says:

Master of human destinies am I,
  Fame, love and fortune on my footsteps wait.
Cities and fields I walk; I penetrate
  Deserts and seas remote, and passing by
Hovel and mart and palace, soon or late
  I knock unbidden once at every gate;
If sleeping, wake; if feasting, rise before
  I turn away. It is the hour of fate,
And they who follow me reach every state
  Mortals desire, and conquer every foe
Save death: But those who doubt or hesitate,
  Condemned to failure, penury and woe,
Seek me in vain and uselessly implore—
  I answer not, and I return no more.

Some time ago I saw a statement to the effect that there are about eight kinds of men in the world, and they all want to make money.

Number One is a plodder, working for each day's wages as he gets it. He has absolutely no gambling spirit and never makes much money.

Number Two is a man who is willing to gamble, but who has poor judgment.

Number Three is the "smart" fellow who thinks nobody can fool HIM and that everybody is trying to. He is convinced that he has a corner on honesty. He is a direct descendant of the original Pharisee—why waste time with him? He is of the class that deal with "wire tappers" and green goods operators and howl like hyenas when they are bitten.

Number Four is timid—careful—not overwise in speculation but wishing to make more than day's wages. He is doubtful, but willing to be convinced by the straight testimony of manifestly honest men whose statements are borne out by proven facts.

Number Five is naturally a gambler—willing to take a reasonable chance—or an unreasonable one, if the odds are big enough. He is usually a shrewd observer of men and things, intuitive, quick, venturesome—and he wins or loses imperturbably. He is not a good man for Number Four to follow, but he is a "good sport" and in the long run usually comes out ahead.

Number Six needs a guardian. He has the sporting spirit—part way. He wants to gamble but does not stop to study the game. He does not distinguish between a legitimate business risk and a "shell game." He either hasn't brains enough to analyze a proposition, or does not use them. He goes in blind, and as the poor deals outnumber the good ones, he usually goes broke before he gets a good one. Or, if by accident he wins once, he loses the winnings quicker than he made them. He supports the bucket shops, the pool rooms and the fake promoters. He was born to lose because he will not, or cannot, use the brains the good Lord gave him. Whoever will promise him the biggest profit gets his money. There is no excuse for him and no help for him.

Number Seven is the backbone of the country—conservative without being hide bound, speculative in a broad and sensible way—willing to take a reasonable risk, but insisting on knowing just exactly what the risk is. Capable of analyzing a proposition right down to its elemental components. Honest, and insisting on honesty in others—believing that the men he meets are

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Address by Mr. W. G. Besler, vice-president and general manager of the Central Railway of New Jersey, before the Central Railway Club.

fair and square, but keeping "his hand on his gun" until he tries them out. Goes into things on conviction—not on impulse—willing to admit that other people know things that he doesn't—willing to accept evidence and able to judge of its value—a good, strong, straight, fair, nervy American business man, who helps to build up the country. A safe man to trust and to follow.

Number Eight believes that the world ends just a few miles from home. He has heard of Denver and London and Leadville, but he hardly believes they are there—and if they are, they are inhabited solely by pirates, boa constrictors and things, and not at all by ordinary human people working just as earnestly and honestly as he does in Nanticoke or Skaneateles. In other words he can't see farther than the end of his nose—and it isn't a long nose. He says "real estate right here at home is good enough for me." Maybe it is good enough for him, but he never makes very much money. If he stacks up his interests and taxes against his rent receipts and increased valuation he maybe nets six per cent—maybe.

Summed up, every one of the eight must needs depend upon Opportunity.

Warren, in his "Thoughts on Business," says:

"There are many young men in business who, because of a lack of early training, either through limited opportunities or wasted opportunities, are struggling with a great handicap, which they hardly realize, in their limited knowledge of certain fundamentals of education. They resemble a man in a boat with only one oar, battling against the waves, without even knowing enough to wish for another oar, and without realizing that the reason others are making better headway is because they have two oars.

The fundamental branches of study—those which every schoolboy is supposed to learn in his early years, and which are often too meagerly understood by young men, are: How to spell, how to use correct grammar, good penmanship, arithmetic, geography, history and etymology.

Simple as these branches are, there are thousands who are deficient in them, and yet are blundering along through life, expecting to make a success in business, and yet not realizing how greatly they are handicapped by the lack of these things. Those who feel a lack in any of the simple fundamentals of education cannot afford to neglect any opportunity they can make to acquire some knowledge of those branches. Fifty years of hard work without them cannot hide the defect which may be overcome by a few years of night study."

Some twenty-five years ago, as a young lad, I was in the service of the C., B. & Q. Ry., and was working in the office of Mr. Henry B. Stone. At that time Mr. Stone was one of the leading lights in the railroad world, and the general time convention, which evolved the standard code, was the result of the work of such men as Mr. Stone and his associates, who dared to do a lot of things in the face of a storm of protest and ridicule, and declarations from a lot of the old-timers that it was impossible, impracticable and undesirable to bring about the uniformity which it was sought to accomplish.

I remember at one time Mr. Stone made this remark, or something akin to it:

"A man is a man, and whatsoever else he is is what he makes himself."

I was at an age when such things made an impression upon me, and I began to look about and see the application of the truth of his remark; and I have continued to look about through all the years since that time, and almost without exception—or perhaps it takes the exception to prove the rule—I have found the truth of the adage.

Several years ago I saw a statement attributed to Mr. Charles M. Hays, second vice-president and general manager of the Grand Trunk Railway, wherein he was quoted as having stated, in answer to the question to what he attributed his remarkable success in railroad work, that largely to opportunity and the element of good luck he attributed his rapid rise in railroad life. I have always respected Mr. Hays more for this alleged remark than many of the so-called "successful" railroad men who have, according to their statements, climbed the ladder—but the "ladder," we have very often found, consisted of but two rungs—a bottom and a top, with influence and money which bridged and pushed them over the intervening gap.

In my own case, and to whatever extent I have had success, I attribute a very large percentage thereof to the element Opportunity, which was given to me through the medium of two railway organizations, the first, a little organization known as "The Central Association of Railroad Officers"; the second "The St. Louis Railway Club." I need not go into details, more than to say that through the medium of those two organizations I made my friendships; I established for myself a place and whatever reputation I was able to secure was very largely accomplished through my association therein. Can you wonder, therefore, or can you blame me for having in my heart a very warm place for the "Railroad Club" and the "Railroad Association?" It is the opportunity presented to the young man to get his candle out from under the bushel. It affords an opportunity for the young man to give himself something of an education.

You all know that you can lead the horse to the water but you cannot make him drink. You all know that you can give a young man a position, but unless he has it in him to hold his job and go ahead from that starting point, he is a misfit, a dead load upon you, and sooner or later must be dropped from the list.

Some persons mistake a diploma as a guarantee of capacity. We sometimes wonder why a certain young man was such a great disappointment. I remember receiving, at one time, an appeal from a college graduate who wrote me, among other things, that he was the master of six languages, and yet here he was actually starving, and with no one to give him employment

Listen to what "Success" says of a college man who failed:

He became saturated with other men's thoughts.

He depended too much on books.

He thought his education was complete when he left college.

He regarded his diploma as an insurance policy against failure.

His mind was clogged with theories and impracticable facts.

He mistook a stuffed memory for an education, knowledge for power, and scholarship for mastership.

He knew languages and sciences, but was ignorant of human nature.

He knew Latin and Greek, but could not make a bill of goods or bill of sale.

He was well posted in political economy, but could not write a decent business letter.

His four years in the world of books left him permanently out of joint with the world and practical affairs.

He was about beginning at the foot of the ladder when he left college.

The stamina of the vigorous, independent mind he had brought from the farm was lost in academic refinements.

He thought that his four years' college course had placed him immeasurably above those who had not had that advantage.

He had never assimilated what he learned, and was crippled by mental dyspepsia.

The habit of discriminating minutely, weighing, balancing and considering all sides of a subject, destroyed his power of prompt decision.

He thought that the world would be at his feet when he left college, and made no effort to win its favor.

He could not digest his knowledge.

He knew enough, but could not manage it effectively—could not transmute his knowledge into practical power.

After all, a man is very much like a horse—it is not so much who or what he is, as what he can do, that makes him valuable.

And now, in conclusion, I propose to communicate to you a real secret and an open sesame for the uninitiated who wish to acquire success and position in the railroad profession. I will take a chance on this audience with the following, which, while it may not be understood by some of my hearers, will be by others; and I will say to those who do not understand, that there is in this city ample opportunity to give light to those who are found worthy and well qualified:

Superintendent Joe Maxwell, of the M., K. & T. Ry., has the reputation of being very particular in the matter of employing trainmen, desiring only those who have had considerable experience in that branch of the service. The following is a conversation said to have been overheard in Mr. Maxwell's office a short time since, between that gentleman and an applicant for a position as passenger conductor:

Where did you come from?

From General Manager St. John, of the C., R. I. & P.

What did you come here to do?

To learn to subdue my energies and improve the railroad service.

Then you are a railroad man, I infer?

I am so taken to be by all officials who know their business.

How may I know you to be a railroad man?

By looking over my letters and examining me in the signals.

Try me.

How will you be tried?

By the punch.

Why by the punch?

Because it is an emblem of honesty, and the principal working tool of my profession.

Where was you first prepared to be a railroad man?

In my mind.

Where next?

Upon a farm adjoining the right of way of a regular railroad.

How was you prepared?

By braking upon a threshing machine for six months, after which I went to town and sought admission to the trainmaster's office.

How gained you admission?

By three cigars placed in the open hand of the trainmaster's clerk.

How was you received?

Upon the sharp gaze of the trainmaster applied to my physiognomy which was thus explained. As it is always a source of great pleasure to the trainmaster to receive callers, I should drop in to chat with him a little while upon every occasion possible.

How was you then disposed of?

I was seated in a chair near to the trainmaster's desk, and asked if I put my trust in safety coupling devices.

Your answer?

Not if I know myself, I don't.

What was then done with you?

I was led up and down the yard three times to accustom me to the noise of the trains, thence to the chief dispatcher.

How was you then disposed of?

I was seated upon a brake wheel before a train box, and caused to take the following horrible and binding oath:

"I, Steve Sears, do hereby and hereon most everlastingly and diabolically swear by the great Horn Spoon that I will always remit and never conceal any of the cash collected by me as conductor, and that I will not cut, make use of, collect or remit any cash fares less than those found in the regular tariff book.

"I further promise and swear that I will not carry on my train free any railroad man's wife, mother, sister, daughter or widow, or permit any other conductor to do so if I can prevent it.

"I further promise and swear that I will freely contribute to all subscriptions circulated to buy my superior officers 'a token of esteem, etc.', as far as he may desire and my salary will permit; to all of which I solemnly swear, binding myself under no less a penalty than that of having my salary cut from year to year, all my perquisites taken away and expended for sand ballast to put under the McKinney extension, where the trains come and go twice in twenty-four hours, so help me Bob Ingersoll and keep my back bone stiff."

What did you then behold?

The trainmaster's clerk approached me and presented me with a Bishop safety coupling knife, and instructed me to take it to the yardmaster, who would teach me how to use it.

How are Bishop coupling knives used?

By sticking them in the left hip pocket with the blade turned up.

Mr. Maxwell here informed the applicant that he was satisfied that he was a railroad man, and asked him if he would be off or from.

"I will be off from here if you will give me a passenger train."

Have you any cigars?

I have.

Will you give them to me?

That is not the manner in which I got them and I cannot so dispose of them.

How can I get them then?

I will match you heads or tails for them.

I will go you. Begin?

You begin.

No, begin yourself, you have the cigars?

Board.

A. Ah. All. Aboard. You are O. K. Come around again in the morning and I will arrange to send you down to the Trinity & Sabine Division to take the mixed train there.

Finally, with all of this admonition and benefit of secret advice, you cannot fail of success. What is success? He has achieved success who has lived well, laughed often and loved much; who has gained the respect of intelligent men and the love of little children; who has filled his niche and accomplished his task; who has left the world better than he found it, whether by an improved poppy, a perfect poem, or a rescued soul; who has never lacked appreciation of earth's beauty or failed to express it; who has always looked for the best in others and given the best he had; whose life was an inspiration, whose memory a benediction. For, in the language of Ralph Waldo Trine,—The greatest greatness and the only true greatness in the world is unselfish love and service and self-devotion to one's fellowmen.

Depressed Cinder Pit

Central of Georgia Railway

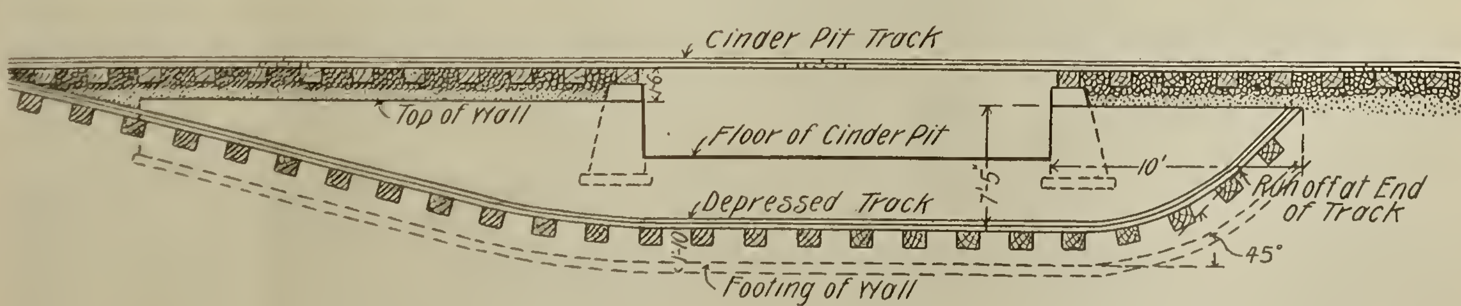
THE standard depressed cinder pit of the Central of Georgia Railway, which is shown herewith, is a type that is in common use. The details of construction, however, should prove of interest and these are given as clearly and concisely as possible.

In the first place it will be noted that the total width of cinder pit from cinder pit wall to depressed track wall is about 10 feet 4 inches, that the distance from the latter wall to center of depressed track is 5 feet 6 inches, that the distance between base of track rail and floor of cinder pit is 3 feet and the depth of depressed track below surface of pit is 5 feet 6 inches. These dimensions allow cinders to be handled readily from engine to cars on depressed track.

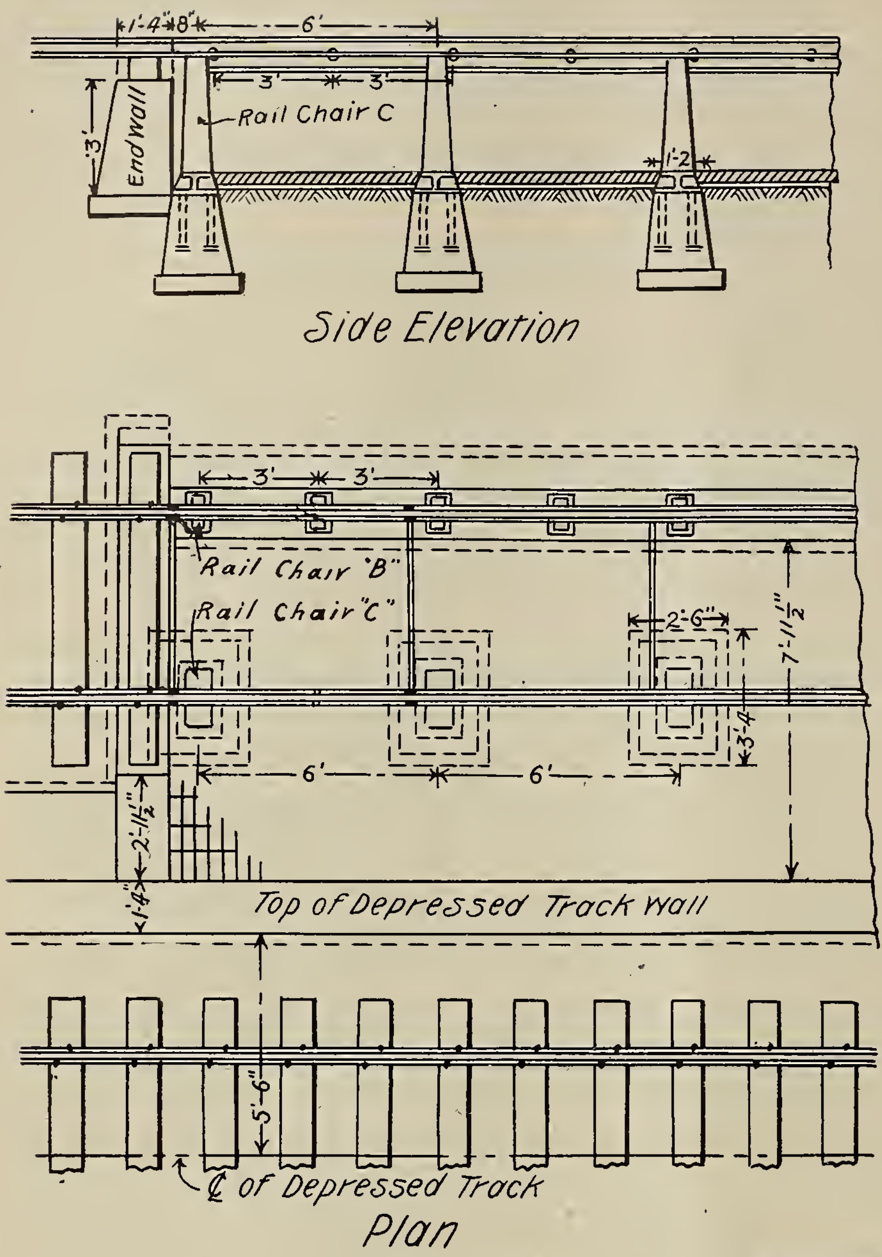
The floor of the pit is paved with vitrified brick laid on edge on 1-inch of sand and grouted with neat cement mortar after being laid. The ground should be well puddled and tamped before the pit is paved.

Rail chairs, B, are placed every 3 feet along top of wall. They are made up of two ¾x11-inch anchor bolts, placed in 2-inch old gas pipe, 6 inches long, and fastened to a 3x10-inch plate washer; bolts, gas pipe and washer are built into the concrete. The bolts pass through a plate, 8x12½ inches, which is grooved to fit rail. Washers 4x4¼ inches and about 1¼ inches thick, hold the rail to plate.

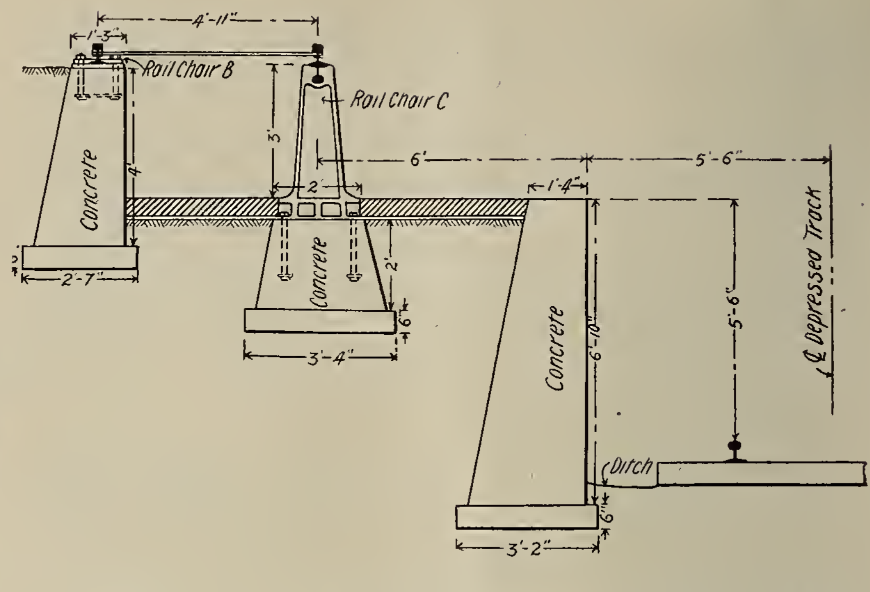
Rail chairs, C, are of web construction, the section being an "I" shape and the metal being 1¼ inches in thickness. The base of the chair measures 1 foot by 10 inches. The chair is anchored to concrete piers



PROFILE SHOWING DEPRESSED TRACK IN RELATION TO CINDER PIT—CENTRAL OF GEORGIA RAILWAY.



SIDE ELEVATION AND PLAN OF DEPRESSED CINDER PIT—CENTRAL OF GEORGIA RAILWAY.



END ELEVATION OF DEPRESSED CINDER PIT—CENTRAL OF GEORGIA RAILWAY.

with four 1-inch bolts, 1 foot 6 inches long, set in 2-inch old gas pipe. The chair is slotted at the top to give a loose fit to an inverted rail. The track rails are riveted to the inverted rails every three feet with two ¾-inch rivets. The rails are drilled, placed in position and then riveted.

The main track rails are braced with ¾-inch rods, 5 feet 2 inches long, which are placed on 6-foot centers. The rods are bolted to the rails.

The depressed track wall is duplicated on opposite side of track where topography makes it necessary.

General Repair Shops

New Orleans Great Northern

THE New Orleans Great Northern Railroad, which has been recently constructed, has under way at Bogalusa, Louisiana, general repair shops for its locomotives as well as passenger and freight cars.

The entire plant, including buildings and equipment, was designed, and is being constructed by The Arnold Company of Chicago, under the supervision of Mr. C. W. Goodyear, president of the road, Mr. N. G. Pearsall, general manager, and Mr. J. F. Coleman, chief engineer.

The general design of the buildings was influenced by

COACH SHOP UNDER CONSTRUCTION, SHOWING THE FORM WORK USED IN PLACING CONCRETE AND METHOD OF HOISTING, AS WELL AS PORTION OF WALL WITH FORMS REMOVED—NEW ORLEANS GREAT NORTHERN RAILROAD AT BOGALUSA, LA.

climatic conditions in Louisiana and economy in construction was effected because of the fact that it was not necessary to provide artificial heat for the buildings. The main buildings are: the locomotive repair shop, including machine, erecting, boiler and forge shops; the coach shop, including planing mill, coach, repair and paint shop, paint stores, upholstering room, etc.; store house and offices; round house; and coal dock.

The locomotive shop consists of a self-supporting steel structure on concrete foundations and enclosed with concrete curtain walls. Black muck bar corrugated iron is used for roofing. This iron is strapped directly to the steel purlins. The yellow pine window frames are placed with and are a part of the concrete forms. The sash are hinged at the top and are operated in gangs. All sash are glazed with one-eighth inch factory ribbed glass. The engine pits are built entirely of concrete. The flooring consists of 3 inch yellow pine laid on 4 in. by 6 in. yellow pine sleepers embedded in sand.

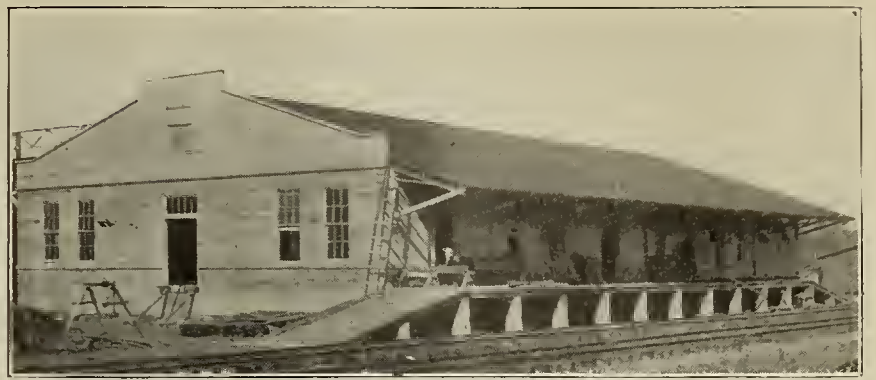
The coach house and store house have concrete foundations and walls with reinforced pilasters supporting

PLACING CONCRETE DURING CONSTRUCTION OF ROUNDHOUSE—NEW ORLEANS GREAT NORTHERN RAILROAD AT BOGALUSA, LA.

timber roof framing. The roofing, millwork, and floors consist of the same material and design as those of the locomotive shop.

The round house consists of concrete foundations and walls with reinforced pilasters supporting timber roof framing. The roof consists of 2-inch yellow pine sheathing with 5 ply composition roofing. No track doors are provided for the side of this building facing the turn table, as the temperature in the locality of the shops rarely drops to a degree requiring the round house to be entirely closed. The roof extends considerably beyond the structure on that side as a protection from sun and rain.

The accompanying views of the round house, coach shop and store house illustrate the form work and methods of placing concrete on the higher portions of the walls, and also show parts of the walls after the forms have been removed.



STOREHOUSE IN WHICH WALLS AND FOUNDATIONS ARE OF CONCRETE WITH REINFORCED PILASTERS SUPPORTING TIMBER ROOF FRAMING—NEW ORLEANS GREAT NORTHERN RAILROAD AT BOGALUSA, LA.

A. S. M. E. Publications

THE American Society of Mechanical Engineers with the desire to still further develop their publications, have been fortunate in securing Mr. Lester G. French to direct their editorial department.

Among the immediate improvements to be undertaken is the establishing of departments in the monthly Proceedings, thus providing a greater variety of technical articles of interest. Many other features are planned and the aim will be to make the Proceedings of such value that no engineer can afford to be without them. All such papers, however, will first be presented and discussed before the society at its meetings, as formerly, thus benefiting the membership two fold.

Mr. French was born in Keene, New Hampshire, in 1869, and very early commenced his training in editorial work and printing at Brattleboro, Vt., his father having been the publisher for a very long time of "The Vermont Phoenix," and a partner in a large printing establishment in that same place.

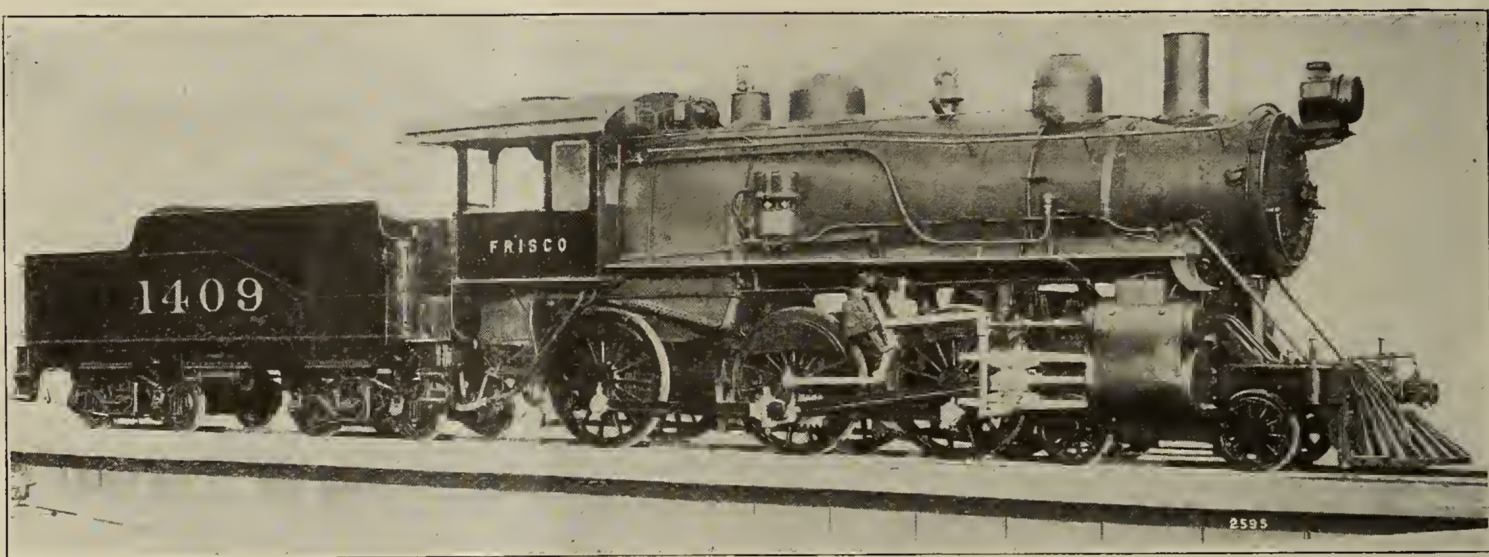
In 1891 Mr. French received his degree in mechanical engineering from the Massachusetts Institute of Technology. After four years' apprenticeship, drafting room and shop experience, principally at the Builders' Iron Foundry shops in Providence and a year and a half as a text-book writer, Mr. French was engaged on the editorial staff of "Machinery," and assisted greatly in the development of that paper and for nine years was its editor-in-chief. Recently Mr. French re-engaged in the publishing of text books on Algebra, Applied Mechanics and of a Treatise on Steam Turbines.

ROUNDHOUSE WITH CONCRETE WALLS AND FOUNDATIONS—NEW ORLEANS GREAT NORTHERN RAILROAD AT BOGALUSA, LA.

Ten-Wheel Passenger Locomotive

St. Louis & San Francisco R. R.

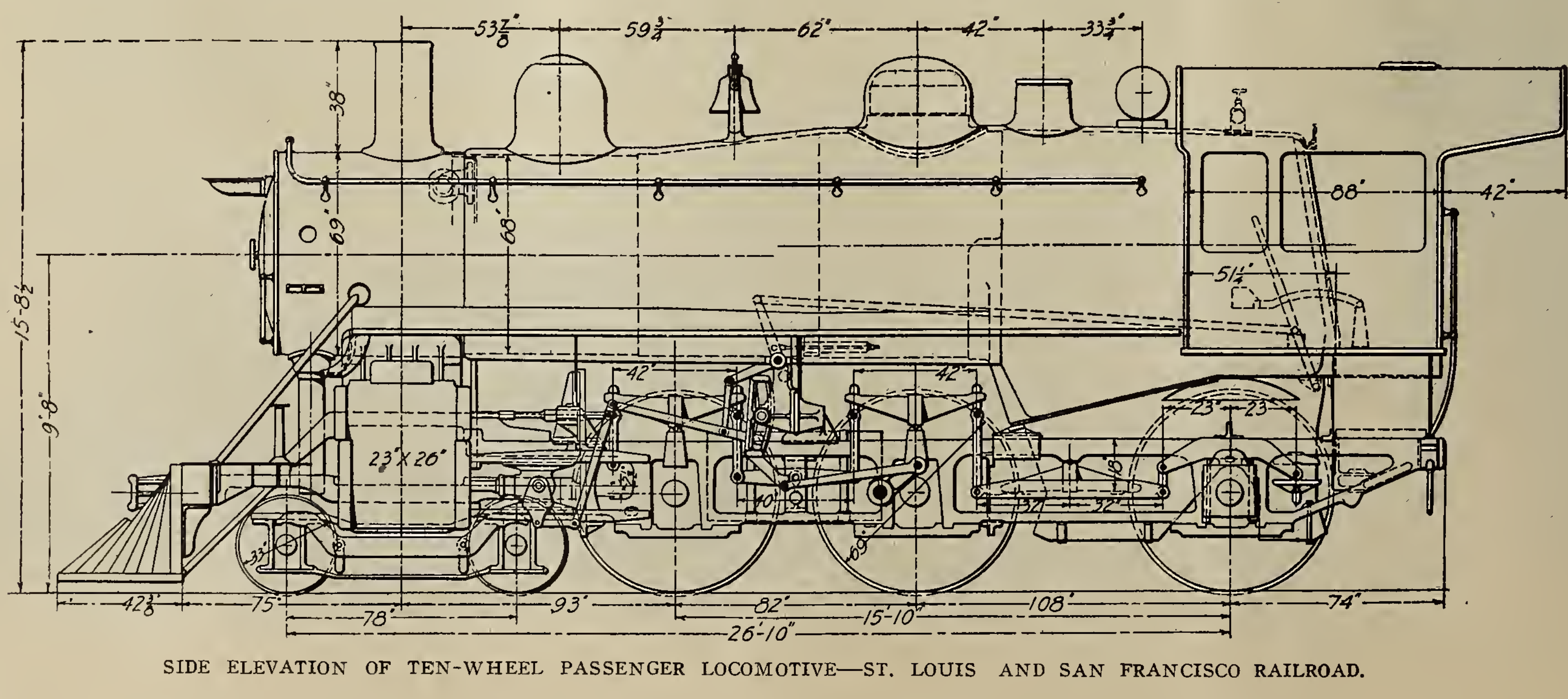
THE Baldwin Locomotive Works has recently delivered to the St. Louis & San Francisco Railroad, ten passenger locomotives of the ten-wheel type. These are among the heaviest engines of this class thus far constructed by the builders, having a total weight of 194,450 pounds in working order. The cylinders are 23 by 26 inches and the driving wheels are 69 inches in diameter, the resulting tractive force with a steam pressure of 200 pounds, being 33,900 pounds. As the weight on the driving-wheels is 141,050 pounds the factor of adhesion is 4.16.



TEN-WHEEL PASSENGER LOCOMOTIVE—ST. LOUIS AND SAN FRANCISCO RAILROAD.

The cylinders are arranged for double front rails, and the castings are bolted to the smoke box and to each other by a double row of 1¼ inch bolts. The valves are of the internal admission piston type, 13 inches in diameter, and work in bushings ⅝ inch thick. The by pass valve consists of a plate which rests on a horizontal seat, and normally covers openings leading to the live steam ports. When the throttle is open, the plate is held down by boiler pressure which acts on its upper surface. Excessive pressure within the cylinder will cause the plate to lift from its seat, thus opening communication between the two live steam ports.

The center lines of the steam chests are placed 4½ inches outside the center lines of the cylinders, thus making possible a simple arrangement of Walschaerts valve gear with all moving parts in practically the same vertical plane. As the engine is equipped with inside admission valves, the eccentic cranks follow the pins. The cranks are of cast steel, and are secured to the main pins by a tapered fit and through bolt. A substantial steel casting, secured to each frame by three 1¼ inch bolts, supports, at each end, a combined link and reverse shaft bearing. The links are of the built up type, with cast steel side plates. Each radius rod is made in one piece, the jaw which embraces the hanger and link block being slotted out. The combining levers are placed back of the cross heads, and are coupled directly to the valve rods, which are supported in bearings bolted to the guide yoke. The valves are set with a constant lead of ¼ inch and a



SIDE ELEVATION OF TEN-WHEEL PASSENGER LOCOMOTIVE—ST. LOUIS AND SAN FRANCISCO RAILROAD.

maximum travel of 6 inches. The steam lap is 1 inch and the exhaust clearance ⅛ inch.

The frames are of cast steel, 4½ inches wide, with double front rails of wrought iron. The lower rail is double keyed, while the top rail is hooked to the main frame, without keys. The pedestal binders are lugged and bolted to the pedestals.

The boiler is of the wagon top type with a wide firebox and sloping throat and back head. The center line is placed 9 feet 8 inches above the rail, and the depth of the throat from the underside of the barrel to the bottom of the mudring, is 23⅛ inches. By spacing the second and third pairs of driving-wheels 9 feet apart, ample room is secured for a wide firebox with a moderate inclination of the grate. The mud ring is supported on sliding shoes in front and a buckle plate at the rear.

The fire box is radially stayed, with two T irons supporting the front end of the crown. The roof and side sheets are in three pieces, with a double riveted lap seam on each side; while the crown and sides of the inside box are in one piece. The boiler barrel is built up of three rings, with the gusset in the middle. The longitudinal

Valves, steam lap	1 in.; exhaust clearance, ⅛ in.
Valve travel, in full gear	6 in.

Ratios.

Weight on drivers ÷ tractive force	4.16
Tractive force × diameter drivers ÷ heating surface	769.3
Total heating surface ÷ grate area	63.7
Tube heating surface ÷ firebox heating surface	16.6
Weight on drivers ÷ total heating surface	46.4
Volume of cylinders	12.5
Total heating surface ÷ volume of cylinders	243.1
Grate area ÷ volume of cylinders	3.8

Boiler.

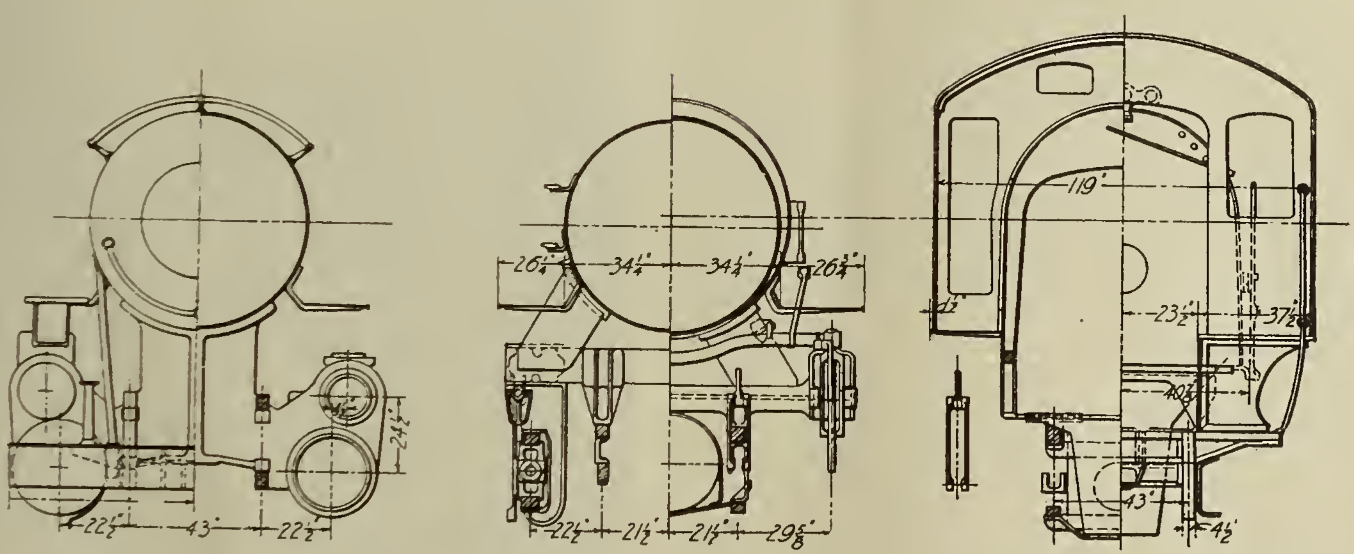
Type	Wagon top
Working pressure	200 lbs.
Diameter first ring	68 in.
Material	Steel
Staying	Radial

Fire Box.

Length	101¾ in.; width, 67¼ in.
Depth, front	77⅜ in.; back, 59⅛ in.
Thickness of sheets, sides	⅜ in.; back, ⅜ in.
Thickness of sheets, crown	⅜ in.; tube, ½ in.
Water space, front	4 in.; sides, 3½ in.; back, 3½ in.

Tubes.

Material	Iron
Wire gauge	No. 11
Number	364
Diameter	2 in.; length, 15 ft. 1½ in.



END ELEVATION AND SECTIONS OF TEN-WHEEL PASSENGER LOCOMOTIVE—ST. LOUIS AND SAN FRANCISCO RAILROAD

seams are butt jointed and sextuple riveted, and are welded at each end. The seam on the dome ring is placed on the top center line and is welded throughout its entire length with a heavy liner inside.

The tender is furnished with a steel channel frame and water bottom tank. The trucks are of the arch bar type with cast steel bolsters, triple elliptic springs and steel tired wheels.

The principal dimensions and specifications are as follows:

Type of engine	Ten-wheel
Service	Passenger
Fuel	Soft coal
Tractive force	33,900 lbs.
Gauge	4 ft. 8½ ins.
Cylinders	23 in. x 26 in.
Valve gear, type	Walschaerts
Valves, type	Piston
Valves, diameter	13 in.

Heating Surface.

Fire box	172 sq. ft.
Tubes	2,867 sq. ft.
Total	3,039 sq. ft.
Grate area	47.7 sq. ft.

Driving Wheels.

Diameter, over tires	69 in.
Diameter, wheel centers	62 in.
Journals, main, diameter and length	10 in. x 12 in.
Journals, others, diameter and length	9 in. x 12 in.

Engine Truck Wheels.

Diameter, engine truck	33 in.
Journals, engine truck, diameter and length	6½ in. x 10 in.

Wheel Base.

Driving	15 ft. 10 in.
Total engine	26 ft. 10 in.
Total engine and tender	57 ft. 10 in.

Weight.

On driving wheels	141,050 lbs.
On engine truck	53,400 lbs.

Total engine	194,450 lbs.
Total engine and tender	About 315,000 lbs.
Dimensions.	
Distance from rail to top of stack	15 ft. 8½ in.
Distance from rail to center of boiler	9 ft. 8 in.
Tender.	
Styles	Hopper bottom
Wheels, diameter	33 in.
Journals, diameter and length	5½ in. x 10 in.
Water, capacity	6,000 gals.
Coal, capacity	12 tons

Car Elevator for Hudson and Manhattan Tunnels

An interesting elevator installation has recently been completed at the Hoboken terminal of the Hudson & Manhattan Railway Company tunnels under the Hudson River. This elevator is for the purpose of placing in and removing from the tunnels and subway the electrically equipped passenger cars which will operate in these tunnels, and is located in the yard of the Hudson companies which adjoins the Hoboken passenger terminal of the Lackawanna Railroad.

The passenger cars which will operate in the tunnels are 48 ft. long, over all, by 9 ft. wide, and weigh empty 64,000 lbs., loaded with passengers 85,000 lbs. To raise and lower these cars into and out of the tunnel there has been installed an elevator of 100,000 lbs. lifting capacity, with a platform 50 ft. long and 12 ft. wide.

To provide for this elevator there was first constructed a wellway, having reinforced concrete walls from the ground level to the tunnel. Upon the side walls of this structure are placed six steel columns supporting a steel girder framing directly over the hoistway, and upon these girders is placed the machine operating the elevator platform.

This machine consist of two drum shafts each 50 ft. long, one placed near each side of the wellway. These drum shafts are at the center of their length driven by a system of four balanced worm gears, arranged so that the load on all four worm gears is equal under all conditions of platform load. All thrust loads are balanced by the worm shafts which have right and left hand worms operating the worm gears. These worms and gears run in oil baths in tight casings. The entire system of drum shafts, worm gears and worm shafts is driven by one 100-horse power motor placed at the center of one side of the elevator machine.

The elevator platform is constructed with two longitudinal steel girders, one under each rail, with suitable steel framing to support the suspension sheaves whereby the platform is suspended from and operated by the elevator machine. The floor of the platform, which is 600 square feet in area, is covered with diamond pattern steel floor plates. At the sides of the elevator platform are dropped from the machine above thirty-two ¾-inch diameter steel cables, which pass under suspension sheaves below the steel plate floor of the elevator and return to anchorage in the steel overhead structure. By this arrangement one-half the load is suspended directly by the overhead structure, and one-half is suspended from the drums of the elevator machine.

In addition to the thirty-two machine cables the platform is suspended by eight counterweight cables, making a total suspension of the elevator platform and load by forty ¾-inch diameter steel cables, having a total combined strength of 1,552,000 lbs. The machine and cables are so arranged that the elevator platform cannot incline from a horizontal position wherever the load may be placed upon the elevator platform.

Iron frame gates are provided which close when the elevator platform is not at the landings.

The elevator is controlled electrically by a pilot switch operated by a hand shipping cable, and the elevator may at the will of the operator be run at speeds of 10 to 20 feet travel per minute, the platform stopping automatically at the track levels. The rise of the elevator from the tunnel track to the surface track is about 30 feet.

ELEVATOR FOR TRANSFERRING CARS BETWEEN HUDSON AND MANHATTAN TUNNELS AND SURFACE TRACKS.

The elevator platform will be equipped with the "third rail," which will be alive only when the platform is at the track levels, and the tunnel cars may be run by their own motors on, off or across the elevator platform. Provision has been made to hold the elevator platform securely in position while the cars are run upon it.

In addition to the usual service of this elevator handling cars into and out of the tunnels, it is arranged to be utilized for quickly changing one or both of the motor trucks under a car body. For this purpose the elevator platform travels three feet above the surface tracks, and when in this position blocks are thrown in place under the car body, the truck connections are released and as the elevator platform descends the car body remains suspended upon the blocks while the trucks descend on the elevator platform. New trucks are in similar manner placed under the car body. This operation permits the quick interchange of car bodies and trucks when either may require repairs.

This elevator has been in uninterrupted operation now for some time, handling rails, ballast and other tunnel equipment material. It provides the only means of access of the cars into and out of the tunnel. The construction of the elevator is fireproof throughout. This elevator is installed for a lifting capacity of 50 tons and has handled loads of 65 tons. It is believed to be the largest elevator in size and lifting capacity that has ever been constructed.

It was built and installed by the Geo. T. McLauthlin Company, Elevator Builders, 120 Fulton Street, Boston, Mass., under designs and patents of Martin B. McLauthlin. The same company has installed a considerable number of railroad car elevators in New York City and elsewhere.

Erwood's Reversible Rolling Shutter

THE advantages attained in the use of shutters composed of independent slats of metal, each hooked to the other, are especially apparent in closing large openings, such as confront us in round houses, shipping platforms, wagon ways and fire walls, core and drying ovens, etc. They occupy a limited space over the opening, on either side, and are readily operated by either a light chain or automatic fusing link, as required; rolling or winding up on a shaft and operated for counter-weight by means of an interior spring mechanism.

Doors of this type have of late years found favor in connection with large core oven and dry kiln work, where a fire proof and fairly air tight closure is sufficient.

Core ovens of 20 ft. in width at the opening and subjected to the ordinary temperature of such a service have been successfully sealed in this way. In the ordinary rolling shutter, however, the slats are formed hook or S shape, and consequently but one side of this combination is water and dust proof, as is obvious in hooking two such shapes into each other, consequently, while it has been the custom to place the weather side outward and thus shield the hinges from the elements and dust, the inside or reverse side, wherein the hinge is exposed by the open groove, has been exposed to all the objections of wear and corrosion curtailed by the admission of moisture and dirt, conditions not possible to remove or prevent in shutters constructed in the old way.

One of the features in the Erwood Patented Reversible Shutter, a sketch of which is illustrated herewith, representing a cross section of two slats in position, is not only to remove this difficulty, but to place before the

shutter using public a reversible device with both sides weather proof. The cut shows a slat of individual construction, but different methods of a compounded slat have also been fully detailed by the inventor, together with other features of operating mechanism. In the sketch it will be observed that what would constitute the reverse or inside of the slat or shutter is protected and shielded by means of a shield composed (in this instance) of the same sheet as constitutes the entire slat, the shield extending over the opening of the hinge and acting as a water shed or eave drip facia, extending down to the center of the hinge and preventing drip or dust from lodgement in the vital part of the shutter. This invention permits of the use of a flat web to the slat, which in rolling closely to the winding mechanism occupies, not only less space, but also lighter counterweighting as the shutter is rolled up.

The shutter is the invention of Mr. John Erwood, mechanical engineer, of 1804 W. Adams St., Chicago.

Personal Mention

Mr. J. W. Monroe has been appointed division master mechanic of the Chicago, Rock Island & Pacific, with headquarters at Chickasha, Okla.

Mr. George S. Hunter, formerly master mechanic of the International & Great Northern, has been appointed master mechanic of the Kansas City Southern at Pittsburg, Kan.

Mr. G. W. Lillie, supervisor of the car department of the St. Louis & San Francisco at St. Louis, Mo., has been transferred to the motive power department at Springfield, Mo.

Mr. B. J. Farr has been appointed master mechanic of the Northern Railway, with headquarters at Limon, Costa Rica, succeeding Mr. T. H. Jordan, resigned.

Mr. W. J. Spearman has been appointed master mechanic of the Idaho & Washington Northern, with headquarters at Spirit Lake, Idaho.

Mr. T. F. Carbery, master mechanic of the Missouri Pacific at St. Louis, Mo., has been transferred to Ft. Scott, Kan., in a similar capacity, succeeding Mr. J. J. Reid, transferred.

Mr. George J. Hatz, master mechanic of the Chicago & Alton at Bloomington, Ill., has been appointed superintendent of shops of the Union Pacific at Omaha, Neb., in place of H. Stovel, deceased.

Mr. C. Paskesen has been transferred from Alamogarda, N. M., to Tusumiari, N. M., as general foreman on the El Paso & Southwestern, the shop at the former place having been abolished.

Mr. G. T. Neubert, who recently resigned as master mechanic of the Kansas City Belt, has been appointed master mechanic of the Chicago Great Western, in charge of the shops at Oelwein, Ia., succeeding Mr. W. P. Chrysler, who has been appointed superintendent of motive power.

Mr. William Gell, master mechanic of the Grand Trunk at Ottawa, Ont., has been appointed master mechanic of the Grand Trunk Pacific, in charge of motive power, cars and shops, with temporary headquarters at Winnipeg, Man.

Mr. F. L. Carson has been appointed master mechanic of the Torreon division of the Mexican Central at Torreon, Mex., to succeed Mr. O. R. Hale, who has been transferred to Cardenas, Mex., succeeding Mr. C. F. Roberts as master mechanic of the San Luis division.

Mr. E. E. Chrysler, master mechanic of the Chicago, Rock Island & Pacific at Chickasha, Okla., has resigned, and Mr. F. H. Williams, superintendent of motive power, will take charge of the shops.

Mr. F. S. Anthony has been appointed master mechanic of the Gulf division of the International & Great Northern at Palestine, Tex. Mr. J. B. Dolsen, who resigned recently as foreman of the car department, is now located at Birmingham, Ala.

Mr. G. T. Depue, division master mechanic of the Erie at Hornell, N. Y., has been granted a leave of absence on account of ill health. Mr. E. S. Fitzsimmons, master mechanic at Galion, O., has been transferred to Hornell to take the place of Mr. Depue.

Mr. George A. Hancock, heretofore superintendent of motive power of the St. Louis & San Francisco, has been appointed general superintendent of motive power, with headquarters at Springfield, Mo., succeeding Mr. W. A. Nettleton, resigned.

Mr. W. A. Nettleton, general superintendent of motive power of the St. Louis & San Francisco, has been appointed general superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Chicago, succeeding Mr. T. S. Lloyd.

Mr. T. S. Lloyd, who has been general superintendent of motive power of the Chicago, Rock Island & Pacific since March, 1904, has resigned to become superintendent of motive power and equipment of the Delaware, Lackawanna & Western, which position he held previous to his connection with the Rock Island. His headquarters will be at Scranton, Pa. Mr. Lloyd succeeds R. F. Kil-

Mr. James Meehan, for many years superintendent of motive power of the Cincinnati Southern, and recently

patrick, resigned.

president of the Ross-Meehan Iron Works of Chattanooga, Tenn., died at his home in Cincinnati, Ohio, Feb. 28, aged 74 years. Mr. Meehan started his railroad career as engineer on the Louisville & Nashville, later becoming master mechanic for the same road. He left this line to become master mechanic of the Cincinnati Southern at Chattanooga, Tenn., eventually being promoted to superintendent of motive power. In about 1886 he invented the Meehan brakeshoe for locomotives and organized the Ross-Meehan Foundry Co. to manufacture the articles.

C. M. & St. P. Ry., orders 2,500 New Cars

The most important item of general interest to the railway trade that has appeared recently, is the purchase by the Chicago, Milwaukee & St. Paul Road, from the Bettendorf Axle Co., of steel underframes, cast steel trucks and swing motion truck bolsters, all of the well known Bettendorf type, for 2,500 new 30-ton 36-foot stock cars. Delivery of this equipment is to begin by June 1 next and continue until the order is completed, which will be in the early fall.

It is also to be noted that the Schwarzchild & Sulzberger Company has just purchased 300 stock cars from Haskell & Barker.

These orders are of more than usual interest, as they would seem to indicate that revival of business in the railway field has begun in earnest.

The Bettendorf Axle Company has just completed a modern and up-to-date steel car building plant and the order for the St. Paul road together with other work on hand will keep the plant in operation to its capacity through the summer and well into the fall.

Chimney-Less Burner for Switch and Signal Lamps

THE accompanying illustration shows a new but thoroughly tested long-time chimney-less burner for switch and signal lanterns, manufactured by Peter Gray & Sons, Inc., 86-88 Union street, Boston, Mass., makers of lamps, lanterns and heavy sheet metal specialties for railroad service. This company states that the new burner has undergone rigorous tests in service by competent railroad officials, and that exhaustive photometric and efficiency tests also have been conducted for a period of several months. The results, it is claimed, show that the burner gives a high candle power after 100 hours of burning, that it costs about one-half as much as long burning signal burners with chimneys, and that the cost of supervision and maintenance is correspondingly reduced. There are obvious objections to the use of chimneys in switch and signal lanterns, for if the burner is designed to operate with the help of a chimney and the chimney breaks, the lantern is no longer dependable. Hence the chimney introduces a certain element of danger. That is the first consideration, and there is another point of almost equal moment. The safety of the switching and signal operation depends upon the effective candlepower of the burner, and this may at any moment be dangerously diminished by a smudge of unburned carbon on the chimney. A successfully designed chimney-less burner has, therefore, in these particulars, a distinct two-fold advantage. A minor but still important point is in regard to the cost of chimney breakage. Not only is the breaking of a chimney a possible source of accident and danger, but it has

CHIMNEY-LESS BURNER FOR SWITCH AND SIGNAL LAMPS.

also, in the aggregate of thousands of such cases, a heavy expense. The makers are equipping the new burner with a newly designed front for long time burning. There is considerable room for discussion in relation to long-time burning lanterns as a detail of sound railroad management. Whatever may be said, it seems certain that the railroads, when equipped with long-time burners, cannot properly permit any avoidable element of uncertainty in such equipment. If the new burner, as stated, maintains steadily a high candlepower after a hundred hours of service, it shows a decided advantage for this class of service.

Technical Publications

The Elements of Railroad Engineering. By William G. Raymond. Published by John Wiley & Sons, New York. Price, $3.50.

This book describes the fixed portion of a railroad plant and gives the underlying principles of the design of its layout, being based on the opinion that a railroad with its rolling stock and buildings constitutes a manufacturing plant which its owners operate in the manufacture and sale of transportation.

The plan of first describing a thing and then discussing its design, has been followed. Part 1 describes the permanent way in some detail; part 2 discusses fundamental principles governing design of grade line, while part 3 describes methods of applying these principles to secure the most economical location and construction. Part 3 also contains many suggestions which should be most welcome to a young engineer in charge of his first residency.

While the book has evidently been written primarily for the use of students in engineering colleges, it is very applicable to the assistance and guidance of railroad men in various departments who have received their training in the school of experience. The text is written in an unusually interesting and logical trend and presents a variety of viewpoints and suggestions that will furnish many ideas to the reader. In the introduction there are presented briefly rational ideas of railroad political economy. Reference to the comparative worth of cross-ties is believed to be sound and to furnish correct principles for economic investigations in other directions. A brief discussion of the locomotive as a traction engine is very valuable, as are the articles on curve resistance and the cost of the worst class of rise and fall. The author uses diagrams and evidently believes in diagramming all formulas for a thorough study of the effect of variations in the variables.

Locomotive Breakdowns and Their Remedies. By George L. Fowler, revised by William W. Wood. Published by the Norman W. Henley Publishing Company, New York City. Price $1.00.

The handy little reference book on locomotive breakdowns, emergencies and their remedies, written by Mr. George L. Fowler, mechanical engineer, of New York, and published in 1903, has been revised by Wr. William W. Wood, air brake inspector. The book constitutes an up-to-date catechism treating on accidents and breakdowns on the road and how to repair them. Every kind of an accident which is likely to occur to a locomotive, including engines of the most modern type, is fully considered and the remedy described in plain language, and, in most cases, clearly illustrated. The Walschaerts valve gear is included with special reference to each individual piece of the mechanism, as is also the locomotive electric headlight, and a full course of instructions on air brake defects, troubles and errors in up-to-date operation, are given. The several styles of compound locomotives are included.

There are chapters on the following subjects: defective valves: accidents to the valve motion, Stephenson link gear; accidents to cylinders, steam chests and pistons; accidents to guides, crossheads and rods; accidents to the valve motion, Walschaerts radial gear; accidents to running gears; truck and frame accidents; boiler troubles; defective throttle and steam connections; defective draft appliances; injector troubles; accidents to cab fixtures; tender accidents; miscellaneous accidents; accidents to compound locomotives; tools and appliances for making engine repairs; locating and remedying air brake troubles; the Pyle-National Electric headlight.

Locomotive Catechism. By Robert Grimshaw. Published by the Norman W. Henley Publishing Company, New York. Price $2.50.

This edition of a useful and interesting study of the locomotive has been so thoroughly revised that it may be said to be a new book. It has been greatly enlarged and the matter more conveniently arranged. The book is up-to-date and treats on the design, construction, repair and running of all kinds of locomotives, containing over 3,000 questions with their answers. It is fully illustrated and is intended for use in examination questions as well as to post and remind engineers, firemen, trainmen, switchmen, shop and roundhouse men.

The superheater, as applied in regular railway service, receives for the first time a place in a popular work on the locomotive. Among other additional subjects included is the electric headlight. That portion relating to breakdowns and other accidents, and to adjustments with a view to economy and smooth running, has received special attention. There is scarcely a part of either a simple or a compound locomotive which does not receive attention.

The Westinghouse Air Brake Company has issued instructive pamphlets descriptive of its Type L and Type M triple valves. These pamphlets are prepared in convenient pocket size and should be in the possession of all air brake inspectors, instructors and repair men. The Westinghouse Company has also issued in pamphlet form the paper entitled The Effect of Brake-Beam Hanging upon Brake Efficiency, presented before the New York Railroad Club by Mr. R. A. Parke, in November, 1897. It is a clear and comprehensive analytical discussion of the many complicated conditions which are involved in the design of a foundation brake system of maximum efficiency.

Notes of the Month

Philip J. Nash has taken charge of the sales department at 863 Monadnock building, Chicago, of the Ernst Wiener Co., New York. Mr. Nash has had long technical and practical experience in the industrial railroad business.

Flexible Compound Company, 3607 Haverford avenue, Philadelphia, has appointed the following agents for its flexible compound for waterproofing and general protective purposes. Timms, Cress & Co., Portland, Ore.; S. P. Holmes & Co., Chicago; J. G. Chadwick & Co., Lakewood, near Cleveland, O.; D. R. Whitaker, 72 Park place, New York; F. A. Barbey, Boston, Mass.; Howard R. Justice, London, Eng.

Panter, Jennings & Co. have been organized by Payne Jennings and John A. Panter, to deal in railroad, factory, machinists' and mill supplies. The headquarters of the company are at 1202 Great Northern building, Chicago.

Frances A. McIntosh, formerly with the Standard Tool Company, Cleveland, O., has been appointed advertising manager of the Buffalo Forge Company, Buffalo Steam Pump Company, and George F. Squier Manufacturing Company, all of Buffalo, N. Y.

Marvin F. Wood has resigned as general manager of the Eyeless Tool Co., Newark, N. J. He has taken the sole selling agency for this concern and has organized a railway supply company with offices at 26 Cortlandt street, New York City. Mr. Wood will sell the Harrington safety switch device in addition to other railway supplies.

National Railway Equipment Company of St. Louis has been incorporated at Jefferson City, Mo., with a capital stock of $50,000, fully paid. The incorporators are: Robert H. Kern, Frank R. Blunt, John R. Nichols, Dallas T. Mason and Robert H. Kern, Jr.

Superior Car Lighting & Equipment Company, St. Louis, Mo., has incorporated to manufacture and deal in railway supplies. The capital stock is $100,000, fully paid. Ethelbert T. Ford holds 998 shares and Wilson S. Siebert and Fred Nussbaum one share each.

Western Wire Sales Company, 356 Dearborn street, Chicago, has been sold to a new organization, the officers of which are: Richard Wick, president; Fred B. Keller, secretary and treasurer; and F. W. Page, sales manager. J. Allen Haines and A. Conro Fiero formerly owned this company.

American Hoist & Derrick Company, St. Paul, Minn., has recently received an order from the Lucius Company, contractor on the bridge work for the Vanderbilt lines, the New York, New Haven & Hartford and the South & Western for two 60-ton bridge builders' steel derrick cars. These cars are said to be the largest ever built, and the "American" propelling device attaches to the main hoisting engine.

Milwaukee Locomotive Manufacturing Company, North Milwaukee, Wis., builder of gasoline and alcohol locomotives, is building a 16-ton gasoline locomotive, capable of hauling a modern railway coach at 30 miles an hour. The company states that a number of roads desire to test this machine when completed, with a view to adopting the type if it proves successful.

S. Owen Livingston, formerly with the Fox Machine Company, has acquired an interest in the Wilmarth & Morman Company, of Grand Rapids, Mich., and has been appointed to the position of sales manager.

The Ward-Packer Supply Co., recently organized, with office at 1107 Fisher building, Chicago, has elected the following officers: President, A. D. Ward, St. Paul, Minn.; vice-president, A. A. Packer, Chicago. J. E. Chisholm, formerly with the motive power department of the Chicago Great Western, is mechanical engineer. The company was organized to deal in railroad, factory, mill and general supplies, and has secured exclusive control of a number of articles of merit, including boiler compounds, bell ringers, metallic piston rod packing, boiler feed pump and vacuum car cleaner.

The Southern Railway Supply Co. has bought the business and good will of the H. F. Vogel Contracting & Railway Supply Co., St. Louis, Mo. The new company will do a general railroad supply business. The management is in the hands of J. F. Bartman, secretary, and the offices and storerooms are at 417 Walnut street, St. Louis.

The National Tube Co., Frick building, Pittsburg, Pa., has brought out a new development in locomotive bells which is designed to obviate entirely troubles with cracked or broken bells. The new type is the Shelby seamless steel bell, and it is formed, not cast, from a solid steel tube, without weld or joint, and therefore variations of temperature cannot affect it, as in the case of a cast bell. It is tuned to any desired note by being turned on a lathe until the bell is in accord with the desired musical tone.

R. B. Kadish & Co., 503 Fisher building, Chicago, railway supplies, represents the Niagara Forged Steel Company, the Niagara Device Company, and a number of other manufacturers of supplies. Mr. Kadish is well known to the railroad trade, as he has been engaged in the supply business in Chicago for a number of years.

The Continental Fibre Co., Newark, Del., which started in business in November, 1906, has recently completed an addition to its plant that will enable it to double its output. This company is now one of the largest manufacturers of vulcanized fiber for track insulation. J. P. Wright is general manager, with headquarters at Newark, and the Wallace Supply Co., Chicago, is western representative.

The Goldschmidt Thermit Company, 90 West Street, New York City, has issued a pamphlet of shop instructions for the use of thermit in repair work. The pamphlet is clearly and profusely illustrated and describes the composition of thermit, the general method of accomplishing welds, as well as a number of specific uses to which thermit is applicable. Thermit has been widely used in locomotive repair work during recent years and railway shop managers will find the pamphlet of great interest.

The Fibrous Paint Co., Real Estate Trust building, Philadelphia, Pa., having succeeded to the business of the Pennsylvania Standard Rubber Paint Co., is now the sole maker of "Standard Fibrous" paint. This is a preservative coating for protecting iron and steel structures. It has for the past ten years been used successfully for the preservation of metal structures under conditions where paint mixed with a linseed oil binder is rapidly disintegrated. By adhering closely to iron and steel, its design is to prevent oxidation by forming an elastic waterproof coating impervious to rust-producing agencies, acid fumes and the mechanical abrading action of exhaust blasts; these properties are especially desirable in the coating of bridges, train sheds, car roofs and other metal surfaces exposed to similar conditions. Sales through agencies have been discontinued and the manufacturers now deal direct with the consumer through their own salesmen.

To avoid possible confusion through similarity with the name of another corporation, the title Maryland Railway & Electric Supply Co. has been substituted for Maryland Railway Supply Co. of Baltimore. Changes in the officers of the company have also been made. Charles Elliott is now president and general manager; Nelson Perin, vice-president, and Thomas D. Claiborne, secretary and treasurer. Mr. Elliott is the son of W. G. Elliott, who was president of the Atlantic Coast Line up to the time of his death. Mr. Elliott served for a number of years in the engineering corps of that road, later going into the railroad supply business, in which he has had considerable experience. Mr. Perin is the son of the late president of the United Railways of Baltimore, and has for some time been engaged in the contracting business, being also treasurer of the Johnston-Perin Contracting Co. Mr. Claiborne is an engineer and also president of the Johnston-Perin Contracting Co. The headquarters of the Maryland Railway & Electric Supply Co. will be continued at 510 Continental building, Baltimore, Md.

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Care of General Tools

THE time lost by men in the various gangs on the erecting floor of a locomotive repair shop is frequently caused by a dearth of handy tools. If a few such tools are provided to serve the entire shop and no given individual is made responsible for their care, it is always a difficult matter to locate them when required, and a search for them causes delay. When such tools are kept under the jurisdiction of the tool room, they are seldom returned promptly, and it is not uncommon for some one to wait for them.

Therefore it seems that there are certain tools and appliances which should be provided for each individual gang and which should be protected under the personal observation of the gang foreman. For this purpose an excellent practice is the provision of a locked box or bin, strongly built, and of sufficient size to contain air hose, temporary bolts of various sizes and lengths, nuts of different sizes, clamps, liners, chain and rope slings, sledge hammers, handle chisels, punches, etc.

By carefully storing away such appliances when not in use, they are always readily found when required, and the foreman who realizes that their condition influences the output of his gang will see that they are repaired promptly and maintained in fit condition for service.

An Apprentice Club

THE organization of a club among apprentices in the Chicago shops of the Chicago & Northwestern Railway, the object of which is to arouse in the apprentice a keener sense of interest in his work, gives food for careful thought among those who are endeavoring to provide for future needs by training a class from which to recruit. The club meets bi-monthly and the several members are expected to present carefully prepared papers on various subjects associated with their work, each subject being opened to discussion by the club at the close of the paper.

There are a number of good features in this plan of interesting the apprentices, that should be given consideration by those who are wrestling with the apprentice problem. A club of this kind provides an opportunity for apprentices to express themselves freely, yet with order and decorum; and with qualified leadership, as well as proper encouragement from officers and foremen, there is every reason to believe that the organization will be fruitful in beneficial results to the boys and consequently to the company.

Unfortunately there are many apprentices who are much more fascinated by the sound of the whistle signaling the close of the working day than they are by the work of the trade which they are learning. To awaken a genuine interest among such boys may be a difficult task, yet it is well worth the effort. If they can be made to understand why parts are arranged according to certain methods and can be taught the principles upon which mechanisms operate, they are more likely to take an interest on their own account than when allowed to work mechanically without knowledge of why and wherefore.

Several railway companies are developing systems for instructing apprentices, but thorough and systematic courses have not yet been generally adopted. An apprentice club will make a good supplement to the apprentice course of training and where the course has not been developed, the club should form a good foundation. One of the strongest features of such an organization is the tendency to develop initiative among the boys. While the boys should actively manage the club themselves, the success of such an organization would be largely advanced by assistance from demonstrators and foremen with encouragement from motive power officers.

Effect of Air Openings Upon Steaming Qualities

SO many enginemen desire a change in the draft appliances of a locomotive as a means of attempting to overcome a failure to steam, that it would seem beneficial for road foremen to emphasize the fact to the men under them that intelligent thought given to other conditions affecting the admission of air would frequently help the situation and react to the good of the much abused draft appliance.

Many roads are opposed to anyone tampering with the arrangement of draft appliances without the authority of the road foreman of engines, after the front end fixtures have been properly adjusted by the shop. This is as it should be, for continued, unintelligent re-adjustment will not improve the steaming qualities of a locomotive and will not tend to determine upon a satisfactory arrangement peculiar to an individual engine or class of engines.

The conclusion is sometimes reached that the draft is not properly regulated, when later investigation shows that the trouble is not within the smoke box. There are a number of places through which air may leak into the smoke box and the admission of air through improper channels will tend to destroy the vacuum and thereby impair the steaming qualities of the engine. There may be leaks between the saddle casting and the smoke box, there may be a hole in the cylinder casting which will admit air around the nozzle box, and again there may be a leak between the smoke box and the stack saddle. One railroad, at least, considers this last mentioned condition as interfering so materially with steaming qualities that instead of putting a gasket between the stack saddle and smoke box, it fits the saddles so carefully as to make them tight and secures the saddle with eight bolts instead of with four, as is more common practice.

A careful consideration of air openings at the rear end of the boiler is equally as important as an investigation of the front end. An unrestricted supply of air beneath the grates as well as a generous admission of air through the grates is necessary to combustion. Careless operation and management sometimes allow openings and air vents to become obstructed, with the result that a supply of air sufficient to support combustion is not admitted and consequently a failure to steam results.

Advantage to Employes in Guarding Against Waste

ONE frequently hears railway employes in various capacities remark that "the company has plenty of money." This is usually said in extenuation of some careless action which has caused a waste. Believing that the company "has plenty of money," or caring little whether or not the company makes an income from its revenue, there are employes who will uselessly break or waste material, caring little of the actual value represented and thinking less of the direct influence upon their own welfare.

A small article which may be taken as an illustration is a water glass. The price of 12x5/8-inch water glasses is 33.3 cents per dozen. A determination of the number of locomotives on a given road, or given division, taken in connection with the fact that each locomotive uses several water glasses in a year—frequently in a month—will serve to give some conception of the value of this small item alone. Besides the glasses actually in use, each locomotive is supplied with several extra glasses and each roundhouse machinist is apt to have a number in his locker, in addition to the supplies carried in the general and local storehouses.

Carelessness in cutting a glass to proper length may result in its breakage; or thoughtlessness in throwing a tool into a drawer in which a few glasses are temporarily stored, may break several. It is true that the individual loss represents but little; yet the total of many such losses would astonish those who have hitherto given little or no thought to the subject.

The price of 12-inch monkey wrenches is $5.32 per dozen and of 18-inch monkey wrenches is $11.40 per dozen. Throwing such a wrench upon the floor or battering it with a hammer tends to destroy the handle. Replacing the broken wrench with a new one represents useless expenditure. The application of a new handle is more economical than supplying a new wrench—but the old wrench frequently disappears or finds its way to the scrap heap.

There are a multitude of instances where ordinary care on the part of workmen will increase the useful life of a tool, device or appliance, or prevent the waste of material. The cases specifically mentioned refer to comparatively insignificant items, but illustrate how small items tend toward large expenses. Larger items are more expensive in proportion.

A railway with its rolling stock and buildings constitutes a manufacturing plant operated for the manufacture and sale of transportation. For this plant to realize an income the revenue must exceed the expense of operation. In order that the maximum number of employes may be maintained, their employment must be justified by the earnings. It would seem, therefore, to the advantage of all employes to guard their own welfare and insure their regular employment by assisting in the reduction of all unnecessary expenditure and waste.

Locomotive Terminal and Car Repair Shop

Illinois Central Railroad, Birmingham, Ala.

THE Illinois Central Railroad has recently completed a locomotive terminal and car repair yard, together with the necessary shop facilities, which embrace a number of features representative of a very serviceable arrangment of an isolated terminal of this character. It is designed to provide for locomotives running and emergency repairs and for freight car general repairs. The plant is located at East Thomas, near Birmingham, Ala., and is tributary to the freight classification yard adjacent to the main lines of the Illinois Central Railroad and the Frisco System. In fact, the roundhouse and shops are to be used jointly by the two railroads until the Frisco erects a shop of its own, which is now planned to occupy a site on the side of the freight yards opposite to the Illinois Central's repair plant.

The plant includes an engine terminal yard, 20-stall roundhouse, freight car repair yard embracing 4 tracks, wood working shop, blacksmith shop, machine shop, boiler room, pump and compressor room, engine room and store and oil house. The general layout is illustrated by the accompanying plan drawing.

CLASSIFICATION YARD.

The classification yard, as now operated, contains 7 tracks parallel with the main line. The capacity of the yard, however, is to be enlarged as required, by the location of additional tracks on the property lying between the present system of tracks and the roundhouse, sufficient area having been reserved for this purpose.

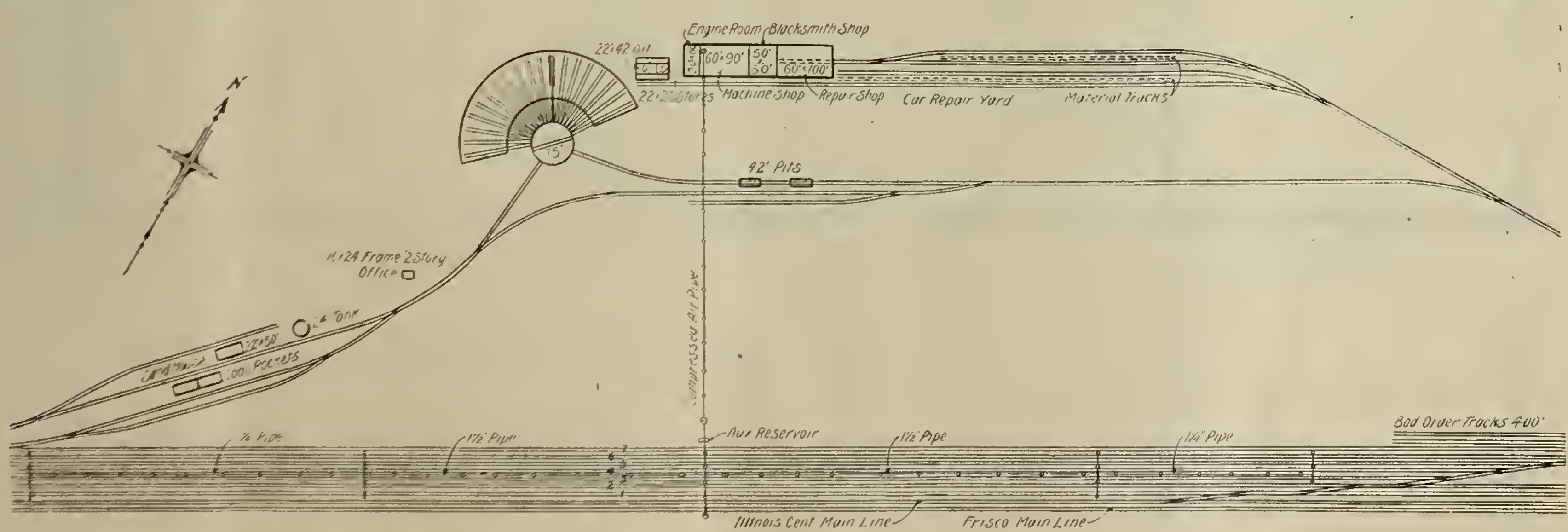
LOCOMOTIVE TERMINAL YARD.

Locomotives enter the roundhouse from the east end of the yard and in leaving the house pass toward the west end of the yard. The incoming track is served by two cinder pits, each 42 feet long. The outgoing track is served by a coal chute containing two pockets, each of 125 tons capacity, a sand house and a 24-foot water tank. Parallel with the incoming track and tributary to the cinder pits are two service tracks. The outer track is for cinder cars, while the inner track is traveled by a locomotive crane equipped with a clam-shell bucket. Cinders are transferred from the pits to cars by the crane. This crane also loads the coal pockets from coal cars placed on a suitable track tributary to the pockets, a suitable track being installed for the movement of the crane between the coal pockets and the cinder pits. When required by the growth of the terminal, coaling facilities will be enlarged and the pockets will be served by the usual trestle and incline approach for the use of hopper cars.

The sandhouse is 50 feet by 20 feet. Sand is dried by a steam sand drier supplied with steam from the shop boiler room, and sand is delivered to an elevated bin by the usual compressed air system.

ROUNDHOUSE.

The roundhouse is of the Illinois Central standard design. As at present constructed, the house contains twenty locomotive stalls, an area being reserved on which to complete the circle when necessary. It is served by a 75-foot turntable, from which the stall



LAYOUT OF LOCOMOTIVE TERMINAL AND CAR REPAIR SHOP OF THE ILLINOIS CENTRAL RAILROAD, NEAR BIRMINGHAM, ALA.

tracks radiate at an angle of 10 degrees. The span of the house is 90 feet and the distance from inner face of door columns to center of table is 80 feet 1 inch. The walls of the house are of brick, resting on concrete foundation. The roof is of Illinois Central standard composition carried upon a wooden structure, supported by three rows of wooden posts. The roof is in two sections; the higher section sloping toward the outer wall, and the lower section sloping toward the turntable. A vertical portion of the structure between the two sections of the roof is equipped with glass sashes and latticed windows, admitting the light at a point above the cabs of engines standing in the house and adding to the means of ventilation. Two locomotive stalls are equipped with a pit for dropping driving wheels and two others with a pit for dropping engine truck wheels, the jacks being hydro-pneumatic of 15 tons capacity and 60 inches lift. The house is arranged with air line for the purpose of firing up engines with oil.

FREIGHT CAR REPAIR YARD.

Two bad-order tracks 400 feet long are situated at the east end of the classification yard and the lead to the freight car repair yard is at this end. The freight car repair yard is northeast of the roundhouse and contains 4 longitudinal tracks. The repair tracks are served by two narrow-gauge material tracks placed between the first and second, and the third and fourth repair tracks.

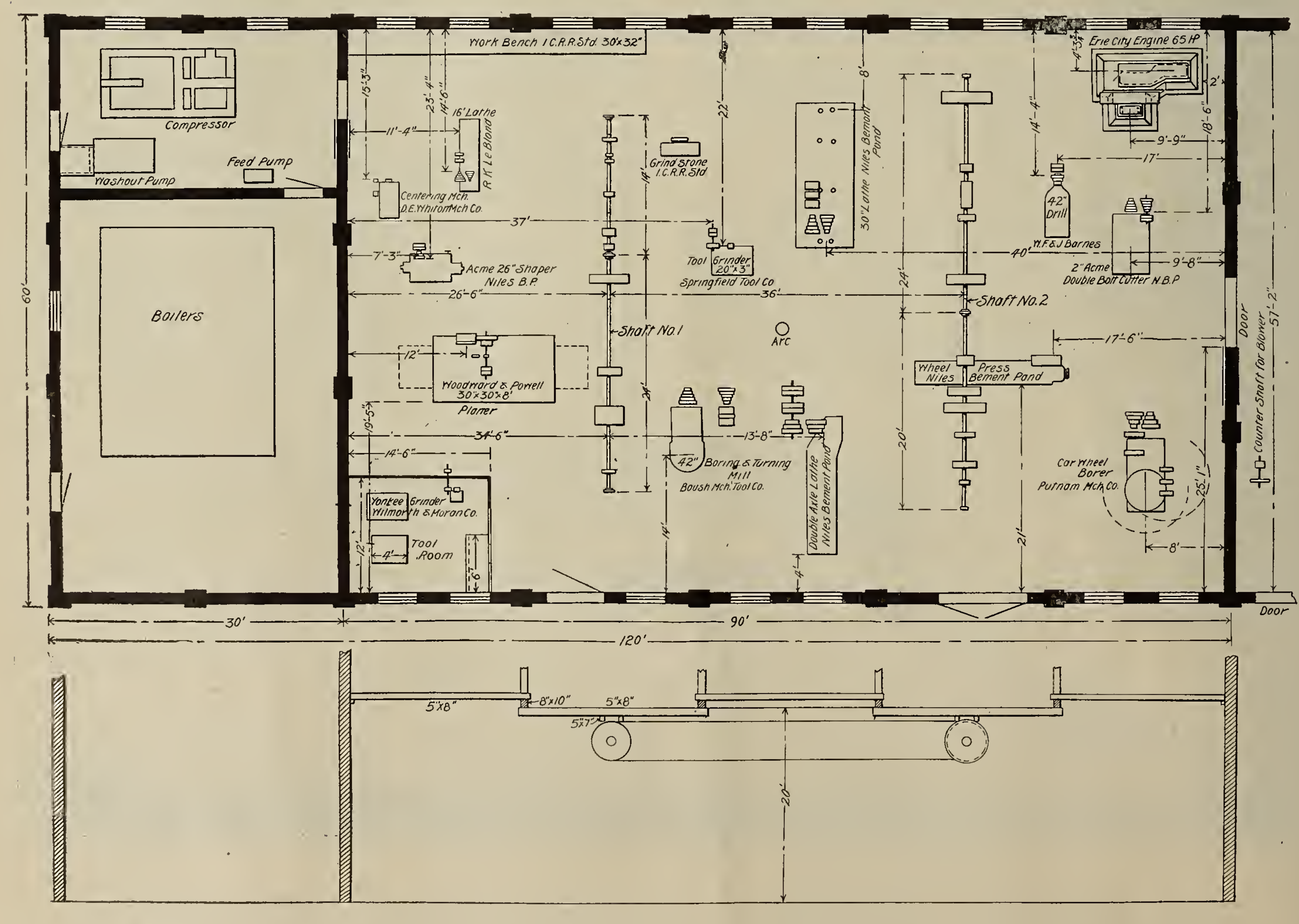
SHOP BUILDING.

The building housing the several repair shops is situated at the west end of the freight car repair yard and between this yard and the roundhouse. The walls are of brick, carrying a wooden roof structure without intermediate supports. The various sections are separated by brick curtain walls.

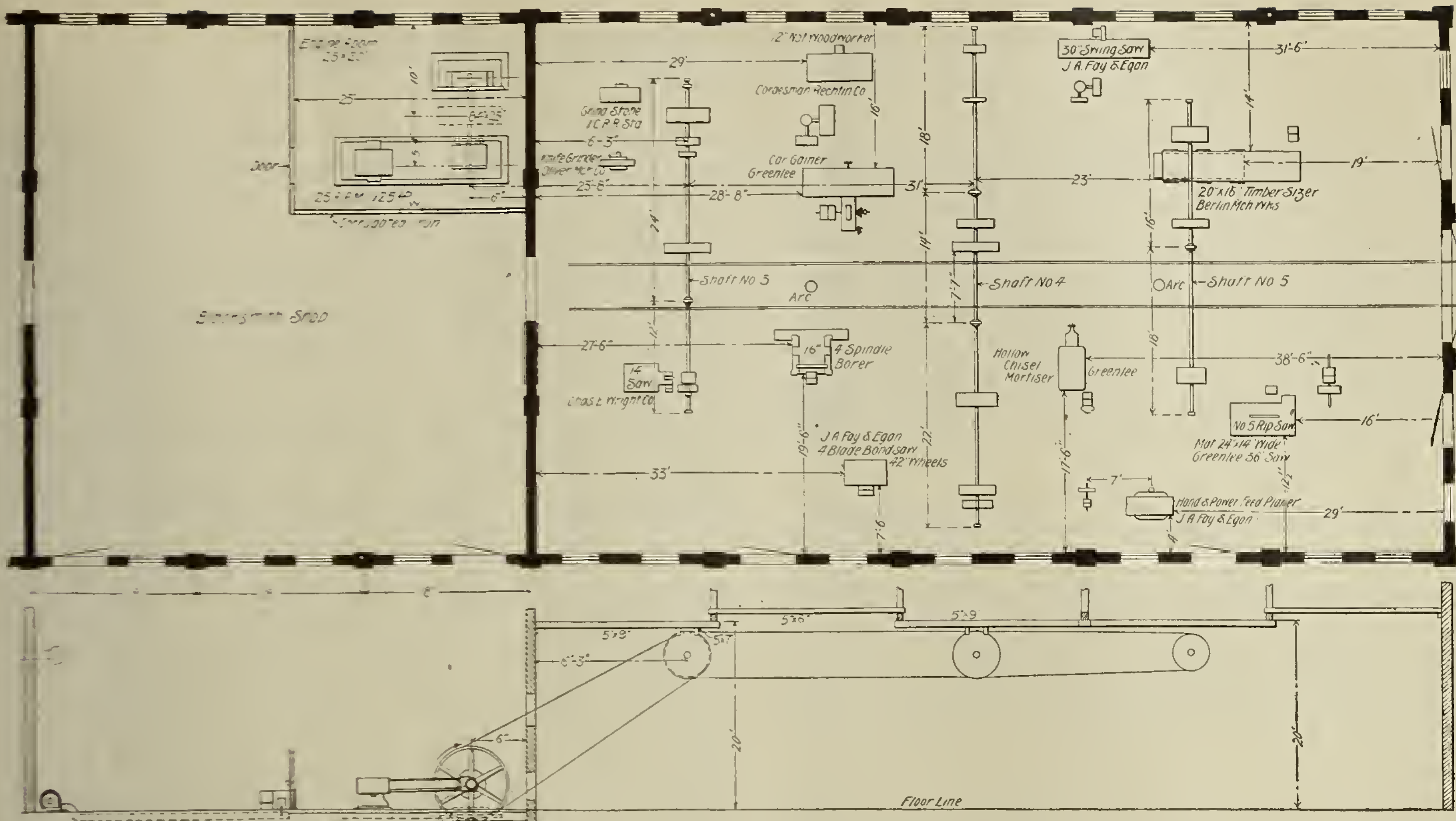
WOOD WORKING SHOP.

The section of this building containing the wood working machinery is adjacent to the repair tracks. It is 100 feet long by 60 feet wide. The layout of the machines is so arranged that unfinished lumber stored in the area tributary to the repair tracks, enters one of the end doors of the shop, passes through the various machines, traversing a path following the length of the shop, returns over another set of machines and passes thence to the repair yard. A continuation of one of the yard tracks traverses the full length of the wood working shop. The arrangement of the machines, shafts, etc., together with the method of drive, is shown by the accompanying line drawing.

Power for driving the wood working machinery is furnished by a horizontal automatic cut-off steam



MACHINE SHOP AND BOILER ROOM—ILLINOIS CENTRAL RAILROAD, NEAR BIRMINGHAM, ALA.



BLACKSMITH AND WOOD WORKING SHOPS—ILLINOIS CENTRAL RAILROAD, NEAR BIRMINGHAM, ALA.

engine of 125 horsepower, operating at 125 revolutions per minute. The engine room is 25 feet by 20 feet, occupying a portion of the section next to the wood working shop. The main belt passes through the wall of the shop.

BLACKSMITH SHOP.

The blacksmith shop is situated between the wood working shop and the machine shop. It is 60 feet by 50 feet and furnished with one fire receiving air from a No. 3 power driven blower.

MACHINE SHOP.

The machine shop is 60 feet by 90 feet and naturally is nearer the end of the building toward the roundhouse. It is provided with a machine tool equipment sufficient to handle locomotive running and emergency repairs, together with the wheel work and machine work required by freight car general repairs.

The arrangement of machine tools, shafting, etc., is shown by the accompanying line drawing. Power is provided by a horizontal steam engine developing 65 horsepower at 150 revolutions per minute. The engine is located in one corner of the shop.

STEAM AND AIR EQUIPMENT.

Steam for the entire plant is provided by a battery of 2 boilers, located in an end section of the main building, next to the machine shop. The boilers are of the horizontal fire tube type, each having a capacity of 150 horsepower.

A portion of the boiler section is arranged as an air compressor and pump room. The compressor has a capacity of 500 cubic feet and supplies air for the operation of air driven machines in the roundhouse and repair yards, as well as for filling and testing train lines in the classification yard. The compressor line is connected by a 2-inch pipe with an auxiliary reservoir at the freight yard, air being delivered to the several points of distribution throughout the yard by 1½ and 1¼-inch piping. This provision for the distribution of air throughout the yard secures a distinct saving in the movement of locomotives, as train lines may be filled and tested before an engine is coupled to the train, thus relieving the engine and reducing the time required for it to stand in the yard.

STORE AND OIL HOUSE.

The store and oil rooms are housed in an isolated building near the roundhouse. The building is 62 feet by 22 feet, a section 42 feet long with basement being devoted to the oil department and a section 20 feet long to the stores department. On each side is a platform 10 feet wide, extending the full length of the building. The south platform is served by a track continuing from the freight car repair yard. Oil tanks are located in the basement; means being provided for filling them directly from tank car. The oil is elevated to the floor above by means of compressed air.

CONSTRUCTION.

This car and locomotive terminal plant was designed throughout by the forces of the machinery and engineering departments of the Illinois Central Railroad. The construction work proceeded under the jurisdiction of the engineering department and the machinery and equipment were installed by the machinery department.

The Care of Engine Supplies at Terminals

THE various tools and supplies with which a locomotive should be equipped require careful supervision to maintain the full complement of necessary equipment. The so-called pooling system which has prevailed for a number of years makes it difficult for an engineer to retain a complete set of oil cans and tools unless they are regularly removed at the end of each trip and placed in some regularly assigned location whence they cannot be removed without proper authority.

Desirable tools, oil cans, etc., left on an engine at a terminal sometimes have a way of disappearing in such a manner that it is impossible to trace them and they are seldom returned. The unwarranted removal of such equipment causes an unnecessary expense to replace them and if their loss is not realized until an engine is about ready to leave the roundhouse, a delay is caused.

The loss of tools and engine equipment has caused such expense as to justify railway companies in the inauguration of systems of caring for such equipment at terminals and the maintenance of forces to handle this work. It has also seemed simpler to provide each engineer with a complete outfit of oil cans and tools rather than to equip each individual locomotive. This is an additional expense, inasmuch as there is always a greater number of engineers than engines on a given division.

To obtain various opinions as to the most desirable methods of caring for engine supplies, a number of road foremen of engines have been requested to give expressions as to their experiences and ideas. The comments made on this subject are as follows:

One road foreman makes this statement: "I am not familiar with practices followed by different railroads in handling their engine supplies and I do not know how the other divisions are fixed, but I believe that a good place to store the tools and supplies, and oil cans, should be provided for in-coming and outgoing engines. A man should be provided at each division point for removing oil cans and tools, and tool boxes when they are furnished. Speaking for my own division, there is a great mix-up. One man will have a good set of oil cans and another will not. One man takes care of them and another doesn't. I believe that all of the tools, i. e., the engineer's tools and all the supplies that belong on a given engine, should be removed each time the engine comes in. I do not believe that one-half of them should be taken off or just the cans that they want to put oil in; I believe that everything should be taken off and be returned to the engine when it goes out. If the cans are piled up in places where the oil is cold in winter, the oil is wasted. At a big roundhouse where the engines are running many ways, there should be a man to keep an absolute check on the tools and supplies. I believe that all defective cans and torches in a leaky condition should be taken to a tinner for repairs or taken out of service and replaced by better cans. I believe there should be an absolute check on the tools."

Another road foreman makes this comment: "In regard to what should be done in taking the proper care of tools on engines, upon arrival at terminals, to get the best results, I will say frankly that I would like to see it brought back to the old times when a man could leave anything he had on the engine when he came in, and when he would go out everything would be there just as he left it. I am glad to say that down our way it is getting back something along those lines. Still at one point we have the supply car, and the supply man, who puts the supplies on the engines; but he only removes just what the engine crew wants him to remove. The worst fault I have to find with the supply man is that if you get a young fellow he is looking for promotion and the engine men can bribe him. The salary paid on this particular job is not sufficient to get a man to take the position and stay with it; so I think the better plan would be to supply all engines, and the first time that we find a man taking from another engine, simply take him out of the service. I think there will have to be some severe measures used in order to get this supply business back to the proper basis.

"I hardly believe that it should be necessary to remove the oil cans and tools on engines upon arrival at terminals, and, where regular engines are used, I think we should be able to reach a point where the tools, oil cans and other supplies could be left on an engine after it arrives, and remain until the crew comes around. To accomplish this we will have to use severe measures on some of the engine crews. As an instance I will add that in three months I have had only three or four complaints that somebody has removed an oil can, or something like that, from an engine."

A third road foreman gives his ideas in regard to handling tools and oil cans on arrival at terminals by saying, "that every engineer, extra and regular, should be charged with a full set of cans. I think that they should be numbered to correspond with his tool box and think his torch, water bucket, broom, scoop shovel and coal pick should also be charged to him and numbered likewise. I think on arrival at every terminal, we should have a man whose duty it would be to take everything mentioned off that engine, put it in a suitable place provided for it, and on going out these tools and supplies should be placed on the engine. I would have this man meet the engine on arrival, check this stuff from the engine, see that the cans are all nicely wiped off and provided with good covers. They should be returned to the engine in the same condition, after the engineer has arrived at his engine ready to go out. Then he will know that he has the proper supplies, both as to cans and tools and that he has the proper amount of oil for the trip. I am satisfied from my experience that we can make the greatest saving both in oil and the supplies mentioned, in this manner, than any other that I have in mind. As to the punishment of a fellow who would steal from his fellow laborers, I believe it would be well to consider that we have to catch them before we can dismiss them. The amount of means employed to hire watchmen to watch these fellows during the night, to see that they don't steal, will well care for the men employed to take the tools off and put them away so that we know they are safe. I would recommend along this line, that a man could not draw anything in the shape of a water bucket, pick, torch, shovel, or can, without returning the old one. I think by following this up closely that we would be greatly surprised at the money that could be saved.

"Where an engine crew is called upon to take an engine from one division and deliver it to another the engineer should use his own tools that have been charged to him. He should get right on the engine, the same as if he was making a trip on his own division. When he gets to the other division point where he would turn the engine over, he should take the supplies to the depot and have them shipped back to the home terminal, reaching the point at the same time that he does, which would not result in any expense and would be in keeping with the proposition as outlined."

The opinion of still another road foreman is expressed thus: "I heartily believe that there is great need for a man to be provided for the purpose of keeping tab on what comes in and what goes out on each engine. I believe a very good way is for each engineer to be provided with a suitable tool box, so that all light tools can be placed in this box and the engineer's name printed on the box. He should be provided with a lock, so that he can keep his box locked. With us, the oil cans, such as the oilers, lanterns, etc., and any light tools or supplies that can be readily removed, appear to be the ones that disappear the most, and I believe that they are the important ones that should be cared for. I do not know of any case where we have lost scoop shovels or coal picks, except in one case where a fireman was found to have taken a scoop off of an engine when he already had one. We dismissed him from the service and I do not believe that any scoops have been changed since.

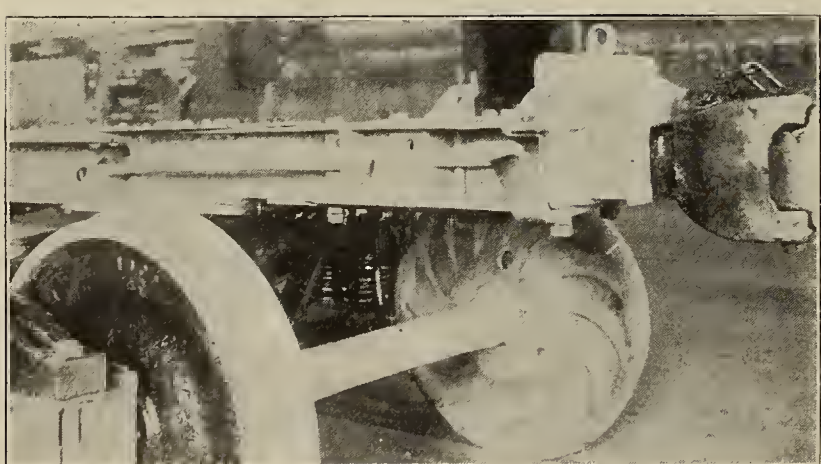
"Some time ago, the engineers tell me, every engine was provided with a heavy Stillson wrench for the purpose of tightening up joints on pipes, etc. At the present time there is not one engine in ten that has a Stillson wrench on it, and we might provide a Stillson wrench for each engine and inside of one week we would have to hustle ourselves to find one on three engines. It is not the engine crews, I think, that get them; I believe that it is the laborers about the rip tracks and roundhouse. I believe we should adopt some form of system whereby the supplies can be kept track of, especially the light ones which are easily carried away. During the season that a vast amount of business is going on on the road and during shortness of power, it is impossible for any engineer or fireman to follow his engine. As a result of that the company being short of power must necessarily use the engines while the engine crews are laying in for rest, thus bringing about a pooling system and unless each engineer and fireman has his own kit of tools and his own supplies it is a very hard matter to keep check of them."

Another comment is this: "The care of tools and supplies on engines has been handled in two ways on the road with which I am connected. Up to several years ago the engines on the system all had regular engineers and firemen. We did not have what they call 'pooled engines,' and up to that time every engineer had a kit of tools on engine and a supply of oil cans. Every man had a lock and key to his box and the supplies and tools were locked up by the engineer or fireman when they left the engine. If another crew went out on the engine, those keys were turned over to that crew and it was very seldom that we had any disappearance of cans, or anything out of order on the engine while the other crew was in charge of it. Since the inauguration of the pool we have had a number of complaints that supplies were missing. We have gone to work and provided engine men with tool boxes and have removed the tool boxes from the engines when they arrived at terminals, put them in the roundhouse or in the store room and even where that is done, the tool boxes are broken open by persons that we were never able to find out, and in two cases I found where an engineer broke open another man's tool box. In view of this I do not know of any place better than an engine to take care of tools and supplies.

"To furnish every engineer with a tool box, that is, both regular men and extra men, requires the company to have about one-third to one-half more tools in use than actually are needed on engines on any one division. For example, on one division we had in a given month 81 engines in service. We have about 115 engineers, each one of those men having a kit of tools. The same would be the result if we had cans, hand oilers and supply cans. You would have an enormous amount of stuff in use, more than you would have engines in service. The expense of keeping a man to remove those tool boxes and oil cans is another expense that we should not have and would not have if the tools and supplies were left on engines when they come in. To provide places for keeping the tools and oil cans costs money and takes space that we don't have at all terminals, and you have ample space on every engine to keep the supplies on that belong on them. There are sufficient boxes and they are adequate for every article that is needed on engines. They should be left on engines when they arrive and locked up and keys kept by the engineer and fireman. I think if we get after the roundhouse foreman in regard to his men removing tools and supplies from engines we will get better results and lose less tools. The company will be out less money in the way of supplying tools.

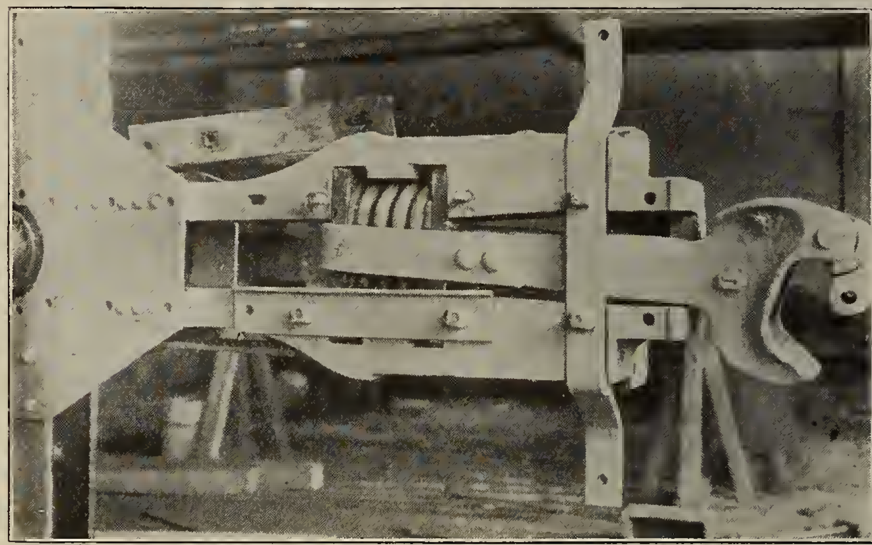
"I have heard the argument that if you have a competent man to remove the tools off of an engine and they are all kept in one place, this man can keep watch of the tools more carefully than he can if they are distributed over a number of different engines. But many times men are dead-heading and the tools are to be shipped from one place to another and are carried by or they will not be loaded so as to reach the opposite terminal when the engineer does and in most cases where a man's tool box is missing he will not have possession of the box for weeks. Sometimes the box is returned to him without a tool in it.

"If the tools are left on the engine you can have the man who puts oil on the engines check the tools when the engineer or fireman comes around and opens the box before going out. He could do the same thing when the engines come in before the crew leaves. If some of the tools are missing when the engine goes out, the man who checks the engine when it comes in should be held responsible for the missing tools."



SIDE VIEW OF DRAFT CONNECTION—SHARP STEEL SUB-FRAME.

A former general road foreman writes: "It was our practice to recommend that all of the supplies coming under this head be numbered and charged to the engineer individually and that they should be taken off at the division points on the arrival of the engine, put in a house provided for that purpose and put back on the engine on its departure; that the man in charge of this work check the supplies when taken from the engine, check them back when they go out. If he finds any shortage it should be immediately re-



BOTTOM VIEW OF DRAFT CONNECTION—SHARP STEEL SUB-FRAME.

ported to the master mechanic or roundhouse foreman. The place for storing the supplies should be so arranged that the oil will be kept warm during the winter months."

Discipline on the Canadian Pacific Railway

THE assistant general managers of the eastern and western lines of the Canadian Pacific recently issued the following circular:

"It is the intention to insist on a more rigid compliance with the company's rules and regulations, which are made for the protection of the lives of the public and employes, as well as for the protection of the company's property. All employes will start with a clean record. Any exceptional service rendered will be credited to the employe's record. A weekly discipline list will be issued on each division. This list will show cause, extent of discipline, or action and extent of reward. Employes will, as heretofore, be subject to summary dismissal for insubordination, drunkenness on or off duty, using intoxicating liquor when on duty, frequenting saloons or places of low repute, incompetency, dishonesty, failing to carry out train orders and rules respecting train movement. Where previously discipline was meted out by suspension, demerit marks will be placed in the record of an employe. For every repetition of an offense by the employe the number of demerit marks will be doubled. When the demerit marks against any employe number 60 his services will be dispensed with. For every 12 consecutive months' good service, free from demerit marks, an employe will have 20 demerit marks deducted from those that may stand against his record. Employes will be advised when demerit marks are recorded against them, the same as they have hitherto been advised respecting disciplinary measures."

Sharp Steel Sub-frame

SINCE the advent of the steel car, the adoption of the heavier locomotive with its greater tractive power, and the common use of the "hump" in classification yards for switching cars, the problem of maintaining the wooden constructed car for service, is a serious one. There are thousands of cars of all wooden construction in existence today, that are of sufficient value to warrant the application of some stronger form of draft gear and draft sills. With this fact evidently in mind, Mr. W. E. Sharp, superintendent of the Armour Car Lines, has designed a steel undersill, which also forms a continuous draft beam.

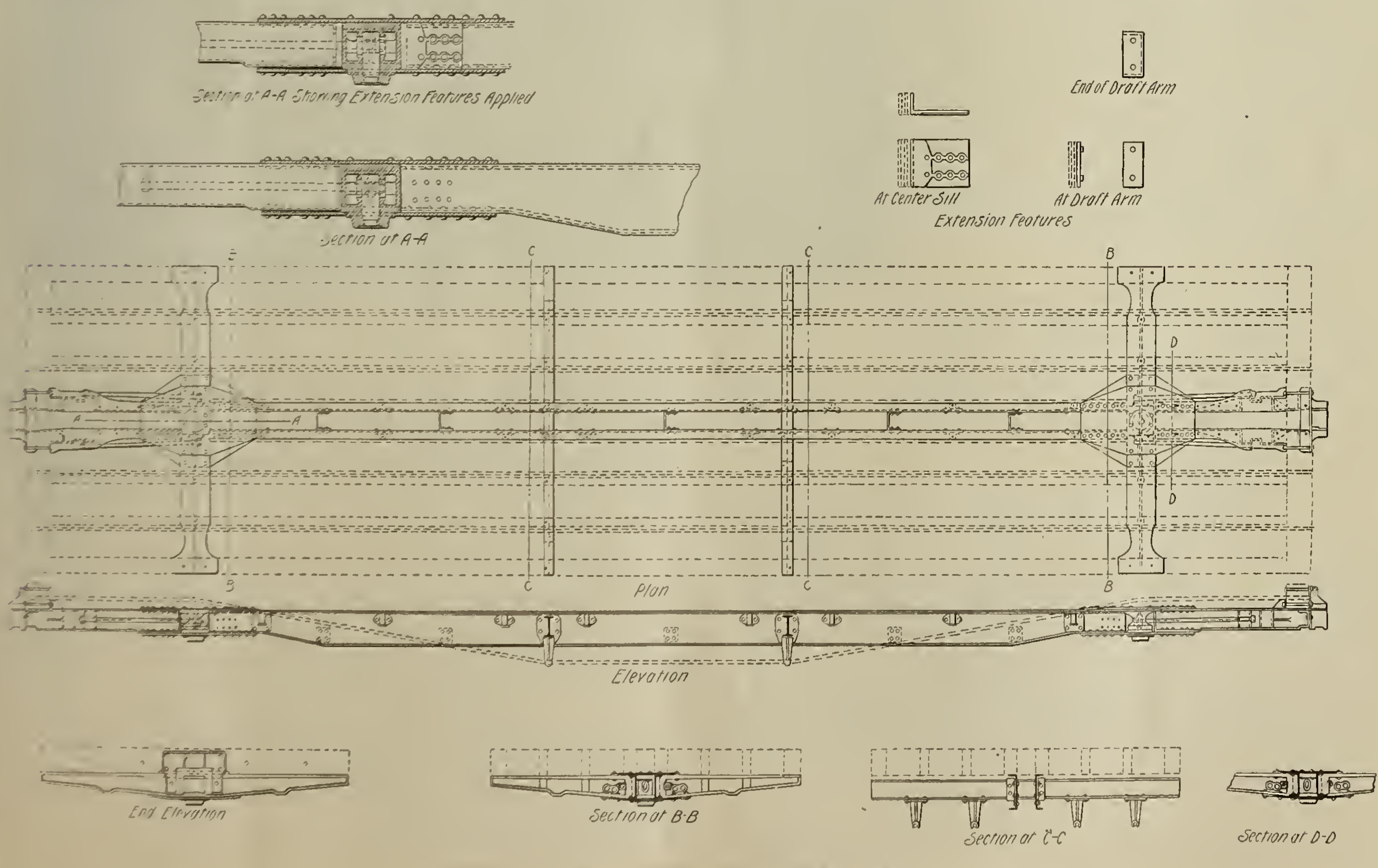
The application of such a device is somewhat difficult, owing to the fact that freight house platforms and loading docks, are fixed at a standard height to conform to the level of the car floor; it becomes necessary, therefore, to apply this steel draft beam or undersill, in a manner that will not alter the original height of the car.

To design a steel undersill of this type is difficult, owing to the variation in dimensions of cars, the distance from the end sill to the body bolster, and the distance between truck centers often varying, on cars built at different dates, and it is essential that this steel draft beam be applied without boring new holes and further weakening the wooden frame of the car.

The cutting away of the body bolster to permit of using a continuous sill, is believed to be a bad practice. It is admitted that failures of a large per cent of bolsters in service are due to the weakness through the center section, and in the design under discussion, the designer has endeavored to produce a continuous steel draft beam, which forms a center sill that can be applied to all wooden cars already in service, at a nominal cost, and at the same time give sufficient strength to withstand the severe shock to which cars are being subjected.

Refrigerator cars of the Armour Car Lines, equipped with this design, have been in service for one year without showing any signs of weakness.

SHARP STEEL SUB-FRAME.



DETAILS OF SHARP STEEL SUB-FRAME.

By referring to the accompanying line drawings the principal features of the design may be seen very clearly. Considering the end elevation first: Particularly attention is called to the steel or malleable iron deadwood, or buffing casting, and draft arms. A deadwood is provided of the proper dimensions, to butt against the forward end of the metal draft arms, and extends up the outside face of the end sill; this casting is also provided with a bracket to accommodate the uncoupling lever.

The draft arm has a stop projecting up to meet the inside face of the end sill, of sufficient height to admit of the application of bolts through end sill, thus securing the metal buffing castings and metal draft beam together through the end sill of car.

The forward end of the draft beam, in this drawing, is made of malleable iron, of a design to admit of the application, and to meet the dimensions, of any form of draft gear, spring or friction.

The longitudinal section "A-A", illustrates the method of uniting the draft arm and draft sills at body bolster, and also shows the extension features used, which makes it possible to manufacture the draft beams and draft sills, to one standard length, and with the application of the extension blocks of the required thickness, this steel sub-sill may be made to meet the varying dimensions of cars. Provision has been made for the application of these filler blocks, by coring holes in the back end of the steel draft arms, and by casting lugs on the filler blocks, of the same dimensions, so that a block may be used of any thickness required, by inserting these lugs into the holes on the draft beam, provided for that purpose before the frame is riveted up, and by punching rivet holes in the center sills to accommodate the wing casting of any thickness required. The longitudinal section "A-A" crosses the sections "B-B" and "D-D", so that referring to these three views gives a clear idea of this arrangement.

Attention is called to the tension and compression plates, shown in "A-A", which are riveted to the steel draft beam, passing over and under, and riveted to the body bolster, and are also riveted to the center sill, making a continuous built up, solid section, from end to end of car.

The buffing and pulling strain of coupler are transmitted through draft arms, through body bolster and through center sills, the bottom or compression plates being cut out to accommodate the center plate, which is cast onto, and a part of, the bolster.

A further support to the draft beam is provided by casting a lug on the draft beam and running a draft rod from the lug on the draft beam and securing it to the body bolster.

In addition to the line drawings, the accompanying half-tone engravings illustrate very clearly the construction of the steel sub-frame built according to this interesting design.

American Society of Mechanical Engineers Semi-Annual Meeting

THE semi-annual meeting of the American Society of Mechanical Engineers will be held in Detroit, Mich., June 23-26. Among the papers to be presented at this session are "A Method of Cleaning Gas Conduits," by W. D. Mount; "A Method of Checking Conical Pistons for Stress," by Prof. George H. Shepard; "Clutches" with special reference to automobile clutches, by H. Souther; "Horse-Power, Friction Losses, and Efficiencies of Gas and Oil Engines," by Prof. L. S. Marks; "Some Pitot Tube Studies," by Prof. W. D. Gregory; "The Thermal Properties of Superheated Steam," by Prof. R. C. H. Heck; "A Journal Friction Measuring Machine," by Henry Hess; "A By-Product Coke Oven," by W. H. Blauvelt; "Tests of Some High Speed Steam Engines," by F. W. Dean. There will be a symposium upon machinery for conveying materials, with papers by several authorities. The Society for the Promotion of Engineering Education and the Society of Automobile Engineers will also hold their annual meeting in Detroit at this time, which will enable members of each Society to participate in the session of the other.

Individual Motor Drive

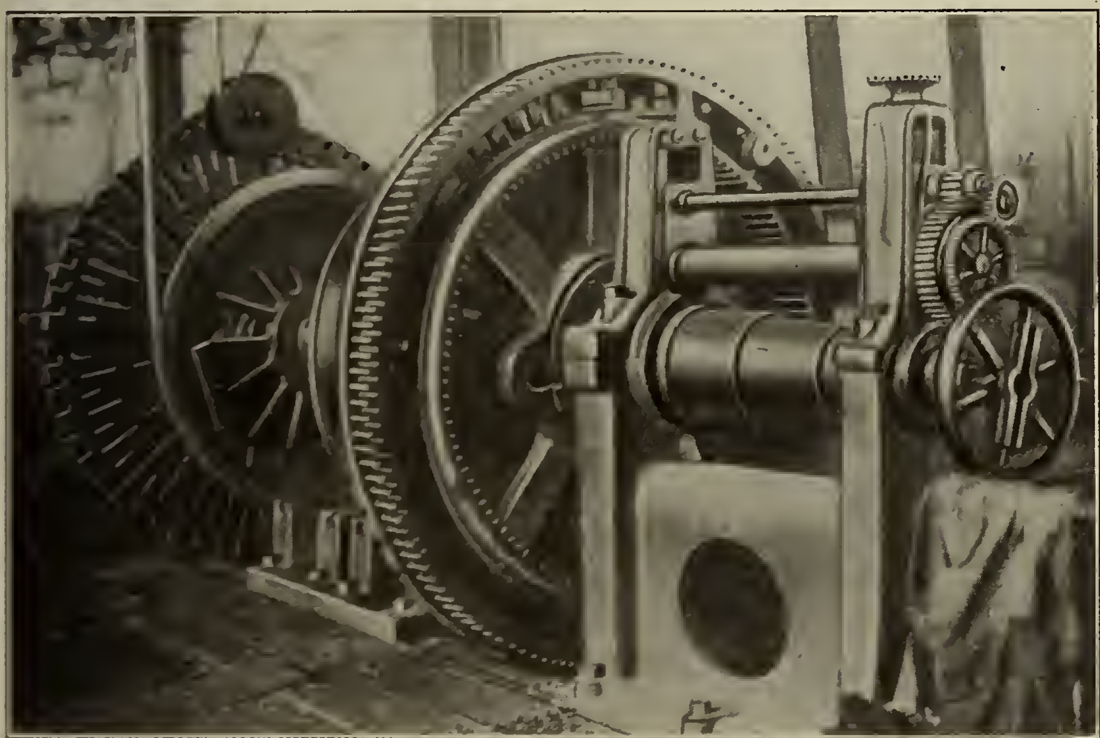
THE delays to shop operation that are often accredited to the individual electric drive for machine tools do not appear to be a serious factor in a completely equipped and well organized shop plant. At the large McKees Rocks locomotive and car repair shops of the Pittsburg & Lake Erie R. R., near Pittsburg, which are equipped throughout for individual motor driving of tools, the average length of the periods of delay to tools due to motor troubles during the year of 1907 was only about 17 minutes. While there are a total of 84 motors in use for machine driving at these shops, the total number of the above delays for the year was 93, an average of 1.1 delays per motor per year, and the longest delay was but 1¼ hours. The total time of all motor delays to tools during working hours was 26½ hours, which resulted in a loss by enforced idleness of the machinists' time (valued at an average of 27½ cents per hour) of only $7.30. In order to minimize such delays standard sizes of motors only were installed, and spare armatures and controller parts are kept on hand for each size, permitting emergency repairs to be quickly made.—The Engineering Record.

Belt Tire Drive for Turning Wheel Journals
By H. W. Jacobs

MUCH can be done by shop foremen and skilled mechanics in increasing the usefulness, the production capacity and the economy of output, by adapting old machines to modern requirements, thus avoiding or postponing capital outlay in expensive machinery.

An example of such a case is shown in the accompanying photograph, where an old driving-wheel lathe has been so arranged that a belt drives the driving wheel using the tire as the driven pulley. The wheels revolve upon the centers, the face plates of the lathe remaining stationary, and the journal is turned up in the ordinary way. The wheels are, of course, weighted on the opposite sides from the counterbalance so as to give an even rotating effect.

Several advantages are derived from this arrangement: Since the spur gear wheel lathe drive is eliminated the chattering effect of the tool on the journal is avoided, thus making the journal absolutely true and smooth. The drivers may be revolved at a high speed for efficient action of the cutting tool instead of being limited by the ponderous slowness of the driving wheel lathe. Much less power is used as the internal friction of the large wheel lathe does not have to be overcome. In a shop equipped with one of the new powerful machines that can do a very heavy job of tire turning in an hour, the old wheel lathe need not be thrown out, but can be used especially on journal-turning work, while the big new machine is used exclusively on the work which it can most economically perform; turning tires.


DRIVING WHEELS BY BELT ON TIRE.

This is a practical illustration of what can be done by a railroad-shop management where interest is taken in the production cost, and the photograph is of a machine so equipped at the Albuquerque, N. M., shops of the Atchison, Topeka & Santa Fe Railway, under the direction of I. C. Hicks, while master mechanic there. This railway is one of the leaders in commercial methods in railroad shops.—American Machinist.

Riveted Joints

THE strength of riveted joints as influenced by the commoner defects in riveted work was investigated at the University of California in 1906, the tests not being designed to determine efficiency or proportions. The results are published in the "California Journal of Technology," from which these notes were taken. The series contained joints with various defects, but the materials were all the same, consisting of ½-in. Carnegie tank-steel plates, and ¾-in. soft steel rivets of Carnegie manufacture. The holes were 13/16 in. in diameter. Lap joints of two styles, each containing two rivets, were used. The first style had the rivets 2¾ in. center to center on a line perpendicular to the line of stress, and in the other style 2½ in. center to center in the direction of the stress. All joints were designed to fail in the rivets. The stress was applied in increments of 1,000 or 2,000 lb. and, except in special cases, carried to failure without stopping the machine. Rivet failure was always in shear with a silky fracture. The report of the test closes with the following summary: "1. That the strength of rivets in a joint having holes punched without reaming is greater, rather than less, than in one in which holes are punched small and reamed to size. 2. That the exact temperature of the rivet or of a particlar part of it is immaterial to the strength of a joint. 3. That a maintenance of pressure for 30 seconds materially increases both the strength and rigidity of the point—the first sometimes by as much as 40 per cent. 4. That rivets burned so that they spit when taken from the fire do not necessarily cause a weakness in the joint, although they do not properly fill their holes. 5. That a rivet 3/16 in. smaller than the holes which it is to fill, will fill the space tolerably well though not perfectly. 6. That joints in which the holes are not perfectly concentric lack rigidity, but give ultimate strengths about up to standard. 7. That the shearing value of a rivet is materially greater after driving than before, this probably being due to increased cross section."

Wetting Coal on Locomotive Tenders

IT IS very general practice among engine crews to wet down the coal supply carried on the tender, in order to reduce the dust nuisance and to improve the condition of the deck. This practice seems to be widely commended. At the same time, however, there is a difference in the method of applying the water as well as in the amount applied, and a question has arisen as to the disadvantage of using too much water. Some firemen are in the habit of wetting down the coal pile with water discharged through a squirt hose attached to the branch pipe of the left injector; others will bail water over the coal when the tender tank is full; while still others will open the water tank spout over the coal and drench it.

In order to induce a discussion as to the extent to which coal on tenders should be wet and to obtain expressions from several sources, the following question has been put to a number of road foremen of engines: To what extent is it beneficial to wet down coal on locomotive tenders?

To this question one road foreman says:

"Relative to the subject of wetting coal down on locomotive tenders, I would say that it would not be advisable to use a great quantity of water on the coal. Any tidy fireman should regard it his duty to wet the coal down enough to settle the dust and after starting out on the road he should repeat that work during the entire trip. My recommendation along that line would be to guard against the difficulty that has been experienced by wetting the coal too much. We find in some instances where firemen, when taking water, will turn the water tank spout over the coal and turn on a great deal of water, flushing the tank with it. This results in washing away a great deal of the fine coal dust. Besides, it saturates the coal to such an extent that it absorbs substances that finally rot the sheets and eat the metal of the tank. If the coal is saturated slightly, we will find that a great deal of the coal dust that otherwise would pass away as soot through the flues with the smoke, will lay in a solid mass on the grates where it will come in contact with sufficient heat to unite with oxygen and burn. In that way we could get heat from it; whereas, if the fireman was firing the coal absolutely dry, that portion of the coal which is in the form of dust, would pass away with the smoke and we would not get any heat from it. On that account we find that it is better to slightly dampen the coal than it is to fire it dry. We will also carry that to another point: I will say that by wetting the coal thoroughly and throwing this wet coal in the firebox, that it has a tendency to temporarily cool the fire below the kindling temperature and in this way, we lose the heat which is necessary to raise the wet coal to that temperature at which the carbon will unite with oxygen or burn, so that it would not be advisable at any time to soak the coal with very much water. I believe that coal can be sprayed with water by means of the squirt or a spray, at frequent intervals, with good results, and these results applying favorably to health, comfort, heat and tidiness."

Another road foreman says: "Coal which is wet down excessively conveys with it into the firebox an amount of moisture which tends to form a honeycomb over the flues, whereas this tendency is much less noticeable when the coal is not so wet. By burning the coal in a dry state, you can get heat from the coal and get it quicker and you lose less heat in your firebox getting the coal to ignite. I believe that if we dampen the coal at all we should wet it just enough to dampen it. The matter of wetting the coal by many of the firemen is handled rather badly, I think. They wet it too much at one time. If they would wet it oftener and not quite so much, it would bring about better results."

Still another road foreman makes this statement: "We must realize that the firemen have other duties to perform besides wetting down the coal and if they are to be asked to wet down the coal a little at intervals, they are going to be off the seat box a great part of the time. The usual system of wetting coal is through the squirt and the squirt, as a rule, is attached to the left injector, and on many of our engines, a non-lifter. The squirt is placed there to compel enginemen to work that injector and if one is told to wet down the coal, he puts on the left injector, breaks it a couple of times, finally gets it on. We have gone down about a 5 or 8-mile hill. Maybe he did not succeed in wetting the coal very well then, and there is only one way to handle Arkansas coal, or, I may say, all coal that I have had anything to do with, and that is to soak it down good and wet, because with Arkansas coal he can stand with the squirt working on the coal for 30 minutes and when you run two miles, the coal is dry-dust coming from it. Now, under those circumstances, if the fireman was required to wet the coal just a little, it would mean put it on 5 minutes and let it off 5 minutes. Another thing about wetting the coal and handling it right away after it has been wet, is that the coal will adhere to the shovel and the firemen object to this method on that account. They want to wet the coal, give the water a chance to soak in and it is just in a nice state for handling, and when they shove the coal in the firebox, all the coal slides off."

The opinion of a fourth road foreman of engines is contained in this communication: "From the wording of the question, I would be inclined to treat it from an economical point of view only. I cannot understand that it is economical to put any water on the coal at all. The data that I have had on this subject teaches that 10 per cent of moisture added to coal decreases its heat value 12 per cent. I am satisfied from my short experience, and the experience of others, that this is a fact. I have always endeavored to give my firemen, as well as engineers, to understand this. I think the greatest caution should be exercised in the use of water about the coal. As to the point of cleanliness, I think this can be brought about with the use of but very little water. I think by keeping the deck and cab well swept and dampened a little, that it will gather a good deal of dust as it is drawn into the cab. I would say the only thing that I could recommend in the point of wetting the coal, either before starting or on the road, would be to have the squirt deliver the water in the form of a spray, which gives off about as much steam as it does water, and blow that over the surface of the coal just for an instant, and also dampen the cab.

"This, however, I would have clearly understood as only a matter of helping to keep down the dust and at the same time give engine crew to understand that what little they have used, has done a great injury to the heat value of the coal. We have all experienced this in rain storms, and more especially in snow storms, where the water in the coal has made it almost impossible to keep the engine going; the steam pressure would fall in spite of all we could do and had to stop and blow up. There was nothing in the world the matter, only the amount of water in the coal had lowered the temperature in the firebox until the combustion was not enough to keep up the required pressure of steam. We take a great deal of interest to explain to a fireman that combustion must be a very rapid combination of the oxygen of the air with the combustible substance, giving off heat and light, and that the more rapid this union takes place the greater point of economy will be reached. Now, if we consider that water has a damaging effect to the fire, we should see also that water should be absolutely lacking to get the best results from the coal. To go into the matter technically, before testing the heat value of any coal, it is put in the pans and dried, to expel all moisture before submitting it to a test. As I stated at first, 10 per cent of moisture in the coal decreases its heat value 12 per cent. With this thought in mind, I would like as much as possible to have my men understand to let the water alone. If they use it at all, use it very judiciously."

The consensus of opinion to be reached as a result of the foregoing expressions would seem to be that just enough water should be put on coal to lay the dust. It would seem further to lead engineers and firemen to understand that the use of water on coal causes a loss in the heating value of the coal and therefore should be used sparingly. It seems to be generally agreed that the best method of applying water is through a squirt hose and that water should be sprayed over the coal.

The results of investigations made by the University of Illinois Engineering Experiment Station, as well as the general data gathered by this bureau, indicate that coal submerged in water does not lose appreciably in heat value. The values found as a result of experiment with coal submerged throughout a period of nine months, show that immersion in water for the time indicated produces changes in the composition and heat of combustion which are so small as to be neglected for practical purposes.

The Western Electric Company of Chicago has built two bins of 4,000 and 10,000 tons respectively below the ground level. The plan is to dump coal into the bins directly from cars and flood it with water until needed for use, when a crane fitted with grab buckets will lift it to cars again.

These facts would lead to the conclusion that water put over coal while on the tender of a locomotive will cause no loss in the heating value of the coal.

Oil Fuel on C. R. I. & P. Ry.

THE Chicago, Rock Island & Pacific Railway is equipping its locomotives on the Kansas and Oklahoma divisions for oil fuel. It is intended that, commencing not later than May 1, oil-burning engines will be used exclusively in all road and yard service in the territory between Herington, Kan., and Chickasha, Okla., and at the yards at Oklahoma City. This includes also the yards at Wichita, Caldwell and El Reno. It is probable that the displacing of coal on these two divisions is preliminary to the introduction of oil fuel over the entire Southwestern and a portion of the Choctaw districts. The Rock Island Employes' Magazine gives this information and states that great economies are effected by the use of oil, to say nothing of the advantage gained by the elimination of smoke and the saving of time in handling engines at terminals.

In the course of equipping the locomotives to burn oil, 46 engines are now being converted at the Horton and Shawnee shops. Eight of these are yard engines and 38 road engines. The yard engines are class I 6-wheel switch engines. The freight locomotives being changed are class C consolidations. For passenger service two 8-wheel class B and ten 10-wheel class D locomotives are being converted, while the remainder are class D freight engines to handle locals.

This move will be followed by the elimination of the coaling stations at Wichita and Caldwell, but at the other points the coaling stations will be maintained for engines on cross lines. For supplying the oil-burning engines with residuum, 500-barrel storage tanks will be erected at Herington, Wichita, Caldwell, El Reno and Chickasha, and tanks of 300 barrels capacity will be erected at Oklahoma City for use of yard engines, and at Horton, Kan., where heavy repairs will be made on the converted engines. Oil for use in the oil-burning engines will be bought from the Standard Oil Company, from the refinery at Neodosha, Kan.

Pacific Type Passenger Locomotives

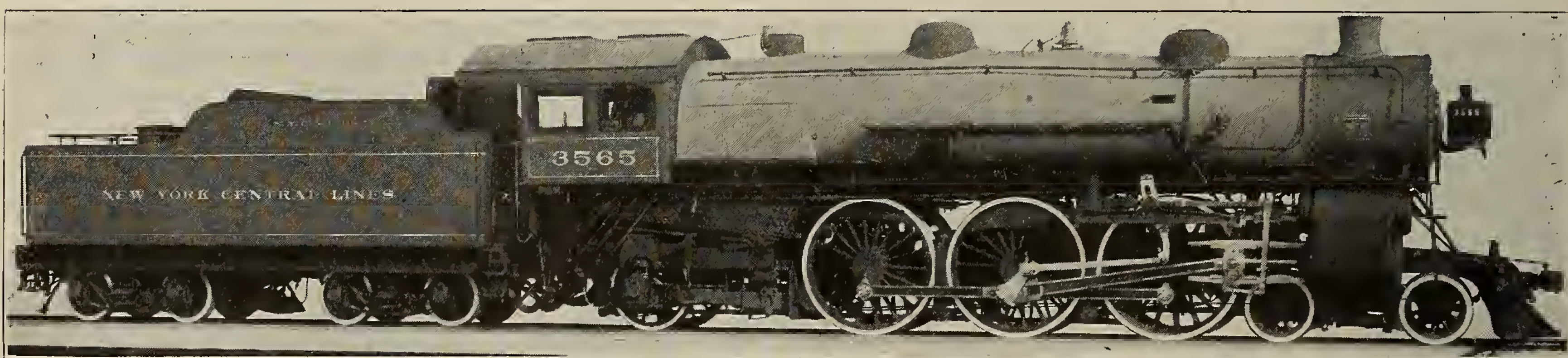
New York Central & Hudson River Railroad

THE Schenectady Works of the American Locomotive Company has recently completed an order of forty Pacific type locomotives for the New York Central & Hudson River Railroad. These are the heaviest passenger locomotives ever built for this road and will be used in hauling their through trains. At the present time these trains are handled by a 21½x26 Atlantic type engine, having a maximum tractive power of 23,300 pounds. The reason for adopting the Pacific type in ordering new passenger equipment was that the Atlantic type engine did not provide the necessary adhesive weight for starting purposes to satisfactorily meet the requirements.

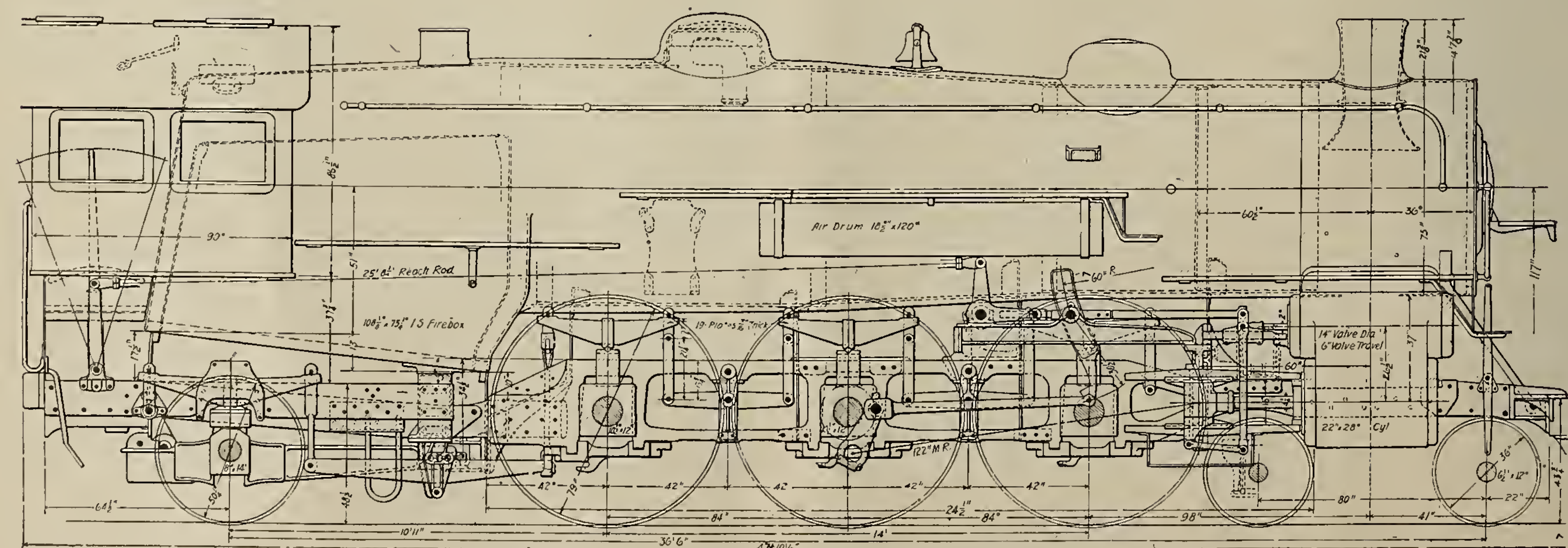
In general the engines here illustrated are duplicate in design of a previous lot built last year by the same builders for the Lake Shore & Michigan Southern Railway, which took the place of the Prairie type as the standard high speed passenger engine on that road and are now hauling all their important trains, including the Twentieth Century Limited. It is probable that this new class will become the standard type of heavy passenger power for all the New York Central lines.

In working order these engines have a total weight of 266,000 pounds, of which 171,500 is carried on the driving wheels. The cylinders are 22 inches in diameter by 28 inches in stroke, and with driving wheels 79 inches in diameter and a working pressure of 200 pounds the engines will develop a maximum tractive effort of 29,200 pounds.

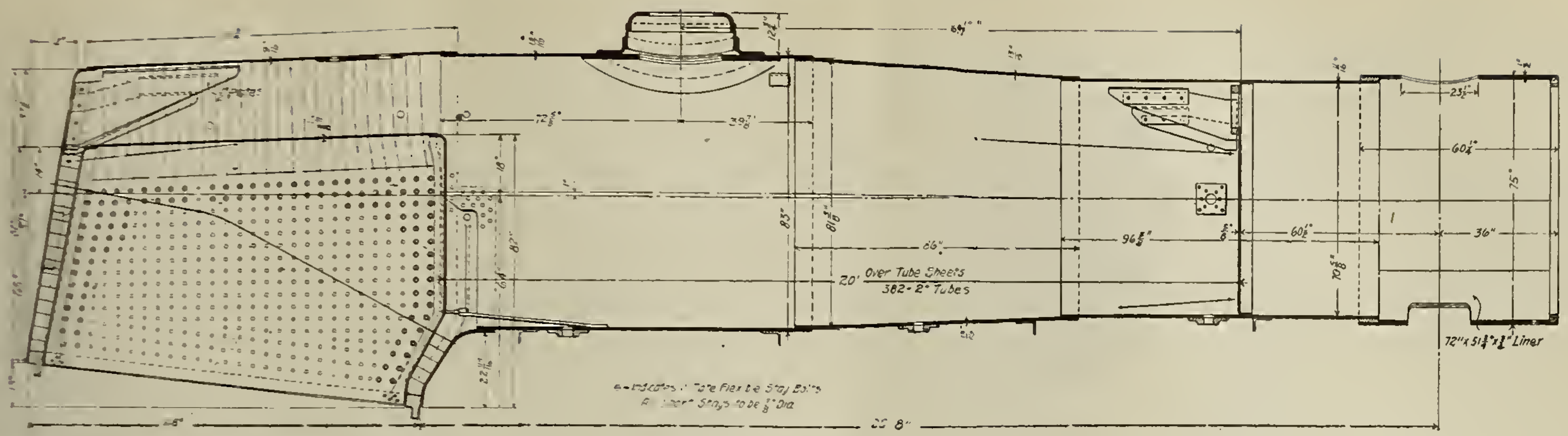
Especial attention was paid in working out the design to providing a boiler of the highest capacity, and it will be seen from an examination of the principal ratios given below that in this respect the design is considerably above the average Pacific type engine. The boiler is of the radial stayed type with a conical shaped middle ring and the outside diameter of the front ring is 72 inches. It contains 382 tubes 2 inches in diameter and 20 feet long and provides a total heating surface of 4,210 square feet, of which the tubes contribute 3,982 square feet and the firebox and arch tubes the remain-



PACIFIC TYPE PASSENGER LOCOMOTIVE—NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.



ELEVATION OF PACIFIC TYPE PASSENGER LOCOMOTIVE— NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.



LONGITUDINAL SECTION OF BOILER, PACIFIC TYPE PASSENGER LOCOMOTIVE—NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

der. The firebox is 108⅛ inches long and 75¼ inches wide and has a grate area of 56.5 square feet. The structural features of the design are shown in the accompanying illustrations and the general dimensions and ratios are given below.

Type of engine	Pacific
Service	Passenger
Fuel	Bituminous coal
Tractive force	29,200 lbs.
Gauge	4 ft. 8½ ins.
Cylinders	22 x 28 ins.
Valve gear, type	Walschaerts
Valves, size and kind	14-inch piston
Valves, steam lap	1 in.; exhaust clearance ⅛ in.
Valve travel-in full gear	6 ins.

Ratios.

Weight on drivers ÷ tractive force	5.84
Total weight ÷ tractive effort	9.11
Tractive force × diameter drivers ÷ heating surface	550
Total heating surface ÷ grate area	74.5
Tube heating surface ÷ firebox heating surface	19.9
Weight on drivers ÷ total heating surface	40.7
Volume of cylinders	12.32
Total heating surface ÷ volume of cylinders	341
Grate area ÷ volume of cylinders	4.58

Boiler.

Type	Straight top
Working pressure	200 lbs.
Diameter first ring	72 ins.
Staying	Radial

Firebox.

Length	108⅛ ins., width 75¼ ins.
Thickness of sheets	Sides ⅜ in., back ⅜ in.
Thickness of sheets	Crown ⅜ in., tube ½ in.
Water space	Front 4½ ins., sides 4½ ins., back 4½ ins.

Tubes.

Material	10 of Shelby steel, 30 of charcoal iron
Wire gauge	No. 11
Number	382
Diameter	2 ins., length 20 ft.

Heating Surface.

Firebox	199.9 sq. ft.
Tubes	3981.6 sq. ft.
Arch tubes	28.4 sq. ft.
Total	4209.9 sq. ft.
Grate area	56.5 sq. ft.

Driving Wheels.

Diameter, over tires	79 ins.
Diameter, wheel centers	72 ins.
Journals, main, diameter and length	10½ x 12 ins.
Journals, others, diameter and length	10½ x 12 ins.
Material, centers	Cast steel

Engine Truck Wheels.

Diameter, engine truck	36 ins.
Journals, engine truck, diameter and length	6½ x 12 ins.
Diameter, trailing truck	50¼ ins.
Journals, trailing truck, diameter and length	8 x 14 ins.

Wheel Base.

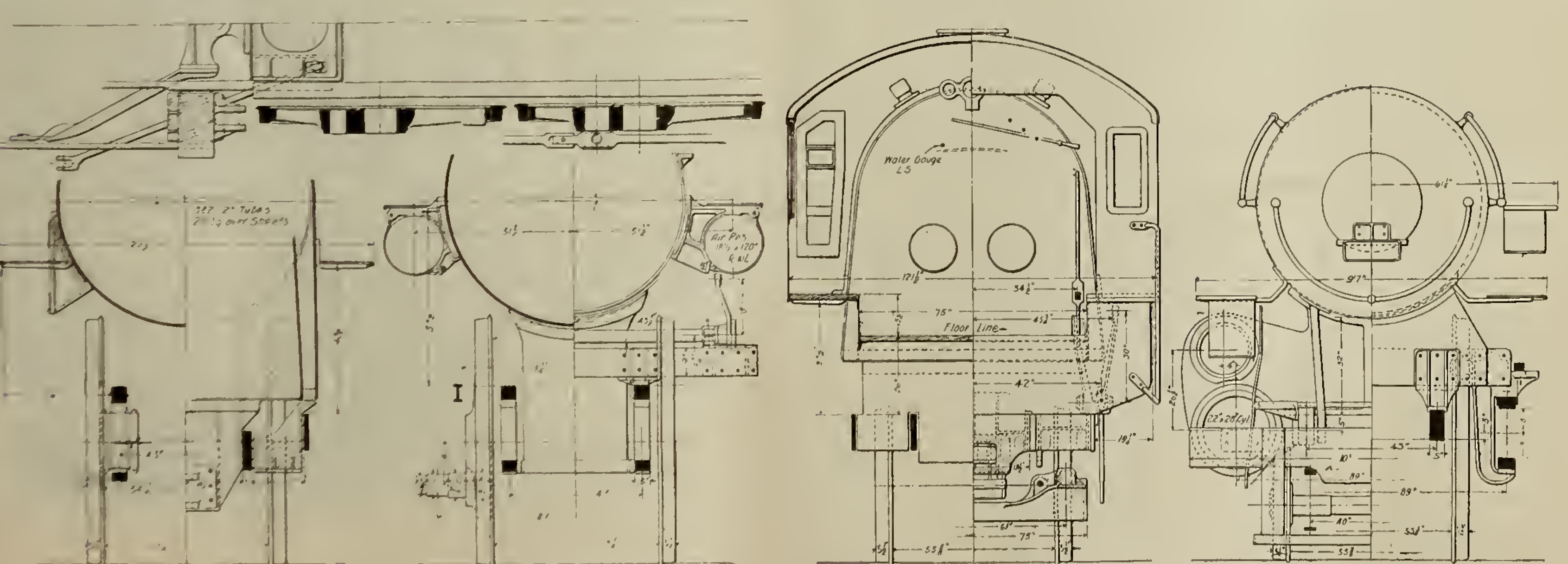
Driving	14 ft.
Total engine	36 ft. 6 ins.
Total engine and tender	67 ft. 11 ins.

Weight.

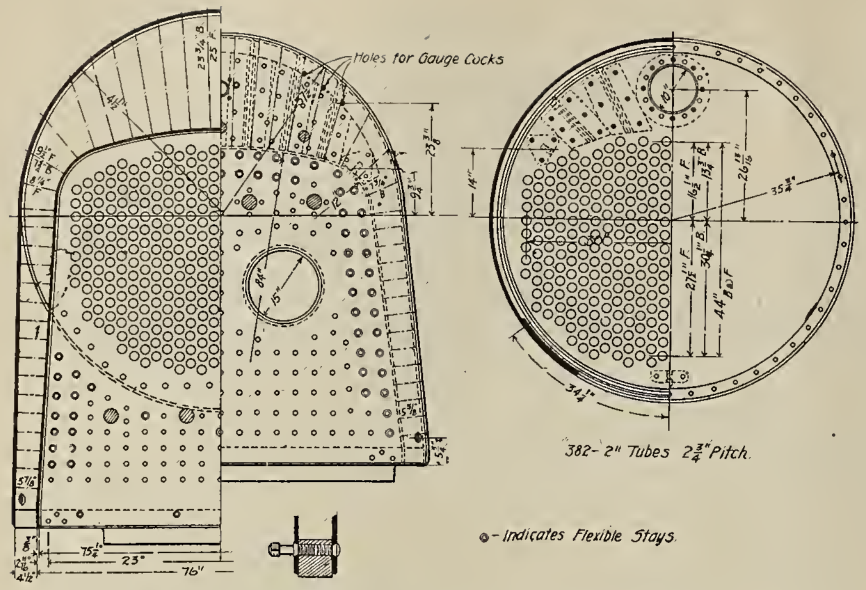
On driving wheels	171,500 lbs.
Total engine	266,000 lbs.
Total engine and tender	430,000 lbs.

Dimensions.

Distance from rail to top of stack	14 ft. 7⅞ ins.



SECTIONS, END ELEVATIONS AND PARTIAL PLAN OF FRAMES. PACIFIC TYPE PASSENGER LOCOMOTIVE —NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.



END ELEVATIONS AND SECTIONS OF BOILER. PACIFIC TYPE PASSENGER LOCOMOTIVE—NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

Distance from rail to center of boiler	9 ft. 9 ins.
Tender.	
Style	Water bottom
Wheels, diameter	36 ins.
Journals, diameter and length	5½ x 10 ins.
Water capacity	8000 gals.
Coal capacity	14 tons

Cab Signals in Germany

THE over-running of signals at danger in Germany, particularly in foggy weather, has brought forward the question, as in the United Kingdom, of transmitting signals to the cab of the locomotive itself. But while the British schemes in general aim at the reproduction in miniature on the cab of the actual position of the semaphores arranged along the railway ahead, it would appear that the Teutonic idea is merely to show to the driver, by means of an apparatus in front of him, that he must expect to reach a signal in less than a distance of 100 meters in advance, and that he should, therefore, take precautions to proceed to the signal post for the definite instruction. The reason for the German abstention from intimating to the driver on the cab the exact position of the signals is said to lie in the belief that if he had no signals to observe outside his cab the attention which he should devote to the track would considerably diminish. It is also held that the look-out from the locomotive, which is unconditionally necessary for the safety of the train, would gradually be abandoned altogether and observations would only be made of the indications given by the small apparatus on the locomotive. However this may be, the new signaling apparatus, which is coming into use on several railways, only aims at drawing the driver's attention by a visual signal on the cab to the fact that a signal will be met in a very short space of time. The system consists in the installation at a definite distance from each ordinary track signal of two parallel iron bars several meters in length, having a slight space between them and laid near the track. From the locomotive projects an arm which carries a brush formed of flexible copper wires, and the brush is led through the space between the bars while passing them. This operation completes an electric circuit on the cab and causes a bell to ring and a red disk to be substituted for a white one. The acoustic and visual signals remain in action until the driver, by pressing a button, disconnects the circuit. It is stated that the contact between the copper wire brush and the bars fixed near the track is entirely free from shock, the flexible arrangement having accomplished what was impossible with rigid contact pieces. It has, in fact, been found by experiments that no rigid contacts are able to withstand the impact, especially at high railway speeds.—Electrical Review (London.)

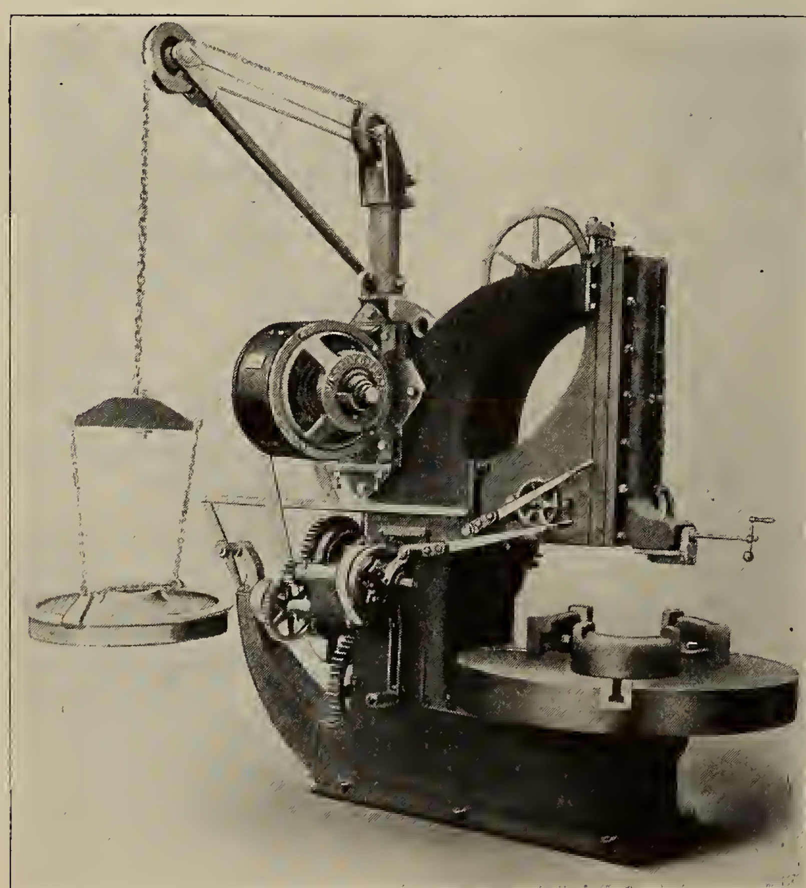
Improved Motor Driven Car Wheel Boring Mill

THE illustration shows a late type of motor driven car wheel boring mill with improved automatic chuck, friction feed disks and crane attachment.

It is a 54-inch machine and its heavy construction and powerful gearing renders it capable of taking the heaviest cuts required for this class of work.

The automatic chuck is self-closing, self-opening and self-centering. It has three adjustable abutments, each provided with an equalizing steel jaw with two bearing points. The work is thus held and centered by six points on the circumference, insuring accuracy in centering.

The first movement of the driving shaft causes the jaws to close in upon the work, after which the motion is transmitted to the table to produce rotation. When the work is completed, the chuck is released



MOTOR DRIVEN CAR WHEEL BORING MILL.

by disengaging the driving clutch and retarding the driving shaft by means of the friction brake provided for the purpose. The inertia of the table and work thus imparts the necessary force to open the jaws.

The work is secured in its correct position in the machine and released with no loss of time and without labor. Since the power of the clutch grip increases with the resistance of the cut, it is never necessary to stop the table to tighten the chuck.

The boring mill is especially arranged for electric drive, and the motor is mounted on the vertical housing of the frame. The motor is a Westinghouse type "S" for a variation in speed of approximately two to one, and therefore eliminates the cone pulley required by line shaft drive. This increases the machine capacity because the variable speed motor gives the desired range of speed in much smaller steps, permitting the mill to be run at all times at its maximum. The mill is manufactured by William Sellers & Company, incorporated, Philadelphia.

Laboratory for Investigating Structure of Important Woods

IT is doubtful if any of the laboratories maintained by the government for scientific research are more unique in character, and yet bear promise of more important results, than one which has been established in Washington by the United States Forest Service for investigating the structure of commercially important woods.

Laymen will not understand the significance of the proposed investigations carried on in this laboratory so quickly as architects, builders and other wood users, who in these days of growing scarcity of the more valuable woods are seriously perplexed in identifying substitutes. Mistakes of this kind in identification have, in the last few years, in several instances, meant the loss of thousands of dollars, and many embarrassing law suits.

Nearly every user of lumber can recognize, and name off-hand, all the usual trees of the forest when he sees them growing, and not much difficulty is encountered in identifying the common kind of lumber in a mill yard because he knows the few trees from which the yard lumber comes. But common kinds are growing scarce, and woods not often cut heretofore are appearing in the markets. The most experienced men are sometimes puzzled when they try to identify them, and persons with less experience have still more trouble. Is a certain good gum or elm? Is another cumumber, linn, or poplar? Is a stick sugar maple or red maple? Doubts may arise whether a piece is hemlock or spruce, or whether it is lodgepole pine or fir, or whether a shingle is cypress or cedar. A dealer may buy red oak and suspect that he is getting something else. There are thirty or more important species of oak. The best lumber dealer might not know which is which in the lumber pile, or if he knows, he might not know how to prove it.

Many of these woods look alike, even to the trained eye of the millman or the builder, and yet they are widely different in value for certain purposes, and it is of the greatest importance to be able to distinguish them quickly and certainly. Again a new wood may come to a man's notice for the first time, and it may be necessary for him to decide what it is and what it is worth.

The government has been helping individual lumber users for some time, but the facilities have not been near so complete as they are now. It is to meet such needs and answer such questions, that the Forest Service has established the laboratory, and placed it in charge of a trained dendrologist. Architects, lumbermen, manufacturers and makers of woodware are already sending in samples of wood for identification, and asking if there are not some structural characters by means of which such woods may be conveniently separated for relative species having greater or less value for some specific purpose.

The laboratory will investigate in a practical way. The structure of the woods, sections lengthwise and crosswise, will be studied so as to separate by structure alone the various species of the genus. These will be based on the arrangement and character of the pores discernible to the naked eye, or by a hand lens.

The results will be published from time to time with good illustrations and placed at the disposal of lumber users. After all the important groups of wood, such as oaks, pines and firs, have been studied and the results published separately, the several monographs will be collected and published in one volume.

A work of this character has long been in demand by architects, builders and other users of lumber. It will, in most cases, enable even a non-technically trained man to determine quite readily the wood he deals with by means of an ordinary hand lens and by comparing the wood in question with the photographs of cross and long sections given in these monographs.

Traffic Club of Chicago

The following officers of the Traffic Club of Chicago for 1908 were elected at the annual meeting in the Great Northern hotel on the evening of March 27th:

President—G. H. Ingalls, freight traffic manager, New York Central lines west.

Vice-presidents—Frank Spink, traffic manager National Packing Company; Harvy Snyder, assistant general freight agent Chicago, Rock Island and Pacific Railroad; and Oscar Bell, traffic manager of Crane Bros. Company.

Treasurer—M. S. Connelly, general western freight agent Chicago, Cincinnati and St. Louis Railroad.

Secretary—John L. Stockton, president Joseph Stockton Company.

Human Fallibility

IN OUR issue for October, 1904, we published an analysis of the railroad accidents that had occurred in the United States during the first six months of 1904, our object being to show the importance of the element of human fallibility in railroad engineering. The results showed that 68 per cent of the accidents were due entirely to the mental or physical state of the human agent, and we summed up the article by showing that whenever an accident occurred, the odds were two to one that the man was at the bottom of it, and not the machine. After an interval of over three years we have made another analysis, this time of the railroad accidents that have occurred in the United States during the twelve months ending March 31, 1907. It is interesting to note the similarity between the results shown in the two tables. The 74 per cent in the present table, representing the human agent, is within 6 per cent of the corresponding figure as given in the former table; while the percentages of accidents due to "mistake" and "forgot" are within 3 per cent of each other.

The figures given are compiled from the reports of the Interstate Commerce Commission, covering a total of 166 prominent train accidents. In these accidents 476 persons were killed and 2,469 were injured; and the damage to property is estimated to be $2,061,297. The reports of the commission are, as a whole, very clear and complete; but it is impossible for anyone to get all the data of every accident, and we have rejected 15 per cent of the accounts as not being as complete as we should wish them to be for our purpose. Our table, as given below, is therefore based upon a total of 141 accidents.

Sometimes, unfortunately, the commission is compelled to give the reason of the accident as "false clear block signal," or "misplaced switch," leaving us in doubt whether the false signal was given because the apparatus itself was out of order, or because the man made a mistake in setting it, or forgot to set it; or whether the signal was falsely given, through the malice of some person not employed by the road.

In preparing a table of this kind, a great deal depends upon the personal equation of the compiler, for in some cases an accident may be classed, with equal propriety, under either one of two or more headings. For example, one accident was due to the fact that when an engineman received a meeting order he put it in his pocket without reading it. This might fairly be classified as "forgot"; but that man had been on duty for 40 hours, and so, under the circumstances, we have classed this under the heading "physically incapacitated," believing that a man who has been on duty 40 hours should not be held responsible for his acts. One accident was due to a runaway on a steep grade—the engineman continuing to use steam too long after passing the summit. We take this case to be a mistake in judgment and a disregard of common sense, so that it might have been placed under the head of "mistake." We have classed it, however, under "reckless." All the accidents due to the operator intentionally disregarding an order are classed under "reckless."

Where the air brakes failed to work, and it was determined, later, that they had not been tested, we have classed the accidents under the head of disregarding orders. Where it is shown that the air brakes had been tested, and yet failed, we have classed the accidents under "defective equipment." It might be said that all the accidents that occur as a result of the fallibility of the human agent are due to disregard of orders; for if the human agent forgot to do a thing it was because he disregarded the implied order not to forget it. Several accidents under the head of "reckless" were due to the engineer exceeding the yard speed rules. We have taken it for granted that he knew those rules, and that he disregarded them wilfully; and we have taken a similar position with respect to the several accidents that were due to the engineman disregarding the five minute interval between trains. One might say that he forgot to maintain this interval, and that the accident should be classed under "forgot"; but we take this order to be of such a nature that when the man disregarded it we may assume that he did so intentionally.

In a few cases, where accidents were due to failure of the air brakes, and this, in turn, was found to have been caused by an air cock in the line being closed, the opinion has been given that the air cock was maliciously closed by tramps riding on the train. This, of course, may be so; but in view of the difficulty of getting a man, who is in a measure responsible for an accident, to tell the whole truth, and not try to lay the blame upon some irresponsible agent, we are inclined to think that the cocks in question were not closed by tramps, but that their being closed when they should not be was due to the fault of the trainmen in not properly testing the brakes.

The vagaries of the human mind are shown very plainly in many instances. Thus in one case an experienced operator, in writing down an order, substituted, for the name of the station a name that he did not intend to write, and afterwards could not explain his action. In another, an operator omitted a word from the order, although he repeated it correctly to the dispatcher. In other words, his voice registered the message that was received by his brain, but his fingers did not. One accident was due to the fact that the conductor, the engineman, and the whole crew, overlooked a meeting order, although that order had been delivered to them only thirty minutes before. In this case, however, all the men had been on duty 16 hours.

On the whole, it is shown that the equipment and road bed are satisfactory; that the elements interfere very little with the operation of the train; that the maliciousness of persons not employed by the railroad is a decidedly minor factor; and, finally, that the man is the cause of three out of every four accidents. The trouble with the man is, that his wits go wool-gathering. This word may not be replete with dignity, but neither are the actions of a man who has lost his head; and so we consider the word well chosen, and make no apologies for it. If we could stop this wool-gathering we should thereby reduce our railroad accidents by 74 per cent.

CAUSES OF RAILROAD ACCIDENTS.

	Nature of Cause	Percentage of accidents due to the cause assigned	Remarks and Explanations.
The Man	Mistake	28	Nearly all due to mistakes in giving or receiving signals, or in writing or reading orders. Two per cent. due to confusion in throwing switches.
	Forgot	27	Just plain forgot to do what he was told to do.
	Reckless	16	Exceeded yard speed limit; failed to observe five-minute interval between trains; did not test air brakes, etc. Might be called intentional mistakes, and would not be called mistakes at all, if he had not been caught.
	Physically incapacitated	3.5	Men fell asleep, presumably on account of previous exposure or exhaustion.
The Machine	Defective equipment	12	Broken rail; broken wheel; failure of air brake; broken switch.
	Defective roadbed	6.3	Mostly washouts; track out of gauge.
The weather	Elements	3.5	Fog or snow interfering with the reading of signals; wind blowing out signal lamps.
	Malice	2.5	Malicious interference from persons not employed by the railroad.

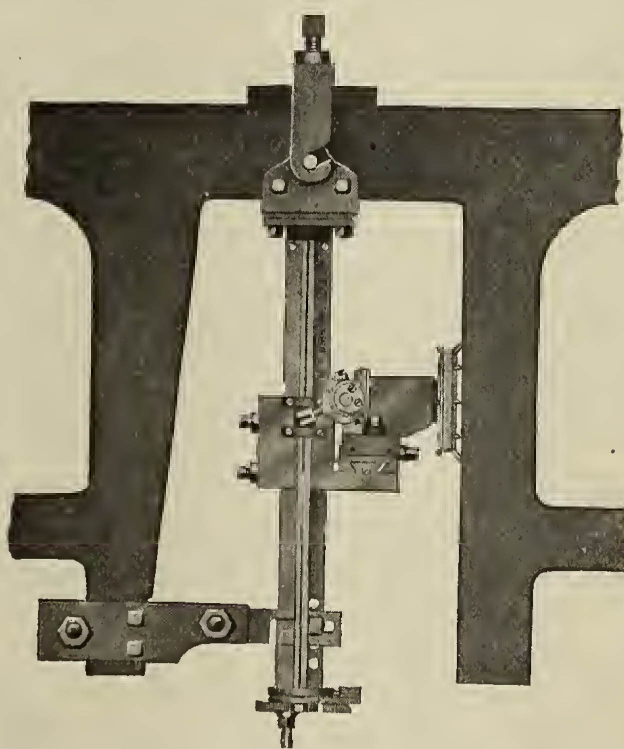
It appears clearly from the foregoing that what the railroad man needs is mental training; and this, backed up by shorter hours of work and longer hours of sleep should make him more dependable.—The Locomotive.

An abstract of the very interesting publication made by the Rock Island-Frisco system, entitled "Factors of Prosperity in the Rock Island-Frisco States of America," forms a 2-page article appearing in the March issue of "The Colonizer," a London publication. Alexander Jackson is the European representative of the system and is making a special effort to bring to the attention of intending emigrants the resources of the southwestern states served by the Rock Island and Frisco lines.

Portable Machine for Facing Pedestal Jaws on Locomotive Frames

H. B. UNDERWOOD & CO., 1024 Hamilton street, Philadelphia, Pa., have recently added another tool to their list of portable devices for general railroad and machine shop use. This new tool, illustrated by the accompanying illustration, is designed for facing the inner surfaces of the pedestal jaws on locomotive frames.

The milling head by which the facing is done is carried by a square bar, which is the main supporting member of the mechanism. This bar is provided at the top with a steel swivel connection to the clamping block by which it is fastened to the frame. This steel swivel allows the cutting tool to be swung around for cutting the other side of the opening, and also allows the square bar to be set at an angle for facing on a taper. The clamping block may be easily



PORTABLE MACHINE FOR FACING PEDESTAL JAWS ON LOCOMOTIVE FRAMES.

changed to enable it to enter narrow spaces. At the lower end of the square bar the universal adjustable clamp holds it securely to the frame.

The milling head is fed along the square bar by a bronze half nut, which may be engaged with, or disengaged from the feed-screw. This screw is revolved by a ratchet and dog at the lower end of the device, operated, through the squared shaft shown, by an eccentric on the milling head. The feed is thus automatic, and may be varied to suit the requirements. The milling spindle has adjustments in two directions—to and from the leg, and across the face. Fine or rapid adjustments may be made without difficulty, suitable cranks being provided for obtaining these movements.

The milling spindle is threaded to receive the milling cutters, which have blades of square high-speed steel, set in a solid head; they are removable for grinding or adjustment. The power is applied by a telescopic shaft with universal joints, operating through gearing on the spindle, and allowing the source of the power to be in any convenient, out of the way place, making belts, etc., unnecessary. The maker's two-cylinder air or steam motor is a very suitable prime mover for a portable tool of this kind.

In using this machine, a large quantity of metal can be removed in a given time, by taking a succession of light cuts and feeding very rapidly.

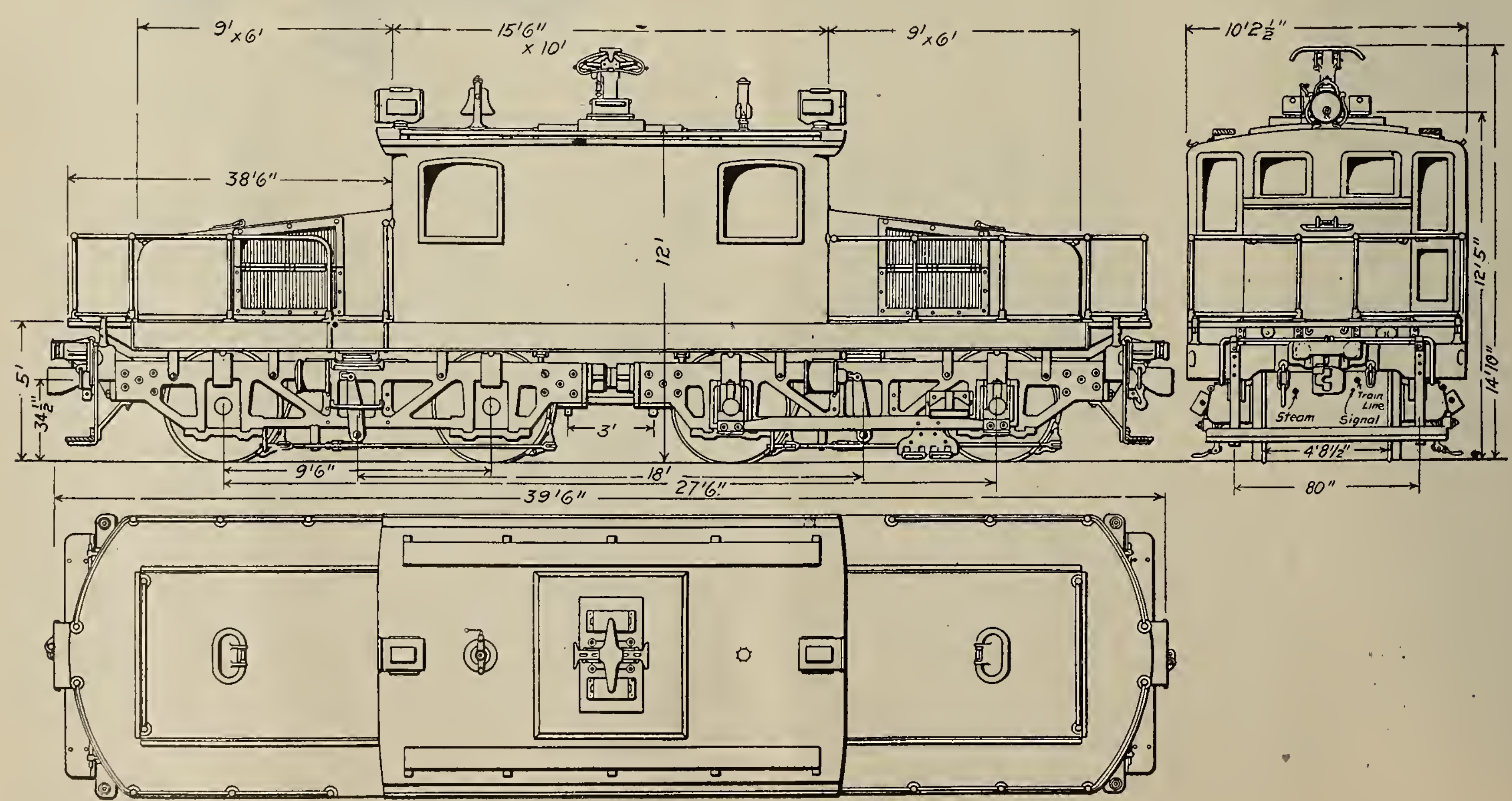
Electric Locomotives for Detroit River Tunnel

SIX electric locomotives are now being built for the Detroit River Tunnel Company by the General Electric Company and the American Locomotive Company. These locomotives will be used to haul both passenger and freight trains of the Michigan Central Railroad through the tunnel now being constructed under the Detroit river from Detroit, Mich., to Windsor, Ont. The accompanying line drawings illustrate the plan and elevations of the locomotives for tunnel service.

These locomotives are moderately slow speed machines and weigh 100 tons on the drivers. The frame is of the articulated type and may be described as consisting of two four-wheel trucks hinged together. The trucks are of a very solid construction, with cast steel side frames of truss pattern carried on semi-elliptical journal box springs. The diameter of the driving wheels is 48 ins. The draft rigging is carried diectly on the outer end frames of each truck, the two trucks being hinged together by substantial hinges and pins. By adopting this method of construction, the draft of the locomotive is carried directly through the truck frames, and the center pins are relieved of all hauling strains.

The superstructure consists of a main operating cab and two auxiliary end cabs. The main cab is 15 ft. 6 ins. in length and contains the engineer's operating mechanism and valves. The contactors, rheostats and air reservoirs are contained in the auxiliary cabs. The height of the end cabs is such as to permit the engineer to obtain a good view of the tracks. Easy access to the couplers is provided by a narrow platform running from the main cab to the end of the locomotives.

The electrical equipment of each locomotive consists of four GE 209 motors and the Sprague-General Electric multiple unit train control. Each motor will develop approximately 300 h. p., and at its hour rating will develop a tractive effort of 9,000 lbs. at a speed of 12 miles per hour. A complete locomotive is to be capable of hauling a 900-ton train up a 2 per cent grade at the required schedule speed. The motors are of the commutating pole type, and are among the largest units of this kind yet constructed for railway work. The current will be supplied to the motors from an inverted third rail at a potential of 600 volts. On account of the heavy torque developed, which



ELEVATIONS AND PLAN OF ELECTRIC LOCOMOTIVE FOR DETROIT RIVER TUNNEL.

amounts to 4,050 lbs. at a one-foot radius, a pinion is mounted on each end of the motor shaft. The motors will be cooled by forced ventilation, a blower having a capacity of 2,000 cubic feet per minute being installed in the main cab for this purpose. A separate compressor of type CP 26 with a capacity of 100 cubic feet per minute piston displacement provides air for operating the air brakes.

The principal dimensions are as follows:

Length, inside to inside knuckles	39 ft. 6 ins.
Length of underframe	34 ft.
Width over all	10 ft. 1 in.
Height from rail to retracted position of contact shoe	14 ft. 10 ins.
Main cab	15 ft. 10 ins. by 10 ft.
Truck wheel base	9 ft. 6 ins.
Total wheel base	27 ft. 6 ins.
Center to center of trucks	18 ft.

Wanted---A School of Toolmaking

IT has been the uniform experience of trade and other schools established for apprentices and other beginners in the trades that their advantages are made use of to a surprising extent by men of mature years, whose needs were considered but little, if at all, in the original plans. This was brought out forcibly at the recent industrial educational convention at Chicago, and another instance not there related, but which has since been noted in these columns, is that of the Winona Technical Institute at Indianapolis. The uniformity of this experience leads to the idea that the needs of adults should be considered in the organization of the schools.

The Winona institute has already secured the necessary equipment for a school in machine-shop work, and it would seem to us eminently appropriate that while the purpose of that school to provide for the beginner should be adhered to, it should, nevertheless, take up more advanced work and provide systematic instruction in toolmaking.

The workman in the shops has two avenues of advancement open to him, one to foremanship and work in an executive capacity, and the other to the tool room and immediate charge of manufacturing methods as distinguished from authority over the working force. There is no doubt that this latter field appeals to many through the positive argument that their satisfaction with their work is obtained through the accomplishment of results by their individual skill or through the negative argument that they are not by nature fitted for an executive position. To such men a school of tool-making would, we believe, prove a magnet, and there is no phase of machine-shop work which is more appropriate to systematic instruction.

Some of the articles which have appeared in recent numbers of the American Machinist point out in a small measure the scope of the instruction to be offered. The locating of holes in jigs, the use of the microscope, making index plates, lapping, the possibilities of the fly-cutter, the camming of automatic screw machines, the treatment of steel and other subjects connected with manipulative skill, such as the use of the measuring machine and the making of gages, form a range of subjects appropriate for systematic instruction. With the aid of modern furnaces and pyrometers the treatment of steel is rapidly becoming an exact science, and to these the study of fractures is about to be enormously advanced by the use of the microscope. A hardening room—we suppose the catalog would call it a laboratory—properly equipped would enable one to acquire more definite knowledge of the proper treatment of steel in a few weeks than most men acquire in half a lifetime. Such a school would also naturally include work on tool and fixture design wherein, with the aid of a competent teacher, the most useful imaginable results might be obtained.

The difficulty of providing a suitable product which confronts other trade schools, would be very much simplified in a school of tool-making. One of the serious difficulties connected with manual-training schools in general, is that it is impossible to secure the interest of the student in work which is to have no value when done, but this difficulty would be absent in a school of tool-making. Its students would have acquired the commercial spirit before entering it, and would have no need of the stimulus of commercial work. On the contrary, they would welcome the opportunity to do the best work of which they are capable for the mere gratification of so doing. We can imagine no more interesting work for machinists than the hardening of sample pieces of steel with the appliances mentioned above, and subsequently testing them out for hardness with Mr. Shore's scleroscope, which was recently described in the columns of the American Machinist, and studying their fractures with a microscope. Moreover, the expense of material would be comparatively small, as there is no kind of work in which the cost of material compared with the expenditure of work is so small as in tool-making. Another feature which should not be lost sight of, is that such a school would appeal to those who have already acquired good earning powers and who could afford the expense of attendance, which most young boys cannot.

So far as filling a want is concerned, such a school wiuld be just as useful as any that can be named. Prior to the recent panic there was no class of men more in demand than capable toolmakers. We have, indeed, heard of one instance in which a manufacturer contemplated starting just such a school as we have described in order to train men whom he could not find. The effect of the school on the general welfare would, we believe, be far in excess of that of an elementary school. All that an elementary school can do is to train boys to serve as one of the rank and file, its influence on manufacturing industry being measured by the number of boys so trained. A school for toolmaking would not only supply toolmakers, but it would do much more, as, if made of the high grade that it should be, it would become a center of influence, and through its graduates spread a knowledge of advanced methods and practice throughout the country.

We believe there is no more useful or promising line of work which the Winona Institute can take up than this, and we hope to see something done about it.—American Machinist.

Notes on Fuel

By John M. Lynch

THE fuel question has come to be one of the most serious problems that railroads have to solve. Over seven per cent of the operating expense of the railroads in the United States is annually paid out for coal. How to reduce that expense and reduce the cost of producing steam has come to be a serious study among up-to-date officials.

Coal is wasted, first, in loading at the mines, in spills along the right of way, in the firebox itself, and in putting it in the firebox.

Considerable waste is caused by overloading the tender; the jarring of the tender throwing much along the right of way. This is a matter that can be overcome by conscientious work at the coal chute.

More is lost through the locomotive itself, grade, curvature, etc., and it will doubtless astonish some to know how great this loss is. The following average figures are given by an authority:*

Firing up	8%
Wasted, keeping steam while standing still	5%
Stopping and starting at stations, etc	15%
Losses due to resistance on curves	3%
Losses due to resistance of grades	15%
Actual energy expended in hauling the train	54%

In other words, nearly half of the coal put into the firebox is not used in actual money-making tonnage.

There are several kinds of engineers and several kinds of firemen: ergo, there are several ways of running and several ways of firing a locomotive. The right man does the right thing at the right place and at the right time.

Every time the safety valve opens up there is a loss in fuel and water. Horse power is thrown away every time a shovelful of coal goes through the stack unconsumed, or is blown off at the pop as waste steam.

Lots of coal is wasted through the stack. Greater care in preparing the fire, and greater deliberation in getting away from the depot would considerably lessen this waste. The violent exhaust through the stack, when first opening up after a stop, consumes enough coal to run the train for a considerable distance after it has gained headway. If the fireman has not prepared for this his fire is torn to pieces, and the steam gauge drops just at the time when it needs all the pressure the engine can give.

Everlasting economy is the price of a low fuel bill, and the economical fireman is worth a good many dollars a year to the company. This is so well known as to become an axiom and yet thousands of dollars are wasted every year through coal that is unnecessarily shoveled into the firebox by men who don't know or don't care.

It is true that the big engine taxes the fireman to such an extent that it is difficult for him to judge in the matter of fuel economy. He knows that he must hold his fire at any cost, and so, when the lever is in the corner, and the exhaust is severe, he throws much unnecessary coal into the firebox.

The waste of coal in transportation is enormous. If coal cars are used care should be taken not to overload them, otherwise much coal will be jarred off in transit. If box or stock cars are used too much care cannot be taken in loading them at the mines. If the cars are overloaded or if proper precautions are not taken, an immense amount of coal will be lost in transit along the right of way, both from the jarring off of coal and from theft.

To prevent this boards should be placed in doorways and the doors should always be sealed. This precaution is taken by railroads when moving farm produce, etc., in order to protect themselves against claims for damages from loss in transit, and there is no reason why railroads should not take as much care in protecting their own goods as they do to protect others. The additional expense of boarding up openings and sealing car doors would be trifling compared to the saving in coal that this would bring about.

I have followed this matter very closely for some time and was myself surprised at the enormous loss of coal in transportation.

All coal wasted in this manner is, of course, charged up to locomotives, and accounts, to some extent, for the over-consumption of coal charged against motive power. Master mechanics and traveling engineers may be called up and instructed that they must make a better coal showing, but if you will take a trip along your right of way and notice the amount of coal that lines it, you will understand one of the reasons why a better showing cannot be made.

Another cause of waste is from overloading engine

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* Walter Loring Webb.

tanks. This should not be allowed, as the coal will drop off. Another saving may be made by putting some device on tanks and gangways to keep the coal from shaking off the tank onto the ground and engine steps.

I have found that shields made from waste pieces of boiler iron, bolted onto the tank or tank deck with lag screws, will keep the coal that jars down from the tank from dropping off onto the steps and ground.

It will be found that these precautions will greatly reduce the so-called consumption of fuel, for all this lost coal is charged up to the engine's consumption so that the coal balance sheet may balance.

The matter of saving in the actual consumption of coal is a difficult problem. The great difference in the records of enginemen in the matter of coal consumption shows what a field there is for improvement in that respect. There is no question but what there is much to be gained by careful instruction and by a continual effort to bring the standard to a higher level, and to bring the men nearer that standard, but there will always be a difference in the coal records of enginemen just as there will always be found all grades of workmen in all lines of work.

Machinery has been brought into use in every line to bring the cost of production to a lower and more uniform level, and I believe that the day will come when some mechanical device will be introduced to bring the cost of producing steam down to a more economical and uniform basis.

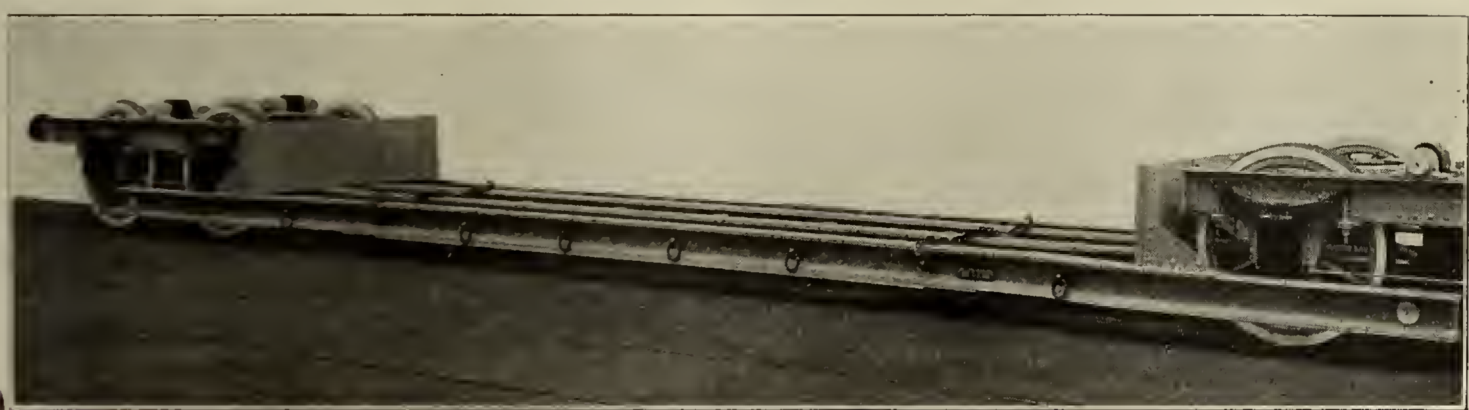
Much may still be done through a system of education, but I am of the opinion that the real solution of the coal question will be found in some device that will equalize the work of firemen, thus making the one-scoop system of firing more practical, and that can be depended upon to do its work of saving regardless of the ability of the fireman.

Another thing that will cause the enginemen to put forth a greater effort to make a saving: railroad companies should endeavor to have cabs fitted as comfortable and convenient as possible so that enginemen may perform their work under the most favorable circumstances, for when enginemen find that the company is looking after their interests they will be more careful of the company's interests.

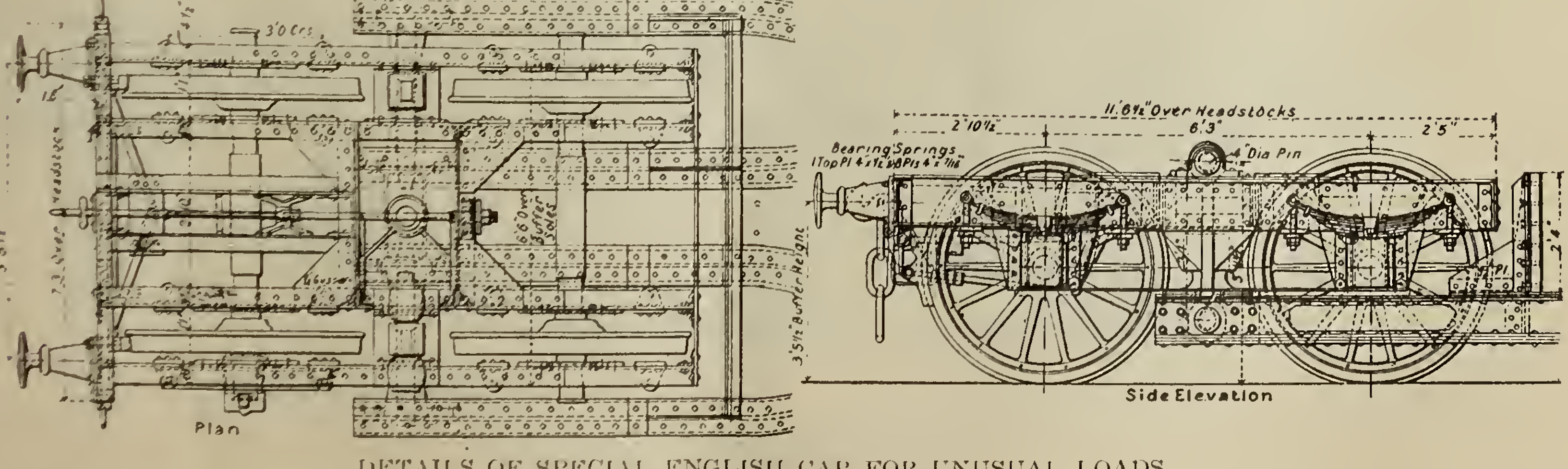
All railroads have a good class of enginemen who do not need much looking after. They also have another class of men not up to the standard of the good men. Every effort should be made to bring this latter class up to the standard set by the best class, and in this way an untold amount of good will be done for the service.

Special English Car for Unusual Loads

A SPECIAL car for the conveyance of large boilers and extremely heavy castings, as well as other machinery of unusual proportions, has been designed by J. G. Robinson, mechanical engineer of the Great Central Ry., England. The car was constructed for use on the Cheshire line, and the type has been found very convenient for the class of service specified. The capacity of the car is 40 tons and it was built at Leeds by the Leeds Forge Co., Ltd. The construction and details are shown in the accompanying illustrations.



SPECIAL CAR FOR UNUSUAL LOADS—GREAT CENTRAL RAILWAY, ENGLAND.



DETAILS OF SPECIAL ENGLISH CAR FOR UNUSUAL LOADS.

The car is equipped with two four-wheeled trucks having centers a trifle less than 40 ft. apart. The total length over all is 59 ft. 3 ins., and the width over head stops is 7 ft. 3 ins. The length of the well is 32 ft., and its width is 7 ft. 5 ins. The floor of the car is 1 ft. 8½ ins. above the rail level. The height of the buffers is 3 ft. 5½ ins. from the rail, and the centers are 5 ft. 8½ ins. apart.

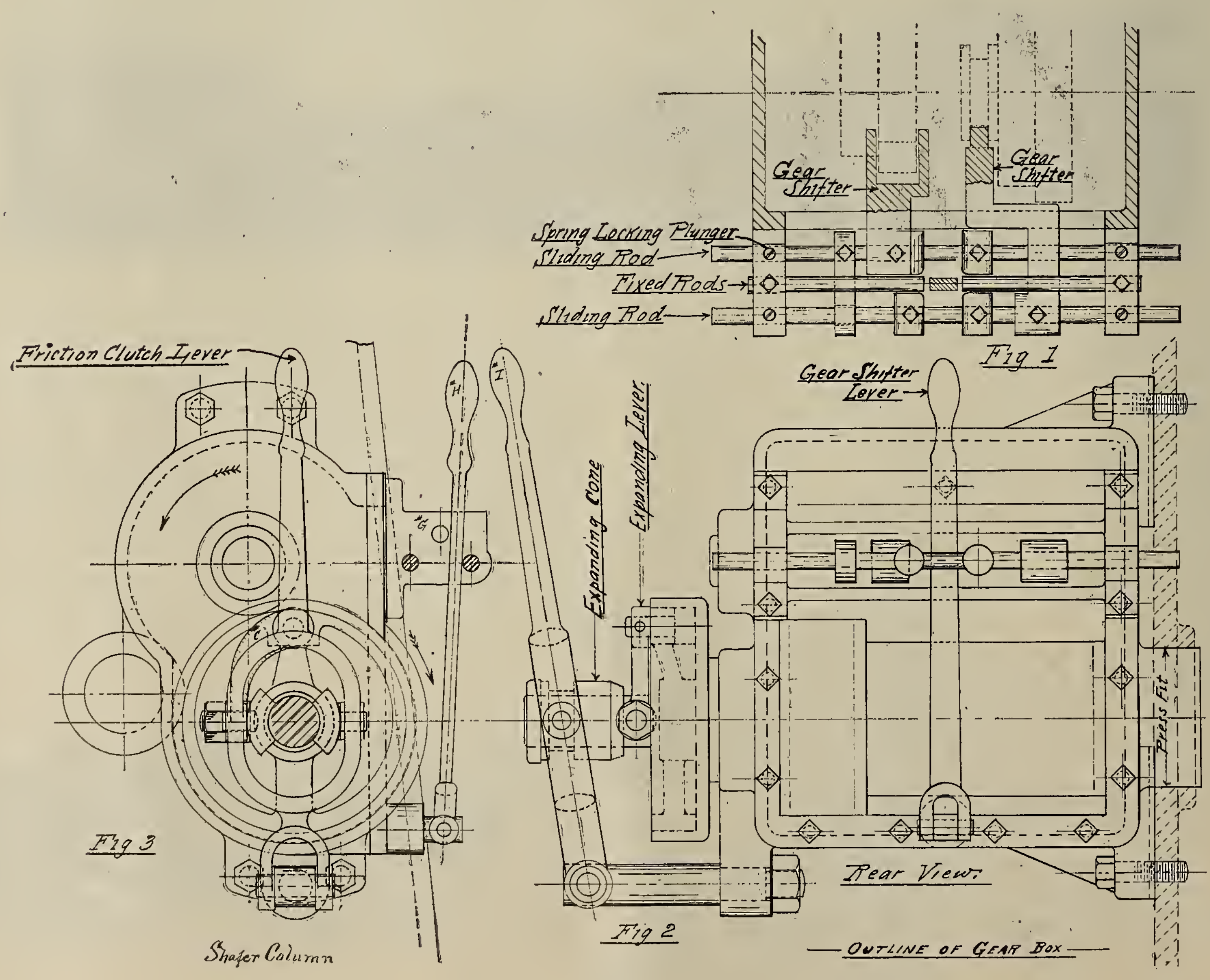
The car is fitted with hand brakes, these being applied only to one pair of wheels on the truck. The truck wheel base is 6 ft. 3 ins., and the wheels themselves are 4 ft. 6 ins. in diameter. The journals are 5½x8 ins.

An Improved Gear Box

AN improved gear box, in which the heretofore undesirable features common to such devices are believed to have been eliminated, has been developed by the Queen City Machine Tool Company, of Cincinnati, Ohio. The accompanying illustrations show this gear box as applied to a 20-inch B. G. crank shaper. Former gear box devices have either been very frail and complicated, or simplicity has been obtained by overlooking or ignoring some of the essential requirements; on the one hand, much trouble has been caused in a short time by the complicated parts getting out of order and failing to co-operate; while on the other hand, the inherent defects, and consequent shocks and jars, have shortened, not only the life of the gear box, but of the whole machine as well. In the latter case it has been the custom to continue to make the parts more and more heavy and clumsy, instead of relegating the whole thing to the scrap heap.

Shocks in the gear box which cause serious damage to the machine itself have been a constant source of annoyance. However, the advantages which the gear box provides in the use of single pulley or constant speed motor drive, render an improved gear box a very serviceable device. In automobile practice, perfected devices of this kind are more common, and from the accompanying drawings it will be seen that, while the construction shown is new and peculiar in its particular appication, yet it compares in many respects to the latest and best types of the automobile gear box.

The drawings clearly show the compact, strong and

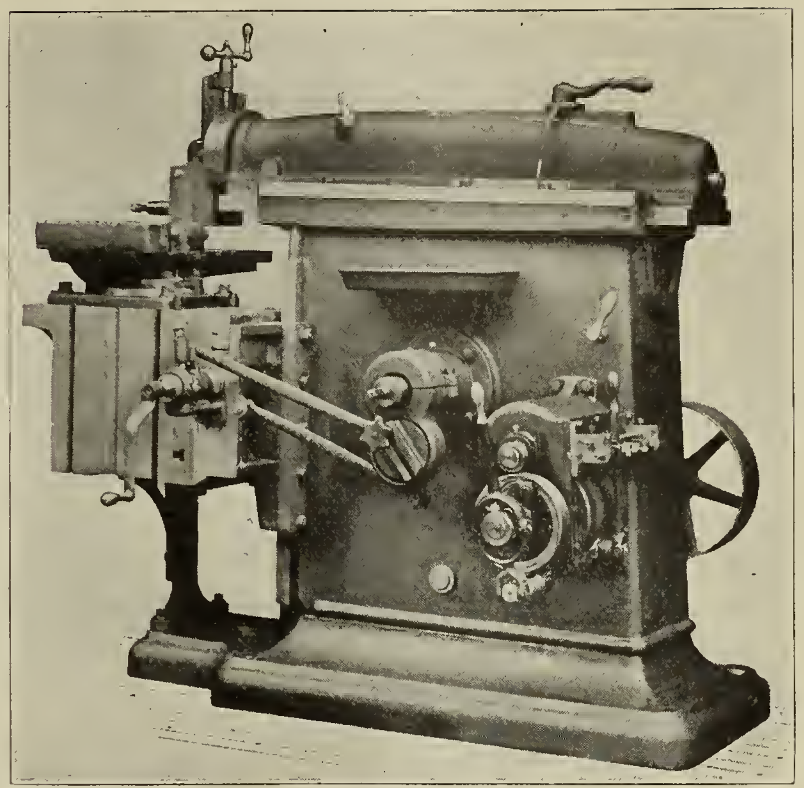


FIGURES 1, 2, 3—IMPROVED GEAR BOX.

durable construction to carry out a correct predetermined principle of action. They show a single pulley drive, and on the opposite end of the shaft, which passes clear through the shaper, is mounted the expanding ring of a clutch; the expanding cone and operating lever are also shown. The driving gears in the gear box are all mounted on a sleeve, telescoping the driving shaft. This sleeve also forms a clutch member outside of the box, which easily engages or releases the driving shaft at all times. The very successful operation is due in a great measure to the simplictiy and practical utility of the unique telescopic sleeve construction and clutch design as shown.

Tumbler gears, with their rattle and bang, and consequent damage; or numerous clutches and levers, some of the clutches being exceedingly small on account of being placed on the inside of pinions; and superfluous construction of all kinds are entirely dispensed with. In the drawings the clutch and all gears are shown disengaged, and it will be noted that the length inside of box is only equal to the sum of the gear faces; the floor space required does not exceed that of the cone drive. The gears are positively slided by the shifting lever at the back, easily, quickly and quietly to their respective working positions, and by the arrangement of the rods shown in the drawings, the driving speeds are made automatically non-interfering, insuring absolute safety and reliability.

Four speeds are obtained in the gear box, and four more by using the back gears, making eight speeds in all, same as in the regular cone drive, and the four gear box changes can be made in four seconds. This is a most remarkable performance, as the expanding clutch and all gears are each time automatically, securely and independently locked in all the different working and idle positions, by a simple spring plunger, and would have so remained indefinitely. When it is desired to shift the gears for a new speed, after throwing out the clutch, the driving shaft alone is running, but the telescopic sleeve continues to creep slowly around without force, facilitating the sliding of gears to position for obtaining



SHAPER WITH IMPROVED GEAR BOX.

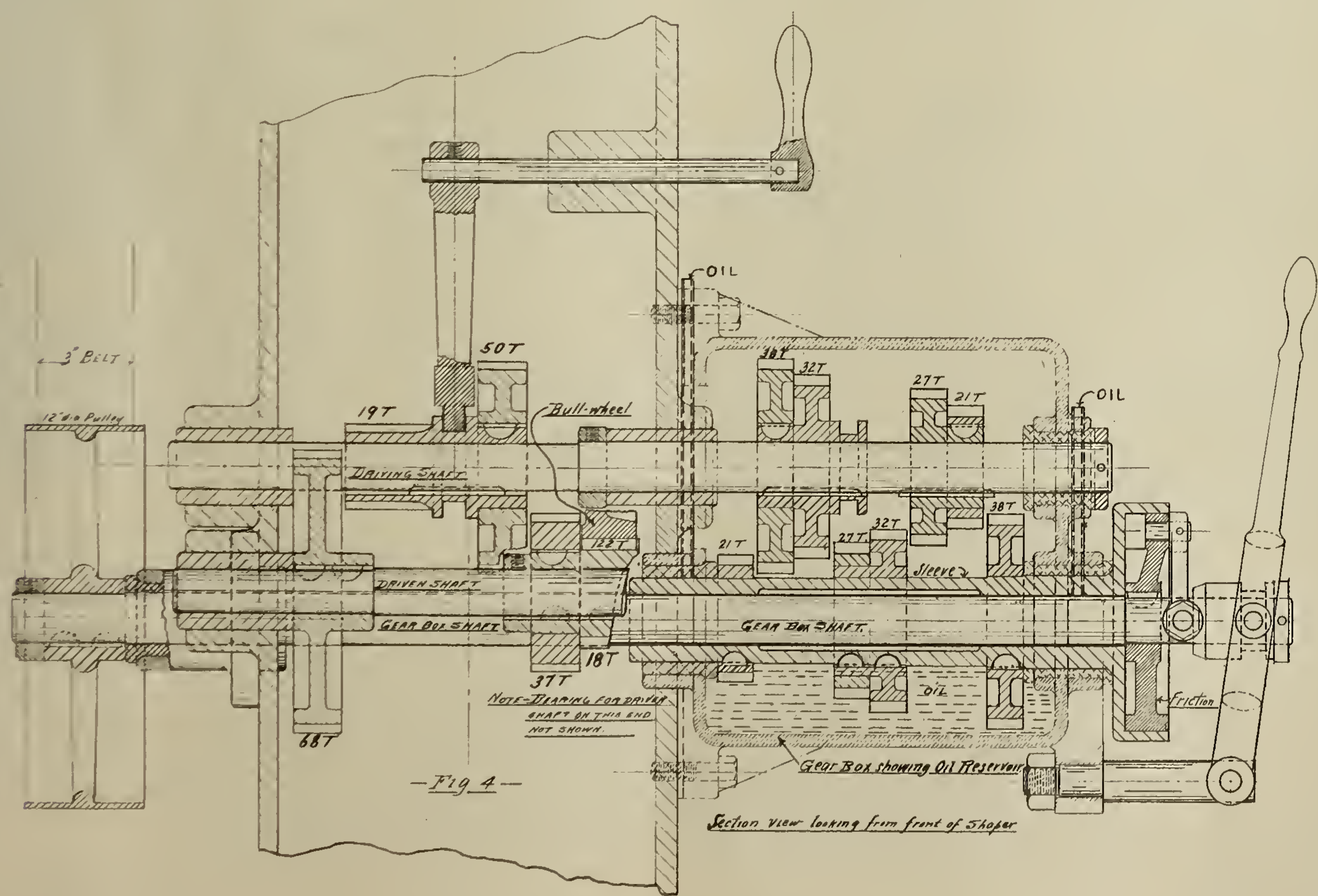


FIGURE 4—IMPROVED GEAR BOX.

the speed desired, and in all cases the load being all off, absolutely no shock occurs, although the power is very much greater than with the cone drive. When using a constant speed motor changes can be made without stopping same; or shaper pulley can be belted direct from line shaft so as to make it run 315 r. p. m., which gives cutting strokes as follows: 7.2, 10.96, 15.4, 23.5, 34.8, 53.1, 74.7, 114. An index plate in plain view aids in choosing the proper speeds.

The gear box proper is a press fit into the column, besides being firmly bolted to same. All parts are easily accessible for inspection without taking box from column. Gear box is fitted to all sizes and no special column is required. As in the regular machine, the in and out positions of the back gears are made by a straight push or pull as clearly shown in drawing. The oiling facilities are perfect; large brass tubes in plain sight provide for this all important feature, carrying oil to the different journals, and the gears are run in oil.

Exhibit of Apprenticeship Systems

A NOVEL feature of the coming Master Mechanics' Convention at Atlantic City will be the exhibit of the Committee on the Apprenticeship System. It is expected that all the railroads operating apprentice schools will send models, drawings and photographs to show in a comprehensive manner the rapid advancement which is being made in this phase of railroad activity.

The following roads have already consented to exhibit: Central Railroad of New Jersey, Grand Trunk, New York Central Lines, Santa Fe.

Personal Mention

Mr. John T. Luscombe has been appointed division master mechanic of the Toledo & Ohio Central at Bucyrus, O., succeeding John B. Morgan, deceased.

Mr. R. M. Galbraith has resigned as superintendent of machinery of the Kansas City Southern.

Mr. F. R. Cooper, superintendent of motive power of the South Buffalo Railway, has been appointed superintendent of machinery for the Kansas City Southern, with headquarters at Pittsburg, Kan., to succeed Mr. R. M. Galbraith, resigned.

Mr. Hugo Schaefer has been appointed master mechanic of the Panhandle division of the Atchison, Topeka & Santa Fe, to succeed Mr. O. A. Fisher. Mr. Schaefer's headquarters will be at Wellington, Kan.

Mr. J. B. Morgan, master mechanic of the Eastern division of the Toledo & Ohio Central, with headquarters at Bucyrus, O., died recently. Mr. Morgan was 76 years old and has been in the service of the company for 26 years.

Mr. Geo. S. Hunter, master mechanic of the International & Great Northern at Palestine, Tex., has been appointed master mechanic of the Kansas City Southern at Pittsburg, Kan.

Mr. F. B. Edwards has been appointed assistant road foreman of engines for the Pennsylvania Railroad at Oil City, Pa., to succeed Mr. H. R. Brigham, who has been promoted.

Since the first of the year, Mr. C. F. Richardson, formerly general road foreman of equipment of the St. Louis and San Francisco, has been fuel agent of the same road, with headquarters at St. Louis, Mo.

The office of Mr. R. Tawse, superintendent of motive power of the Detroit, Toledo & Ironton, and of the Ann Arbor, has been moved from Jackson, Ohio, to Toledo.

Mr. D. R. MacBain, assistant superintendent of motive power of the Michigan Central, at Detroit, Mich., has been appointed assistant superintendent of motive power of the New York Central & Hudson River, with headquarters at New York City.

Mr. W. J. Spearman has been appointed to the new office of master mechanic, of the Idaho & Washington Northern, with office at Coeur d'Alene, Idaho.

Mr. J. W. Storey has been appointed mechanical engineer of the Central of Georgia, with headquarters at Savannah, Ga. Mr. Storey formerly held the same position with the Cincinnati, New Orleans & Texas Pacific at Ludlow, Ky.

Mr. G. F. Weiseckel, general foreman of the Baltimore & Ohio at Glenwood, Pa., has been appointed master mechanic of the Cumberland division to succeed Mr. A. H. Hodges, resigned. Mr. Weiseckel's headquarters will be at Cumberland, Md.

Mr. A. S. Williamson has been appointed mechanical engineer of the Mexican Central, with headquarters at Aguascalientes, Mex., succeeding Mr. F. J. Lass, who takes the place of Mr. Williamson as mechanical inspector at Aguascalientes.

Mr. John R. Thompson has been appointed mechanical engineer of the Chicago Great Western, with headquarters at Oelwein, Iowa, effective May 1st. Mr. Thompson was formerly mechanical engineer for the Fitzhugh-Luther Company, at Hammond, Ind.

Technical Publications

MANUAL OF RECOMMENDED PRACTICE FOR RAILWAY ENGINEERING AND MAINTENANCE OF WAY. Published under direction of the Committee on Publications by the American Railway Engineering and Maintenance of Way Association, Chicago, Ill. Cloth or half-morocco binding, 291 pages, 6x9 inches, illustrated. Price: cloth, $3.00, and half-morocco, $3.50.

The book contains definitions, specifications and principles of practice adopted by the above mentioned association from its first convention to and including its eighth annual convention in March, 1907. Only such practice as has been finally accepted by the Association is given in the manual.

In this volume is represented the combined efforts of the leading railway engineers toward standardization in all lines covered by the engineering department. This fact gives sufficient reason to say that every railroad engineer should have a copy in his possession.

Each year since the organization of the Association, additional data has been presented by the various committees and this has been put into such shape in this volume that it may be readily referred to by the engineer. A chapter covers the reports of a committee on a single subject, such as roadbed, track, masonry, iron and steel structures, etc. There are in all 16 chapters and the subjects are similar to those outlined elsewhere in this issue under the synopsis for the next annual convention.

The Weathering of Coal. By S. W. Parr and N. D. Hamilton. Bulletin No. 17 of the Engineering Experiment Station of the University of Illinois. Published by the University.

In a bulletin, No. 17, of the engineering experiment station of the University of Illinois, the subject of "The Weathering of Coal" is discussed by S. W. Parr and N. D. Hamilton. The bulletin relates to the weathering of coal and losses in fuel values which accompany storage under various conditions. The information heretofore available concerning the behavior of coal in storage is exceedingly meager. The results of tests, as outlined in this bulletin, add materially to the information available and open a way for a better understanding of matters pertaining to weathering, spontaneous combustion and other difficulties which attend the storage of coal in large masses. Deterioration has been studied with samples maintained in the open air, under cover at varying temperatures, in air-tight containers and in the submerged conditions.

Popular Publication

Judge Three Legs and The Shanghai is a very clever book just published by the Iron Trail, a monthly magazine at Minneapolis, Minn. The author of the book is Mr. Ed. E. Shuasgreen, editor of the magazine. While the book is "A Story for the Little Rails," it will doubtless be read with interest by older folks.

Notes of the Month

The receivership of the Westinghouse Machine Co., Pittsburg, Pa., was vacated on March 31. The company now has no floating debt; it has a large number of orders and about $1,000,000 cash on hand.

The Nathan Manufacturing Co., New York, has appointed Clifford Nathan general western manager. Mr. Nathan will make his headquarters at the Chicago office in the Old Colony building and will have charge of the Nathan Manufacturing Co.'s business in the west.

Dressel Railway Lamp Works, 3866 Park avenue, New York, on account of greatly increased business throughout the west, has appointed Edward W. Hodgkins as western sales manager, effective May 1. Mr. Hodgkins, who is well known in railway circles, will have offices in the Western Union building, Chicago.

H. S. Moulton, formerly superintendent of the Allison Car Works, Philadelphia, Pa., and more recently connected with the New York office of the Fitz-Hugh, Luther Co., Chicago, is now with the Empire Steel & Equipment Co., New York, the eastern agents for the Hicks Locomotive & Car Works, Chicago.

The Illinois Tie & Timber Co., Chicago, has been incorporated with a capital of $20,000, for the purpose of manufacturing and dealing in timber. The incorporators are Charles M. Putnam, Eugene S. Nelson, Charles E. Holden.

Standard Steel Works, Philadelphia, has shipped 2,648 locomotive tires of special design to the Japanese government. This is the largest single order ever executed by the company.

Harry C. Quest, formerly with the Heath & Milligan Manufacturing Company, has become manager of the railway sales department of John Lucas & Co., with headquarters in Chicago.

A. E. Mitchell, formerly manager of purchases and supplies of the New York, New Haven & Hartford Railroad, has resigned to accept a position with the Wyckoff Pipe & Creosoting Company, Stamford, Conn.

Thomas F. Shannon has resigned as first vice-president of the Maryland Rail Company, Baltimore, Md., and will remove to Columbus, O., where he will represent the company. Mr. Shannon is succeeded as vice-president by John E. Edwards.

Mr. Fred K. Potter, for many years connected with the Capell Fan Engineering Co., has been appointed manager in the Pittsburg district for the Sirocco Engineering Co. Mr. Potter's offices will be in the Keenan building, Pittsburg. It is only recently that the Sirocco fans and blowers have been manufactured in the United States at the new plant of the Sirocco Company at Troy, N. Y.

The McGuire-Cummings Mfg. Co., Chicago, Ill., has received the following orders: Western Glucose Co., ten tank cars of 100,000 lbs. capacity; Sandoval Zinc Co., four tank cars of 100,000 lbs. capacity; Ardmore Traction Co., four double truck electric cars and two 30-ft. open cars; New Orleans Railway, Light & Power Co., 35 single-truck electric cars.

Balanced Chute Dump Car Company, St. Louis, has been incorporated with a capital stock of $500,000 by Arthur T. Morey, Oliver T. Ledford and Frank L. Morey.

Falls hollow staybolt iron, made by the Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, is to be used in the 30 locomotives being built by the American Locomotive Co. for the Paris-Orleans Railroad, France.

A. Johnston, Jr., for two years with the VanDeventer & Rider Co., Chicago, and before that for a number of years in the engineering department of the Chicago & Eastern Illinois, has opened an office as railroad fencing contractor at 152 East Lake street, Chicago.

D. R. Day, secretary of the Northwestern Malleable Iron Co., Milwaukee, Wis., for the past 10 years, has been made manager of the Union Malleable Iron Co., East Moline, Ill. The capacity of this company's plant has recently been doubled. The products include both agricultural and railroad material.

The Bushnell Company, Chicago, has been incorporated with a capital of $2,500, for the purpose of manufacturing and dealing in railway supplies. The incorporators are William J. Candish, J. Clifford McCally, Frank G. Clark.

The Continental Fibre Co., Newark, Del., one of the oldest makers of vulcanized fibre joint insulation, whose output has heretofore been sold through one of the large railroad supply houses, will now deal directly with the railroads, giving them the advantage of more prompt service and cooperation.

Chicago Brake Shoe Company has been incorporated with a capital stock of $5,000 to manufacture and sell the Brown brakeshoe and the Brown steel band back and lug brakeshoe. The officers of the company are: R. L. Brown, president, and E. K. Harris, secretary and treasurer. The company will have offices at 406 Fisher building, Chicago.

The Railroad & Car Material Co., Bessemer building, Pittsburg, Pa., was recently incorporated to deal in wholesale lumber, railroad equipment and supplies, including castings and forgings. The officers are: President, J. W. Scull, formerly purchasing agent of the Pressed Steel Car Co., Pittsburg, Pa.; vice-president, C. W. Cantrell, formerly eastern manager of the Herman H. Hettler Lumber Co., Chicago; and secretary, W. H. Coyle.

General Railway Supply Company, Marquette building, Chicago, will equip 15 coaches and three dining cars being built for the Chicago, Milwaukee & St. Paul with the National trap door and lifting device. This device will also be used on 10 coaches for the New York, Ontario & Western and 25 coaches for the Chicago & Northwestern. H. U. Morton is vice-president and general sales manager of the General Railway Supply Company.

Quincy, Manchester, Sargent Company announces that in order to devote more attention to its metal sawing machines, cranes and hoists and car steps, it has decided to discontinue the manufacture of the line of pneumatic compression riveters acquired when the business of Pedrick & Ayer Company was purchased. The Quincy, Manchester, Sargent Company has disposed of the entire line to the Hanna Engineering Company, Chicago, and states that the latter company will make improvements on it and will be able to furnish repair parts for such riveters as have been sold in the past.

Ralston Car Works has been organized and will build a car plant at Ralston, a new industrial suburb that is being created near Omaha, Neb. The company will have an authorized capital of $500,000, with $150,000 paid up. Construction work on the new plant will be commenced in about two months and it is expected that 200 men will be employed at the beginning of its operation. C. A. Ralston of Ralston & Le Baron, Fisher building, Chicago, is vice-president and general manager of the new enterprise.

Parsons Locomotive Engineering Company, the incorporation of which was reported will introduce the Parsons system of combustion upon locomotives, by which it is claimed smoke and clinkers are eliminated and a great reduction in the quantity of fuel consumed is effected. The offices of the new company are at 730 Old Colony building, Chicago, where Ira C. Hubbell, the president, will make his headquarters. John H. Parsons, inventor and patentee of the system, is vice-president; John E. Neary, treasurer; and Theodore W. Triggs, secretary.

Mr. Samuel H. Harrington, of the Harrington Signal Co., 120 Liberty street, New York, attended the Maintenance of Way convention last month and met scores of old railroad associates and acquaintances. He exhibited his new automatic stop, known as the "Harrington automatic train control and alarm." The device which is located on the top of the locomotive cab is operated by a hanger from the arm of a distant signal. It has been in operation for some nine months on the Erie R. R. at the Bergen tunnel and is reported as giving most satisfactory results.

James H. Baker, formerly president of the Solid Steel Tool & Forge Co., Breckenridge, Pa., has established an office at 316 Fourth avenue, Pittsburg, Pa., as a forging engineer, making specialties of forging development, examination of plants, forging and special machinery, the design of forgings and castings, etc. Mr. Baker has been in the forging business for over 20 years. Last December he resigned from the Solid Steel Tool & Forge Co., which had, before that, absorbed the James H. Baker Manufacturing Co.; the latter has been organized in 1900. Several concerns previously founded by Mr. Baker are now merged in other companies.

It is announced that William H. Donner has been elected vice-president of the Westinghouse Machine Co. in place of E. E. Keller, who retires. The new vice-president will be in direct responsible charge of all activities. The committee on the reorganization of the Westinghouse Electric & Manufacturing Co. has issued a circular to depositors of securities extending the time for the making of such deposits until May 15, 1908. This extension is due in part to the fact that a committee of merchandise creditors and representatives of the company are working on the plan for changes in the reorganization scheme, which changes are expected to make the reorganization more attractive and equitable.

The General Railway Supply Company has acquired a number of new and high grade specialties of exceptional value and recognized merit, a general description of which, together with illustrations, is contained in a neat and attractive catalogue recently issued. Among these specialties are included metallic (steel) sheathing for coaches, the National steel trap door and lifting device, Schroyer friction curtain roller, Garland ventilator, Flexolith composition flooring, National vestibule curtain catches, National standard roofing and Ideal roller center plates.

The Hyatt roller bearing is fully described in a complete and thoroughly illustrated pamphlet, bulletin number 31, issued by the Hyatt Roller Bearing Company. The distinctive feature of the Hyatt Roller Bearing is the roller, which is made from a strip of steel wound into a coil or spring of uniform diameter. The greatest advantage of a roller of this construction lies in its flexibility, enabling it to present at all times a bearing along its entire length, resulting in a uniform distribution of load on the roller itself, as well as the surfaces on which and in which it operates. The roller will adjust itself to all irregularities that may be present, there being no necessity for hardening the various parts of the bearing, any soft steel surface satisfactorily answering all requirements. It essentially acts as an oil reservoir, while the spiral and roller together perform the function of an oil carrier, thereby assuring perfect lubrication of all parts at all times, making it possible to operate the bearing for considerable interval without attention.

Established 1878

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CONTENTS

Promotion

THE recent appointment of a superintendent of motive power, who has been advanced from the office of assistant superintendent of motive power, together with the number of promotions made to fill the vacancies made by his advancement, involves a feature which should offer encouragement to every employe of the machinery department of that road, officers and men alike.

The ideal long held by us with regard to filling positions made vacant through resignation, has been that in all branches of an organization, from that of a small division point to the organization of an entire department, any vacancy should be filled by the man next in line of promotion. By such a system of elevation and promotion a vacancy will cause no disorganization and the only new member of the force to be employed from an outside source will be an apprentice or a machinist.

A letter received in this office outlining the changes brought about by the appointment of this superintendent of motive power, indicates a system of promotion entirely in accord with such an ideal. The list of appointments is headed by the name of the former assistant superintendent of motive power as superintendent of motive power; next is the name of a master mechanic appointed to the office of assistant superintendent of motive power. The vacancy thus made in the roster of master mechanics is filled by the transfer of two master mechanics and the appointment of a former general foreman to one of the positions thus made vacant. The general foreman's office is filled by the appointment of a former gang foreman of promising material selected from the company's principal shop and the last vacancy has been filled by a capable machinist.

An announcement of this kind is worthy of careful consideration on the part of competent officers and intelligent workmen on all roads. The policy represented would seem to indicate due appreciation of worthy effort and a desire to officer the system with timber tried and trained in the service.

A Book on Economical Shop Production

ABOUT four years ago the Santa Fe broke loose from the ranks of traditional railroading and adopted a general plan of shop betterment work that to many was radical if not of a revolutionary nature. That the plans outlined and carried into effect were practical and not visionary has been demonstrated in a manner as evident to the directors and stockholders as to the humblest mechanics.

Articles dealing with various phases of this work have appeared from time to time, setting forth some of its prominent objects. We now have before us a book treating of the subjects of mechanical betterment in a comprehensive manner, which elucidate the elements and general principles not only as applied to the shops and management of the Santa Fe motive power, but as applicable to the practice of any progressive railroad. The plan adopted in the prosecution of this work and the methods described will strike home to every man having an interest in railroad problems. The detail descriptions of practical accomplishments will be of especial interest to railroad men who will, more than others, appreciate the magnitude of the undertaking and the far-sighted aims of the Santa Fe management in putting a pioneer work of this kind into effect. The vice-president in charge of maintenance and operation, is known as a man who has an unusual appreciation of the relative importance of the problems confronting such an officer, and he does not hesitate to strike out into new paths if they enable the journey to be accomplished more effectively.

The betterment method described in this book is a striking example throughout of the working of such a policy. This book is reviewed in the usual column of "Technical Publications" on another page of this issue.

Packing Journal Boxes

WHEN the authorities with jurisdiction over a given division receive advice that the statement of oil used for such a month shows the cost per 1,000 miles to be considerably in excess of the guarantee, or that the oil record of the division compares very unfavorably with that of other divisions, a circular is promptly sent out to "all concerned." However, issuing instructions and sending out queries do not always alleviate the difficulty.

The condition of packing found in many freight car journal boxes bears evidence that some car repairers have a great deal to learn with regard to the proper method of packing these boxes. There are, of course, printed instructions for packing boxes, neatly framed and posted in conspicuous places. But these are not sufficient. What is actually needed is a capable instructor to visit the repair tracks and outside interchange points, to demonstrate to repair men by actual performance, how to apply fresh dope, readjust the old and to discriminate between old dope that is fit for further service and that which should be discarded.

In packing journal boxes, as in many other processes, personal instruction and demonstration are much more productive of results than stereotyped letters and bulletins.

First Aid to the Injured

FORTUNATELY it cannot be said that the number of accidents to life and limb in the average railway shop is large. At the same time, however, accidents do occur even where every precaution against them is believed to have been taken. When a workman is injured the first step should be to secure medical assistance. To provide for the safety and comfort of the injured until the arrival of such assistance is equally important.

In most instances the presence of a calm and forceful character has a quieting effect at the time of an accident, not only in composing the sensibilities of the injured but in directing movements necessary to provide assistance. The presence of such a character, together with prompt action, may sometime save a life and frequently prevent a panic.

Foremen are usually selected because of their ability as leaders and because of their capacity to handle men. It would seem then, that a foreman is apt to prove himself capable in an emergency arising from accident and by virtue of his position more or less authority is vested in him.

If foremen were given instruction in first aid to the injured, they would be able to act promptly and effectively in cases of personal injury, preparing the way for the work of the doctor and saving much unnecessary suffering, at times, possibly, life itself. A man who is trained in this work and proceeds deftly and quickly, exerts a composing influence upon the mind of the injured person, as well as upon the surrounding crowd, which alone is of much value.

It is not essential that the men trained for this work shall be foremen, but it is necessary that they should be forceful characters and natural leaders.

An Interior Track for Storing Mounted Wheels

THE passage of mounted wheels in and out of a shop building causes much discomfort in cold weather, because of the frequent opening of large doors. This discomfort is felt particularly by machine operators and others working near the doors, though the entire shop is chilled more or less and all occupants feel the effects of drafts to some extent.

The comfort of workmen is being realized more and more fully in its effect upon output and where it is not looked upon from a humane standpoint, it is worthy of consideration as a business proposition. For this reason the provision of a storage track of sufficient length to hold a large number of wheels seems well worthy of consideration in preparing plans for the arrangement of a car wheel or car machine shop. By the use of such a track the output of the machines may be temporarily stored within the building until the track has been filled. This will permit the doors being opened at infrequent intervals and will provide against an almost continuous opening.

One railway, for instance, has constructed a car wheel shop as an extension of the building containing the coach repair shop, and tributary to the freight car erecting shop. The car wheel shop has been made of such length as to allow space for a track traversing the entire width of one end of the building. This track is tributary to the wheel presses and during cold weather the doors serving this track are kept closed except when the track has been filled. The wheels are then run out as rapidly as possible, after which the doors are closed promptly.

Scrap wheels are run out of a small door adjacent to the wheel press, causing no inconvenience in any way.

The Apprentice School

IN the May issue of the RAILWAY MASTER MECHANIC it was announced that all railroads operating apprentice schools are expected to send models, drawings, photographs, etc., for an exhiibt to be held at the coming convention of the Master Mechanics' Association, showing the development in this work. The co-operation received by the committee on the apprenticeship system from the railways which have installed apprentice schools, indicates the interest which is being taken in the sane development of a commendable railroad activity. It is believed that this exhibit will receive very favorable attention from railway mechanical officials generally and there can be little doubt that it will serve to stimulate wider action in the inauguration of training schools for apprentices.

The results obtained from the apprentice schools by one of the railway companies in particular, have been very gratifying and encouraging. The attainment of these results is probably due directly to the wisdom exhibited by those responsible for the preparation of the courses of instruction and to the fact that each boy is made to profit by much individual attention. Ordinary methods of instruction have not been followed and it has been necessary to develop a system of training to fit the peculiar need of the apprentice. This system has not been based on the usual courses of instruction followed in the high schools and colleges.

Investigation has shown that discouragement rather than economic necessity leads many a boy to give up his school work. The discouragement is said to be the result of a lack of attention and friendly stimulus at critical moments. There are some disadvantages in the plan of instruction which requires a fairly rigid course for every student without regard to individual differences of temperament or natural inclinations.

Clearly then, the important factor must be the instructor and the power to draw pupils out is that which makes the good instructor. To study individuals, find out their natural ability and then give every possible encouragement toward personal development is the ideal for the successful instructor.

Reviewing the situation briefly, it is evident that the success achieved by one railway system as a result of a course of instruction developed according to the peculiar requirements of the shop apprentice, in which the personal element is uppermost, contrasted with the discouraging features of the large classes common to the usual school course, shows beyond a question of doubt that it is impossible to make each apprentice student fit the same mould.

Before the apprentice school system receives further impetus, it should be duly recognized that the usual school system is not applicable and a flexible system of instruction must be instituted, by which each student may receive personal instruction according to his needs and capacity for progress.

Coal

By W. B. Landon, Chemist, Erie Railroad

IF the locomotive could speak it might call our attention to one of the popular food ads "There's a reason," and continue, why any engine should have good coal.

The boiler of the locomotive scored a point ahead of the firebox when the water softener was born and now thousands of tons of carbonate of lime and magnesia and sulphate of lime and magnesia which at one time went into the locomotive boiler, by the water softener, are taken out.

The dawn of a new era for the firebox is being seen in the study given to the subject of coal, a partial result of such study being the coal specification. But that is not all. The coal is here and must be used, and while everybody would like, for locomotive use, a soft coal of hard texture with a low percentage of ash which does not clinker, yet a large amount of coal contains a high percentage of ash and some times coals containing a small percentage of ash contain constituents that cause clinkers. The high ash coal causes a great deal of trouble by filling up the firebox with ashes and also means a loss of heat units. The ash of the clinkering coal fuses and fills up the air spaces, enclosing some of the carbon and thus a loss and also destroys the grates.

In the laboratory of the Erie Railroad there has been a great many analyses made and some tables gotten out based on the analyses. And from our study it would seem that where a particular coal was not satisfactory a mixture should be used that would give the best results at each point with a low cost. It is sometimes not good to use just one coal alone. A clinkering coal should be mixed with a non-clinkering if this can be done economically and a non-clinkering coal containing a high percentage of ash might be mixed with a coal with a small percentage of ash or there might be a clinkering coal with a small per cent of ash mined along or near the railroad and also a non-clinkering coal with a high percentage of ash along or near the railroad in which case a mixture would give a good coal when neither of the coals alone would make good locomotive fuel. This mixture could vary in percentage either with one coal or the other (within certain limits) until the distance of haul made the price prohibitive, in which case coal of other characteristics might be near enough to be economically used in a mixture: such for instance as anthracite pea, buckwheat and rice coal mixed with bituminous (soft) coal. Following are analyses of coals, also with tables giving cost per ton, haul, heat units in one ton, and the number of heat units that can be purchased for one dollar at various points. Also tables of mixtures of coal. The coals will be designated by numbers.

No. 1. Bituminous Coal.

	A.Mine	B.Mine	C.Mine
Moisture	.60	.27	.40
Ash	5.08	3.98	6.72
Volatile	24.72	20.51	24.46
Fixed carbon	69.60	75.24	68.42
Sulphur	1.43	2.81	1.87
B. T. U. (heat units)—			
Parr Calorimeter	14,687	14,158	14,438
Pounds of water	15.20	14.66	14.95
Color of ash	Grey	Grey	Grey
Ash Analysis.			
Silica	35.64	26.76	38.46
Iron oxide	28.30	24.80	23.70
Alumina oxide	31.54	23.24	35.84
Lime oxide	3.14	9.89	1.76
Magnesia oxide	1.16	Some	.86

No. 2. Bituminous Coal.

	A.Mine	B.Mine	C.Mine
Moisture	.19	.50	.56
Ash	7.96	8.54	12.28
Volatile	29.50	27.90	31.76
Fixed carbon	62.35	63.08	55.40
Sulphur	1.47	3.09	4.13
B. T. U. (heat units)—			
Parr calorimeter	14,218	13,815	13,285
Pounds of water	14.72	14.30	13.75
Color of ash	Grey	Grey	Grey
Ash Analysis.			
Silica	40.38	23.52	34.96
Iron oxide	8.95	36.30	30.10
Alumina oxide	38.33	34.80	31.40
Lime oxide	5.39	3.28	1.72
Magnesium oxide	1.22	Trace	Trace

No. 3. Bituminous Coal.

	A.Mine	B.Mine
Moisture	.25	.36
Ash	12.42	17.40
Volatile	17.89	16.16
Fixed carbon	69.44	66.06
Sulphur	1.40	.75
B. T. U. (heat units)		
Parr Calorimeter	14,133	12,980
Pounds of water	14.63	13.44
Color of ash	Grey	Grey
Ash Analysis.		
Silicia	52.84	46.94
Iron Oxide	3.60	3.10
Alumina Oxide	43.34	46.52
Lime Oxide	Trace	Trace
Magnesium Oxide	Trace	Trace

No. 4 Anthracite Pea Coal.

Have not a complete analysis of this particular coal.

Ash	26.30%
Sulphur	.55%
B. T. U. heat units	11,572

TABLE NO. 1.

Comparative value of fuel for locomotive use on divisions 1 and 2.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 1 Bituminous Coal.				
Station A	$2.322	....	28,856,000	12,427,214
Station B	2.589	89 miles	28,856,000	11,145,616
No. 2 Bituminous Coal.				
Station B	$2.17	390 miles	27,544,000	12,693,088
Station C	1.858	286 miles	27,544,000	14,824,564
No. 3 Bituminous Coal.				
Station B	$2.205	235 miles	27,112,000	12,295,692
Station C	1.893	131 miles	27,112,000	14,322,240
No. 4 Anthracite Pea Coal.				
Station B	$1.70	73 miles	23,144,000	13,614,118
Station A	1.967	162 miles	23,144,000	11,766,141

TABLE NO. 2.

Comparative value of fuel for locomotive use on divisions 3 and 4.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous Coal.				
Station C	$1.858	286 miles	27,544,000	14,824,564
Station D	1.615	205 miles	27,544,000	17,055,108
Station E	1.438	146 miles	27,544,000	19,154,381
Station F	1.195	65 miles	27,544,000	23,049,372
No. 3 Bituminous Coal.				
Station C	$1.893	131 miles	27,112,000	14,322,240
Station D	1.65	50 miles	27,112,000	16,431,515
Station E	1.827	109 miles	27,112,000	14,839,628
Station F	2.07	190 miles	27,112,000	13,097,585

TABLE NO. 3.

Comparative value of fuel for locomotive use on division No. 5.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 4 Anthracite Pea Coal.				
Station G	$1.45	....	23,144,000	15,961,379
Station B	1.70	73 miles	23,144,000	13,614,118
No. 2 Bituminous Coal.				
Station G	$2.251	417 miles	27,544,000	12,236,339
Station B	2.17	390 miles	27,544,000	12,693,088
No. 3 Bituminous Coal.				
Station G	$2.286	262 miles	27,112,000	11,860,018
Station B	2.205	235 miles	27,112,000	12,295,692

TABLE NO. 4.

Comparative value of fuel for locomotive use on Division No. 6.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous Coal.				
Station C.....	$1.858	286 miles	27,544.000	14,824,564
Station H.....	1.978	326 miles	27.544,000	13,925,177
No. 3 Bituminous Coal.				
Station C.....	$1.893	131 miles	27.112,000	14,322,240
Station H.....	2.013	171 miles	27.112,000	13.468,455
No. 4 Anthracite Pea Coal.				
Station C.....	$1.57	40 miles	23,144,000	14,741,401
Station H.....	1.45	....	23.144,000	15,961,379

TABLE NO. 5.

Comparative value of fuel for locomotive use on Division No. 7.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous Coal.				
Station D.....	$1.615	205 miles	27,544,000	17,055,108
Station I......	1.798	266 miles	27,544,000	15,319.244
No. 3 Bituminous Coal.				
Station D.....	$1.65	50 miles	27,112,000	16,431,515
Station I......	1.533	11 miles	27,112,000	17,685.584

TABLE NO. 6.

Comparative value of fuel for locomotive use on Division No. 8.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous Coal.				
Station E.....	$1.438	146 miles	27,544,000	19,154,381
Station J......	1.717	239 miles	27,544,000	16,041,934
No. 3 Bituminous Coal.				
Station E.....	$1.827	109 miles	27,112,000	14,839,628
Station J......	2.106	212 miles	27,112,000	12,864,198

TABLE NO. 7.

Comparative value of fuel for locomotive use on Division No. 9.

	Cost per Ton	Haul	B. T. U. Heat Units Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous Coal.				
Station D.....	$1.615	205 miles	27,544,000	17,055,108
Station K.....	1.897	299 miles	27,544,000	14,519,452
No. 3 Bituminous Coal.				
Station D.....	$1.65	50 miles	27,112,000	16,431,515
Station K.....	1.932	144 miles	27,112,000	14,033,126

TABLE NO. 1 OF MIXTURES.

Mixture of No. 2 Bituminous with Pea, Buckwheat and Rice coal in various percentages.

	Percentage	Cost of Mixture Per Ton
Station B.		
No. 2 Bituminous, alone......		$2.170
No. 2 Bituminous	.60	
Pea	.40	1.98
No. 2 Bituminous	.70	
Buckwheat	.30	1.915
No. 2 Bituminous	.75	
Rice	.25	1.795
Station C.		
No. 2 Bituminous, alone		$1.858
No. 2 Bituminous	.60	
Pea	.40	1.730
No. 2 Bituminous	.70	
Buckwheat	.30	1.656
No. 2 Bituminous	.75	
Rice	.25	1.528

TABLE NO. 2 OF MIXTURES.

Mixture of No. 2 Bituminous with No. 3 Bituminous coal, in various percentages.

	Percentage	Cost of Mixture Per Ton
Station D.		
No. 2 Bituminous, alone		$1.615
No. 3 Bituminous, alone		1.65
No. 2 Bituminous	.50	
No. 3 Bituminous	.50	1.63
Station E.		
No. 2 Bituminous, alone.....		$1.438
No. 3 Bituminous, alone.....		1.827
No. 2 Bituminous	.75	
No. 3 Bituminous	.25	1.535
Station F.		
No. 2 Bituminous, alone.....		$1.195
No. 3 Bituminous, alone.....		2.07

No. 2 Bituminous should be used at Station F with as low percentage of No. 3 Bituminous as possible to give good results on account of the low cost of No. 2 Bituminous.

TABLE NO. 3 OF MIXTURES.

COAL MIXTURE.

Station B.

	Cost Per Ton	B. T. U. Heat Units For $1.00
No. 2 Bituminous, alone........	$2.17	12,693,088
No. 3 Bituminous, alone........	2.205	12,295,692
No. 1 Bituminous, alone........	2.589	11,145,616

No. 1 Bituminous coal should not be used at Station B on account of its costing more than No. 2 or No. 3 Bituminous coal with less heat units for $1.00.

Percentage of Mixture		Cost per ton	B. T. U. Heat units For $1.00
No. 2 Bituminous coal	.75		
No. 3 Bituminous coal	.25	$2.179	12,593,739

Station C.

Percentage of Mixture		Cost per ton	B. T. U. Heat units For $1.00
No. 2 Bituminous, alone		$1.858	
No. 3 Bituminous, alone		1.893	
No. 2 Bituminous	.75		
No. 3 Bituminous	.25	1.867	14,698,983

The above analyses show that this road is receiving on its eastern divisions, soft coal that clinkers and soft coal that does not clinker, but has a high percentage of ash. The physical characteristics of the coal are quite different. A large percentage of the clinkering soft coal is of soft texture and goes into a powder very easily and causes trouble in the firebox by its fineness. On the other hand the non-clinkering soft coal is of a hard texture and does not break up into fine material readily. In consequence, especially for slow freight engines which are on the road from eight to fourteen hours, it would be better to use a mixture of the clinkering soft coal of soft texture and the non-clinkering high ash soft coal of hard texture, as the engines using a large quantity of coal of either kind would be liable to have trouble. On passenger runs the engine should have a soft coal of hard texture with a small percentage of ash. On fast freight runs a mixture of soft clinkering coal of soft texture and soft coal of hard texture could be used, both coals having a low percentage of ash, either coal could vary in the mixture to that degree that the mixture produced made good fuel and the cost was not excessive. Or a mixture of soft coal of soft texture with a low percentage of ash could be mixed with a soft coal of hard texture with a high percentage of ash, using as much soft coal with a high percentage of ash to bring the ash of the mixture up to about 15.00 if economy would be the result.

At Station A No. 1 bituminous coal gives 661,073 more heat units than No. 4 anthracite pea coal for one dollar at a cost of 35.5 cents more per ton. As one cent will purchase 117,661 heat units from pea coal for 35.5, the difference in cost would add 4,176,966 heat units. Therefore, at Station A No. 4 anthracite pea coal would be considerably cheaper. This, however, should not be used alone on the locomotive, and so to cheapen the fuel at Station A, No. 4 anthracite pea coal should be added from 10 to 30 per cent.

At Station B, No. 2 and No. 3 bituminous coal gives respectively 1,547,472 heat units, and 1,150,076 heat units more than No. 1 bituminous coal for 41.9 and 38.4 cents less per ton. As No. 2 bituminous coal is just as good, No. 1 should not be used at Station B. No. 3 bituminous coal has more heat units, as shown above, but that is the average of a good and poor sample, and more often would run less on account of the high percentage of ash which is so often found in No. 3 coal. Following is the percentage of ash in a few No. 3 coals:

	Ash Percentage
No. 3 Bituminous	25.98
No. 3 Bituminous	23.11
No. 3 Bituminous	21.51
No. 3 Bituminous	23.30
No. 3 Bituminous	26.60
No. 3 Bituminous	25.01
No. 3 Bituminous	23.62
No. 3 Bituminous	25.36

At Station B No. 4 anthracite pea coal gives, for $1.00, 926,947 and 529,551 heat units less than No. 2 bituminous and No. 3 bituminous, but costs 47 cents less per ton than No. 2 and 50½ cents less per ton than No. 3, which at 117,661 heat units, for one cent, would give respectively 5,530,067 and 5,941,881 heat units more, which added to the heat units already obtained would give a considerable excess for the same money, but this coal should not be used alone, and so to cheapen No. 2 bituminous, 10 to 30 per cent of No. 4 pea coal can be added. No. 4 pea coal should not be mixed with No. 3 bituminous coal, as they are both high ash coals.

At Stations C, D, E, F, G, H, I, J and K it is largely a case of mixing No. 2 and No. 3 bituminous, with the exception of Stations G and H, where No. 4 pea coal could be used with No. 2 bituminous in a proportion not to exceed twenty-five per cent to thirty per cent, and No. 3 bituminous could be mixed with No. 2 bituminous up to twenty-five to forty per cent, that is, if the cost per ton remains normal and good results can be obtained in the locomotive.

An engine test was made on engine, pulling slow freight, burning No. 1 bituminous coal, which analyzed as follows:

	Percentage
Moisture	.54
Volatile	23.82
Fixed carbon	68.19
Ash	7.45
Sulphur	1.11

Ash Analysis.

Iron oxide	35.66
Alumina oxide	25.56
Silica	36.64

A great deal of clinker was formed during this test.

New 50-Ton Drop-Bottom Gondola

Chicago, Burlington and Quincy Railroad

THE Chicago, Burlington & Quincy Railroad Company has recently received the balance of the order for 1,000 100,000 lbs. capacity, all steel, drop-bottom gondolas, which were built by the Bettendorf Axle Company, of Davenport, Iowa. The car presents a decidedly handsome appearance, and is worthy of more than passing note, because of some rather peculiar features of construction, and the combination, by the builders, of various methods of present-day design to secure a light yet exceedingly strong type of construction.

The car is an unusually open type, as can be seen by reference to the accompanying engravings, which renders inspection easy. The majority of the different members are of standard rolled sections, easy to obtain and easy to apply. The side and end sheet constructions are radical departures from the generally accepted style of side girders and ends. Instead of the ordinary top chord angles, the side coping is formed by rolling the sheet at the top into a long tube, 2¼ inches inside diameter. The end sheet has a heavier top roll and is additionally stiffened by a heavy corrugation which forms an end construction capable of withstanding the heavy shocks of the coal service.

The efforts of car designers during the past few years have been along two distinct lines; one where the entire load is carried upon deep, fish-bellied center sills, while the side sheets of the cars are not considered as having any carrying value at all; the other theory where the reverse is considered and the center sills, usually light channels, simply act as columns to absorb the buffing strain.

The Bettendorf Axle Company has produced in its design a car which combines the essentials of the two theories, that is, to allow the sides and the center sill to carry their respective loads, yet unifying the carrying power of all the members, which results in a design in which no one part is unduly stressed or requires an abnormal section to gain the necessary strength.

NEW 50-TON DROP-BOTTOM GONDOLA—CHICAGO, BURLINGTON & QUINCY RAILROAD.

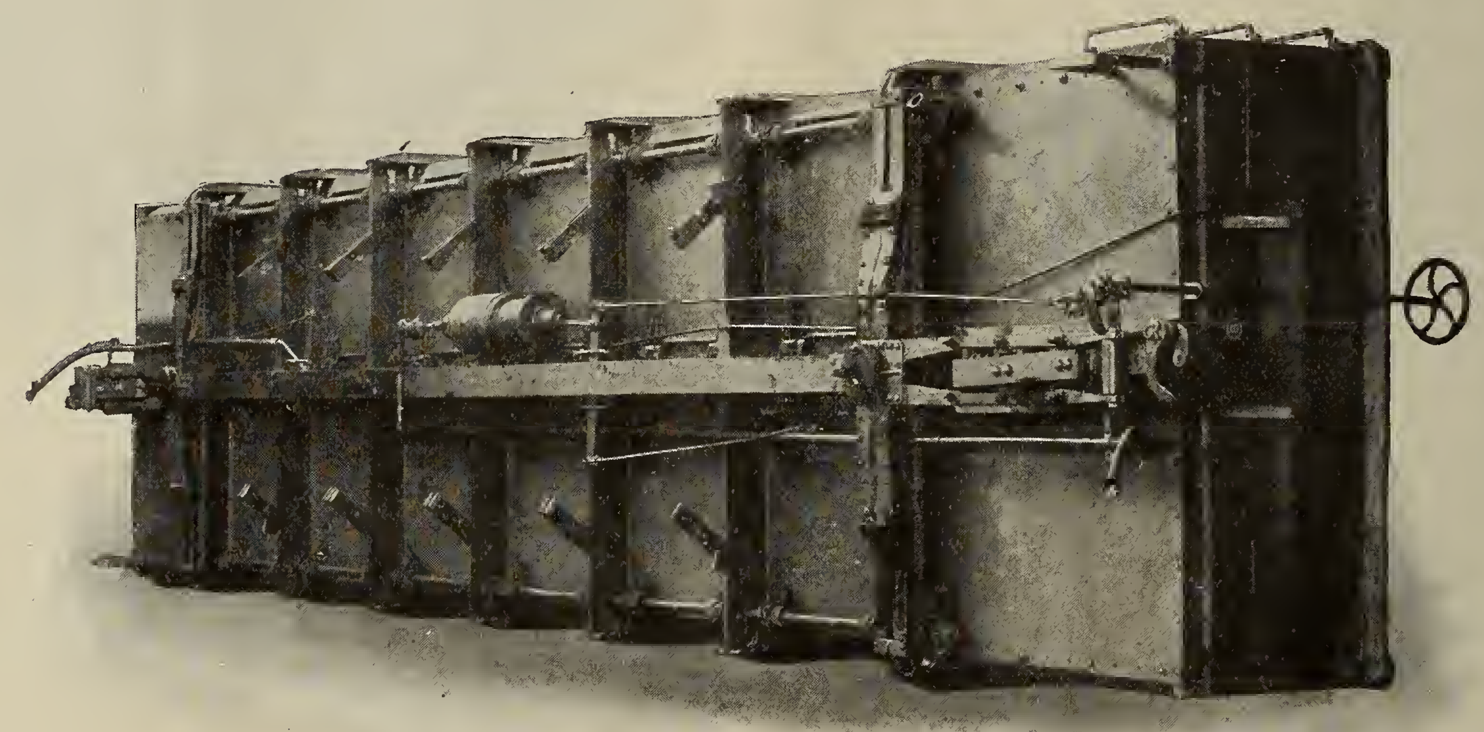
The general dimensions of the car are 40 ft. long inside, 9 ft. 6 in. width inside, 51 in. depth inside. The side sheet is of ¼ in. steel, shaped at the bottom with a wide sloping flange, which does not pocket any material when the car is dumped. Each side is made up of two sheets,

NEW 50-TON DROP-BOTTOM GONDOLA—CHICAGO, BURLINGTON & QUINCY RAILROAD.

spliced at the center by center stake and a heavy splice plate. The sheet is stiffened by seven stakes to a side, made of pressed steel. Each stake is riveted to the end of a cross-sill, for a length of 10 ins. forming a strong resistance against side thrusts, a feature not commonly found. The illustrations clearly show the coping roll and other details which make the entire side present a neat and compact appearance.

The end sheet is made with a deep, heavy, top roll, and flanged at the corners to make a connection for the side sheets. It is further stiffened by a large star-shaped corrugation, 3 in. The sheet is made of ¼ in. steel and is cold shaped during the different operations. The end sill is riveted to the sheet and is made of a 10 in. channel, the top flange of which is bent upward to lay flush against the end sheet, and the web is shaped into a long, straight, corrugation across the car. Poling pockets are also tend from the striking plate to back of the body bolsters where they are riveted to the center sill I beam with heavy rivets. The body bolster is continuous and passes through the center sill ends and is securely riveted to them, both top and bottom. The cover plate runs the entire length of the car. The drop door hinge butts are riveted to cover plate and web of I beam center sill. Permanent floor plates of 5/16 in. steel extend from the body bolster to the end sill, and are riveted to the side sheets with the center sill compression plate hiding the joint of the plates.

Five 10 in. I-beams and two Bettendorf body bolsters constitute the cross-sills. With the usual run of construction, heavy transoms and light floor-beams are used. However, in this design of car, each needle-beam has been made strong enough to transmit its load to the center-sill, and because of the beam being continuous from



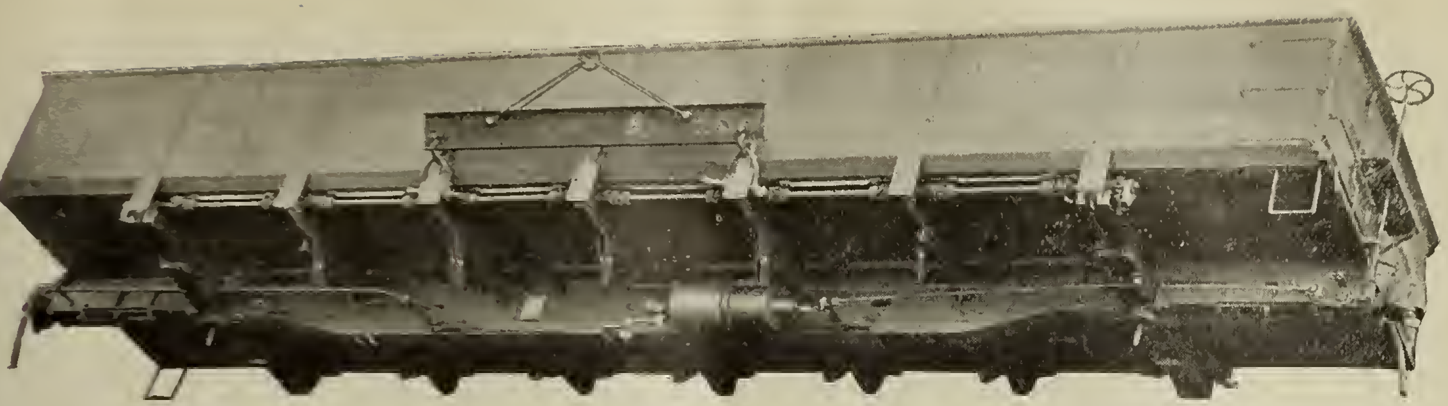
NEW 50-TON DROP-BOTTOM GONDOLA—CHICAGO, BURLINGTON & QUINCY RAILROAD.

pressed into the channel web. The end sill is shaped in one operation with the metal cold, the severity of treatment given it ensuring only the best grade of open hearth steel being used.

The characteristic feature of this car is the single center sill which is designed, should concentrated weights be hauled, to carry the entire load, or when the car is loaded uniformly, to carry only 58 per cent of it. The center sill is made up of three distinct members; a 24 in. 80 lb. I beam; an 18 in. cover plate, and Bettendorf cast steel center sill ends or draft sills. The I beam center sill extends between the bolsters and the web and is cut out at each end and the bottom flange thrown up, reducing the beams' depth at ends from 24 ins. to 15 3/16 ins. The Bettendorf center sill ends are cast steel with draft lugs cast integral and are arranged for Miner tandem draft gear, but they can be designed, however, to accommodate any draft gear desired. The center sill ends extend side to side of the car, it does not depend upon rivets to properly perform its duty. The top flange of the I-beam is set down at the center which allows the top of the needle-beam to come flush with the floor level without making a cut in the top flange of the center sill.

The load is dumped by means of 12 drop-doors, operated by winding chains and a 2¼ in. diameter shaft. The doors are made of 5/16 in. steel, flanged and secured to the center sills by malleable iron hinges. Steel hangers riveted to the needle-beams catch the doors and take away all strain from the winding chains when the load is dumped. The dumping mechanism is of the creeping shaft device and is protected from injury by the bottom flange of side sheets.

The trucks are the Bettendorf standard cast steel side frame 50 ton type. The truck has the journal boxes cast integral with the side frames, and dispenses with the old style arch bars, columns, bolts, etc. The cast steel side



NEW 50-TON DROP-BOTTOM GONDOLA—CHICAGO, BURLINGTON & QUINCY RAILROAD.

frame reduces the weight of trucks per car about 1,000 lbs. and eliminates nearly 200 pieces per set of trucks. The light weight of the car is 37,800 lbs. and trucks alone 14,260 lbs. The light weight runs about 2,000 to 3,000 pounds lighter than the usual car of like dimensions. The openness and simplicity of its construction make inspection a quick and thorough task. The fact that there are but a few hot pressed shapes, facilitates repairs at small division points, and as the various members have not their coating or iron oxide destroyed by reheating, it helps them to resist the corrosive action of coal or moisture. The construction of the center sill gives it power to resist high buffing strains and the equality of design and distribution of stresses enable the car to withstand the heaviest kind of service.

A car of this design will be on exhibit, on the tracks, at the M. C. B. and M. M. Conventions, which will be held at Atlantic City, June 17th to 24th.

Ash Pan Openings

IN the May issue of the Railway Master Mechanic, page 114, there appeared a short article discussing the effect of air openings upon the steaming qualities of a locomotive. The necessity of directing careful attention to openings at the back end of the boiler was mentioned and care in preventing unobstructed admission of air beneath the grate was urged.

This article has induced some little discussion as to the effect of obstructed ash pan openings upon combustion. The comments made are as follows:

Editor, Railway Master Mechanic:

The remarks which appeared in the last number of your magazine relative to air openings at the rear end of the boiler, lead me to call attention to some conclusions which I have reached as to obstructed air openings to ash pans. Ash pan openings are provided for two purposes; principally to admit air into the firebox for combustion and for drawing the ashes that accumulate in the pan. The openings are usually at front and back part of pan, while on some pans the openings are on the side and bottom of pan, and it is very necessary that the pan be kept clean of ashes and not allowed to get filled. This is because when ash pan becomes full of ashes it will not allow the required amount of air that is needed for combustion to pass through the grates and to the fire. It will also cause the grates to be burned, resulting in a poor steaming engine and heavy expense applying new grates. There are only a few elements that perform the most important functions in the act of combustion when burning bituminous or soft coal, and these are oxygen and carbon, together with a mixture of gases and the vapors of volatile liquids which are expelled from the coal when subjected to heat. Carbon is the fuel and oxygen is the supporter of combustion. When we have combustion in a firebox, it is because of the strong natural affinity that oxygen and carbon have for each other, but they cannot unite freely till they reach a high temperature, when they combine and burn, producing intense heat. All the air required for combustion in a firebox is taken from the atmosphere which consists of a mixture of 21 per cent of oxygen and 79 per cent of nitrogen. Nitrogen is a natural gas and gives no aid to combustion, but it passes into the firebox with the oxygen and has to be heated to the same temperature as the other gases that are admitted to the fire box through the opening in the ash pan or hollow stay bolts. If the openings in the ash pan are sufficient they will admit a liberal supply of air so that an abundance of oxygen is had for the burning fuel. The carbon will unite with the oxygen in proportion of 1 atom of carbon to 2 atoms of oxygen producing carbonic acid gas, the combination being accompanied by intense heat. When 1 pound of carbon is united with oxygen to form carbonic acid gas, it will generate 14,500 heat units, or sufficient to raise 85 pounds of water from the tank temperature to a boiling point. If the supply of air is restricted and the oxygen is scarce and the carbon combines only in equal proportion of oxygen producing carbon mon-oxide, it generates only 4,500 heat units, or sufficient to raise 26 pounds of water from tank temperature to a boiling point. Of the two illustrations of combustion taking place in a fire box the same amount of fuel is used; the only difference being that in the one instance not enough oxygen was admitted to the fire with the result that valuable heat producing gases passed away unconsumed and fuel was wasted. While it is important to know that coal and air can combine and burn in different ways, it must be remembered that there is a great difference in the amount of heat produced. When the supply of air to the fire is sufficient to burn the coal perfectly there will be 3 times more heat obtained from the same amount of coal than we could obtain if the supply of air for a fire mixture is restricted and the combustion imperfect. A fireman may endeavor to keep a thin bed of fire and the grates free of ashes for the free access of air through the fire, yet his efforts to obtain perfect combustion will be unsuccessful if the ash pan does not have openings sufficient to permit the necessary amount of air to the fire box. To burn soft coal economically there should be means provided for regulating the supply of air above and below the fire and the same should be under the control of the fireman. Dampers should be so constructed that the supply of air needed for the fire could be regulated to the needs of the fire. On many of the engines netting dampers are used at both ends of the ash pan and the meshes will, after being used for some time, become coated over with dirt so that air cannot pass through them. Ash pans are sometimes rather shallow and if ashes are allowed to accumulate in the ash pan, it will have the same effect as closed meshes in wire dampers. Engineers and firemen should keep close watch of ash pan while in charge of an engine and keep it clean and should inspect dampers before leaving terminal to know that they are in good working order so that a good supply of air needed for the fire can be had at all times while making trip over the division.

Yours truly,

A. G.

Editor, Railway Master Mechanic:

I have noticed your article about obstructed ash pan openings and would like to say a word or two on the subject. I understand that the ash pan opening proper is only the damper or the screen that covers the hole formerly covered by a damper. We have had some engines and I have run some that just had the screen there and the engines would not steam properly if ashes or cinders were in the pan. As we all know, it is well enough to speak about the ash pan being kept clean, but it does not take very long for a few inches of cinders to accumulate and the opening is restricted. Now, if we are going to stop and clean this, we are going to have an engine failure, and, I have seen engines where it was necessary to raise that screen and tie it up in damp and snowy weather. Where the back end of the ash pan is perforated or the screen runs all the way up the back of the pan, I have never heard of any trouble being experienced with what you would call a restricted ash pan opening.

We have quite a good many engines with netting in the sides of the ash pan in front of the back driver box, and some engines with the side of the ash pan perforated in front of the back driver box. I believe that is a bad arrangement for the reason that every time the fireman shakes the grates and any fine ashes drop through the grates when the engine is running, a side wind carries a lot of that dust around into the back driver box and fills it up; it then takes up the lubrication and has a tendency to make those back driver boxes run warm. I have had a great deal of trouble running engines with that style of pan. It is very common for the back cellars to gather the ashes and cinders and a great many times ignites the packing in the cellar. Of course, it is necessary to stop at once, no matter where you are.

I think that we should be careful about the ash pans filling up with ashes. I think we ought to insist on the firemen keeping the pan clean to the extent that the air passage is not restricted. We should impress on their minds that it takes about 250 cubic feet of air to burn one pound of coal, and on that basis, figuring that a shovelful of coal weighs 10 pounds, it would require 2,500 cubic feet to burn one shovelful of coal. By giving them the figures, it excites a curiosity as well as an interest in their minds and by doing so, you can show them that by allowing their ash pans to fill up or the passage in the netting to be stopped up that there is no possible means of getting this air to the fire. I think they should be very careful to rap the dampers with something that will free the substance in the meshes and clean it out.

I would recommend that engines have deep ash pans where practical, and increase the opening in the back end of ash pan by putting in more netting above the back ash pan damper to insure a free circulation of air at all times through the grates.

Yours truly,

Traveling Engineer.

Fast Run on the Pennsylvania Lines

A FAST run between Pittsburg and Chicago was made by a special train of the Pennsylvania Lines on April 26. The train carried a theatrical party and made the distance of 468 miles in 462 minutes, actual time from start to finish, without any deductions for stopping and forced delays. The train, consisting of an engine, two baggage cars and two sleepers, left Pittsburg at 1:16 a. m. and arrived at the Union station in Chicago at 8:58 a. m. Between Fort Wayne and Chicago it overtook the regular "Pennsylvania Special," the 18-hour train between New York and Chicago. Two stops were required for a change of engines, one at Crestline and the other at Fort Wayne. At the latter station the special was stopped by the block signal before it got out of the yards and waited five minutes until the 18-hour train got away. From there into Chicago the special continually ran "on top" of the 18-hour train, and was frequently compelled to stop or slow down until it coud get a clear block. The average speed of the 18-hour train between Pittsburg and Chicago is about 51 miles an hour, including stops.

Flue Testing Apparatus

Illinois Central Railroad.

VARIOUS devices for testing flues of locomotive boilers have been contrived and many boiler shops contain flue-testing equipment designed according to the ideas of local authorities. For simplicity in design and construction, ease in operation and quickness of performance, a flue-testing apparatus designed, built and put in operation at the Burnside shops of the Illinois Central Railroad, is the most serviceable and satisfactory appliance of this kind of which information is at hand. The device was planned by and built under the supervision of Mr. George M. Crownover, assistant master mechanic, with supervision over the Burnside shops.

The general appearance and details of construction of the flue-testing apparatus are illustrated by the accompanying line drawing. The principal features of the apparatus include a water reservoir in which one end of a flue is partially submerged in water; a cylinder on an adjustable base, by which the free end of the flue is held and the flue is clamped securely in position; a hollow piston rod through which compressed air is admitted to the flue, and a frame supporting the reservoir and cylinder.

Defects which are likely to develop in a flue usually appear at the end to which the safe-end is applied and in the weld between the safe-end and the body of the flue. Therefore, it is at this end of the flue that defects are looked for. When testing with air under pressure within the flue, supplemented by a film of soapy water on the exterior surface of the flue, more satisfactory results are obtained with air unmixed with water. If a quantity of water is within the flue, a leak is not so readily detected.

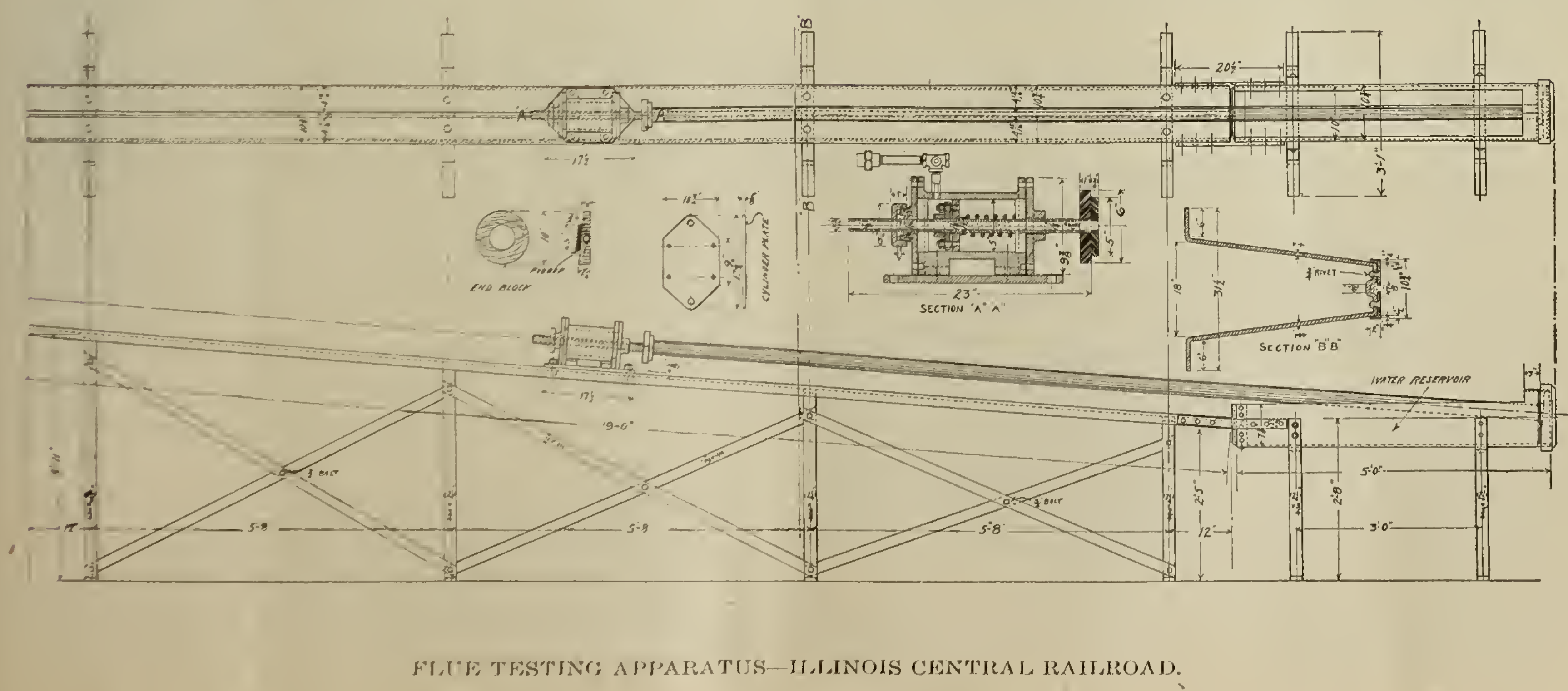
These principles have influenced the arrangement of the flue-testing apparatus. The flue under test is secured in position at a slight angle with the horizontal, bearing against one end of the water reservoir and clearing the other end. Thus a small portion of the flue length comes within the range of the reservoir. The water in the reservoir is kept at such depth that very little water enters the flue when placing it in position, yet it is a simple matter to coat the surface with a film of water by means of a brush. Joints at each end of the flue are made by rubber gaskets.

The water reservoir is made from a section of 10-inch gas pipe, 5 feet long, with a portion of the pipe cut away, and properly capped at each end. At the end of the reservoir at which the flue is placed, a wooden end block is inserted. This block is tapered to conform with the angle at which the flue is supported and a blind gasket 5 inches in diameter by ¾ inch thick is attached to the block, to make a serviceable joint at the end of the flue.

The support for the opposite end of the flue serves to clamp the flue in position quickly and firmly. A clamping block, supplemented by a rubber gasket, is carried on the end of a piston rod operated by an air cylinder. This piston operates against a coil spring and is controlled by a three-way cock. When applied against a flue, pressure behind the piston holds the flue in position and the gasket makes the required joint.

An extension of the piston rod passes through the back cylinder head. This rod, having a ⅞-inch opening through its entire length and being attached through a flexible connection with the air line, admits compressed air to the flue.

The table, or guide, carrying the cylinder is built up of two angle irons, supported upon a light, rigid iron frame, and is of sufficient length to accommodate a 20 foot flue, the longest in service on the Illinois Central. The arrangement of the angle iron guides, together with the offset in the supporting brackets, provides a groove to accommodate the heads of bolts by which the cylinder is clamped in place. By merely loosening the nuts on these bolts the location of the cylinder may be adjusted to suit the length of any set of flues to be tested



FLUE TESTING APPARATUS—ILLINOIS CENTRAL RAILROAD.

Tools and Supplies Furnished Locomotives and Train Crews

BY A. T. SEXTON.

ECONOMY in the use of tools and supplies entrusted to locomotive and train crews is an important matter confronting railway managements of the present day.

The subject has been very ably presented in the March number of the "Railway Storekeeper" by Mr. E. Fish Ensie.

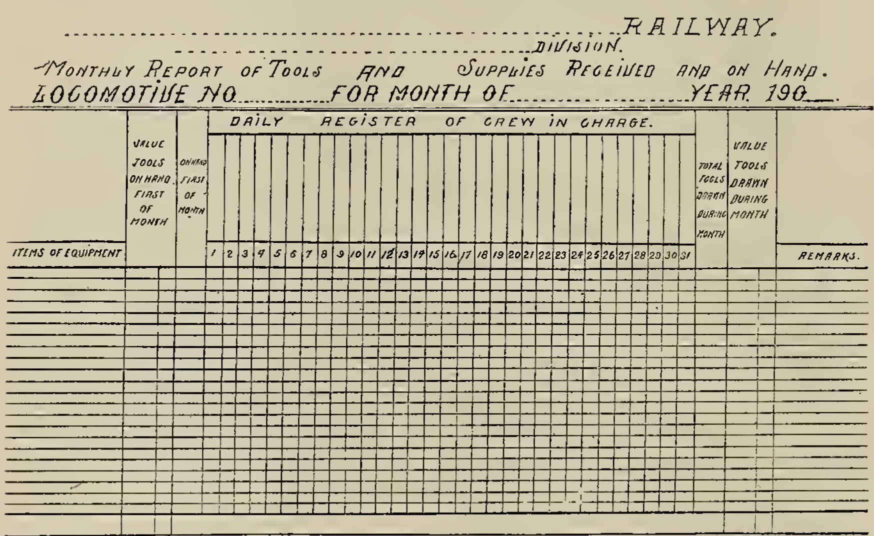
An idea may be formed of these expenditures from the fact that, under the present system generally in use, a small road expends monthly $1,300 for tools and supplies for locomotives and train crews and a large system expends $6,100.

Authority is given engineers and firemen to draw their tools and supplies, except oil and waste, upon an approved order from the roundhouse foreman, where the engine is laid up at the end of a run.

On many roads the management provides a person to draw oil and waste for locomotives.

Train crews draw their tools and supplies upon an approved order by the train master of the division to which the crew is assigned.

Both departments are provided with printed lists, setting forth the items that constitute an equipment. It is



.................................RAILWAY.

.................................DIVISION.

Monthly Report of Tools and Supplies Received and on Hand.

LOCOMOTIVE NO.......... FOR MONTH OF.................. YEAR 190__

Items of Equipment	Value Tools on Hand First of Month	On Hand First of Month	Daily Register of Crew in Charge. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Total Tools Drawn During Month	Value Tools Drawn During Month	Remarks.

Exhibit A.

AUDIT SHEET FOR LOCOMOTIVE SUPPLIES.

the purpose of the blank to check up the tools and supplies monthly; but this is not carried out, possibly due to the lack of organization.

Locomotives and train crews are expected to have the old tools in their possession repaired, so far as is practical; but in this connection it is admitted that the average employe uses second-hand material with the utmost reluctance and will resort to considerable maneuvering to obtain new supplies. It is in this particular regard that a very decided leak exists, often bordering on extravagance.

Ample provision is made for locking up tools and supplies upon engines standing in roundhouses, supplies in cabooses in transit or at terminals; and train boxes or lockers with locks are provided for crews in passenger service.

Notwithstanding these precautions on the part of the management, those engaged in train service regard tools and supplies in a large measure as common property, appropriating whatever may best suit their convenience from one equipment to another, or from supplies in transit. This tends to mar the efficiency of the train service, as some crews are over-provided with supplies, while others are markedly deficient.

Numerous instances arise where scrap brasses and defective air-hose are left on the right of way after applying new ones; also tools, frogs and switch ropes are often left after being used.

To obviate these conditions and care for the necessary requirements with efficiency and judicious economy, I would suggest that the practice of locomotive and train crews drawing tools and supplies, be entirely abolished; that a responsible person of intelligence and good judgment be stationed at all large terminals, for each department, clothed with authority to check up the locomotive and caboose equipments with the audit sheets, hereinafter described, after each round trip—switch engines each day during the noon hour—supplying and properly charging any articles that may be deficient. At the smaller points this duty could be performed by the car, roundhouse foreman, or any other person whose duties would admit of it. At the large terminals, the person entrusted with these duties would carry a petty stock of emergency supplies. An emergency slip should be provided for supplies drawn en route and a record sent the checker in charge of the supplies at the home of the engine.

In this connection a printed list of the items, constituting an equipment and approved by the management, should be provided in duplicate for each locomotive, caboose and passenger train box or locker, the duplicate list to be held by the person having supervision over the checking and issuing of supplies for the department in question.

The audit sheets would provide columns for:

1.—The items constituting an equipment.

2.—Tools on hand the first of the month, and the value of same.

3.—Tools drawn during the month, showing day and date.

4.—Total of tools drawn during the month, and the value of same.

5.—A daily register of the crew in charge.

Audit sheets marked Exhibit "A" and "B."

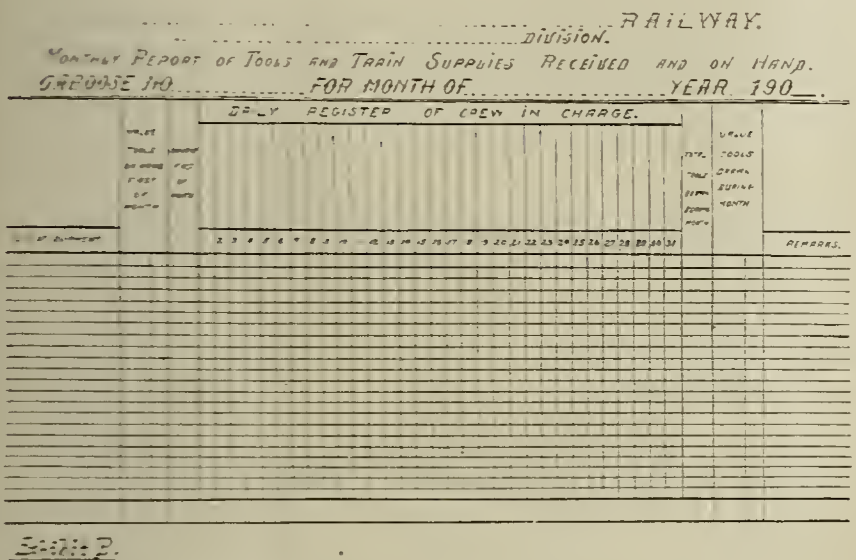
Engines and cabooses assigned to work train or construction service would expect to have their tools and supplies checked up as often as they return from the con-

*Papers presented at the May, 1908 meeting of the Railway Storekeepers' Association.

struction work to any of the terminals provided for this checking.

Under this plan fifteen minutes or less would be required to check the supplies of an engine, ten minutes for a caboose.

I maintain by instituting a system of this description a marked saving can be had over and above the additional cost of checking and furnishing the tools and supplies.



AUDIT SHEET FOR CABOOSE SUPPLIES.

Delays in the departure of trains incident to crews drawing equipment at the last moment would be eliminated.

Tools admitting of repair would receive prompt attention and a high standard of efficiency in the train service would be attained at a minimum expense.

Employes would enter upon their duties with greater assurance, knowing they were in possession of the necessary tools and supplies in good order, thereby diminishing wrecks and protecting life and property.

The audit sheet in this compact form would afford valuable information for the management at all times, open the way for commendation to the frugal locomotive and train crews, and bring into the lime-light those not acquainted with the definition of economy.

For illustration, let us apply the foregoing suggestion to a terminal where three important divisions and eighty engines center, and thirty-five road, fifteen switch engines and thirty cabooses are handled daily. The cost for tools and supplies for locomotive crews is $575.00 per month, which includes the service of a boy at $15.00 per month to deliver oil and waste to the engines.

I believe an extra man, as I suggest, with the aid of the oil boy, could care for this terminal at an increased expense of say 10 per cent, and that a net saving of at least 25 per cent would result.

Equally satisfactory results could be brought about by handling the train equipment in the same manner.

Considering the best interests of all concerned and the disadvantages resulting from present methods, I am earnestly of the opinion that were the plan which I suggest adopted and executed, conditions would materially improve, opening an avenue whereby economy incident to the use of tools and supplies for locomotives and train crews would become a fixture.

BY C. L. WARNER.

The expense of railroads incident to tools and supplies furnished for use on locomotives and to train crews, has always been a considerable factor in operating expenses. Numerous methods and accountings have been devised for properly checking and curtailing this expense, resulting beneficially, but seldom entirely satisfactory.

The greatest difficulty to overcome in the effort to effect proper use and care of tools and supplies we find is, primarily, lack of knowledge of the value of the materials upon the part of the employe in whose hands the materials are placed, with the consequent carelessness in their use and protection, and the difficulty of definitely locating responsibility for waste.

Our locomotive performance reports show an average cost per ton mile for locomotive tools and supplies, our cost statement of train supplies, and other valuable data in connection with these important items of expense; and yet the results obtained are not what they would be if the employe were personally responsible for loss of tools entrusted to his care. There is occasionally an excuse for loss of an engine rake, ash hoe or scoop shovel while the engine is in service, but with sufficient thought and care this should not often happen.

The most simple, inexpensive and effective plan or system that has come under my observation for checking tools and supplies issued from stock, and the caring thereof is herewith set forth:

First: A suitable building should be furnished at terminals, properly fitted with shelving, for caring of engineers' tool boxes, hooks placed in the ceiling and side walls for hanging thereon lanterns and scoop shovels. The oil house could be arranged and readily adapted for this purpose, provided it is spacious.

Second: Each individual engineer should be provided with a tool box, his name printed thereon, made preferably of No. 24 galvanized iron, outside dimensions of box 19⅞ inches by 5⅛ inches, top to be in one piece, bottom in one piece, double seamed with the edges turned to sides, side made in one piece with edges turned, double seam, No. 8 wire used on wired edge of box, all other wired edges made of No. 10 wire, four 5-lb. rivets in handle, all other rivets to be 3-lb.

In this box can be placed the following tools required on a locomotive: 1 cold chisel, 1 set chisel, 1 clamp for valve rods, 1 packing hook, 1 hard hammer, 1 soft hammer, 1 packing iron, 2 torches, 1 12-inch screw wrench, 1 15-inch screw wrench, 2 wrenches for grease plugs, 2 lubricator glasses and gaskets, 1 grease canister containing grease, 1 oil spanner wrench, 3 red fusees, 3 green fusees, 12 torpedoes and assortment of Cotter keys.

Third: Upon arrival of engine at terminal the tool box and loose tools about the engine, such as jacks, brooms and lanterns should be removed and taken to the storage building for necessary check and ascertaining if the full equipment required is intact. The first important feature for a systematic check on engine supplies is to see that the engineer is fully equipped with necessary tools and supplies as prescribed by the rules of the operating department, a complete individual record made, showing the date supplied, so that ready reference may be obtained at any time. This individual record should show, at all times, all tools and supplies excepting oils, waste and fuel furnished the engineman, the date supplied, why necessary, whether account loss, breakage or worn out. If on account of the latter two named causes, the worn out or broken tool must be returned in exchange and the records show accordingly. If the tool is lost the tool checker must make prompt report through the channel desired to reach the official under whose supervision the engineman comes, so that proper discipline can be exercised. The tool checker should be advised through the proper channel the action taken in the premises to enable him to make record. In addition to keeping this individual record, a monthly report should be made to all the officials concerned, showing the name of the person receiving any tools during the current month, the date supplied, the value and why necessary, and whether or not the old tool was returned in exchange. Such reports, issued monthly, should assist much in bringing about the maximum saving in this item of operating expense. Make this tool and supply question a personal affair between the company and employe.

By these reports and records, the general manager, superintendent of motive power, or any other official can readily determine who the trustworthy, economical enginemen are and who are careless, indifferent and extravagant. Necessary steps can then be taken to correct the trouble.

Fourth: One of the most important necessities in having a systematic check on engine tools and supplies is a competent, determined, thoroughly reliable tool checker. Such a man should be well paid, and have full authority in order to bring about economical results. A person qualified, looking after this item of expense, will fully reimburse the railroad by the saving he will be enabled to attain. These tool checkers should be furnished with the necessary assistance for removing the tools and supplies from the engine upon arrival at termnial and the return of same to the engineman when he is ready for the next trip over the division. The duties of the tool checker should be to check the tools after they are brought to the storage building, see that they are properly placed in storage and that the full equipment be returned to the engineman when he is ready for the next trip—tool checkers to personally keep the individual record.

I do not believe it advisable to offer premiums to employes for economical use of tools and supplies. The fact of his being an employe should be sufficient surety for the safeguarding of the company's property.

The tools and supplies used on rear end of train by conductor and the trainmen should come under the supervision of the conductor, issued from stock in his name upon duly approved orders, a complete record to be kept by the tool checker similar to the engineman's and reports furnished, the conductor to be held responsible in the same manner as engineman, the caboose car to be used by him for storage thereof and safe keeping. The conductor usually has a regular caboose car assigned to him. If, for any reason, the car in his charge should be transferred to another division or assigned to another conductor, he should readily obtain from his successor a receipt in duplicate on appropriate blank form for all tools and supplies turned over, the duplicate receipt to be mailed to tool checker for record and file. Should the car go to shops for repairs, it should be billed to tool checker, keys belonging to car accompanying billing, the usual blank form filled out by conductor showing tools and supplies in the car which must be checked and receipted for by the tool checker, whose duty it will be to remove all articles, place them in storage until such time as the car is returned for service, then replace the tools and supplies thereon, getting necessary receipt from the conductor for same.

________________ RAILWAY.

________________ DIVISION.

Report of Tools and Supplies drawn enroute at .... Station account of

(Here state reasons for drawing these Tools and Supplies) ________________

____

Engine No. ______
Caboose No. ______
Pass Box or Locker ______

Items of Equipment	Quantity	Value		Remarks

REPORT OF TOOLS AND SUPPLIES DRAWN.

The marker lamps and what few supplies are used on the rear end of passenger trains, or by the conductor and brakeman, should be issued in the name of the conductor and record kept thereof and be held responsible for their safe keeping. These supplies can readily be stored in a small tool box to be furnished the conductor and which can be stored in the baggage car at the end of each trip, the box to bear his name and to be kept under lock and key.

The economical uses of oils, greases, waste and fuel used in train service can readily be checked, reducing this expense to the minimum by having proper schedules in effect, showing allowances of these supplies for the different runs, keeping an individual record of what is furnished each employe, thereby ascertaining and correcting any extravagance.

In conjunction with this system of checking supplies issued with a view of having an accurate and honest record made, it is very necessary that your oil house man be efficient and trustworthy.

To summarize: First, Have a thoroughly organized and efficient corps of reliable tool checkers and oil house men.

Second: Inaugurate systematic schedules, records and reports and follow them up continually, locating careless employes.

Third: Insist upon having each engineman or conductor keep a full complement of tools as prescribed by the rules of the company, holding them responsible for neglect to do so at any time.

The procedure outlined above, if adopted, should result advantageously and bring about the economical uses of tools and supplies.

BY C. B. FOSTER.

I fully realize that the subject assigned to me this year, by our worthy Executive Committee, is a very important one, and one capable of being handled in many different manners.

To my notion, there are no operating expense accounts in railroading that leave the way open for more extravagance than do those which include the "Tools and Supplies Furnished Locomotives and Train Crews."

There are many reasons for this existing fact. Among them and most prominent are two which I consider the main ones, namely: the continual changing about in the make-up of our various train crews and the absolute indifference displayed by a large percentage of the trainmen and enginemen in caring for company property placed in their possession.

It is also quite often the case that those issuing requisitions for locomotive and train supplies are careless in handling them too prone to allow the men everything called for, in order to pass the matter quickly and avoid the trouble of going into detail as regards the proper absolute requirements.

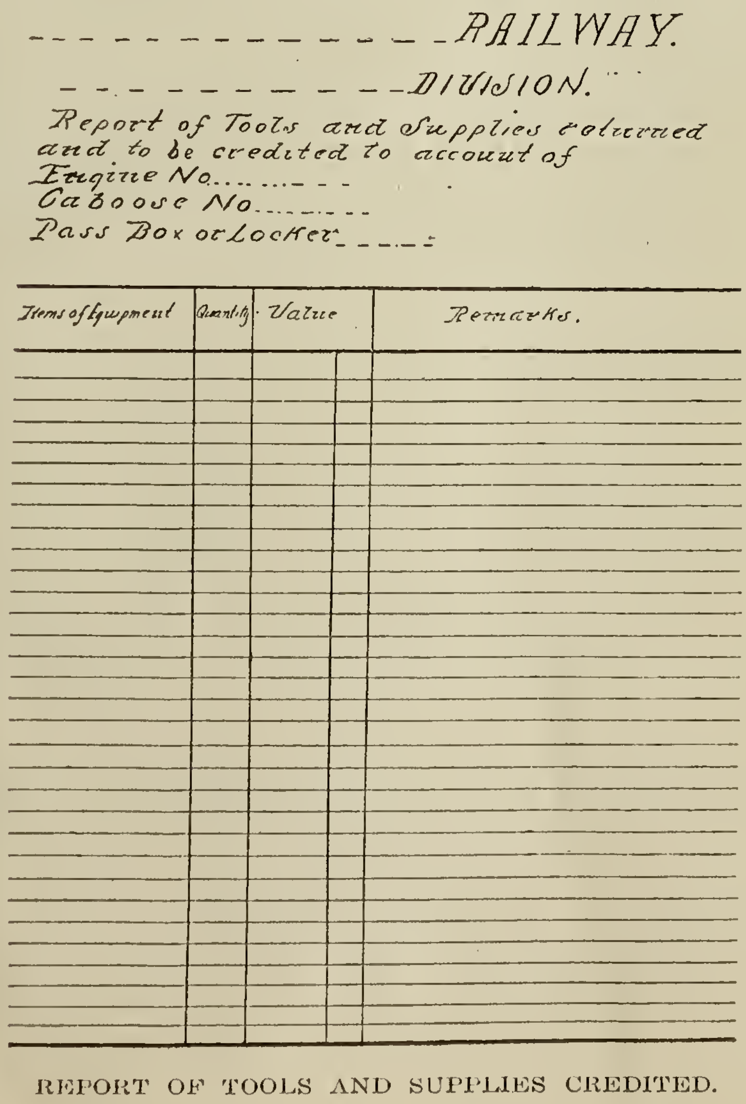
To successfully reduce the amount of tools and supplies thus furnished, I would suggest the following as a general plan of operation which I have made up from observation and practice after ten years spent with the "Comfortable Route."

It is conceded by the members of this association, that I am a crank upon the subject of "co-operation" and possibly other things. Co-operation is a hobby of mine and because of the fact that last year, I put a bunch of "co-operation" into my small paper, in which I spoke of Pete Maher as being a powerful aid to our Store Department in this respect; Brother Murphy poked fun at our jolly and rotund Superintendent of Motive Power by stating that he knew him well and that he was so big that he had grown to be the whole thing on the Clover Leaf. He is a much bigger man now and is still co-operating.

I regard co-operation with the storekeeper, upon the part of the Mechanical and Transportation Departments, as the most essential element looking toward a reduction in this matter of tools and supplies. With the aid of the officials in these departments we may start a saving in the requisition which is issued under their direction. Requisitions should be issued by one person only, representing each department; and before being issued, the reason for same should be gone over in detail with the conductor or engineer applying. Upon our line, the roundhouse foreman issues all requisitions for locomotive supplies and the trainmaster for train supplies.

In the Transportation Department, a complete record caboose with the articles as furnished, under the proper should be kept of all requisitions so issued, charging each date. This is a valuable reference when new requests from conductors are received and gives a quick and ever ready comparison in the items used by the various crews.

Each engineer should be furnished a tool box with lock and key in which should be placed his equipment of necessary tools. These should be charged to him and, after receipting for some, he should be made personally responsible for the contents. All lanterns furnished both enginemen and trainmen should also be treated as personal property and a receipt, at a fixed value, should be held against


______________ RAILWAY.
__________ DIVISION.
Report of Tools and Supplies Returned and to be credited to account of
Engine No. ________
Caboose No. ________
Pass Box or Locker ________

Items of Equipment	Quantity	Value		Remarks.

REPORT OF TOOLS AND SUPPLIES CREDITED.

them until returned or accounted for in some other manner. With us, this also applies to switch keys and books of rules.

Strong boxes should be placed on the engines and cabooses in which oil cans, tools and other supplies looked after by firemen and brakemen should be placed. These should be locked at all times, and in the case of a change of crews, each item should be checked out by the old and receipted for by the new crew, under direction of the roundhouse foreman or trainmaster as applicable to engine or caboose.

One supply box should be carried on each passenger train and the brakeman in charge should be held responsible for its contents, while on duty, and should turn it over in proper shape at the end of his run, checking it before leaving.

At certain periods, an inventory should be taken on every caboose under direction of the trainmaster and each engine under direction of the roundhouse foreman. All supplies of an unnecessary or obsolete nature, should be turned over to the store foreman and the crew be cautioned against again overstocking.

When an engine or caboose is brought to the shops for repairs, all tools and supplies should be taken off and placed in the storeroom for safe keeping, or for use as secondhand stock. Upon completion of the shop work, these supplies as needed to be re-issued on proper requisition.

When new supplies and tools, such as shovels, cans, wrenches, brooms, flags, etc., are issued at the storeroom, an old article of the same nature should be returned for each new one given out. This should be an iron-clad rule on every road in the country.

Whenever a can, lamp, or tool becomes out of repair in the service, it should be taken to the store and examined carefully. If it is found that, after repairs are made, it would answer further uses, it should be placed in the shop at once and returned to store stock as promptly as possible.

Upon all roads it is customary to hold stated meetings of trainmen and enginemen for instruction and a general interchange of views. At every meeting of this kind, the subject of ordering and caring for supplies and other property should be brought up and the men be instructed thoroughly in the proper methods of ordering and also be cautioned against the carelessness which is more or less exhibited in matters which, while small apparently to them, are in the aggregate of immense importance to the management.

A storekeeper, himself, can do a vast deal of good in this direction, by getting into close personal touch with the trainmen, by careful examination of all requisitions, by looking into all conditions surrounding the issuing and the uses of such supplies and by taking up promptly with the various heads of other departments, anything which in his judgment will tend toward lessening the output.

In the present day and age we are confronted by co-operation upon all sides. We have co-operative stores, co-operative factories, co-operative mines and co-operative housekeeping. To my notion, co-operative railroading brings an essential element in a saving of material and supplies as well as in the ordering, purchasing and caring for the same.

One of the mottos of our organization should be, "get next to the other officials and to the trainmen generally." We should then stay with them upon all subjects that interest us. Wear a continual happy smile upon our faces and let everyone we come in contact with, know that the company places the same value upon its property as the private individual does upon his own; that it should be cared for in equal measure; that it should be called for only when necessary for the good of the service, and that a man's proper standing is partially dependent upon his interest in what appears to be such minor details in railroading. Small matters make railroads as do the pennies the almighty dollar.

A Resourceful Engineer

ONE very prolific source of annoyance and incidentally correspondence to the average Master Mechanic is having to explain delays due to trifling mishaps which apparently could have been avoided or greatly reduced by the exercise of ordinary ingenuity on the part of the engineer. Of course it frequently happens that a comparatively small break down or failure results in excessive delay on account of difficulty in removing a bolt or absence of necessary material or some similar cause. The fact remains, however, that when the engineer has "his head working" a great many failures are avoided. They are failures only because they fail to materialize.

Probably as good an illustration of the value of ingenuity and resourcefulness at a critical time as it would be possible to find is contained in an experience of Robert Staver, familiarly known as "Old Bob," a veteran engineer of early days on the Union Pacific and other Western roads. Staver, in addition to being a first-class man at the throttle, was an exceptionally fine machinist, and since leaving the road has worked at his trade.

The incident referred to occurred some years ago on a western division, when the habit of wearing ornaments bearing the name of Colt was still in vogue. Staver, in common with other railroad men, was fairly proficient in the use of a "six-shooter" and usually carried one when on his engine.

The road had accepted 25 cars of perishable freight under penalty of forfeiting $100.00 per car if it was not delivered in Salt Lake City at a specified time. Through a run of bad luck, which some times occurs even on the best of railroads, the train arrived nearly two hours late at the last division point out of Salt Lake. Naturally, as the importance of the train was known to all, there was considerable excitement as it would require a phenomenal run on the last division to get the train through on time.

Staver, who had been called to take the train through, had been waiting over an hour when it finally arrived and promptly coupled on and pulled out of town. The engine was in first-class condition and made good time for the first fifty miles. At this point there was a down-grade stretch of about five miles followed by a stiff grade of nearly seven miles, and in order to make any kind of time, it was necessary to run down grade as fast as safety permitted in order to get a run for the hill.

When near the bottom of the hill Staver noticed a bad pound developing in the right main rod and found that the key was loose. On any other part of the division it would not have caused a serious delay to stop, but at this point it would have been impossible to stop without losing at least an hour. Some engineers would have been down and out, but the resourceful Staver merely reached for his six-shooter. Two shots were fired at the proper moments and the key was tight.

The relief, however, was only temporary and the key soon became loose again. Staver had but four cartridges left and realized that he would be in remarkable good fortune to reach the top of the hill. He fired two more shots at the main rod key and then noticing the set screw for the main rod key projecting a trifle beyond the edge of the brass he fired a third shot at the head of the set screw with such accuracy that the set screw tightened and held the key as firmly as though set up with a wrench.

Staver fired his last shot at a rattlesnake which was sunning itself on a prairie-dog mound and finished the trip without further incident, arriving at Salt Lake five minutes ahead of the time limit.

The accuracy of this account was vouched for by a member, in high standing, of the Ananias Club.—Editor.

Engineman Dead in Cab

Another case of a locomotive engineer dead at his throttle with the fireman and train crew unaware of his condition and the train running unchecked, is reported from the Chicago, Milwaukee & St Paul Ry. on Monday, May 25. Albert Gauvins, of Chicago, engineer of the Overland limited train, died suddenly on his run from hemorrhage of the brain. Fireman Nash did not notice anything wrong until the train passed several adverse signals at full speed.

Hugh M. Wilson

THE personality at the head of any business always makes itself felt and known throughout the entire organization. This is especially true in the journalistic field, the personality of the publication reflects the personality of the publisher. Mr. Hugh M. Wilson, who has for a number of years been at the head of the company publishing the Railway Age, has made that publication known far and wide in railway circles.

We are not attempting to give our readers any news in referring to the consolidation of the Railway Age and the Railroad Gazette; but it seems eminently fitting that some mention should be made in the columns of this paper of the retirement (temporary, we hope) of the man who made the Railway Age. Mr. Wilson, for a newspaper man, is of such a retiring and diffident nature that we have found it impossible to persuade him to furnish us with a photograph of himself, of the regulation size and style. We feel sure, however, that his many friends will be interested in the accompanying picture which was taken a few years ago at Saratoga, during the convention of the Railway Master Mechanics' and Master Car Builders' Associations.


HUGH M. WILSON.

Mr. Wilson is represented as resting—how unusual. It certainly is, for the energetic publisher of the convention "Daily" was always at work. And this in large measure has been the secret of the success which Mr. Wilson has made in his journalistic career. We understand that he is now to take a long and well deserved rest. The future of the Age will be in the hands of the publishers of the Railroad Age-Gazette of New York City.

Mr. Wilson, through his publication, has been one of the leaders in journalism in the railway field. The Railway Age did an important and effective work for the American Railway Engineering and Maintenance of Way Association during its organization period and the first days of its history. More than that, it has continued in the way in which it began, and from year to year it has given not only the report of the annual meeting of the association, but in its special issue following the convention it has contributed much of value to current railway literature.

Perhaps the "Daily," which has appeared at the annual conventions of the Master Mechanics' and Master Car Builders' conventions for many years, better reflects the personality of its publisher than any of the other enterprises of the Railway Age. Mr. Wilson did pioneer work in this field and did it well. The seven issues were filled with complete records of the papers and discussions in the convention hall, descriptions of the many exhibits and stories of the always interesting social life of the conventions.

We do not want to be led into writing an obituary—far from it. We wish Mr. Wilson "bon voyage" and hope to welcome him back in good time to our fraternity—the best, biggest and broadest in the country—the fraternity of the railway and railway supply men.

Mikado Type Locomotive

Kentucky and Tennessee Railway

The Baldwin Locomotive Works has recently completed, for the Kentucky & Tennessee Railway, a Mikado type locomotive which possesses a number of interesting features. This engine is intended for comparatively short hauls on a line having grades of 4 per cent, which occur in combination with curves of 20 degrees, and not compensated. In order to enable the locomotive to easily enter sharp curves when running in either direction, the 2-8-2 wheel arrangement is employed. The piston stroke is comparatively short, and by using driving wheels of small diameter a tractive force of 40,900 pounds is developed, while the rigid wheel base is only 11 feet 6 inches.

The leading truck is of the usual swing bolster design, with radius bar, and is equalized with the first and second pairs of driving wheels. The two remaining pairs are equalized with the rear truck, which is of the Rushton type, with inside journals. A half elliptic spring, having arms of unequal lengths, is used in the equalization system, between the rear driving wheels and the back truck.

The main frames are of cast steel, with rear sections of the same material, and double front rails of wrought iron. The splice between the main and rear sections is located back of the rear driving wheels, at which point the frame is supported by the spring previously mentioned. The pedestral binders are lugged and bolted to the pedestals.

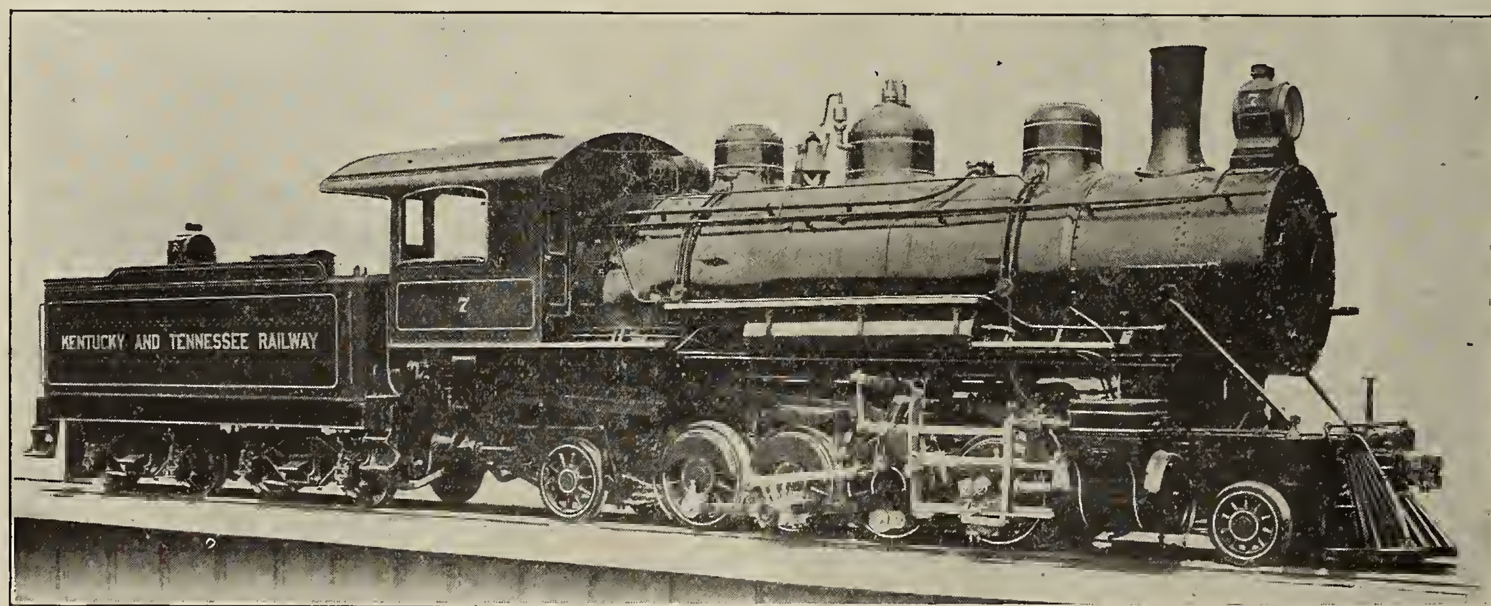
The cylinders are single expansion, equipped with balanced slide valves which are actuated by the Walschaerts valve gear. The link is of the built-up type, and is supported by a cast steel bearing which is bolted to the back of the guide yoke. The valve rod is supported by a bracket which is bolted to the top guide bar. There is sufficient room in this design to place the combining lever in front of the crosshead, and thus use a short valve rod, which is substantially supported, adding to the rigidity of the motion. The reverse shaft is placed in bearings which are bolted to the guide yoke. The radius rod is extended back of the link, and is suspended at the rear end. The valves have an outside lap of 1 inch and an inside lap of 0 inch. They are set with a maximum travel of 5½ inches, and a constant lead of 3/16 inch.

The guide yoke is made in three pieces, the lower extension, on each side, being bolted to the main section. This feature adds to the convenience in handling these parts. The guides are of the "alligator" form and the cross-heads have cast steel bodies and bronze gibs.

The boiler is of the straight top, radial stay type, with wide firebox having a vertical throat sheet and back head. The mud ring is supported on sliding shoes in front and a buckle plate at the rear. The front end of the crown is supported by one L bar, and 330 flexible stay bolts are located in the breakage zone in the throat, sides and back. The boiler barrel is built with three rings, the dome being centrally located. The longitudinal seams are welded at the ends, except on the dome ring, where the seam is placed on the top center line and is welded throughout its length on either side of the dome opening. The seam is reinforced by a heavy inside liner.

The tender is carried on arch bar trucks, which are equipped with cast steel bolsters and chilled cast iron wheels. The tender frame is built of steel channels. A pilot is provided at the rear end.

This locomotive, although not intended for long hauls in main line service, is an interesting example of a design built to operate under difficult conditions. The 2-8-2 wheel arrangement is particularly suitable for roads hav-



MIKADO TYPE LOCOMOTIVE—KENTUCKY AND TENNESSEE RAILWAY.

ing light rails and many curves, while it allows the use of a larger boiler than could be applied to a consolidation type locomotive with the same weight on driving wheels.

The principal dimensions and specifications are as follows:

Type of engine	Mikado
Service	Freight
Fuel	Soft coal
Tractive force	40,900 lbs.
Gauge	4 ft. 8½ ins.
Cylinders	21 ins. x 24 ins.
Valve gear, type	Walschaerts
Valves, kind	Balanced, slide
Valves, steam lap	1 in.
Valve travel-in full gear	5½ ins.

Ratios.

Weight on drivers ÷ tractive force	3.42
Tractive force X diameter drivers ÷ heating surface	649.79
Total heating surface ÷ grate area	64.9
Tube heating surface ÷ firebox heating surface	17.08
Weight on drivers ÷ total heating surface	52.31
Volume of cylinders	9.6 cu. ft.
Total heating surface ÷ volume of cylinders	278.8
Grate area ÷ volume of cylinders	4.3

Boiler.

Type	Straight
Working pressure	200 lbs.
Diameter first ring	72 ins.
Material	Steel
Staying	Radial

Firebox.

Length	90 ins., width 66 ins.
Depth	Front 66½ ins., back 59 ins.
Thickness of sheets	Sides ⅜ in., back ⅜ in.
Thickness of sheets	Crown ⅜ in., tube ½ in.
Water space	Front 4 ins., sides 3½ ins., back 3½ ins.

Tubes.

Material	Iron
Wire gauge	No. 11
Number	315
Diameter	2 ins., length 15 ft. 5 ins.

Heating Surface.

Firebox	148 sq. ft.
Tubes	2,529 sq. ft.
Total	2,677 sq. ft.
Grate area	41.2 sq. ft.

Driving Wheels.

Diameter, over tires	44 ins.
Diameter, wheel centers	38 ins.
Journals, diameter and length	8¼ ins. x 10 ins.

Engine Truck Wheels.

Diameter, front	28 ins.
Journals, front, diameter and lenth	5½ ins. x 10 ins.
Diameter, back	36 ins.
Journals, back, diameter and length	6 ins. x 10 ins.

Wheel Base.

Driving	11 ft. 6 ins.
Total engine	25 ft. 5 ins.
Total engine and tender	51 ft. 10 ins.

Weight.

On driving wheels	140,050 lbs.
On truck, front	16,350 lbs.
On truck, back	24,000 lbs.
Total engine	180,400 lbs.
Total engine and tender	About 280,000 lbs.

Tender.

Wheels, diameter	33 ins.
Journals, diameter and length	5 ins. x 9 ins.
Water, capacity	5,000 gals.
Coal capacity	6 tons

Wetting Coal on Locomotive Tenders

Editor, Railway Master Mechanic:

I have read with much interest, in the May issue of your paper, the article of wetting down coal on locomotive tenders. We have experienced one trouble from wetting down coal that has not been brought out in this article and which I would like to mention, as it may prove of benefit to others in keeping down engine failures. We have had failures in the past, due to the netting in the front end being stopped up, to which we could attribute no other cause except by wetting the coal too much and the fine coal going through the flues with vapor on it and clogging up the netting by adhering to it, and we have found that by not wetting the coal down in the engines which had had the trouble and using the same grade of coal, this trouble was not experienced.

We have tried this a number of times and in each case we have found by using an excessive amount of water, especially if the coal is fine, that we have had trouble with the netting stopping up. In order to overcome this trouble we have made it a practice to spray the coal with water just enough to lay the dust and not wet the coal to any extent, and in this way we have overcome the netting stopping up. We burn Illinois coal, and this trouble may not occur from the use of water with all kinds of coal.

Trusting that this item will be of some interest to those who are interested in this matter, I am,

Yours truly,

C. B. Summers,

R. F. of E., T. St. L. & W. R. R.

The National Treasury

THE first 10 months of the fiscal year closed April 30 with a deficit in the United States Treasury of $51,645,829. Of this deficit, $15,970,678 is due to the excess of expenditures over receipts in the month of April alone; that is, the Government expended in April an average of $500,000 each day more than it took in. It is probable that the deficit for the fiscal year, which will end June 30, will be not less than $75,000,000. It may go as high as $80,000,000. On May 1, last year, there was a surplus in the Treasury amounting to $56,474,886.

Since the beginning of this fiscal period the receipts from customs have been less than in the corresponding 10 months of last year by $34,000,000, and the internal revenue receipts have been $14,000,000 less. In April the customs returns were $7,000,000 less than in the same month of 1907, and the internal revenue receipts $2,600,000 less. On the other hand, the expenditures of the Government in the last 10 months have been $67,000,000 more than in the same months of the fiscal year 1907, in the month just ended the expenditures were nearly $12,000,000 more than in April of last year.—The Iron Age.

Opinions on Grease as a Lubricant

FOR several years the use of grease as a lubricant for some bearings in locomotive service has gained such favor that the question has arisen as to the extent to which its use can be carried still further. The most prolific source of information is among those who actually use and closely supervise the use of grease. For the purpose of drawing out personal opinions a number of road foremen of engines have been requested to express themselves as to how far the use of grease on a locomotive is justified.

With regard to this subject the author of the first reply says: "I do not believe that anyone will question the advantage of using grease in rod cups for lubricating crank pins. Its successful use for that purpose is shown in its general use on the heavy locomotives in all classes of service, which has done away almost entirely with the delays on account of hot crank pins, which were so common while they were lubricated with oil. While grease is used for lubricating crank pins almost everywhere, its use for other purposes is not so well known. It has proven itself as successful when used in cellars of driving boxes in reducing the delays caused by journals heating as on crank pins. From the showing made on the road with which I am connected in freedom from hot driving boxes when grease is used in cellars, I think we are justified in extending the use of it for that purpose as fast as possible. I have not had much experience in using grease in lubricating eccentrics and straps. Have only one engine using it on my division. This engine is in fast passenger service, and is not troubled with hot eccentrics. As the use of grease in rod cups and driving box cellars has not only reduced the delays from hot crank pins and driving boxes, but also reduces the expense of keeping the engines clean, I believe we are justified in using grease not only in rod cups and driving boxes, but also in engine trucks and eccentric straps."

Another correspondent writes: "The use of grease on a locomotive as a lubricant has attracted the attention of nearly all of the mechanical men of the country, and it has been used with varying results. When the bearings of locomotives were made larger and subjected to greater friction and higher speed demanded, it was found that oil cups on main pins and middle connection on side rods were not to be relied upon to keep these bearings cool, and a hard oil, as grease, was tried and found to give very satisfactory results. This has gradually been used on all side rods, and on many engines for eccentric straps, and in driver box cellars, usually giving satisfaction. But it is a question in my mind if we have not gone beyond the economical point in the use of grease for side rods on locomotives. At the present time when an engine goes through the back shop, we find that all side rods and back end of main rods have been equipped with grease cups, and where these cups are not forced onto the rods, they are a source of annoyance on account of the weight of the grease cup plug breaking off the spud that holds cup on the rod. When the grease cup is forged on the rod the plug and jamb nut will be lost off, and it causes a good deal of labor and expense to keep these parts in repair, and now that the engineers have been relieved of the duty of filling the grease cups on their engines, they do not give them the attention they require to keep the jamb nuts tight and avoid loosening the plugs. To save the expense of furnishing a man to fill so many cups and to reduce the amount of grease used, I would recommend that grease should be used only on the main pin and middle connection of ten wheel and consolidation engines, and only on main pin on eight wheel engines, and that instead of using an oil cup where grease cups have been used, that a brass plug with a hole in it be screwed into the rod to permit of oiling the pin, and if there is room in the rod to permit of putting in a small amount of wool waste, this should be done, to hold the oil that would not be required to lubricate the pin when applied. I feel confident that just as good results can be had by running side rods in this way as with the use of grease. By doing this, 50 per cent of time can be saved in filling cups; 50 per cent of the grease can be saved; and 50 per cent of the cost of applying and renewing and maintaining of the grease cups can be saved. I do not think any additional oil would be required as the actual amount of oil necessary to lubricate a side rod is so little, that the present oil allowance will easily take care of them.

"Now as to distinction in the use of grease or oil as to size of engine or character of service. I believe we are justified in the use of grease on main pins, middle connection on ten wheel and consolidated engines, and main pins on eight wheel engines, also on eccentric straps on heavy passenger engines, and in driver box cellars on heavy passenger engines and fast freight engines. When the right kind of driver box compound is applied, there is no trouble from heated journals, and with this class of service it is necessary to have the bearings so protected that no delays will occur from heated journals that would cause an engine failure. It is a well known fact that rod and driver box brasses wear faster with the use of grease than with the use of oil, and for this reason I hesitate to recommend the use of grease on all driver box journals. On the less important runs I would advise the use of oil for the present. If journals become heated, the engine crew has more opportunity to give them attention, thereby lessening the liability of an engine failure. The quality of grease used has a great bearing on the success of lubricating journals properly, and too much care cannot be taken to obtain the right kind of grease, and when driver box cellars are packed, to have the grease formed into cakes to fit the cellar and also the journal."

A third comment is as follows: "Relative to the subject of the use of grease on locomotives, I would say that it is my opinion that we could carry its use with good results further than we have in the past. I consider it the proper means of lubrication of the pins, driving boxes, engine trucks and eccentrics, yet I don't think that there is any necessity of having the grease plugs for rods as large as we have used them. On main and middle connections, we could use a smaller cup and plug and on the forward and back end of the side rod the cup and plug should be about one-quarter the present size. By that means, we could not be annoyed with the common practice of throwing the plugs out or stripping the threads. In many instances an engine runs too many miles without a stop to rely on a few drops of engine oil lubricating the pin. In fact, I have had pins get very hot from this cause. For instance, with our modern engines with five or six thousand gallon tanks in through freight and passenger service, it is very common to run 50 miles without making a stop, also at a high rate of speed. I do not think oiling the pin with engine oil would be safe to run the engine this far with the bushing a snug fit. The cost of lubrication by grease is much cheaper than oil. Another thing that is very detrimental is the fact that the packing in cellars will ignite at a very low temperature. In its burning, it ruins the polish on the journal and an engineer, knowing this, often has to stop, causing an engine failure, for no other purpose than to put out the fire in the cellar. From his past experience, he knows that this mass of oil and waste burning, only increases the temperature of the bearing and, as before stated, injures the polish, sometimes causing a hot bearing for more than that trip. Taking this view of the matter, it is my opinion that we could use grease to better advantage."

Another road foreman says: "The use of grease I believe is all right on any part of the engine where it can be applied, but it is like anything else applied to an engine, unless it receives the attention at the right time, the service will not be satisfactory. The use of grease is cheaper than the use of oil on bearings where it is used and the only disadvantage experienced in grease is that of the plugs and rod cups, there being a great many of them lost. This, I feel, is due possibly to the fact that cups are filled too full or the jamb nut not screwed tight enough against the cup. As far as my experience has been in the use of grease, it had only been used on rods; however have seen it used on a few engines on the eccentrics and in the driver box cellars and the eccentrics, as far as I know, gave very satisfactory results with the use of grease, but not any better results than oil did. Am afraid that the use of grease cups on eccentric straps (they being located under the engine) would not receive the attention from engineers when it would be necessary to avoid trouble, inasmuch as they don't follow up the side rod cups which are convenient to get at, resulting in plugs being lost out of the side rod cups. The grease cups on side rods and back end main rod could be smaller and give good results.

"On engines where grease is used in driver box cellars, I feel that while there have been some poor results obtained, that it was more due to the quality of grease than it was to any other thing. As far as the use of grease on an engine as a whole, I believe that it can be used satisfactorily on any bearing on an engine where it can be applied. If we consider that grease is cheaper to lubricate journals on a locomotive than it would be to use oil it seems that there should not be any distinction in the size of the engine or as to the class of service, but if the grease could be used with good results on a heavy engine on the different bearings, I see no reason why we should not use it on the smaller engines.

"Talking over this subject with some of my friends has led to the argument that a very small cup capable of holding a small amount of wool waste soaked in engine oil, would answer the purpose of properly protecting pins and bearings in the forward and back ends of parallel rods. These cups should be provided with a small hole through the upper plug so that the engineer can apply a few drops of engine oil at the same time that he oils the engine around.

"A number of heavy freight engines now in service on a neighboring division are running the front ends of their main rods without any cups and the engineers claim that ordinary engine oil applied at terminals when engines are oiled around, keeps the front end of main rods in perfect condition without the use of the cup. Where grease has been used on the side rods and the cups have been lost off, I do not know of a case where the engineer was unable to successfully lubricate the pin with oil without a cup. At the same time, however, I do not believe that the fact of the front end of the main rod running successfully without a cup is a sufficient argument to warrant an attempt to run the side rods without cups. I believe that the front end of the main rod will run with less oil than the back end of the side rod. As a general thing, an engine that has made a trip over the division, has about as much oil on the top of the main rod and running along the side of it as is required to lubricate the pin at the front end of the rod and it is a question whether the front end of the main rod really requires as much oil as the front end of the side rod or the back end of the side rod. There is not the friction on the front end of the main rod there is on the side rod, because the pin does not make a complete revolution. Of course, the main rod generally is heavier than the side rod, but it does not have that oscillating motion that will create friction that we have on the side rod."

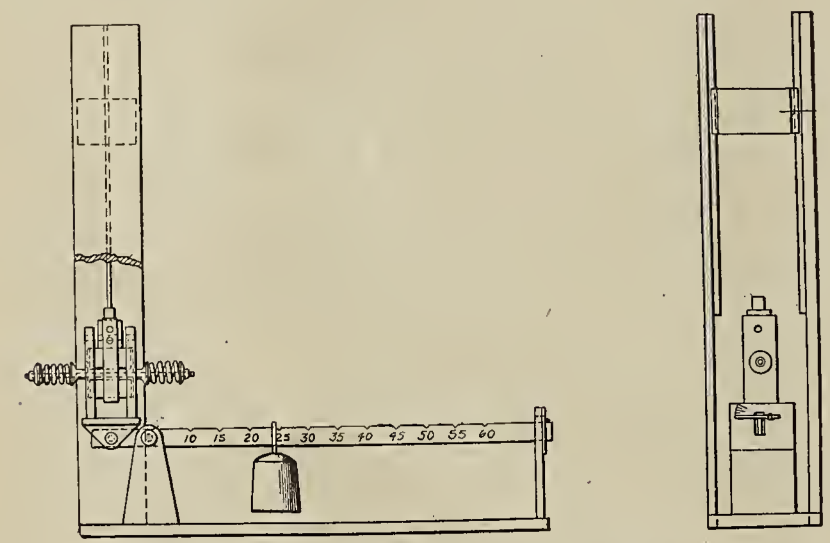
The gold medal offered by the Scientific American for the most meritorious invention in transportation, which has been competed for at the exhibition of the American Museum of Safety Devices, which has been held in New York City during the past month, has been awarded to the Rich Marine Fire Detecting & Extinguishing system, which is an apparatus for detecting fires in the holds of vessels. From a glass case on the bridge pipes, one inch in diameter, run to each hold and coal bunker and, by means of a small exhaust fan, kept constantly running, any smoke which might be formed in a given compartment would emerge from the corresponding pipe in the glass case, and thus warn the officer in charge of the danger of fire. Every fifteen minutes a bell rings, calling attention to the necessity of looking at the pipes.

Novel Drop Test Machine for Draft Gear

A NOVEL device for determining and demonstrating the capacity of a draft gear for absorbing and cushioning shocks has been devised by the Cardwell Manufacturing Company.

The large locomotives of today, together with the long, heavy trains hauled, as well as the severity of present time switching service, especially in gravity yards, imposes upon the draft gear a serious ordeal in protecting cars against the severity of hard service. To be successful in heavy service the draft gear must be capable not only of withstanding heavy shocks, both buffing and pulling, but particularly of so absorbing or cushioning the shock that the car is largely relieved of the effect of the blow. At the same time it must be capable of easing off the effect of the recoil action. Thus the efficiency of a draft gear depends upon its capacity to absorb frequent, heavy blows and to so cushion these blows as to be effective in affording protection to equipment.

To determine the per cent of this efficiency the testing machine has been devised to afford a method of actually measuring the force of a blow delivered through a draft gear and of comparing the effect of the blow transmitted



DROP TEST MACHINE FOR DRAFT GEAR.

through the gear with that of a blow delivered direct and with no cushioning mechanism to absorb it. The principle of the device involves the simple scale beam and poise. The testing machine is illustrated by the accompany engraving reproduced from a blue-print accompanying a report on this machine made by Robert W. Hunt & Company, Chicago. As so far constructed, the machine has been built to a reduced scale only and it has been used to test a ¼ sized model of a draft gear.

The machine is so constructed that the draft gear to be tested is supported on the short end of the beam at a point near the fulcrum. A falling weight properly directed by a pair of guides furnishes the blow. The long end of the arm extends through a bracket which serves to prevent any unnecessary and excessive deflection of the arm. Attached to this bracket is an indicator which measures the deflection.

A one-quarter size model of the Cardwell Friction Draft Gear, equipped with 22 pound capacity springs, was tested in this machine by Robert W. Hunt & Company, and by these tests it is shown that with the poise somewhere between 10 and 15 lbs., with the weight dropped from a height of 9 inches, the force of the blow transmitted through the gear ceased to deflect the beam through the maximum distance of 3/16-in. The gear was made rigid by inserting a pin through a hole in the housing of the gear, and the coupler thus preventing its action. With the gear so blocked and the weight dropped 9 inches, the blow ceased to deflect the beam through the maximum of 3/16-in. when the poise was at about 40 lbs. Another test was made with the gear still blocked solid and a spring having a capacity of 34 pounds, 1¼ ins. high when free and ⅝-in. high when closed, resting on the coupler head of the gear. Under this arrangement the end of the beam ceased to be jarred the maximum distance of 3/16-in. when the poise was at 35 to 40 lbs. The results obtained by these tests would seem to demonstrate that the draft gear tested absorbs at least 65 per cent of the force of the blow.

It will be observed that this testing device differs from the ordinary drop testing machine in several important respects.

The practice has been to place the draft gear to be tested on a solid foundation of stone or concrete, and then drop a heavy weight (usually 1,640 lbs.) on it from varying heights, until the gear becomes in-operative.

The only result of such a test is to determine approximately the strength of the materials from which the draft gear is made. This is very good as far as it goes, but it does not go far enough. It will be conceded that all of the parts which enter into the construction of the gear must be of sufficient strength to withstand the severest shocks delivered in fair service. But much more than simple strength is demanded of the draft gear. Were strength the only thing to be considered, it would be a simple matter to design a gear that would be strong enough to easily withstand the heaviest blows. But manifestly, such a gear would afford little or no protection to the car.

What is required is not only a draft gear that will not break, but a draft gear that will keep the car from breaking.

It seems evident, therefore, that the only true and practical test for determining the efficiency of a draft gear is a test that will measure in real pounds that part of a blow which the gear prevents from reaching the car.

As a means of obtaining such results the principle embodied in the construction and operation of the device described is evidently of much merit. It would be naturally granted that the design of a full size machine would entail the development of some details. Yet, as the draft gear is one of the most important devices in car construction engaging the attention of railroad mechanical men today, it would seem that the M. C. B. Association could with profit consider the construction of a testing machine involving the principle of the machine suggested.

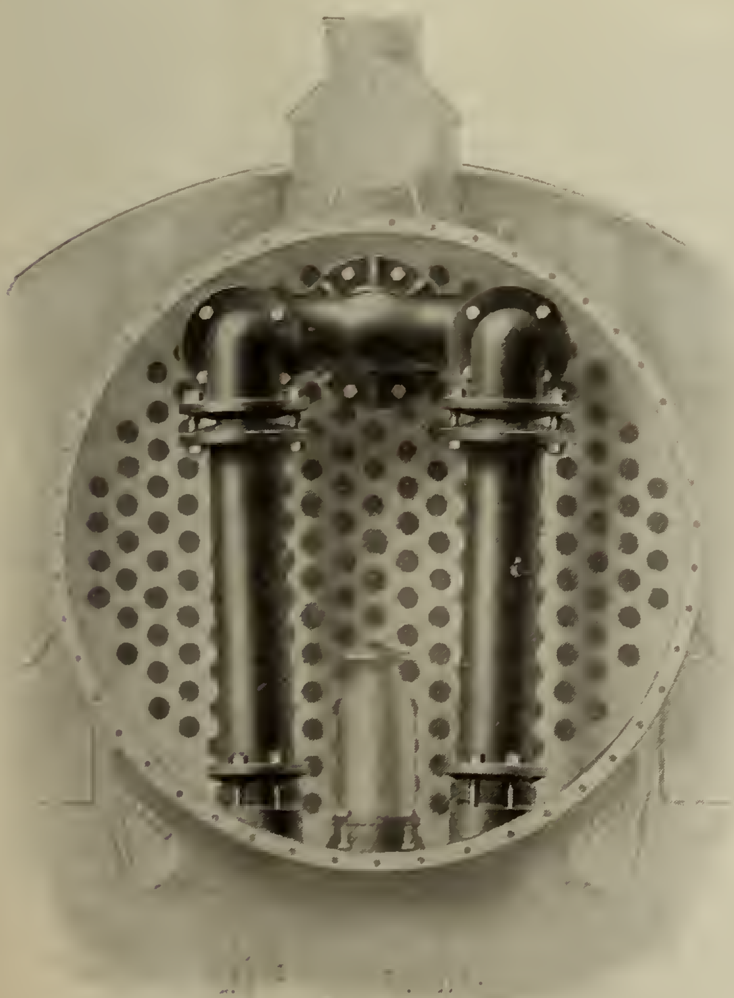
Tests of the various draft gears on a machine of this kind would disclose results that would be of much interest not only to railroad officials but to draft gear men as well.

Universal Front End Steam Pipes for Locomotives

LEAKING joints are not so frequent in big locomotives of recent design as they were in the older locomotives, due to the fact that larger and more numerous bolts are used in the cylinder saddles and in the steam pipe connections. But even in these locomotives scraped and ground joints are used with the attendent evils of expense and occasional leaks; and the multiplicity of patterns and large stock of castings are not reduced.

The "railway supply company" of J. L. Yale & Co. has thoroughly tested and finally put on the market a design of front end steam pipe which is claimed to do away with brass rings, scraped and ground joints, rights and lefts in the side pipes and with the multiplicity of patterns and large casting stock, and with leaking joints.

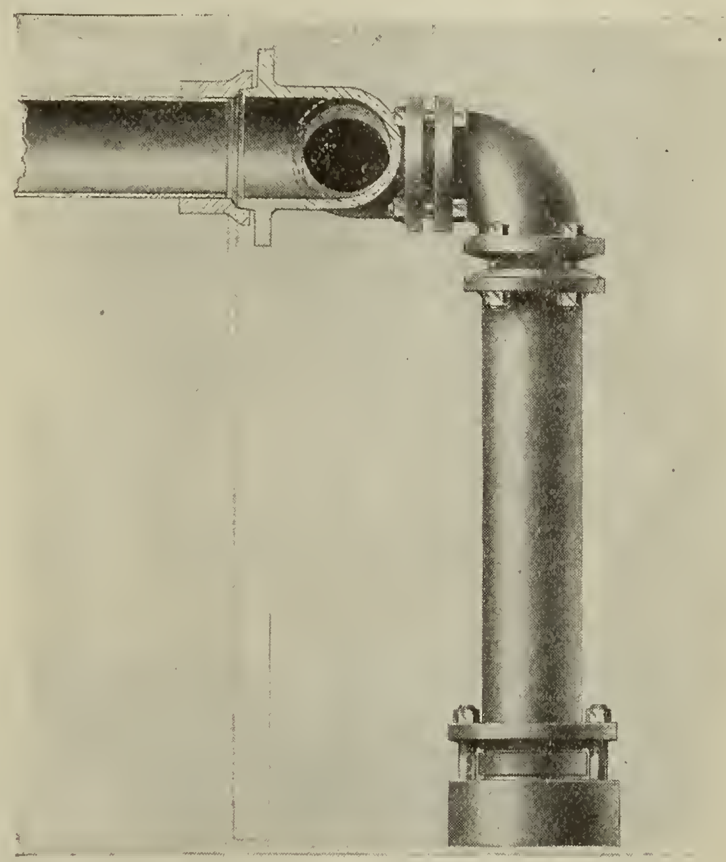
The design and arrangement of the steam pipes manufactured and sold by Yale & Co. are illustrated. The joints of the pipes are neither ground nor scraped, but are simply straight taper turned joints that make up tight and yet permit of liberal movements due to expansion and contraction and vibrations. This design of joint is the same as that used in universal cast iron pipe manufactured by The Central Foundry Company and sold by Yale & Co.



END ELEVATION OF A SET OF UNIVERSAL FRONT END STEAM PIPES IN POSITION.

Steam pipes of this design have been under test for more than two years on engines the front end steam pipe joints of which were frequently leaking, notwithstanding great care and expense being put upon them. The only change made was that of taking out the old pipes and joints and the putting in of universal pipes instead.

In universal pipes but two or three diameters are used and these are sufficient to cover the range of diameters of dry pipes. The nigger or tee heads, elbows and straight pipes are standard for each of the two or three diameters. There are no rights and lefts. The straight pipes are all of the same length, differences in heights are taken care of by the short nipples between the lower ends



SIDE SECTIONAL ELEVATION OF A SET OF UNIVERSAL FRONT END STEAM PIPES.

of the vertical pipes and the cylinder connections. The flexibility of the joints permits of swinging the lower ends of the pipes in or out to comply with the different spreads of cylinder connections. No work is required on the joints after they leave the lathe, and no scraping or grinding are required when replacing pipes. The patterns are simple, and few in class and much cheaper than the patterns for the usual form of pipes; and on account of standardizing on tee heads, elbows and straight pipes a very much smaller stock of castings is necessary.

While the advantages of the complete design of front end steam pipes here described could be realized by substituting same for the present designs of crooked pipes it is not absolutely necessary to discard the present forms of pipes in order to get the benefits of the universal joint for the reason that the joints can be applied to the present designs of pipes in other respects; however, in order to get the full benefit of the design of pipes as furnished, a gradual substitution for the present pipes should be brought about.

A catalog furnished by J. L. Yale & Co., 617 Railway Exchange, Chicago, gives designs, description and advantages of Universal front end steam pipes.

Ryerson Crank-Pin Truing Machine

ONE of the expensive and time consuming operations in the railroad shop is the truing of locomotive crank pins. It has usually been done by filing, a procedure which is not only slow and expensive, but seldom results in a perfectly round pin.

There are many railroad shop men who resort to the expense of removing the old crank pin and replacing it with a new one, rather than take the time and cost burden of filing the old pin to shape.

Some machines that have been devised for doing this work have been unsuccessful partially on account of the many and careful adjustments necessary, and largely because they depended on the wheel being absolutely true for their bearing.

Machines which are bolted to the side of the wheel or hub will only square the pin with those parts, and as they are seldom true with the wheel (on account of the distortion due to pressing on the wheel and shrinking on the tire) the pin cannot be trued in perfect alignment.

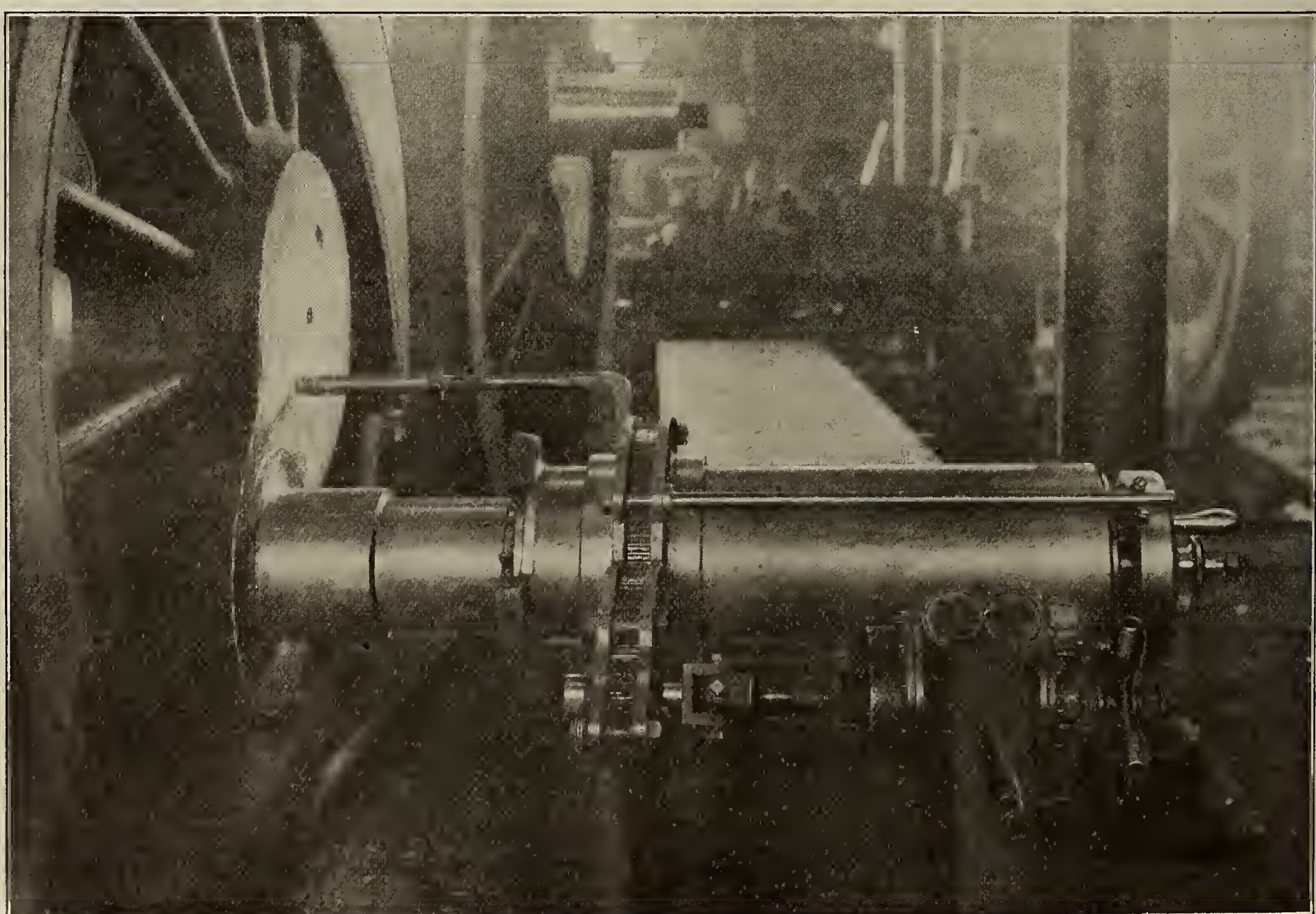
The Ryerson crank pin truing machine takes its bearing directly on the pin itself, and as the crank pin hole is bored after all other work on the wheel is accomplished, the pin must necessarily be in absolute alignment with the axle.

The Ryerson crank pin truing machine was designed by a railroad mechanic after several years study of the requirements and a careful investigation of the methods used in various shops throughout the country. The features which have made some machines objectionable were finally overcome, and from the results obtained in the shops now using this machine, it is considered a rapid and efficient crank pin truing machine.

The machine is simple in construction and consists of only four parts, no one of which is too heavy to be easily handled by one man.

The accompanying illustrations show the machine as connected to the crank pin and ready for operation, also the various parts of the machine before assembling. In operating, the barrel of the machine is first secured firmly to the gudgeon screw at the end of the crank pin by means of two handles. These are then removed, and the sliding sleeve is placed on the barrel. Attached to this sleeve there are lugs containing the necessary tools for roughing, finishing and filletting the crank pin. These tools are of high speed tool steel. The gearing wheels and casing are then slipped over the two feather keys.

The forward or feed motion of the sleeve is accomplished by means of a hand wheel which is so designed that the feed may be either automatic or done by hand. The arrangement of the feed is such that it is unnecessary to stop the machine in order to engage or disengage the gearing. The sleeve is caused to revolve around the

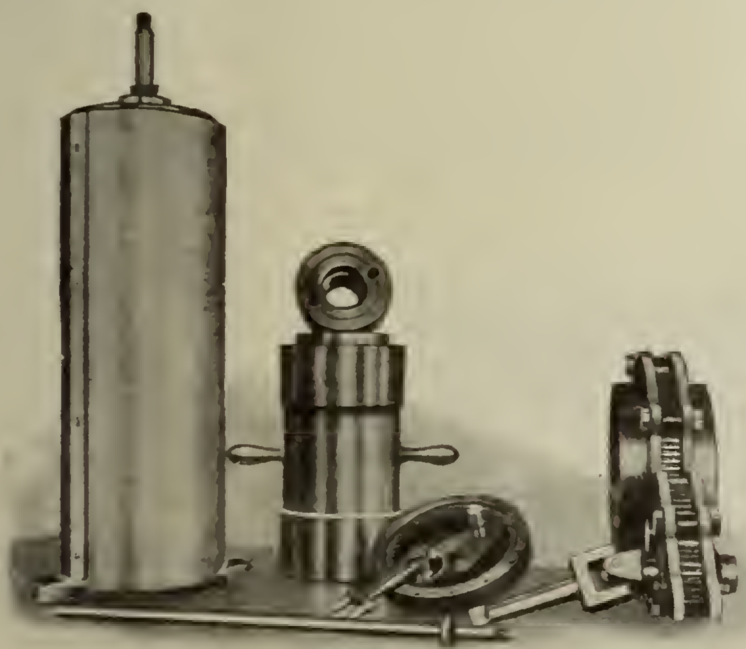


RYERSON CRANK-PIN TRUING MACHINE.

crank pin by means of an air motor, which is the only power necessary in operating.

The Ryerson portable automatic crank pin truing machine can be adjusted to any pin having a threaded end by simply making a face plate to suit the pin, and threading it to suit the extension. It is also an easy matter to drill the end of the crank pins having collars, and insert a gudgeon screw to which the machine can be attached.

This machine can be used in any roundhouse without removing the wheels from the engine, thus prolonging the life of the rods, as well as the brasses. The breaking of many rods has been traced directly to the imperfect condition of the main crank pin, and it has been demonstrated that if the main pins are kept in good condition, those in the front and back wheels will require little or no



DETAILS OF RYERSON CRANK-PIN TRUING MACHINE.

attention, and the number of broken rods will be greatly reduced.

The machine requires but a short time to set in position. This is easily understood from the fact that the outside end of the pin, from which the gudgeon screw projects, never changes. This provides an exact center and when the machine is screwed tight against the end of the pin it is of course absolutely square.

The machine complete weighs three hundred and fifty pounds, exclusive of the air motor. Any standard air motor can be used for its operation.

Heating System in Kingsland Shops

D. L. & W. R. R.

THE object primarily desired in every manufacturing plant is, of course, efficiency, i.e., the greatest possible results from the least possible expenditure, either of money or, which is the same thing, labor. Taking for the moment the consideration of the steam equipment of such a plant. Every individual B. T. U. generated has in itself a certain and very real money value which must, or at least should be, reckoned with. Whether or not it is

INTERIOR OF SHOP AT KINGSLAND, N. J.—D., L. & W. R. R.

that "familiarity breeds contempt," how often it is that to those whose profession brings them into contact with such plants, certain great and apparent "leaks" or losses are noticeable, which appear to be entirely lost sight of by those in charge of the plant, no effort being made to change the methods through which these losses result.

Let us for a moment consider the heating of a machine shop or building of similar type. We enter the building and possibly notice that it is apparently well heated, comfortable, with temperature fairly uniform throughout, that it seems exceptionally well designed and efficient. In making our examniation we climb to the gallery or to the crane and then—we find the leak. Beneath the roof, in a veritable bank, hangs a strata of heated air, stagnant, useless, constantly fed from below, fresh heat taking the place of that already given up without results, withdrawing from service continuously heat which it has cost no small amount to generate and which is absolutely thrown away. There is the "joker," and how frequently we find it.

At the Kingsland shops of the D., L. & W. R. R., at Kingsland, N. J., illustrations of which are shown, this factor has been taken into consideration and the plant is an interesting one. In the passenger and truck shop, the mill building and the carpenter shop, the heating plant is divided into two systems. Wall and skylight coils are carried broadly in the usual way, but with the difference that the coils have merely enough surface to properly care for the natural radiation from the walls, windows, roof and skylight, with a scant surplus. Located in the trusses of each of these buildings is a large motor driven blower, driving air over hot water coils, which air, heated to the necessary temperature, in its passage over the sections, supplies necessary heat for the actual raising of the temperature within the building to the point desired. By this method all of the air which would ordinarily lie among the trusses is drawn continuously toward and into the fan, is by the fan forced into the building again and downward, being diffused through the entire shop and again drawn back and sent once more along the same line. In this way uniform temperatures are obtained throughout the entire shop, the pockets of dead air are broken up, every particle of heat put into the air is utilized to the end for which it was put there, i. e., the heating of the building. The plant has been throughout most successful.

The American Blower Co., of Detroit, Mich., furnished the complete equipment for this plant through the contractors, Evans-Almirall & Co., of New York City, whose patented systems of hot water circulation is used in connection with the apparatus.

Personal Mention

Mr. W. Cockfield has resigned as locomotive superintendent of the Mexican Railway to become chief locomotive superintendent of the Peruvian Corporation at Lima, Peru.

Mr. A. S. Barrows, chief motive power clerk of the Rock Island Lines, has resigned to accept a similar position with the Delaware, Lackawanna & Western at Scranton, Pa.

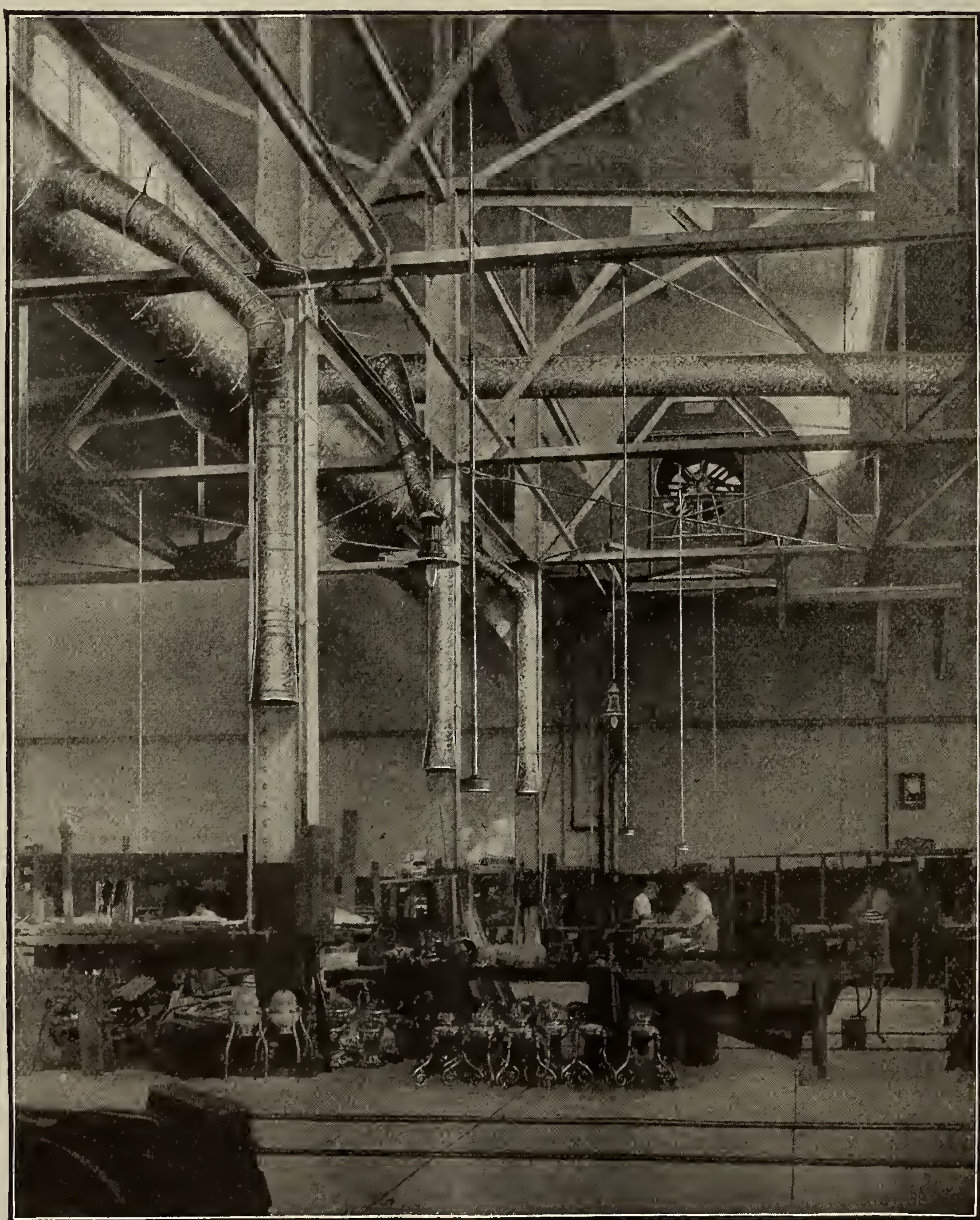
Mr. W. C. Whittaker has been appointed assistant master mechanic of the Rio Grande Western at Helper, Utah, in place of Mr. C. E. Deweese, resigned.

Mr. N. L. Smitham, heretofore master mechanic of the Texas Midland, has been appointed master mechanic of the Texas Central, with headquarters at Walnut Springs, Tex.

Mr. A. C. Miller has been appointed general foreman of the mechanical department of the Texas Midland, with headquarters at Terrell, Tex., in place of Mr. N. L. Smitham, master mechanic, resigned.

Mr. J. M. Robinson, general foreman of shops of the Wabash at Ft. Wayne, Ind., has been transferred to St. Thomas, Ont., in a similar capacity, succeeding Mr. W. C. Chambers. Mr. Henry Eisle takes the place of Mr. Robinson at Ft. Wayne.

Mr. William Renshaw, heretofore superintendent of



HEATING APPARATUS IN KINGSLAND SHOPS—D., L. & W. R. R.

machinery of the Illinois Central Railroad, has resigned and this office has been filled by the appointment of Mr. J. G. Neuffer, heretofore assistant superintendent of machinery, with headquarters at Chicago. Mr. R. W. Bell, heretofore master mechanic at Waterloo, has been appointed assistant superintendent of machinery, with headquarters at Chicago. Mr. R. J. Turnbull has been transferred from Memphis to Waterloo as master mechanic. Mr. H. C. Eich has been transferred from East St. Louis to Memphis as master mechanic. Mr. W. McIntosh, formerly general foreman at McComb, has been appointed master mechanic at East St. Louis, and Mr. William O'Brien, formerly gang foreman at Burnside, has been appointed general foreman at McComb. Mr. William Ormsby, formerly machinist at Burnside, has been appointed gang foreman.

New Speed Record, L. S. & M. S. Ry.

A new record for the Cleveland-Buffalo run on the Lake Shore & Michigan Southern Ry. was established May 21, by train 24, covering the 181 miles in 160 minutes. It left Cleveland at 5:43, arriving at Buffalo Creek at 8:23 p. m. This is a solid express train of four cars. The average speed for the total distance was 67.8 miles an hour, or 1.13 miles a minute.

Technical Publications

Betterment Briefs, by Henry W. Jacobs. Printed by the Author at Topeka, Kansas.

During the last few years the Atchison, Topeka & Santa Fe Railway has worked diligently to improve shop methods. The actual results obtained in greater production at lower cost, prove conclusively that labor saving devices to cheapen output, apply equally as well in the railway shop as in the manufacturing plant. This is further emphasizd by the fact that economies made by the Santa Fe have not been due to the replacement of old machine tools by an entire complement of new ones, but have been due to revolutionizing old methods by the gradual introduction of improved processes, by the perfection of labor saving devices and the standardization of parts, supplemented by standardizing manufacturing tools and templates. To derive the greatest benefit from these economies, manufacture has been centralized and materials manufactured according to carefully supervised standards, have been distributed throughout the entire system.

The introduction and perfection of this work has not been without its obstacles and discouraging features. That these have been overcome successfully is striking evidence of the responsibility devolving upon the higher officers. While the achievements of economy and the improvement in men, machines and methods, have seemed to produce the results obtained, the actual attainment has had its inception in the enthusiasm, earnestness and confidence infused by Mr. J. W. Kendrick, second vice-president of the Santa Fe System.

Opportunities for similar improvement are equally open to other railway systems and the actual decreased cost of operation which has been attained, presents occasion for careful consideration upon the part of railway officials generally. The methods pursued by the Santa Fe have not been protected by secrecy, nor surrounded by seeming mystery; on the contrary they have been openly explained from time to time in various technical journals.

Abstracts from the principal articles so circulated have been revised and assembled in convenient book form, with the title of "Betterment Briefs," by Mr. H. W. Jacobs, assistant superintendent of motive power of the Santa Fe, under whose personal supervision the betterment work on the system has been conducted.

The book constitutes a unique addition to railway technical literature and is absolutely novel in the field which it covers. The field is one which offers a large opportunity, and the preparation is book form of data selected from actual shop practices of a large system, together with descriptions of typical every day performances, will be of much benefit to railway officials, operating as well as mechanical. The author has collected information from the most fertile source, the shop itself, and has endeavored to lay stress upon the improvement possible in the railway shop by the application of modern devices and methods. The book is not a systematic treatise covering the whole field of design, construction and operation of railway shops; nor is it intended as such. It is a discussion of a definite and limited part of a great department of railroading and it is devoted to modern methods of railway shop operation. That the principles and facts described are not mere, untried theories is clearly demonstrated by a large selection of striking illustrations of actual improvements made and methods used, many of them showing graphically a comparison of the old and the new, together with relative results.

The book is bound, printed and illustrated in an unusually attractive form. A comprehensive index and a complete list of illustrations, supplemented by an inclusive system of marginal notes, assist the reader in promptly locating the subject of which he may be in search.

The Architects' and Builders' Pocket Book, by the late Frank E. Kidder. Published by John Wiley & Sons, New York. Price $5.00.

The fifteenth edition of this useful handbook for architects, structural engineers, builders, contractors and draftsmen, and valuable book of references for everything relating to the construction and equipment of building, has been revised and brought up to date. The changes in this edition consist of the correction of all typographical errors reported to the publishers, and the rewriting of Chapters XXIII and XXIV. This work has been done by Rudolph P. Miller, who was for ten years connected with the Department of Buildings, New York City, and for the last five years as its chief engineer. During his connection with the Department of Buildings he had large opportunities for studying fireproof construction particularly, and gave the subject of Reinforced Concrete much study, drafting the first regulations ever promulgated in this country regarding its use. These regulations have formed the basis of the regulations since adopted by the cities of this country, in many instances the major part of them being copied verbatim.

Chapter XXIII has been revised, one-half of the matter in the old edition having been used again. The new matter has been substituted for such parts as have been found unnecessary or out of date.

Chapter XXIV, on Reinforced Concrete, is entirely new, the whole manuscript being original and Mr. Miller's own work.

Professor Alvah H. Sabin has brought the section on Paints and Varnishes up to date.

Locomotives of 1907, By Charles S. Lake. Published by Percival Marshall & Co., London. Price, 50 cents.

This book succeeds "Locomotives of 1906," with which it forms a supplement to "The World's Locomotives" by the same author. The text and illustrations contained in these two supplements afford an inexpensive means of bringing the more comprehensive work up to date, and of recording in convenient form such improvements as have been made in general locomotive construction since the publication of the original volume.

Notes of the Month

Julian L. Yale & Co., 617 Railway Exchange, Chicago, have recently issued a booklet devoted to locomotive front-end steam pipes, their troubles and the remedy. It is fully illustrated.

Illinois Malleable Iron Company, Chicago, has issued an eight-page pamphlet which describes the different types of brakeshoes for steam and electric railways manufactured by this company.

The Stewart Railway Speedometer Company, Railway Exchange, Chicago, has issued a pamphlet describing the Stewart railway speedometer, an instrument which accurately indicates the speed and mileage of locomotives and railway cars, and is adaptable for use in cabs, observation cars, private cars, passenger cars, interurban railway cars, etc.

John Lucas & Co., Philadelphia, have purchased a plant at Sixteenth and Morgan streets, Chicago, and are now installing machinery for the manufacture of paints. Harry C. Quest, formerly with the Heath & Milligan Manufacturing Company, is in charge of the railway sales department of John Lucas & Co., with offices at 708 Marquette Building, Chicago.

Bettendorf Axle Company, Davenport, Ia., have moved their Chicago office to 1170 Old Colony Building. They have also moved their New York office from 42 Broadway to Hudson Terminals Building, 30 Church street.

Parsons Locomotive Engineering Company, 1590 Old Colony Building, Chicago, has issued the first booklet by this company, consisting of 12 pages, in which are set forth some convincing arguments in favor of the Parsons system of combustion.

Charles H. Spotts, for the past 10 years manager of the paint department of the Joseph Dixon Crucible Company, Jersey City, N. J., has resigned. Mr. Spotts is contemplating establishing a paint manufacturing plant in the vicinity of New York and is making his headquarters for the present at the Engineers' Club, New York.

It is a sad duty to announce the death of Mr. William A. Pitcher, who was one of the twelve who lost their lives in the burning of the Aveline Hotel at Indianapolis, Ind., on Sunday morning, May 3d. Mr. Pitcher has been with S. F. Bowser & Co. for two years, holding the position of eastern railroad representative. He was highly esteemed, and had many warm friends, not only in this company, but among the entire railroad fraternity. Mr. Pitcher was forty-eight years old. The remains were taken to his old home at Bellevue, Ohio, for interment.

Mr. Paul R. Brooks has been secured by the Machine Sales Company to be their general manager. He was at one time a special apprentice on the Burlington road. Subsequently Mr. Brooks represented the Quincy, Manchester-Sargeant Company and more recently the Otto Gas Engine Works.

The Machine Sales Company has a large plant in Peabody, Mass., which is exceptionally well equipped, including foundries and a hammer shop.

Their business address is 68 William street, New York City, and they will build presses, machine tools, commercial automobiles and special machinery complete, on contract.

Bulletin No. 10 of the Lincoln Motor Works Company, Caxton Building, Cleveland, O., is a 16-page booklet, is devoted to Lincoln variable speed motors. It contains a full description, including detail drawings, speed and efficiency charts, tables of ratings and general outline dimensions. The principle of operation and its peculiar advantages for all forms of individual drive requiring variable speeds are set forth. A few illustrations of typical applications to machine tool drive are shown.

Iola Portland Cement Company announces that on April 29 its sales department was moved from St. Louis, Mo., to 815 Commerce Building, Kansas City, Mo. The latter location will afford additional facilities for expediting business, as the sales department will be in daily touch with the works at Iola, Kan.

Hyatt Roller Bearing Company, Newark, N. J., recently issued a catalogue devoted to Hyatt roller bearings containing information regarding more than 300 sizes that have been standardized and are now carried in stock. Each bearing has a capacity rating which enables the engineer to determine the most efficient size.

Acme Railway Equipment Company, Philadelphia, reports that its Acme uncoupling device is to be applied on the 300 box cars for the Lehigh & New England, to be built by the American Car & Foundry Company, and 300 steel ore cars for the same road, to be built by the Cambria Steel Company. This device is also to go on 1,000 cars now being built by the Laconia Car Works for the Boston & Maine.

American Blower Company, Detroit, Mich., has purchased the foundry formerly operated by the Northwestern Foundry & Supply Company of Detroit, manufacturer of cast-iron soil pipe and fittings and plumbers' specialties and expects to operate it for the manufacture of blower, exhaust fan, engine and heater castings. The company desires to dispose immediately of all of the soil pipe and fitting patterns and foundry equipment complete, and also a large stock of finished pipe fittings, bell traps, etc.

Griffin Double Tread Car Wheel Company, Buffalo, N. Y., has been incorporated with a capital stock of $200,000 to manufacture a car wheel patented by P. H. Griffin, who recently resigned as general manager of the New York Car Wheel Company. Mr. Griffin is not an officer or director of the new company, but his two sons, H. F. Griffin and W. A. Griffin, will be president and secretary, respectively.

An Error Corrected

The statement in the Railway Age recently to the effect that Mr. H. H. Sessions had resigned his position as vice-president of the Standard Coupler Company, of New York, was an error. Mr. Sessions' connection with the Standard Coupler Company continues, as it has for many years, his official and personal relations with that company being entirely harmonious and satisfactory. His connection with another company, which conducts a business confined exclusively to the repairs of old or bad order cars, in no way interferes with his duties in the Standard Coupler Company, nor does it bring him in competition in any way with builders of new car equipment, either freight or passenger.

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JULY, 1908

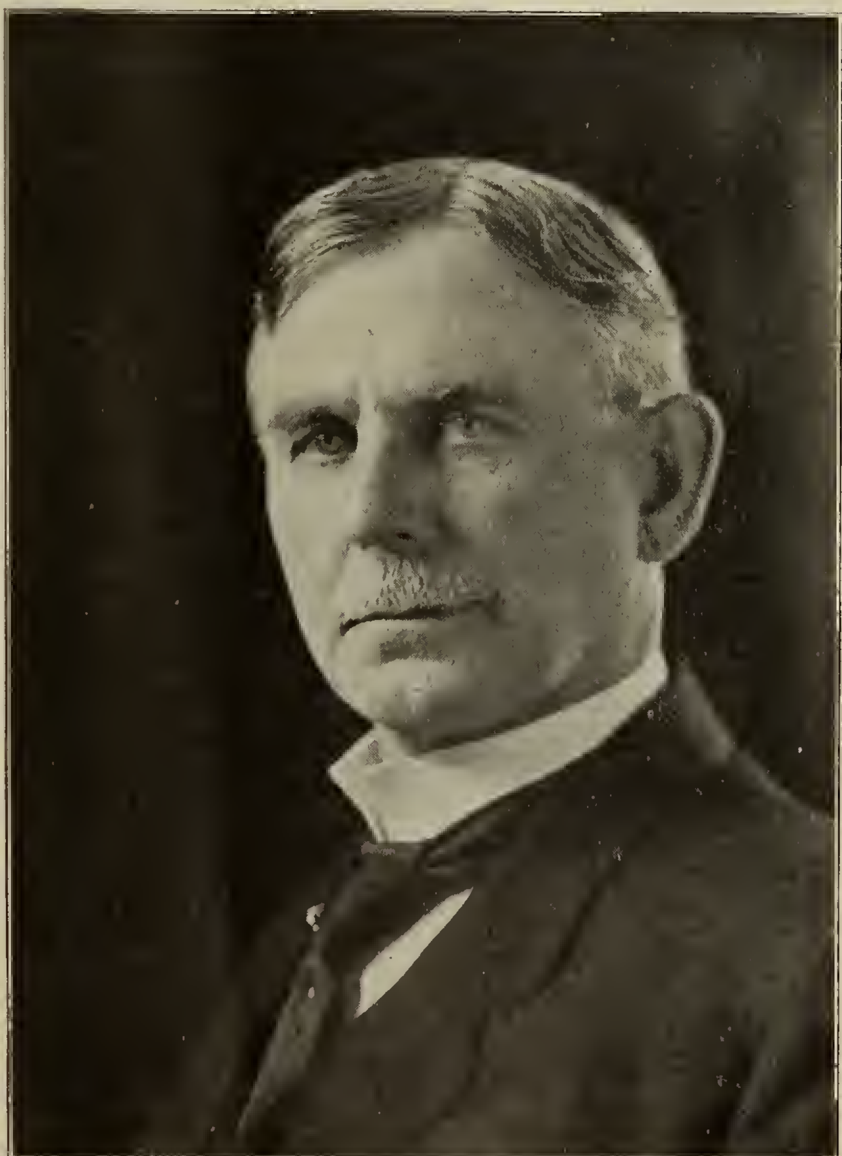
The June Conventions

THE forty-second annual convention of the Master Car Builders' Association was held at Atlantic City, N. J., June 17, 18 and 19. The forty-first annual convention of the American Railway Master Mechanics' Association was held at the same place on June 22, 23 and 24.

Mr. George N. Dow, Lake Shore & Michigan Southern, presided over the sessions of the Master Car Builders and Mr. William McIntosh, Central Railroad of New Jersey, the Master Mechanics. Photographs of the presidents of the two associations are published in this issue. The annual addresses by the presidents of the association we give as being not only comprehensive in their treatment of the history and work of those organizations, but suggestive as to problems to be faced for the future.

The address of President Dow to the members of the

GEORGE N. DOW, GENERAL MECHANICAL INSPECTOR, L. S. & M. S. RY., CLEVELAND, OHIO. PRESIDENT, MASTER CAR BUILDERS' ASSOCIATION.



WILLIAM McINTOSH, SUPT. MOTIVE POWER, CENTRAL R. R. OF NEW JERSEY. PRESIDENT, AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

ON THE WAY TO THE CONVENTION HALL.
PRESIDENT GEO. N. DOW AND MAYOR STOY.

T. H. CURTIS, C. E. FULLER, WM. McINTOSH, J. F. WALSH.

Master Car Builders' Association is in part as follows:

"Forty years ago this month this statement was made at the second annual convention of this association, by the first president, A. W. Van Houten: "I trust that our deliberations will be harmonious and beneficial to ourselves and to the best interests of the railroad companies that we represent. Taking into consideration the millions of dollars, the expenditure of which the railroads entrust, in a great measure, to their respective master car builders, it is important for us to consider the best and most economical way to expend such an amount of money with credit to ourselves and to the best interests of our respective companies."

If this were true at that time, how much more applicable is it now? At that time the cars represented could be named in hundreds, while now they are numbered in millions.

The two great objects of this association are, first, to procure uniformity in car construction, and second, to secure the most economical results in the interchange of traffic between the railroads of the country. They are both so closely related that to secure the best results in interchange it is necessary that railroads carefully observe the standards adopted by the association. Of course, we all know that the standards of car construction adopted by this association

JOHN TONGE, H. MONKHOUSE.

J. F. DeVOY, P. H. PECK, C. A. SCHROYER, J. J. HENNESSEY,

GEO. T. ANDERSON. F. W. BRAZIER.

J. E. BUKER.

are only recommendatory in character, but on the other hand, a closer observation of these standards will result in a decreased cost for conducting the interchange of cars, and thus promote one of the great objects of the association. It may be said that our standards are not permanent in character; that changes are constantly being made, but the reason for this cannot be laid exclusively at the door of the Master Car Builders' Association. The demands and conditions of the traffic and operating departments are as constantly changing, and as new conditions in operation arise, they must be met by new designs in car construction, and to the Master Car Builder the managing officer looks for results. It therefore behooves us to be alert at all times to meet these demands, and thus enhance the value of the work performed by the association. With this object in view we are assembled here today, and I would ask your earnest and careful consideration of the various recommendations which will be presented to you during our deliberations.

Each year our standards are being more carefully scrutinized by the operating officers; the application of couplers of the vertical plane or M. C. B. type, the complete equipment of cars with air brakes, the adjustment of height of couplers as formulated by this association have become the law of the land, and it has even been proposed to enact into law our stand-

S. A. CRANE. T. J. COLE. E. A. MANCHESTER, W. S. MORRIS.

A. M. KITTREDGE, THOS. PROSSER.

GEO. A. HANCOCK, W. E. FOWLER.
(Photo by Dr. J. M. Griffin.)

PETER H. PECK.
(Photo by Dr. J. M. Griffin.)

ards relating to the protection of trainmen. It will thus be seen that more and more the actions of this association are being recognized, and emphasizes to us the absolute necessity of paying close attention to what we adopt.

It is not my intention to point out in detail the various recommendations made by your committees; they have labored faithfully during the year, and the results are before you in their reports. I only bespeak your careful study.

In the past there has been some difficulty on the part of some of the members and some of the car builders to determine satisfactorily from the published standards of the association important data on the protection of trainmen. When this was brought to my attention a special meeting of the executive committee was called, and as it was found that the work of the committee on 'Standards' was so onerous, it was decided to appoint a special committee to review the standards of the association for the protection of trainmen, with a view of increasing their usefulness by more complex illustrations, and at the same time recommend such modifications as might be necessary to meet the requirements of modern car construction.

PORCH GROUP, INCLUDING MESSRS. ARP, KEEGAN AND LEWIS.

W. H. LEWIS.
(Photo by Dr. J. M. Griffin.)

W. C. ARP.

J. W. BETTENDORF, J. H. BENDIXEN.

This committee's report is submitted to the convention with the reports of the other committees.

A few thoughts suggest themselves to my mind which this association should consider.

The necessity for co-operation and co-ordination of the work of the various railway associations has led the American Railway Association to propose changes in its organization which will admit of more harmonious relations between the various railway associations, and at the same time tend to centralize the recommendations for authoritative action with that association. In view of the nature of a great deal of the work of the Master Car Builders' Association, it is important that this association co-operate to the fullest extent with the American Railway Association, and in order that this may be accomplished, some change in the constitution and by-laws of the Master Car Builders' Association will be necessary.

The constitution at the present time does not provide for filling vacancies which may occur in the office of president and vice-president or members of the executive committee, except by election at the convention, nor is it required that these officers of the association and members of the executive committee should be actually engaged in the railway service. I would therefore recommend that the constitution be changed

H. J. SMALL, ALL THE WAY FROM THE PACIFIC COAST.

GEO. A. COOPER R. F. McKENNA.

GEO. H. SARGENT.

T. H. CURTIS, E. H. WALKER.

to cover these points, after the subject is given full consideration by the proper committee.

In the past, a large list of subjects has been referred to the association, and in the future I would recommend reducing the list so as to give better opportunity to investigate and discuss the subjects more thoroughly.

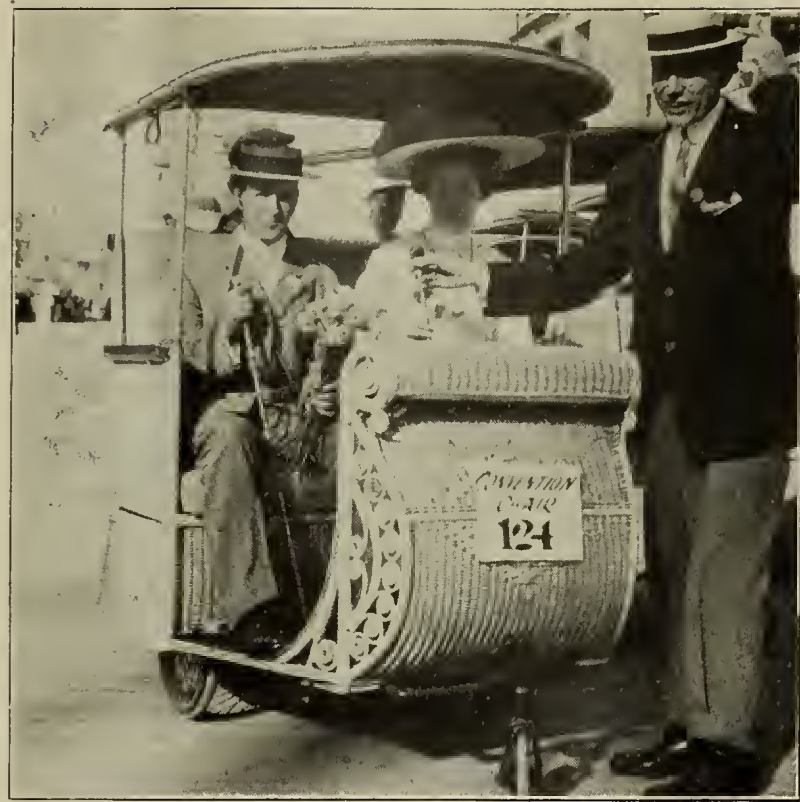
The importance of the work of the association is such that the members who accept membership on a given committee should do so with realization of the work required of them and fully understand the necessity of attending as many meetings of the committee as the chairman may feel is necessary to call. It should be remembered that when a member fails to attend a committee meeting the committee is not only deprived of the benefit of his experience, advice and opinion, but the representation from a given district, as it is generally the practice, in appointing committees, to endeavor to cover, as far as possible, different portions of the country. I would urge the members of the association to seek rather than avoid committee work. The subjects considered are all of moment to the railroads you represent and it is their interest as well as those of the association which must be considered.

In the past, it has been the practice by a great many

HARRY L. OSMAN.

"OLD TIMERS" LINING UP FOR THEIR PHOTOGRAPHS.

DR. J. M. GRIFFIN AND HIS CAMERA.



MR. AND MRS. H. H. ROBERTSON, ROBERT J. MOLLAN.

repair men to ignore or neglect the use of the repair cards, as called for in rule No. 76 M. C. B. Rules of Interchange. Some look at this as a dishonest act on the part of repair men, but in my opinion it is only a case of neglect on the part of those making repairs. In order that the full benefit of the rule may be obtained, as was the intention of the members of this association when it was adopted. I would recommend to all heads of car departments the issuing of such instructions to their repair men as would make it impossible for them to either ignore or neglect the use of this card, and thereby avoid the suspicion of dishonesty.

The adoption of a standard M. C. B. coupler. Several years ago an ineffectual effort was made in that direction. I believe the time is now ripe for such action.

There has been a steady increase in the use of steel in car construction. The steel car has come to stay and I believe this association should give attention to this important matter to the end that its use may be extended more and more. I would recommend the appointment of a committee on standard steel shapes.

Several years ago the question of the adoption of standard dimensions for the box car recommended by the American Railway Association was considered, and

PAUL H. MONTANUS, EDWARD S. MONTANUS.

DONALD C. BARBEE, A. B. BOHAN.

C. H. SPOTTS AND SON, WALTER F. SWEARER.

H. U. MORTON.

a system of framing only adopted. The question was not given the consideration it deserves and to my mind is one that should be revived and studied to a conclusion. This subject at that time was referred to us by the American Railway Association, and we should complete our work and carry out the instructions given us. The appointment of a committee on this subject should be considered by your executive committee.

The past year has been a strenuous one for the mechanical officer. When we met here a year ago our shops were being pushed to their fullest capacity to keep in motion the immense traffic offered the railroads, but during the early winter a depression in business overtook us which has rendered necessary a general policy of retrenchment. Under these varying circumstances it has required the exercise of the utmost care and wisdom to properly conduct the affairs of our department of railroad work."

The address of President McIntosh to the members of the Master Mechanics' Association is given below:

"Officially and personally I welcome you to the forty-first convention of this association, which has

S. A. HOWELL.

FRANK A. MORRISON, ELDON MACLEOD.

J. W. MOTHERWELL, G. H. BUSSING.

W. E. FOWLER, RUSSELL DALE, W. F. HEACOCK.

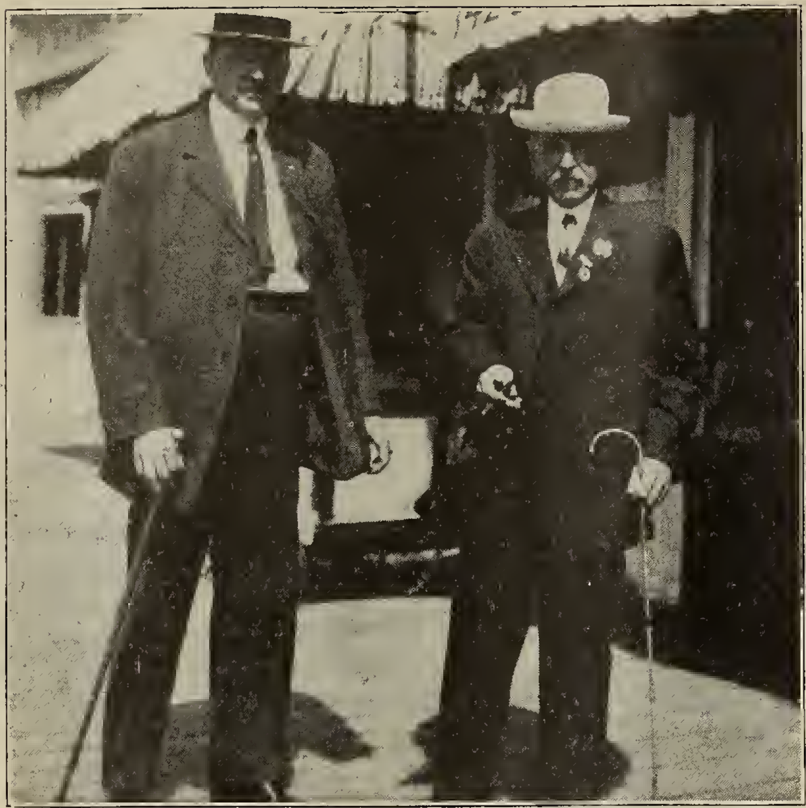
already covered the span of the active life of man and which is ready for its best and most efficient work. You need no word of mine to stimulate or inspire your efforts, but let me entreat you all to remember that because of the greatness of the problems before us, because of the monumental work that is behind us, much is expected of us for the future, and we must make this, and every convention which is to come, more effective than any that have gone before.

Let us remember that this association has seen the small problem grow to be one of the very greatest problems faced by man. Think a moment of the locomotives and trains, the ships, the bridges, the tunnels, the buildings, the cities which we knew as children; think of them again as they have grown to their present state. Statistics are not needed to show that we have a man's task before us. A gray hair or two that speaks of experience is the authority upon which we place before those who are to take our places the rule of life that will be most greatly needed in the future.

Without question our greatest problem is that of the selection, treatment and organization of men. The recent years of abnormal business activity have serve that they must be proportionately affected by re-

RUSSELL DALE, L. C. BROWN, W. F. HEACOCK, G. A. BORDEN.

J. L. CONNORS, C. M. GARRETT.



GEO. H. BRYANT, JOHN T. CHAMBERLAIN.

D. W. PYE, G. BURGERT, JOHN T. CHAMBERLAIN.

brought to the surface the slumbering tendency of organized labor to drift away from harmonious relations with employers and array itself on the side of the radical and demagogue, who seek notoriety and selfish advancement in creating and fostering discord between employers and employes whose every interest are identical. We know that any attempt on the part of either to operate independently must result disastrously. The demagogue and the radical lay great stress on the instances where some few in financial and commercial lines have overstepped the boundaries of correct business methods, and these would-be reformers, in their rampant enthusiasm, would destroy the whole business structure, and invite railroad employes to participate in the movement under the vague proposition that in some mysterious way they would be benefited by the catastrophe.

The sovereign remedy is lower tariffs, in the face of low rates and already large reductions from natural causes, and other embarrassment of the railroads with class legislation and impracticable laws, confiscatory in scope and surrounded with political red tape, that would largely increase operating expenses and further reduce earnings. How can employes expect to be benefited by such complications? Their interests are so closely allied with the interests of the company they

G. P. BAIN, JOHN DICK.

J. R. CARDWELL.

FRANK L. DE ARMOND.

J. W. MOTHERWELL, MARK A. ROSS.

serve that they must be proportionately affected by reduced earnings. There is no magic way of escaping. The laws that govern are immutable.

The points of issue between railroad companies and their employes are usually few in number and easy of solution. Wages are at present generally satisfactory, and only questions of methods conflict. Mechanics, especially machinists, are reluctant to adopt other than hourly rates of pay, while manufacturers and corporations are in favor of some system of fixed output, profit sharing or piece-work. The men claim, and with some grounds for their contention, that they have frequently been treated unfairly where piece-work has been adopted. This was often owing to bad judgment on the part of local officials in their efforts to adjust piece-work prices that had been established at unreasonably high figures, as a result of the adoption of hurriedly prepared piece-work schedules, or perhaps no schedule at all, merely guessing at prices and then

MR. AND MRS. C. M. WALSH, MRS. CHAFFY, F. C. LIPPERT.

"DIXON" BOOTH.

J. C. McQUISTON.

GEORGE H. E. ROBINSON.

arbitrarily putting them in force. On the other hand, workmen have interfered with normal results by restricting the output, under the mistaken idea that they would benefit thereby. Abnormal rates are bound to result from such methods, and dissatisfaction and protests from the workmen follow, for no matter how fairly and carefully these adjustments are made, the workmen are naturally suspicious that some advantage is being taken of them. It is evident, therefore, that the establishment of piece-work prices should be arranged with the utmost care and deliberation. It must further be borne in mind that agreements to be enduring and stand the test of time should be agreeable to both parties interested, and that due consideration should be given the workmen's side of the question in order to insure this result. Fairly adjusted piece-work rates should prove advantageous to the workmen, enabling them to earn much better

A. L. GUILFORD, J. A. MURRAY.

J. ALEXANDER BROWN, CHARLES SHULTS, F. K. SHULTS.

A. L. HOLTZMAN.

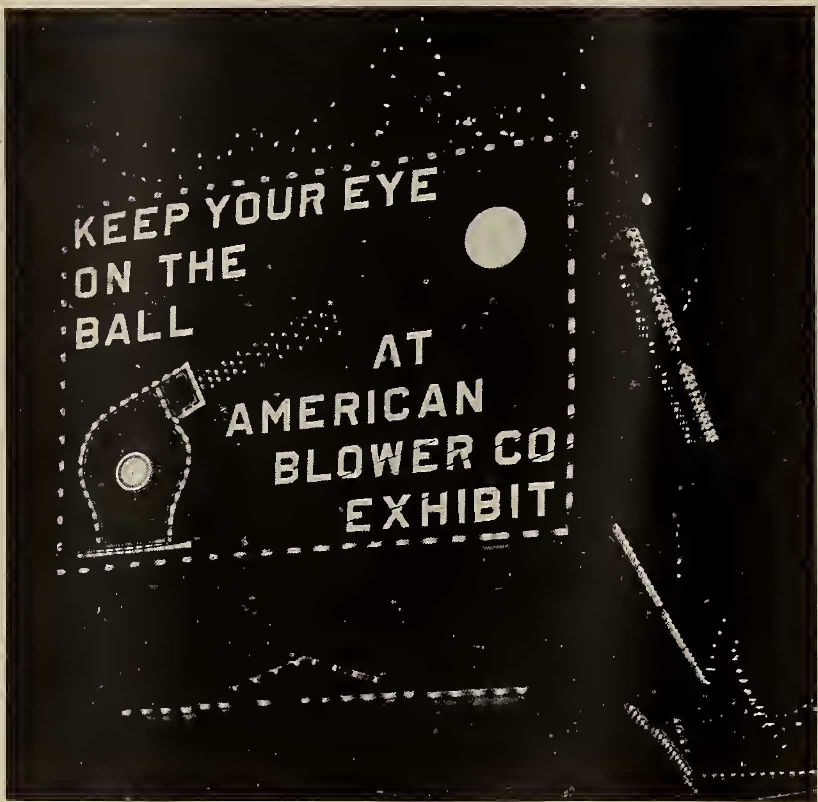
CASS L. KENNICOTT.

wages with but little greater physical effort, only requiring closer mental application and attention to details on their part, while the manufacturers and corporations would be the gainers by having their tools and machinery working at all times to their full capacity.

The only one to suffer under the stipulated output system is the indifferent and lazy workman. There should be no place in the ranks of honest railroad mechanics, nor in the membership of labor organizations, for the dissolute floater, inefficient imposter and agitator, who demands the highest rate of pay for the smallest return, by him, in labor and its products, giving most of his time and energy to sowing seeds of discord among his fellow workers, seeking to make himself a leader in his organization and always in bitter opposition to the independent workman who prefers to win increased compensation and promotion upon his merits.

CHAS. WAUGHOP, H. BOUTET.

A. TELFORD, GEO. N. RILEY.



AMERICAN BLOWER CO.'S NIGHT EXHIBIT.

There is another kind of workman, however, who should be welcome to both the companies and the unions. He would first be a citizen of good repute, or at least had declared his intention to become a citizen; he should be a good mechanic—his union demands that; he would be a man of good habits—his union requires that, too; he would do an honest day's work, seeing that the tools and machines entrusted to his care were properly handled, and that the latter were always working to their full capacity, and that his employer's interests would be advanced in every way possible. An organization founded on such principles would require no coercion to obtain membership and its members would not be seeking employment, for they would always be in demand. I am confident there is not a member of this association who would not be glad to secure the services of such men.

In my railroad experience, extending over forty years of active service in different departments and various branches of railroad work, much of the time in charge of large bodies of workmen, I cannot recall an instance where it has not been possible to adjust any of the ordinary differences that arise by free and frank discussion of the questions at issue with the men affected. I therefore think the average railroad employe is too intelligent to be led very far astray by scheming politicians or unwise agitators. They must keep in mind that their own and their families' interests are bound up with the company they serve, and that they cannot prosper when the company does not. No doubt they have grown up in the service, and their fathers before them. Many of the present officials have been advanced from their ranks and there should be no reason why they too should not become officials in due time. Then why should they combine with those who would embarrass the company, when their every interest is with it and against such a proposition? Officials and workmen should join hands and stand shoulder to shoulder against this common enemy and resist, by every honest means, its efforts to handicap their prosperity. One year ago there were, approximately, 1,600,000 railroad employes in this country, and their influence prevails wherever civilization and commerce extends. Their efforts unitedly directed to protect the railroads from unjust attack would exert such restraint upon the radical, of whatever class, as to cause him to stop and consider and modify his actions to conform to fair dealing and the interests and wishes of those employed by the companies, and depending upon their success for support for themselves and their families. The folly of workmen assisting in directly or indirectly curtailing the earning capacity of the railroads, and at the same time expecting to continue to draw the liberal wages they were receiving when earnings were good, is about as ridiculous as the tailor to expect golden eggs after he had killed the goose that laid them.

My honored predecessor pleaded eloquently for a man. He said, "We have inherited. What shall we bequeath?" Yes, we want many men, both in command and in the ranks. Wise men, strong men in their respective lines, reasonable men and independent men, who would respect the rights of others as readily as they would contend for their own. We must have young men qualifying themselves for advancement, young men with patience and determination to work up, step by step, to the most important positions. It should not be necessary to seek beyond their ranks for selections to fill positions that become vacant. There should be a waiting list of men available. Each of us who now occupy official positions should have his own successor selected, so far as it is possible to prepare and qualify him by training for the position.

No doubt we do not know our men as well as we should, and while it may be impossible to gather this intimate knowledge directly, we can accomplish much by gathering indirect information and keeping systematic records. We perhaps are not training our young men as thoroughly as we should, and to accomplish this result we need the co-operation of managing officials. This will no doubt be forthcoming on proper presentation of feasible plans, as is evidenced by the hearty support given recent liberal methods of training apprentices, now being introduced on several railroads, and which promises to be much farther reaching in satisfactory results than its earlier promoters dared to hope for. Equally liberal inducements, carefully worked out for other departments, would no doubt bring about similar results and well repay the effort. It may not be out of place to mention here that all of our propositions and plans for better conditions will come to naught without the sincere help of those who control the financial affairs of large enterprises.

We require more than men. We need an organization. An organization that develops men; develops them broadly and quickly. We need men of all kinds—leaders and followers. The followers are most important, for if we develop the followers the leaders appear automatically, and consequently take care of themselves.

Let us note for a moment the careful training given young men in many lines of business to qualify them for important positions awaiting—and railroad work is not less important. One of the prominent trans-Atlantic lines has just commissioned a substantial ship for training purposes, and from which will be graduated recruits for the fleet, and in the line of recent experience by railroad companies of the difficulty of securing reliable help, perhaps the time is now propitious for them to take action of the kind suggested, adopting some such system of education, training and promotion that will first induce promising young men to take up employment, then educate and train them in the line of their duties, finally opening up to them a line of promotion that will encourage them to remain permanently in the service and eliminate the growing tendency that now exists of employes seeking other employment as soon as they have gathered an outline of the duties they are expected to perform. Certainly well prepared young men are worth as much to the railroads as they are to other industries to which they are attracted.

It seems fitting to sum up what the man who must assume our duties and responsibilities must be prepared to do. He must prepare himself for leadership by efficient service in subordinate places. He must know men. He must help in building up an organization of men. It is a mistake to always seek genius; it is more important to build up that combination of various abilities, capabilities and temperaments which will form a united, homogeneous body before which the difficulties of the greatest problems will crumble and disappear. We should all strive to build up a working organism which shall be so complete and so satisfactory and with a correct policy so firmly established that those who follow can find little which they will be willing to change or to discard.

It is my earnest hope that I have, in a modest way, brought to your attention a few salient facts that may be suggestive of further and deeper thought along the path outlined, to the end that we may have concerted action in the direction indicated by him whom we all love, Burns, when he pointed out that we are leading steadily, though slowly, to that goal.

"Where man to man the world o'er,
Will brothers be and a' that."

As president of this association I attended the recent conference of state governors which assembled last month at the White House, by invitation of the President, for a discussion of means for the conservation of the resources of the country. Once before, 122 years ago, President Washington called the state governors together, that time to consider the "Development of Natural Resources."

After little more than a century the development in some directions seems to have been too rapid, leading to wastefulness, and it is clear that our resources must be husbanded.

Before the Master Mechanics' and Master Car Builders' associations lies a great responsibility in that we represent an enormous cousumption of natural resources. To be faithful to our trusts we must, therefore, use every effort to carry out the spirit which led to the recent conference.

"Conservation of Resources" was the object of the assemblage at Washington. This suggested to my mind the thought of conservation of energy as applied to the problem before the railroad officials of this country. I wish to suggest a thought which is not new, but is, in my judgment, becoming more important every day. My suggestion, briefly stated, is that sooner or later the energies of mechanical officers of railways must be conserved by the concentration of every effort. Sooner or later the Master Mechanics' and Master Car Builders' associations must be consolidated into one powerful, united, representative organization. Let me place this proposition squarely before you by expressing the opinion that the progress of the times, the conditions of our work and the character of our problems demand this step. I will not presume to outline how this should be brought about, but I most earnestly recommend that the executive committee be instructed to raise the question with the executive committee of the Master Car Builders' Association and consider ways and means looking towards such consolidation, which I believe, if we are true to the interests which we represent, must not be long deferred.

I cannot close this address without expressing thanks—which sentiment I am sure is endorsed by the association—to the supply men who are responsible for the wonderful display of railroad machinery and appliances, the greatest ever assembled outside of the world's fairs at Chicago and St. Louis; also to that splendid body of business men of Atlantic City—those hustlers whose co-operation has made it possible."

MASTER CAR BUILDERS' CONVENTION.

The first session of the annual convention of the Master Car Builders' Association was called to order Wednesday morning, June 17, 1908, by the president, George N. Dow. After the usual formalities at the opening of the convention the president delivered his annual address. Then followed the report from secretary.

The secretary, Joseph W. Taylor, in presenting his report, showed that in June, 1907, the active membership was 377, and that in June, 1908, it was 424; that the representative membership in June, 1907, was 249, and that in June, 1908, it was 275; that the associate membership in June, 1907, was 14, and that in June, 1908, it was 13; and that the life membership in June, 1907, was 15, and that in June, 1908, it was 14. The total membership is as follows: Active 424; representative, 275; associate, 13; life, 14; total, 726.

The number of cars represented in the association compared with last year was stated to be as follows: June, 1907, 2,254,397; June, 1908, 2,283,330; increase, 28,933.

The report showed receipts and expenditures for the year of $14,091.67.

The report showed that 29 railroads and private car lines had signified their desire to become subscribers to the rules of interchange governing freight cars, and their names will appear in the list of subscribers when the revised code is issued. Five railroads have also advised of their acceptance of the code of rules governing the interchange of passenger equipment.

Mr. E. A. Mosely, secretary of the Interstate Commerce Commission, addressed the convention in his usual earnest and interesting manner. He said that this was the seventh consecutive convention of the association which he had attended, and that at no gathering of railroad men did he obtain more valuable information nor derive greater pleasure. "I believe," he stated, "your members have confidence in me, and for you I entertain the highest regard and respect. We are co-workers to the same end—safety upon American railroads. The chief aim and purpose of the inspectors employed by the commission under the safety appliance law is safety for employes and travelers upon railways, not prosecution of the railroads. Their most earnest desire, and mine, is to lessen the risks incident to railway employment and reduce the number of casualties to employes and the public."

After Secretary Mosely's address, Secretary Taylor announced that notice regarding certain proposed amendments would be sent to the members before the end of this year.

On motion the chair was authorized to appoint a sub-committee of three members of the executive committee of the association to confer with the proper committee of the American Railway Association and report to the executive committee so that the recommendations of the executive committee as to changes in the constitution and by-laws necessary to secure greater co-operation between the American Railway Association and other railroad associations may be distributed to the members of the association prior to December 15, 1908.

Mr. Seley then read the report on "Revision of Standards and Recommended Practice," exclusive of "Protection to Trainmen."

BRAKE SHOE TESTS.

The report of the Standing Committee on air brake shoes in its report presented the following as "a review of the work of the past years."

"It will be remembered that the association has definite specifications covering the frictional qualities of brake shoes, and that the work of the committee, during recent years, has been confined to testing shoes under these specifications. The effect of this work has been to stimulate interest in the brake-shoe problem, and to make of record information concerning the action of shoes on both cast-iron and steel wheels. The fact that your committee has reported that most shoes recently tested have met the requirements of the association's specifications, may be accepted as evidence that its work has been effective in improving the friction of shoes sold to railway companies. Two years ago your committee called attention to the need of information concerning the wearing qualities of brake shoes, and under authorization from the executive committee, initial steps were taken to establish tests which would serve as a measure of wear. Proceeding, your committee's report of last year was devoted almost exclusively to a discussion of methods and to the presentation of results obtained from fifteen different shoes when exposed to wear under a definite program. The results, which were obtained by exposing the shoe to wear under a single set of conditions only, showed great variation in the wearing qualities of the several shoes tested. In presenting them, their value as a measure was frankly questioned as will be seen from the following quotation: 'Whether the relative results would be the same had the conditions of test involved lighter pressure or higher speeds than those which were actually employed, is a question which the committee has not yet had time to determine. It is not impossible that a shoe giving a relatively poor performance under the conditions of the test, would show relatively better under some other conditions. If, for example, shoes are designed for specified service, it would perhaps be unfair to expect all to show at their best under a single condition of operation.' The purpose of your committee during the present year has been to thrown light upon the question raised by the statements quoted. To this end arrangements were entered into with the authorities of Purdue University to extend the work along the lines of last year's investigations. Out of the 15 shoes dealt with in last year's report, there were nine presenting sufficient material to serve under the program of the present year." Their report also dealt with the frictional and wearing qualities of shoes submitted by railway companies, a table showing shoes tested, a schedule of the tests and some conclusions concerning wearing qualities. For future wear they submitted the following: "Your committee believes that the work of the present year leaves two questions open which should be settled beyond doubt before a specification governing wearing qualities should be adopted. These are: (1) A confirmation of the general conclusions based upon the work of the present year; and (2) investigations which will disclose the effect of different brake shoes upon the wheel. With reference to the confirmation of the results of the present year, it would seem wise that not less than fifteen newly selected representative shoes be tested, the program of operation being identical with that employed this year. The results of such tests added to those now available would give a volume of data sufficient to permit limits to be set defining performance, which would be safe and reasonable. The importance of determining the effect of the shoe upon the wheel becomes apparent, when one considers the possibility of a shoe showing a high resistance to wear, which may, in fact, be protected at the expense of wear upon the wheels. In discussing this matter last year, your committee expressed its regret 'that no measure has yet been made which will disclose the wear of the wheel under the influence of the shoe.' To secure such a measure it will be necessary to have a balance of sufficient capacity to weigh the wheel and of such delicacy as to indicate differences of weight as small as 1-500 part of a pound. No such balance is now available at the laboratory."

TESTS OF M. C. B. COUPLERS.

A summary of the recommendations which the committee offered to be submitted to letter ballot, to be adopted either as "Standard" or "Recommended Practice" is as follows:-

Standards.

1. That 1¼-inch rivets be used for attaching yokes to coupler butts, and that Sheet M. C. B. 11 be changed to conform to this recommendation, showing 1 5-16-inch rivet holes in coupler butts.

2. That the following be added to third sentence of paragraph 5 of specifications for automatic couplers, "and the rivet holes in the butts must be drilled, or if cored, must be broached out."

3. That all new types of couplers put on the market after January 1, 1909, have a dimension of 9¼ inches from back of coupler horn to inside face of knuckle, and that the face or front wall of coupler have a minimum thickness of 1¼ inches, and that a note to this effect be added to coupler drawings on Sheet M. C. B. 11.

4. That the total lift of the locking pin be not more than 6 inches, and that a note to this effect be added to coupler drawing on Sheet M. C. B. 11.

5. That all couplers must have an eyelet for locking device located immediately above locking-pin hole, so that the recommended links and clevices can be applied, and that a note to this effect be added to coupler drawings on Sheet M. C. B. 11.

6. That the pulling test under specifications for automatic couplers be changed to read as follows: "The couplers must stand a steady pull of 150,000 pounds." "A coupler shall be considered as having failed to stand this test . . . if the knuckle has opened more than ⅝ inch . . ." "Should either or both couplers fail to stand the prescribed test, but both stand 100,000 pounds, another complete coupler or pair of couplers shall be provided.

Recommended Practice.

1. That drawing on Sheet M. C. B.—B, showing coupler butts, be omitted, as this will be identical with butts shown on Sheet M. C. B. 11.

2. That drawing of uncoupling attachment on Sheet M. C. B.—B be changed to conform to Sheets 1 and 2 attached, and that Recommended Practice for uncoupling arrangements be also changed so as to conform to this recommendation.

The report on "Journal Box and Pedestal for Passenger Cars with Journals 5 and 9 and 5½ by 10 Inches," was presented and referred to letter ballot.

The report on "Marking of Freight Equipment Cars" was next presented and referred to letter ballot.

The report on "Air Brake Hose Specifications" was received and the committee continued.

The report of the committee on "Automatic Connectors" was presented and on motion was received and the committee continued with instructions to investigate further.

The report of the committee on "Lateral Bracing of Steel Freight Cars" was received and the committee continued.

The report of the committee on "Slide Bearings and Center Plates for Freight and Passenger Cars" was presented, and the committee continued.

The report on "Steel Passenger Cars" was presented but the lateness of the hour prevented discussion at this session.

The committee on "Nomination" reported the following ticket.

President—R. F. McKenna.

First Vice-President—F. H. Clark.

Second Vice-President—T. H. Curtis.

Third Vice-President—LeGrand Parish.

Executive Committee—J. E. Muhlfeld, C. E. Fuller, H. D. Taylor, J. F. Walsh, C. A. Schroyer.

At the next session the secretary, on motion, was directed to cast the ballot of the association for ticket named above.

MASTER MECHANICS' CONVENTION.

The first session of the annual convention of the American Railway Master Mechanics called to order Monday, June 22, 1908, by the president, William McIntosh. After the usual formalities at the opening of the convention the president delivered his annual address. Then followed the report from the secretary.

The secretary, Joseph W. Taylor, in presenting his report, gave the following figures regarding the membership: 862 active members, 19 associate members, 37 honorary members, total 918. The secretary's report referred to the death during the year of E. Ryan, L. M. Kidd, O. Stewart, James Macbeth, J. B. Morgan, active members, and M. N. Forney, honorary member.

The report showed that the receipts of the secretary's office for the year had been $5,200.33 and expenses $5,200.33, with unpaid dues amounting to $1,440.

The secretary's report stated that in regard to the scholarships at Stevens Institute, R. W. Pritchard graduated this fall, and that there are now four vacancies in the scholarships. The June examinations are being conducted this week, there being one application from the Master Mechanics' Association.

As to the Joseph T. Ryerson & Son Scholarship at Purdue University, the present incumbent following the course of instruction is in his second year, and is the second candidate under the head of the Ryerson scholarship.

The report of the committee on Mechanical Stokers was the first report presented to the convention.

MECHANICAL STOKERS.

The committee on this subject was continued and made a standing committee. They made the following report to which was added complete illustrated descriptions of the various mechanical stokers.

The mechanical stokers used on locomotives in this country up to the present time have at least demonstrated the fact that freight and passenger engines, in road service, can be successfully fired by mechanical means. Mechanical stoking, however, has not made much progress abroad. In reply to an inquiry on this subject, Mr. G. J. Churchward, chief superintendent of the locomotive, carriage and wagon department of the Great Western Railway of England, says: "We have tried some mechanical stokers, but with our lump coal and the amount per mile we use, neither of the appliances I have yet seen has any prospect of superseding hand firing. Our average consumption per engine mile over the whole railway is only about 400 pounds."

Your committee is advised that some experiments are now being made with an underfeed type of locomotive stoker, and other forms are also undergoing experiments on various railroads throughout the country, and in presenting this progress report, your committee, while acknowledging its indebtedness to those who have kindly communicated the results of stoker trials, yet feels that the data so far available has not been sufficiently conclusive to warrant its being formally presented to the association.

BEST SYSTEM OF WASHING OUT AND REFILLING LOCOMOTIVE BOILERS.

The report of this committee was presented by H. T. Bentley. "In taking the question up with a number of superintendents of motive power, who are using various devices having the object of washing out, changing water and raising steam quickly, by the use of hot water, and live steam where necessary, the following information was gathered:

1. That there are four or five different systems in use.
2. They have been in use from one to three years.
3. The cost is from $5,500 to $20,000, depending on size and number of stalls equipped, or at 5 per cent interest would mean an expense of from $275 to $1,000 per year.
4. In the various systems reported, statement is made that they are entirely satisfactory.
5. With this installation they can wash out and get ready for service 20 to 26 engines per 24 hours.
6. The average time to wash out and get an engine ready for service, is from 55 1-3 minutes to 4 hours 15 minutes.
7. Average time formerly taken, 3 to 6 hours.
8. Practically no change or improvement made since installed, one user saying that in his system he would suggest a settling well, so that water blown out of boiler might be utilized again after the mud and scale had been deposited.
9. In all cases a very marked reduction was reported in flue leakages and broken staybolts, although very little data were available on this subject. At one point it had been possible to reduce the number of boilermakers employed from ten to four, because of the decreased boiler work, since the hot water washing-out system has been installed.
10. Some of the other benefits derived are given as follows: No evidence of steam in roundhouse. Always plenty of water (hot) to refill boilers at 212 degrees. Temperature of water reduces time and fuel necessary to get engine hot. Facility in turning engines, reduction of engine failures, reducing overtime. Reduction of time at terminals where washing out is necessary."

BLANKS FOR REPORTING WORK ON ENGINES.

The report of this committee was presented by its chairman, Mr. T. H. Curtis (Louisville & Nashville), as follows: "The committee on 'Blanks for Reporting Work on Engines Undergoing Repairs,' which reported at the last convention, was continued for the purpose of submitting additional reports showing the condition of locomotives in service in addition to those undergoing repairs. We submit 'Exhibit G', which we believe covers in concise form the additional information desired. This report should be made monthly by the division master mechanics to the superintendent of motive power. The daily reports referred to in the discussion of this subject at the last convention would be of service to division officials, but we believe that such a system cannot be successfully handled by the general officers of a large railroad and that on railroad systems owning 500 locomotives, or more, a monthly report of the conditions from the division officials is preferable to a daily report. We submit this report as a supplement to the original report.

CASTLE NUTS.

The report of this committee was presented by Mr. T. F. DeVoy (C., M. & St. P.). The committee made the following recommendations:

1. A series of castle nuts having U. S. standard thread with dimensions as shown.
2. A series of thin castle nuts having U. S. standard thread with dimensions as shown.

3. A series of special thin castle nuts having outward proportions the same as thin castle nuts, but having special number of U. S. threads, as shown.

4. Finished castle nuts to have diameter across the flats as shown. Rough nuts to be from 1/64 to 1/32 greater distance across the flats than the finished nuts, to provide for finishing by grinding and buffing.

5. Finished nuts to have facing washer on bottom with dimensions as shown. Rough nuts to have bottom corner slightly chamfered.

6. A series of standard cotter pins with dimensions as shown.

7. A series of Player cotter pins with dimensions as shown.

A series of taper pins with dimensions as shown.

9. Both ends projecting beyond the bolt with cotter-pin hole location as shown.

APPRENTICESHIP SYSTEM.

The report of this committee was presented by C. W. Cross (N. Y., C. & H. R.). The report of this is as follows:

Your committee, recognizing the fact that there is a wide difference in organization and local conditions as to available material and facilities for instruction, considers that a hard-and-fast general apprenticeship code is impracticable, and, therefore, suggests the discarding of the code adopted in 1898 and the substitution of basic principles rather than a formal code.

PRINCIPLES.

To assure the success of the apprenticeship system, the following principles seem to be vital, whether the organization is large or small:

First: To develop from the ranks in the shortest possible time, carefully selected young men for the purpose of supplying leading workmen for future needs, with the expectation that those capable of advancement will reveal their ability and take the places in the organization for which they are qualified.

Second: A competent person must be given the responsibility of the apprenticeship scheme. He must be given adequate authority, and he must have sufficient attention from the head of the department. He should conduct thorough shop training of the apprentices, and, in close connection therewith, should develop a scheme of mental training, having necessary assistance in both. The mental training should be compulsory and conducted during working hours, at the expense of the company.

Third: Apprentices should be accepted after careful examination by the apprentice instructor.

Fourth: There should be a probationary period before apprentices are finally accepted; this period to apply to the apprentice term if the candidate is accepted. The scheme should provide for those candidates for apprenticeship who may be better prepared as to education and experience than is expected of the usual candidate.

Fifth: Suitable records should be kept of the work and standing of apprentices.

Sixth: Certificates or diplomas should be awarded to those successfully completing the apprentice course. The entire scheme should be planned and administered to give these diplomas the highest possible value.

Seventh: Rewards in the form of additional education, both manual and mental, should be given apprentices of the highest standing.

Eighth: It is of the greatest importance that those in charge of apprentices should be most carefully selected. They have the responsibility of preparing the men on whom the roads are to rely in the future. They must be men possessing the necessary ability, coupled with appreciation of their responsibilities.

Ninth: Interest in the scheme must begin at the top, and it must be enthusiastically supported by the management.

Tenth: Apprenticeship should be considered as a recruiting system, and the greatest care should be taken to retain graduated apprentices in the service of the company.

Eleventh: Organization should be such as graduated apprentices can afford to enter for their life-work.

For the purpose of obtaining data as to the conditions on various roads of the country, information was secured which is summarized as followws:

1. A shop plant for the purpose of this report is one in which general repairs of locomotives or cars are made. Fifty-five roads report 301 shop plants having apprentices.

2. Fifty-five roads report 67 shop plants in which there are no apprentices.

3. Fifty-five roads report a total of 7,053 apprentices in shop plants.

4. Fifty-five roads report apprentices in each trade as follows:

Machinists	4,814
Boilermakers	952
Blacksmiths	311
Patternmakers	64
Cabinetmaker	22
Tinner-pipefitter	365
Molder	82
Electrician	14
Painter	137
Upholsterer	27
Carpenter	249

5. Reports from fifty-five roads show the average ratio of apprentices to mechanics in each trade to be as follows:

Machinists	1 to 4.8
Boilermakers	1 to 6.8
Blacksmith	1 to 13.9
Patternmaker	1 to 3.3
Cabinetmaker	1 to 23.3
Tinner-pipefitter	1 to 5.1
Molder	1 to 8.2
Electrician	1 to 8.6
Painter	1 to 19.2
Upholsterer	1 to 11.3
Carpenter	1 to 72.4

6. The majority of replies indicate difficulty in securing apprentices in some of the trades, but no difficulty in others. A few replies state no difficulty in securing apprentices. This is apparently due to local conditions.

7. Out of a total of fifty-five replies, ten, or 18.2 per cent, indicate special instruction in trades is given apprentices. Forty-five replies, or 81.8 per cent, do not provide for special instruction.

8. Out of a total of fifty-five replies, sixteen, or 29 per cent, indicate an established school system and thirty-nine, or 70.9 per cent, have no school system.

9. Out of a total of fifty-five replies, thirty-nine, or 70.9 per cent, have apprentices and no school system, and eight roads state that they intend to establish such a system.

10. Eighteen replies favor day schools and three, or 14.3 per cent, favor night schools out of a total of twenty-one replies.

11. Fifteen replies show thirty-seven schools with 1,567 apprentices attending. The majority of the schools were recently established.

12. Of the above schools, twenty-eight are held in working hours and nine are held in the evening.

13. Of the above schools, thirty-four are compulsory and three are optional.

14. Out of fifty-five roads, twelve pay the apprentices for time spent in school.

15. Modern apprenticeship training has been introduced in seventeen shops on four roads with 506 apprentices since the convention of June, 1907. The following roads and systems of roads have made substantial progress in this work.

Union Pacific—Two schools, one at Omaha and one at Cheyenne; the former established Sept. 1, 1906, 71 apprentices; the latter established Dec. 1, 1907, 21 apprentices.

Michigan Central—One school at St. Thomas; established Dec. 1, 1907; 36 apprentices.

Santa Fe—Ten schools, established 1908; 363 apprentices.

Southern Railway—Two schools, one at Knoxville, Tenn., established 1907; and one Spencer, N. C., established 1907.

Delaware & Hudson—Three schools; located at Green Isle, Oneonta, and Carbondale; established 1907; 86 apprentices.

Substantial progress has also been made on roads having schools previously established, on the Grand Trunk Ry., Central R. R. of N. J., Boston & Maine R. R., Union Pacific R. R., Minneapolis, St. Paul & Sault Ste. Marie R. R. and New York Central Lines.

The Canadian Pacific R. R. and the Erie R. R. advise they intend to install the improved plan of apprenticeship during the present year. Other important roads have the subject under contemplation.

These replies cover apprenticeship which is both new and old, some of the statements coming from roads of many years' experience.

The new apprenticeship, which combines instruction in the trade with mental training, is progressing rapidly on railroads, as described in answers to question 15.

The results of these questions show how large a field is available for the new apprenticeship, as well as illustrating the extent of the present development.

Your committee believes that the strongest part of this report is embodied in the practical exhibit of apprentice training and methods in Booth No. 67 on the pier, which, it is hoped, every member will take opportunity to visit. This exhibit illustrates the development of the several roads in this matter up to date. The exhibit is worthy of most careful study, and your committee believes that the exhibit itself speaks in a far more definite and practical way of the details of the methods which are being employed than could possibly be put into words in even a very long report.

Your committee recommends that the Association provide an appropriation for establishing an exhibit of apprentice training to be a feature of each convention.

Your committee wishes to gratefully acknowledge the co-operation of the Railway Supply Manufacturers' Association in making the present exhibit possible.

An appendix to this report shows the present state of apprenticeship training in England.

It has often been said that apprenticeship is a thing of the past. This certainly is not true of American railroads today, where a new appenticeship has sprung up and has attained a healthy growth with brightest promise for the future. Your committee does not hesitate to characterize the new apprenticeship as the most important influence introduced into railroad organizations during the present generation. This development is sure to be rapid, requiring great wisdom, combined with conscientious and systematic efforts in its control. We believe this movement will become the most powerful influence in supplying and preparing the men of the future for the motive power departments (and perhaps other departments) of American railroads; because the movement trains men in the ideal way, and because men properly prepared for their work constitute our greatest problem today.

Appendix to Report on the "Apprenticeship System."

RECENT PROGRESS OF APPRENTICE TRAINING IN ENGLAND.

Manufacturers and railroad managers in Great Britain have long been alive to the apprentice situation and have developed a number of successful systems embodying advanced and novel ideas. The subject has been given more careful consideration and fuller discussion than in this country and that more general results have not thus far been produced, is probably due to the natural conservatism of an older community and to the hereditary idea of class or caste, evidenced in the retention of many firms of the premium apprentice, a young man paying for the opportunity of entering the shop and usually given special privileges in learning the business. There still remain also in many cases long term apprenticeships of from five to seven years.

The British system of evening technical schools is such that each manufacturing center may be said to have its "Cooper Union." These district technical institutes, as they are called, are usually maintained jointly by grants from the Educational Board, by railroads and manufacturers, and to a small extent by the nominal fees charged for instruction. The use of such schools by firms having apprentices is quite general.

Several establishments make it a practice to excuse apprentices for six months of each year for attendance at day technical schools, crediting the time lost on the apprentice term, but it should be remembered that in such cases the apprenticeship is usually seven years. Both railroads and manufacturers appear to be united in placing emphasis on the value of technical education, and the offering of prizes for high scholarship in evening classes is a common ractice.

The Lancashire & Yorkshire Ry. has built a mechanics' institute at Horwich, a point which is the location of large shops. Apprentices are supposed to attend evening classes at a nominal fee, and as a reward for progress thirty boys are selected each year for free instruction during company time for two half-days per week. The teachers are mainly from the railway company and the character of the instruction is such that many outsiders take the course, paying increased fees.

The Great Western Ry. has day and evening courses with engineering and trade classes in the local technical school at Swindon. About forty-five per cent of the apprentices attend these classes. After one year in shop, apprentices may compete for day scholarships, consisting of instruction for two half-days weekly, extending over twenty-six weeks per year for three years, the railroad paying wages for the time spent at school, also the school fee. The subjects taught are practical mathematics, practical mechanics, geometrical and machine drawing, heat, electricity and chemistry. The number of scholarships at any one time is limited to thirty. In addition a limited number of apprentices are allowed to attend day classes, two afternoons per week of three hours each, without pay, and paying their own school fee. Apprentices taking full evening courses have the liberty of being late for shop the following morning.

For over sixty years the London & Northwestern Ry. has maintained the Mechanics' Institute at Crewe, where out of a population of 45,000 there are 8,500 men in the railroad shops and roundhouses, besides many in other departments. Schooling is optional except with electrical apprentices, who are paid wages for one afternoon per week instruction. Prizes are offered by the company for progress in evening classes, which are taught, as a rule, by employees. The classes are open to outsiders, but employees are admitted at reduced fees.

One of the latest movements among manufacturers is that of Messrs. Clayton & Shuttleworth, who in February, 1907, decided "to graft the advantages of the bygone system upon the so-called factory system of modern times." The aim was first to supplement shop work with courses of instruction directly bearing on the work in the shops; and second, to give all deserving apprentices a varied shop experience. The movement through the shops was to depend on the proficiency of the apprentices. The firm was to maintain its own school in working hours, furnish books and material free. A superintendent was to give full time to the apprentices. The apprentice regulations allow apprentices to enter between the ages of fifteen and twenty-two—sixteen to eighteen preferred—and offer a choice of eight trades. Machinists and patternmakers entering at eighteen serve three years. Molders, blacksmiths and boilermakers entering at eighteen serve four years. Schooling is compulsory in all cases. The aim is to make mechanics, but those showing ability to go higher will be given the opportunity. After twelve months of operation with fifty apprentices, the management reports slightly increased cost of production, but expects compensation in future benefits.

Another interesting system is that of Messrs. Brunner, Mund & Co., who in 1884 started voluntary evening class attendance at the public school, but soon made the attendance compulsory and offered prizes to those attending seventy-five per cent of the time. In 1904 school attendance was made compulsory for nine-tenths of the possible evening classes, and the rule was made to apply not only to apprentices but to other employees under nineteen. Since 1905, apprentices with three years' good record in evening class have been given two-year day courses—two afternoons a week under full wages. The report states that "this system was not commenced as a work of philanthropy, but as a matter of business." The work manager says: "Up to the present we have gained (1) a better understanding of mechanical drawing, (2) greater ability in setting up work. Up to a few years ago, few mechanics understood a drawing—now many of our lads show great ability in hand sketching, placing their measurements on paper in an understandable form. It used to be the most difficult of all things to teach an apprentice to set up his work, but now in many cases it comes to him naturally. I consider that our younger generation of mechanics show a marked improvement both in ability and keenness for work, and it is a pleasure to deal with many of them on account of the interest they display."

Out of a list of fifteen described in recent issues of the Engineer (London), seven make a practice of sending the most promising boys while under pay and at the company's expense to day classes for one or two days per week. The classes in most cases are at neighboring technical schools and the selection of apprentices for the day scholarships is usually based on competitive work in the evening classes. Eleven of the fifteen manufacturers advise apprentices to attend evening classes and three make such attendance compulsory. When an English firm intends to pay the school fees the accepted method appears to be for the apprentice to first pay the fee and later be reimbursed by the firm if he makes satisfactory progress or attends a sufficient percentage of classes.

Several grades or classes of apprentices are maintanied by the British Westinghouse Co. and by Yarrow & Co., including a special classification for techical graduates.

The North-East Coast Institution of Engineers & Ship Builders have recommended a system of marks for apprentices, to include the attendance, industry and advancement in evening study, and the behavior and efficiency in the shop. Those apprentices reaching a given percentage of marks are rewarded by increased wages and by special opportunities for advancement. The scheme is designed to foster self-help and has been applied by several manufacturers.

A departure in student-apprenticeship courses has been made by the Sunderland Technical College. These courses, which were started in 1903, are open to apprentices in shipbuilding and engineering shops who are under eighteen years of age, who have already served two years in the shops, showing ability and giving satisfaction, and who have attended evening classes for at least two years. Boys are allowed leave of absence from the shops from October 1 to March 31 of each year to attend the college, the time counting on the apprenticeship term. A combination diploma is given signed by the firm, by the college and by the Association of Ship Builders and Engineers of Sunderland and District. The suggestion has been made that these courses be extended for nine months with classes repeating each two weeks, thus giving short alternating periods in shop and school, not unlike the idea being carried out in the United States by the University of Cincinnati.

Evening classes versus day classes is already arousing discussion in England. Evening classes have failed to produce the expected results. In a recent paper on the subject one investigator says that a large amount of evening instruction is wasted and recommends that evening schools give asistance to enable a few to train themselve above the average, rather than trying to produce a light crop over a large area and attempting to reach the rank and file. The statement is further made that only a very exceptional youth, strong both mentally and physically, can make any great headway by evening study and at the same time work regularly and well in the shop from 6 a. m. to 5 p. m. In this connection the experience of Messrs. Cochran & Co. is instructive. In 1903 a three-year course of evening apprentice instruction was started, but in 1905 this was changed to day classes, holding sessions from 8 a. m. to 10 a. m. without deduction of wages. The results have been all that could be wished and the coaxing previously necessary to make boys attend evening class is no longer needed. Prizes are given boys who apply the school training in the shop. Messrs. Cochran & Co. report a direct benefit in the shop due to school work.

In conclusion it might be mentioned that nearly all the firms who are attempting to solve the apprenticeship question have abandoned the premium apprentice. Attention should also be called to the fact that there is but little reference to methods of handling the shop side of the question and no mention of shop instructors in connection with any of the roads or manufacturers, and it would therefore appear that the problem in Great Britain has been considered almost entirely along educational lines and hardly at all in the shop.

TESTS ON BRIQUETTED COAL.

The paper of A. W. Gibbs on this subject was presented by Mr. Nelson.

"These tests were carried out under the direction of Dr. J. A. Holmes, expert in charge, technologic branch, United States geological survey.

It was intended to ascertain if low volatile coals of a semi-smokeless nature but friable and, therefore, not fairly satisfactory in locomotive use, could, when briquetted, be used to reduce the amount of smoke and prevent the loss sustained from the discharge of cinders, which is large in coals of this character. The coal selected had the following proximate analysis in percentages: Fixed carbon, 73.21; volatile combustible, 17.75; moisture, 2.43; ash, 6.61; total, 100. It contained 1.34 per cent of sulphur and had a calorific value of 14918 British thermal units per pound.

A series of tests was run with the raw coal and another series with the same coal briquetted in two forms, square and round, and experiments were made with the percentage of binder from 5 per cent to 8 per cent.

All tests were run on the locomotive testing plant, a simple cylinder Atlantic type locomotive being used, having a total heating surface including fire side of tubes of 2,320 square feet and a grate area of 55.5 square feet. The results give the full performance of the boiler, together with the draw-bar pull.

The series with the raw coal were run in such a way as to show the full performance of the boiler from low rates of evaporation to the highest possible rate of evaporation. The lowest rate of evaporation was about 18,000 pounds of water per hour, equal to eight pounds per square foot of heating surface; this being increased throughout the test until, with the briquetted fuel, an evaporation of 44,500 pounds of water from and at 212 degrees F. was obtained. This is equivalent to 19 pounds of water per hour per square foot of heating surface.

The briquets were fired with ordinary shovel and handled in the manner usually employed for coal, no necessity being found for breaking the briquets.

The following table taken from a plot of actual results shows comparatively the evaporation of the natural and briquetted coal.

Evaporation per square foot of heating surface. pounds.	Equivalent evaporation per pound of fuel Natural Lloydell coal pounds.	Briquetted coal, pounds.
8	9.5	10.7
10	8.8	10.2
12	8.0	9.7
14	7.3	9.2
16	6.6	8.7

The quantity of cinders collected in the smokebox showed no material difference as between the raw coal and the briquetted coal. The quantity collected per hour when burning 100 pounds of fuel per square foot of grate was about 400 pounds, reaching a maximum of about 750 pounds per hour with the coal being burned at the rate of 120 pounds per square foot of grate.

Firebox and smokebox temperatures were practically the same at the same rates of evaporation, whether the coal was used in its raw state or briquetted.

The apparent reason for the increased evaporation per pound of fuel with the briquetted coal is that, although, as already stated, the loss due to cinders in the smokebox is not different as judged by the quantity collected, the calorific value of the cinders from the briquetted coal was lower than with raw coal, and, further, on account of the uniform size of the briquetted fuel the distribution of air through the fire permitted more complete combustion and liberation of heat than with the raw coal.

The fuel consumed per draw-bar horsepower with the locomotive running at a speed of 37.78 miles per hour and a cut-off of 25 per cent was 4.48 pounds using raw coal and 3.65 pounds using round briquets.

This is equivalent to stating that the amount of briquetted coal was 81 per cent of the amount of raw coal required per draw-bar horsepower at this speed and cut-off.

Smoke observations were made by Ringelmann's method and by photographs. By this former method no smoke is indicated by 0 and very black smoke by 5; there being a total of six gradations from 0 to 5 inclusive.

The following table indicates for a portion of the speeds and cut-offs the comparative smoke readings, these being an average of a large number of observations made at regular intervals.

Speed miles per hour.	Cut-off. Per cent.	Average Smoke.	Kind of fuel.
28.34	20	1.2	Raw coal.
28.34	20	0.8	Round briquets.
37.78	25	1.8	Raw coal.
37.78	25	0.7	Round briquets.
37.78	30	2.1	Raw coal.
37.78	30	1.8	Round briquets.

It is evident from this that the briquetting of this coal materially reduced the amount of smoke, but it could not me determined whether difference in percentage of binder used made any difference in the smoke produced.

At the end of one test at about 37 miles per hour and a cut-off of 32 per cent, the locomotive was shut off and the blower put on and at the end of two minutes the smoke had entirely cleared from the stack.

Various supplemental tests indicated that with care the locomotive could be brought into a terminal where smoke was objectionable by the proper use of blower and judgment on the part of the engineman in regard to the amount of fuel in the shape of briquets fed to the fire.

There was no difficulty in starting the fire with briquets the same method being used as with the raw coal.

To determine the effect of weathering, a number of round and square briquets were placed on the roof in January and February and examined in May or about four months after and these showed no signs of change whatever in their condition.

For these tests, the briquets which had been made at the station of the geological survey were shipped to Altoona carefully stacked in open gondola cars and were carefully unloaded and restacked. Very few were broken and the amount of fine coal abraded from the surface was practically negligible.

This method of handling was all carefully done, but if the briquettes had been shipped for regular locomotive service it is not thought that the breaking and abrasion of handling briquettes would be a serious matter for regular service."

SIZE AND CAPACITY OF SAFETY VALVES.

The report of this committee was presented by F. M. Gilbert, of the New York Central. It was accompanied by a minority report presented by James Milliken. On motion the recommendation contained in the minority report was adopted.

FOUR-CYLINDER COMPOUND LOCOMOTIVE.

This report was presented by the chairman of the committee and will appear in full in the next issue of the Railway Master Mechanic. After the report of the committee on resolutions the following officers were elected for the ensuing year: President, H. H. Vaugh; first vice-president, G. W. Wildin; second vice-president, C. E. Fuller; third vice-president, J. E. Muhlfeld; treasurer, A. Sinclair. Members of executive committee, H. T. Bentley, T. Rumney and T. H. Curtis.

Apprenticeship System Exhibit.

The following railway companies joined in an exhibit of the committee on the apprenticeship system, Central Railroad of New Jersey, Grand Trunk Railway, Atchison, Topeka & Santa Fe Ry. Co., New York Central Lines, Union Pacific R. R., Erie Railroad, St. Louis & San Francisco R. R., Canadian Pacific Ry. and Pennsylvania R. R.

The committee report contains the following: "It has often been said that apprenticeship is a thing of the past. This certainly is not true of American railroads today, where a new apprenticeship has sprung up and has attained a healthy growth with brightest promises for the future. Your committee does not hesitate to characterize the new apprenticeship as the most important influence introduced into railroad organizations during the present generation. This development is sure to be rapid, requiring great wisdom combined with conscientious and systematic efforts in its control. We believe this movement will become the most powerful influence in supplying and preparing the men of the future for the motive power departments (and perhaps other departments) of American railroads; because the

RAILROAD APPRENTICE SCHOOL'S UNITED STATES & CANADA

movement trains men in the ideal way, and because men properly prepared for their work constitutes our greatest problem today."

In a little circular given out at Atlantic City called special attention to the simple and inexpensive character of the school outfits required. The drawing-tables shown are constructed in company shops. Many of the locomotive, car or machine tool parts used for demonstration and drawing in the class rooms are condemned parts, valued only as scrap, which are, however, just as useful for illustration purposes.

The exhibit showed in a striking manner a new method of teaching, devised to meet the special needs of apprentices in the shop. The instruction is of a direct, practical, hand-to-hand type, using every-day problems, with the actual objects for illustration. Apprentice instructors are everywhere working out their own instruction sheets, and are drawing on their local shops for examples and problems.

One distinctly American feature of apprenticeship which could not be fully shown in the exhibit, is the system of special shop instruction. This feature as used by a number of the roads exhibiting makes possible an immediate increase in the shop output of apprentices.

The may shown herewith gives an idea of the present extent of railroad apprentice schools in the United States and Canada.

Convention Notes

The best and biggest yet—the convention of 1908.

The baseball game this year was between the railway and railway supply. The game played on Saturday afternoon resulted in a defeat of the railway nine. Score, 25 to 19.

The Railway Supply Manufacturers' Association held its annual meeting Saturday morning and elected the following officers for the ensuing year: Alex. Turner (Galena-Signal Oil Co.), president; A. L. Whipple (Forsyth Bros. Co.), vice-president; R. H. Weatherly (Scullin-Gallagher Iron & Steel Co.), treasurer. At district meetings the previous day the following were elected members of the executive committee: Samuel G. Allen, of the Franklin Railway Supply Company, and E. M. Grove, of the McConway & Torley Company, to succeed George N. Riley and Frank L. DeArmond, for the third district; S. P. Bush, of the Buckeye Steel Company, for two years to succeed A. G. Hollingshead, of the fourth district, who resigned owing to a change of residence; L. R. Phillips, of the National Tube Company, to succeed R. T. Walbank, of the fifth district; A. C. Langston, of Jenkins Bros., to succeed L. O. Cameron of the sixth district.

George H. Sargent was present at the convention this year with his own device, the "Sargent Rerailers." Mr. Sargent was formerly with the Sargent Company and later organized the Railway Appliances Company, which recently was combined with the Q. & C. Company, making the Quincy, Manchester & Sargent Company, of which company he was made vice-president. Mr. Sargent's pictures appears among the Snap Shots in this issue.

Mr. Willard A. Smith, publisher of the Railway Review, was responsible for the registering of the "old timers." A larger picture of them taken at Atlantic City was published in the issue of the "Review" of June 27. We quote the following, which was published with the picture:

"The attendance at the annual conventions of the railway mechanical associations has in the course of years grown into as many thousands as it formerly was hundreds. Naturally those who have been coming for many years like to talk over the former days, and little groups of them may be seen at any time around the corridors. Last year the desire to get together became especially manifest. This year a register was opened at the Railway Review office of those who attended their first convention 20 years or more ago. Some of these are retired from business, and some are still as active as ever. Some of them began as boys and are still young men. They include railway men and railway supply men alike. One of them (Mr. Dan. M. Brady), has the unique distinction of having attended every M. C. B. convention for 34 years and every M. M. convention for 33 years; and he is still decidedly a young man. Mr. J. H. Setchell began at the Pittsburg meeting of the M. M. Association in 1869, 40 years ago, was elected secretary at Louisville at the fourth convention, and served in that capacity for 18 years and as president two years. Mr. Wells and Mr. Sprague are charter members, having participated in the first meeting for organization of the Master Mechanics' Association. Not all of those who registered were present when the group picture was taken; but there are 63 faces which will appear familiar to many of our readers, although it may require a magnifying glass to bring out some of them distinctly."

Mr. C. M. Spotts appeared this year as president of the Spotts Formulae Paint Company of New York City. Mr. Spotts is well and favorably known to those attending the June convention because of his connection for the past ten years as manager of the paint department of the Joseph Dixon Crucible Company, manufacturers of Dixon's silica graphite paint. He has severed his connection with that company with a view of establishing a paint company in the vicinity of New York that will make a specialty of paints for structural and ornamental work. Mr. Spotts has made a specialty for a number of years of architectural and engineering specifications, and has had charge of the painting of such structures as the hotels St. Regis, Astor, Knickerbocker and Belmont; Altman's new department store, the new McAdoo Terminal Buildings, the City Investment Building, Broad Exchange Building, as also a number of other important structures in New York and other cities. The recent legislative work done by Mr. Spotts, as chairman of the legislative committee of the Eastern Paint Manufacturers' Association has attracted considerable attention. Associated with Mr. Spotts is Mr. Walter F. Swearer, as vice-president and treasurer of the company. A snap shot elsewhere in this issue shows Mr. Swearer and Mr. Spotts and his young but growing son and heir.

Mr. H. Boutet, chief paint inspector at Cincinnati, was in evidence at the conventions because of his earnest efforts in behalf of the Chief Joint Car Inspectors' and Car Foreman's Association of America, of which he is the able and energetic president. The objects of his association are "the advancement of knowledge relating to safe and economical railway car interchange and inspection and to the construction, maintenance and service of railway cars and car shops, by discussion in common, investigation and reports of the experience of its members; to provide an organization through which the members may help to bring about uniformity and interchangeability of the railway cars and for the mutual interests growing out of their interchange and repair." New members are always welcome and may send their application for membership to Stephen Skidmore, secretary, Chief Joint Car Inspectors' and Car Foremen's Association, F. C. D., C. C. C. & St. L. Ry. Co., Cincinnati, Ohio. Their next annual convention, which is to be held in Detroit in September, promises to be the largest convention ever held by the association.

The Detroit Hoist and Machine Company in addition to an attractive and well displayed exhibit distributed an "optimistic" card which read as follows:

"When the whole blamed world
seems gone to pot,
And business is on the bum,
Helps some, my boy, helps some."
A 2-cent grin.
And a lifted chin

President Walbank of the Supply Men's Association, was made the happy recipient of a very handsome solitaire diamond ring by some of his friends just after the close of the convention at Atlantic City. The presentation was entirely informal and was a complete surprise to Mr. Walbank.

Donald C. Barbee, president of the Standard Metal & Mfg. Co., Chicago, was among those who got caught at the convention by the Railway Master Mechanic's camera. Mr. Barbee takes a good photograph, as the illustration in this issue will show. This was only his second convention, as he is one of the more recent additions to the association, but he says he does not intend to miss any of these great meetings as long as he lives. From his youthful appearance, which is also his actual condition, he has a great many more conventions to enjoy. Mr. Barbee has been very successful in the railway supply business. His company is barely two years old, but he has built up a fine trade on his journal bearings.

Dr. J. M. Griffin, His Camera

Dr. Griffin, president of the Wheel Truing Brake Shoe Company of Detroit, had his usual exhibit of wheel truing brake shoes for which he makes the following claims:

You do not have to lose time of cars or engines.

You do not have to jack them up.

You do not have to remove trucks.

You do not have to throw away flat wheels.

You do not have to put in expensive machinery for truing up wheels.

You do not have to keep an extra crew of men to remove, true up and replace wheels.

You can continue running a car or engine with untrue wheels when on a long run and away from shops.

It prolongs the life of the wheel at least ten per cent.

The doctor also had another interesting exhibit in the shape of a very fine camera known as the Press-Graflex. This camera takes pictures in a fifteen-hundredth part of a second and takes good ones, too, as is evidenced by some pictures reproduced elsewhere in this issue. The publisher of the Railway Master Mechanic is under obligations to the "doctor" for his help, on Sunday forenoon during the convention, in taking some of the best pictures shown in this issue.

A Modern Mechanism

UNDER the title "A Modern Mechanism" the Pilliod Company, Swanton, Ohio, have issued an attractive booklet describing the Baker-Pilliod Locomotive Valve Gear. The motion of the valve is derived from two independent sources—the main crank by connection to the crosshead and from an eccentric crank opposed at right angles to the main crank. A swinging lever, or radius bar is suspended from a reversing yoke, movable to any desired angle to impart the required throw and cut-off. The lever action of the eccentric arm actuates the lap and lead and maintains a constant lead.

The crosshead connection imparts the motion of lap and lead when the swinging lever, or radius arm, and the reversing yoke are in its central position. Thereforce in the mid-gear, with the reverse lever in the center notch this will be practically all the motion imparted to the valve.

By moving the reverse lever forward the angle of the reverse yoke is changed and brought into combination with the main imparting motion, towards the eccentric arm, whereas the opening motion of the valve is accelerated for the forward motion of the engine.

For the backward movement the reverse yoke is changed to an opposite position while the path of the valve rod remains the same as for the go-ahead movement. The excessive compression and back pressure in the short cut-off is entirely eliminated. No change is required in the valves or auxiliary parts to the main valve as at present in use—merely a change in the imparting motion accomplishes the improvements set forth. No change of construction or different parts are required for either inside or outside admission, except the position of the eccentric crank which leads the main crank for outside admission and follows it for inside admission. And it naturally follows that our low terminal pressures admit of a larger exhaust nozzle.

Their exhibit at the recent convention exciting a great deal of interest among those in attendance. They make for it the following claims:

The weight of the gear as compared with the Stephenson link gear represents about 40 per cent of the latter's weight; about 60 per cent of the weight of the Walschaert.

It is a universal application for all types of engines. Absolutely outside of frame and all power reciprocating parts, with perfect accessibility to all parts. It requires no special design for the different style, type or class of locomotive, reducing first cost and facilitating repairs at minimum costs.

The imparting motion is of a very low throw of 6½ inches and speed has no destructive or high deteriorating effects. Its reciprocating parts are as light as is consistent with the labor to be performed. No loose, sliding or lifting joints or link blolcks. Each and every connection of the gear is mechanically positive.

The reverse requires no change in the reciprocating parts, no readjustments of its bearings or alignment, merely a movement of its positive connected radius arm, overcoming all objections of any type of valve gear that employs a link movement.

It produces a greater range of valve events than any other type of valve gear, for the reason that its various positions are a positive and direct connected movement.

T. H. Symington Co.

The T. H. Symington Co., the well known manufacturers of journal boxes, and a general line of malleable castings, were well represented at the M. M. & M. C. B. convention recently held at Atlantic City by an attractive exhibit and a number of the members of their large sales department.

Their exhibit was apparently the subject of general interest to motive power and car men attending the convention. The display of locomotive castings made of "Symington" iron included test pieces of this material showing the various tests made to illustrate its superior strength and wearing qualities. The tensile tests showed an average strength of 40,000 lbs. per square inch, which together with the very superior wearing qualities claimed for this material, would seem to promise a very wide field for its introduction as a substitute for locomotive wearing parts now made of cast iron.

Uwanta Wrench

The Uwanta wrench which was exhibited at the Atlantic City convention is manufactured by the Uwanta Wrench Company at Meadville, Pa.

These wrenches are built in standard sizes but the nut capacity of each size is greater than the ordinary railroad wrench. A 10-inch and 15-inch wrench can be used for engine equipment in place of the 12 and 18-inch, commonly used.

The wrench has been made practical for railroad purposes by using a very high carbon drop-forge steel bar. This, in addition to the tie-piece on the back of jaw prevents the annoying feature of the bar springing and bending. This tie-piece so stiffens the jaw that it will withstand more than the ordinary strain and abuse.

The hexagon nut, a distinctive feature of the Uwanta wrench, enables the user to operate the jaw regardless of grease or dirt. If a firmer grip than can be obtained by the hand is desired a second wrench can be applied.

The special construction of the iron handle has made it one of the popular and saving features of the wrench. Because of this fact alone a large number of their railroad customers have changed from wood to iron handles.

The Uwanta wrench is the result of a careful study of railroad needs and the fact that many of the large railroad systems have adopted it as their standard shows that it is in every way practical and a money-saver for their lines.

Standard Coupler Company

The Standard Coupler Company made an optimistic exhibit which it had framed and displayed in its booth. It read as follows:

IT IS AMERICAN TO SMILE.

Everybody knows that railroads and those interests dependent upon their prosperity for a satisfactory volume of business, are suffering from drastic diminution of earnings. But that is no reason for having the mulligrubs. Anybody can be gay and lighthearted when things are coming his way. Courageous men don't cry when they are hurt. They keep a stiff upper lip, smile, and hustle.

This country is all right, but sometimes some of its people are foolish and do fool things. Most of the time, however, Americans are wise, and when they are, they do things worth while.

Why, the very consciousness that we are Americans, ought to be good for an eighteen-hour-a-day smile. If we are GOOD Americans, we'll be in bed the other six hours, when we can dream about it—and smile in our sleep.

The above are the optimistic sentiments of the

STANDARD COUPLER COMPANY,

No. 2 Rector Street, New York City.

When times are good, we sell a lot of

STANDARD STEEL PLATFORMS

and

SESSIONS STANDARD FRICTION DRAFT GEARS

Because they are good things.

Traveling Engineer's Association

Mr. W. O. Thompson, secretary of the Traveling Engineers' Association, has made the following announcement regarding the next annual convention of that organization: "The sixteenth annual convention will be held at Detroit, Mich., commencing Tuesday, August 25, 1908, at 9:30 a. m. The Hotel Cadillac will be the headquarters and the rates are as follows: American plan: rooms without bath, $3.50 to $4.00 per day each person; rooms with bath, $4.00 to $8.00 per day each person. European rates, $2.00 to $6.00 per day each person. The capacity of the Hotel Cadillac is about 300 people and would suggest that all those desiring accommodations at headquarters make application for their rooms early in order not to be disappointed. The Pullman people will extend to persons attending the convention, and dependent persons of their families, the same courtesy as heretofore, viz.: Persons to pay full fare en route to convention and upon presentation of receipts showing fare paid, together with proper credentials of the association, to Mr. C. J. Segar, district superintendent, Detroit, Mich.; passes will be issued for return trip to persons who are properly identified as bona fide employes of railway companies, in active service, and legally entitled to reduced rates under the provisions of the interstate commerce law. The committees have been hard at work and their reports on the several subjects are very interesting indeed, and it is believed that this will be one of the most interesting conventions yet held."

Tests of Falls Hollow Staybolt Iron

The results of vibratory tests of eight samples of Falls Hollow staybolt iron at the Purdue University laboratory for testing materials give the following results:

Tension Load lbs. per sq. in.	Revolutions per Minute.	No. of Revolutions to Rupture.
4000	100	10188
4000	100	13123
4000	100	8339
4000	100	9363
4000	100	8868
4000	100	10880
4000	100	11888
4000	100	5318
	Average	9746

The tests were made on an Olsen Staybolt machine in accordance with the specifications recommended by Committee on Staybolts of the American Society for Testing Materials.

These specifications include the following tensile strength:

Not less than 48000 lbs., per sq. in.

Per cent of elongation in 8 in., not less than 28.

Per cent of contraction of area, not less than 45.

Must stand 6000 revolutions, when one end is fixed and the other end (8 inches from fixed end) is moved in a circle of 3/32 inches radius, while the bolt is under a tension load of 4000 lbs. per sq. in. The bolts were threaded with standard staybolt dies, 12 threads to the inch.

General Railway Supply Company

Mr. H. U. Morton, vice-president of the General Railway Supply Company of Chicago, represented his company at the conventions in Atlantic City. They had an elaborate and interesting exhibit consisting of the stub end of a passenger coach with full size vestibule complete, showing in position the various specialties and devices handled by this company, including: Metallic (steel) sheathing and lining, steel sash rest, steel door and window lintels, steel letter board, steel corner post casings, steel pilasters, battens, angles, etc.; National stele trap doors and lifting device, Schroyer friction curtain rollers, Garland ventilators, National standard roofing, Ideal Roller center bearings, Flexolith composition flooring and National automatic vestibule curtain catches.

The exterior sides and ends of the car are covered with metallic (steel) sheathing, made of steel plates pressed to an interlocking formation for application on a wooden frame or on steel construction with screws and rivets respectively in such manner that the method of fastening is not discernible on the exposed surface, there being no rivet heads or screw heads in sight. Every detail in connection with the application of the other parts, such as sash rest, lintels, etc., has been carefully worked out, thus giving an attractive exterior.

One of the main advantages claimed for this sheathing is the formation of air chambers between the inner and outer walks, and by plugging up the bottom and top openings with wood or asbestos, dead air chambers are produced, thus providing the best kind of insulation against heat and cold. The fact that the sheathing is furnished direct from the factory with two priming coats of paint baked on is an important factor and effects a saving in time and expense. The sheathing has been applied to several new coaches built for the Chicago & North Western and the Atchison, Topeka & Santa Fe, also to thirty-one new St. Louis & Santa Fe baggage cars having steel frames,. The Pullman Company has adopted it as standard and is now applying it to all of its new cars, having in service 125 cars with this sheathing on the exteriors.

Robertson Box Car Roof

Among the interesting exhibits was that of the Asbestos Protected Metal Company, Canton, Mass. Their product is a durable, weather-proof, flexible covering for freight cars, which will not rust and which will minimize interior condensation. This car roof is constructed on thoroughly practical lines and has been tried out in actual service, proving faultless.

The Robertson roof is an inside roof and is constructed entirely of asbestos protected metal. This material consists of a core or body of annealed American Bessemer sheet steal, which is thoroughly coated with a special asphaltum compound or sealer. Firmly embedded in this compound on both sides of the sheet is a layer of pure, long fibre asbestos felt. The steel core is hermetically sealed within the asphalt coating. The coating is proof against the attack of moisture, gases and acid fumes and thoroughly and positively protects the steel from the attack of rust or corrosion. The asbestos felt serves as a covering to the asphaltum compound and gives it permanent protection.

The roof consists of sheets of asbestos protected metal extending from within a grooved recess in the ridge pole to the outer edge of the facias, having flanges on each side turned up 1 inch and butting closely together. These upturned edges or flanges fit into a grooved strip of the same material which fits snugly over them and is held in place by a grooved intermediate carlin or wood rafter. This grooved rafter is tenoned at one end and fits into a mortised recess in the ridge pole in such manner as to be absolutely firm yet flexible. The opposite or outer end of the grooved rafter is secured by means of screws or bolts to the eaves plate. This form of joint between the roofing sheets is absolutely weathertight and at the same time provides for all oscillation or working of the car frame, without breaking down or deteriorating.

Each sheet is further secured by a malleable iron clip, which is interposed between the facia and the frieze. This clip is held in place by screws and provides space for the free circulation of air and water.

The ridge pole is shaped to provide the required pitch to the roof and the pitch of the grooved longitudinal recesses should conform with the same.

The roof sheathing is applied over the intermediate purlins in the usual manner. The ridge joint formed by the abutting ends of the roof sheathing boards may be covered under the running board saddles by a strip of asbestos protected metal, secured to the sheathing by nails.

The whole construction is simple, the finished roof is flexible and on account of the rust-proof qualities of the asbestos protected metal roofing sheets, the Robertson roof is absolutely permanent.

The Noscalon Company

One of the new concerns in the field of bad water treatment exhibiting at the M. C. B. & M. M. A. convention is the Noscalon Co. of New York, Chicago and Toledo. In claiming a solution of the question of hard scale formation it leaves the well trodden paths of past efforts and is exploiting a machine and material which they term a "water food," which operates upon a theory that will appear to be new and novel to many. They do not claim to treat the raw water as such. The material which is proportionately and automatically ground is fed by a Noscalon machine attached between the injector and the boiler on the feed water pipe on locomotives and on the end of the pump in stationary plants.

The material is a secret earthy combination which is comparatively inexpensive and the Noscalon Co., when asked for an explanation of its methods, referred to several solutions of the bad water problem made by eminent chemists, engineers and professors, one of whom in particular summed up the question in substance as follows: That three ways appear to be open to the scientific world to solve the hard scale nuisance. First, treatment of raw water by attempting to remove the deleterious solids. Second, using a compound that will eat out and remove hard scale already formed, and, third, placing something in the water that will prevent the solids therein from becoming hard and adhering to the iron tubes and sheets. It is the last class to which Noscalon belongs. The powder is harmless and is practically indestructible in water, even remaining in tiny particles in the steam when generated. These minute particles at once mingle with the precipitated solids when steam is formed and together they form a heterogeneous mass which remains floculent and which feeds the liberated gases and renders it physically impossible for the precipitated solids to become hard or to incruslate the iron. This floculent mass is constantly in motion while in the boiler and is readily and easily blown off.

The Noscalon Company maintains that their material acts only at the time that steam is actually generated, having no effect whatever until the very moment that the water reaches the boiling point. They claim that when water is heated to a point of making steam the salts which incruslate are precipitated and are not apparent until heated to this degree in the boiler. Contrary to all other systems which treat water before entering the boiler, the Noscalon system treats the water at the point of usage, supplying the necessary salts whose absence from the water causes the scale formation when the water is subjected to a high temperature.

As an example of boiler incrustation the company cites a sample of raw water from Poland, Arizona, the analysis of which shows that it contains no iron oxide whatever. Yet scale taken from the tubes and sheets of a boiler using this water contains 48.73 per cent of iron oxide. The natural query at once arises, Where does the iron oxide in the scale come from? The answer must be, From the iron. Therefore a slow but sure disintegration and consumption of the tubes and sheets is occurring.

The Noscalon material added to this water the necessary "food" on which the liberated gases acted and at once stopped the scaling and eating of the iron. They claim that water at Poland is "bad" because it lacks certain natural preservative salts which were supplied in the form of the Noscalon powder.

The company claims that in addition to the scale removing and preventing qualities of their Noscalon it contains great lubricating properties owing to the material being carried in suspension into the steam cylinders and being of an unctious nature is a natural lubricant.

Blast Equipment in the New Shops of the Grand Trunk Railway at Battle Creek, Mich.

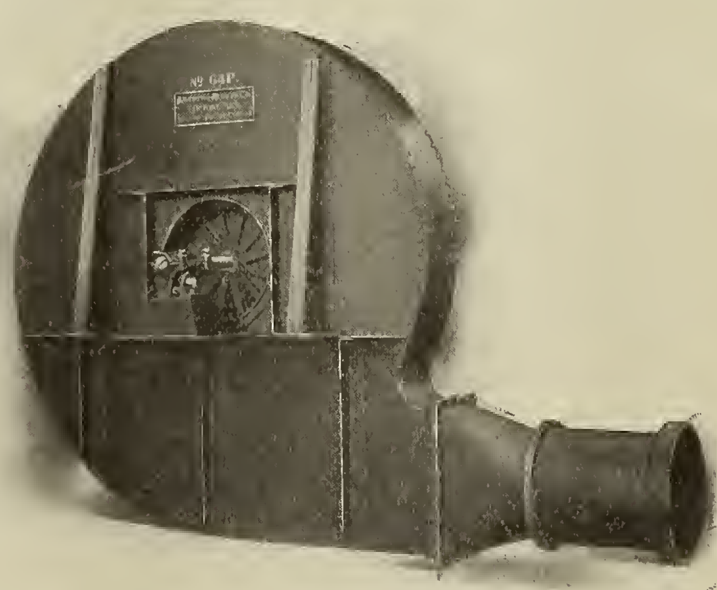
The Grand Trunk Railway System, who have been building and equipping a new and modern group of shops at Battle Creek, Mich., were evidently very particular about the design of system and class of equipment to be included in their smith, boiler and flue shops, for as early as October, 1907, Mr. J. T. McGrath, master mechanic, located at Fort Gratiot, Mich., began negotiations for a blast equipment, the contracts for which were not let until March, 1908, six months later.

Questions of various volumes of air, and pressure, at which same was to be delivered were matters of utmost importance, both from the standpoint of the proper working conditions, as well as the greatest economy in power consumption.

As each individual case presents new conditions to be encountered, the engineering department of the American Blower Company of Detroit, Mich., who have had long experience in this class of work, decided to know all the requirements down to the minutest details, before submitting their proposal, and one of their engineers made a trip to Battle Creek to go over the ground thoroughly, and another engineer conferred with the master mechanic at Ft. Gratiot, and later made a special trip to Montreal to consult with the officials there.

The tenders and plans submitted by the American Blower Company were accepted by the railway officials as embodying the best engineering practice, and the finest constructional features of apparatus. A separate blast equipment was installed in each shop.

The boiler shop equipment included a No. 8 "ABC" type "P," steel pressure blower of standard design con-



structed with steel pedestal and coupling for direct connected motor, and a system of heavy riveted and soldered galvanized steel piping, installed complete. The flue shop was equipped with a No. 6 "ABC" type "P", steel pressure blower of standard construction, for belt connection with system of riveted and soldered piping installed complete. The forge shop is a typical railway layout, modern in every respect, including special furnaces and forges for spring hammer, axle, bulldozer and frame work, including ten forges of the McCaslin type, a number of Ferguson fuel oil burners for 5-in. blast pipes.

The blast system in the forge shop was somewhat more of an elaborate layout than either the boiler or flue shops, and required over 500 ft. of main horizontal overhead heavy galvanized steel blast pipe, reducing in size as the various branches supplying the furnaces or forges were taken off and as the distance from the blower outlet increased. The success of the system to a large degree rests on the proportion and design of the piping system, and it was on this point that the previous large experience of the American Blower Company's engineers came into play, and on which they exhibited keenest skill. All curves were laid with long, easy radii, thereby reducing frictional loss. Each branch was equipped with a unique explosion damper, the design of which was supplied by Mr. McGrath, M. M. of the system.

The American Blower Company guaranteed to maintain a pressure throughout the system of not less than 10 oz. per square inch, and employed for supplying the blast, a steel pressure blower of special design and construction throughout. The blower was of the top vertical discharge, for connection to overhead system of galvanized piping, supplied with a rubber gasket connection between the outlet and piping. The blast wheel was 61 in. in diameter by 12¾ in. wide at the center, having 24 blades of the curved pattern, made of No. 12 gauge steel, riveted to No. 12 gauge steel rims. The blower had two inlets, each covered with wire screen to prevent anything being drawn into the blower wheel, thereby causing possible injury to same, also answering as protection to the attendants. The bearings of the blower were of the double ring oiling and self-aligning type, carried on cast iron pedestals, entirely independent of the blower housing. The blower housing was constructed of No. 7 steel plate, each side being reinforced by two girder plates, made of No. 8 steel, heavily stiffened with steel angles. These girder plates act as a support for the blower housing, and prevent vibration and pulsation of the blower sides, due to the air pressure within.

A 100 H. P. type "CCL," 3-phase, 60-cycle, 440-volt, Westinghouse, alternating current motor, wound for a speed of 1120 r. p. m., was direct connected to the blower shaft by means of an ingenuous flexible strap coupling, designed by the American Blower Company.

The American Blower Company exhibited at the Atlantic City convention one of their type "P" steel pressure blowers in connection with their spectacular "Keep your eye on the ball" scheme, but such installations as above described would carry out the claims of the American Blower Company in that their blowers are the most practical, thoroughly constructed and efficient machines in everyday service.

Fourth Annual Convention International General Foreman's Association

THE fourth annual convention of the International General Foremen's Association was held at the Lexington Hotel, Chicago, May 25 to 29. The sessions were presided over by President E. F. Fay, shop superintendent of the Union Pacific Railway at Cheyenne, Wyoming.

At the opening session addresses were made by Mr. J. F. DeVoy, mechanical engineer of the Chicago, Milwaukee & St. Paul Railway, and Mr. Angus Sinclair, editor of Locomotive Engineering. At one of the later sessions, the convention was addressed by Mr. Robert Quayle, superintendent of motive power of the Chicago & North-Western Railway. Mr. C. B. Smyth, assistant mechanical engineer of the Union Pacific Railway, read a paper on the Union Pacific gasoline motor car. The design of the car was illustrated by wall diagrams and the author stated that this car had been such a success that the demand for it now exceeded the output of the shop; the company had already built 24 cars. The later cars are 55 feet long and have a capacity for 75 passengers and the engines are 200 horsepower. Tests made to show the value of the pointed front end and round back end of these cars demonstrated the fact that 40 per cent more gasoline was used in the same service with a car having flat ends than with those of the pointed shape generally adopted. The endurance of these cars had been shown by the recent trip of one of them from Omaha to Los Angeles, running almost continuously day and night and the car being ready for service the next day after its arrival at destination. The average consumption of gasoline was at the rate of three miles per gallon and the operating cost averaging 15 cents per mile.

The first regular subject taken up by the convention was "The Pounding of the Left Main Driving Box in Preference to the Right. What Causes the Pounding and How Could it be Avoided?" Three papers read by the secretary had been prepared by Mr. C. H. Voges (New York Central Lines), Mr. E. K. Berry (Chicago, Burlington & Quincy), and Mr. W. H. Kidneigh (Union Pacific). Mr. Voges' paper explained the combination of forces acting on the driving axle due to relative positions of the right and left pins and showed these forces tended to cause a greater pound on the following side. His arguments were illustrated by a blueprint diagram passed among the members. This view was supported by a number who explained that the greater number of broken frames had been found to prevail on the side of the engine on which the pin followed and that an engine which pounded on the left side when going ahead would pound on the right side when backing up and vice versa. Some members explained that they had experienced no difference and many were inclined to attribute any greater pound on the left side to the fact that as an engineer rides on the right side of an engine he can detect a pound more readily and therefore the right side receives more care and attention.

The next regular subject was "Modern Shop Construction—Cross Pits or Horizontal. Location of Wash Rooms and Lavatories. Best Location of Each Department. Care of Shop Order Material and Convenience of Storage." This was discussed in three papers by Mr. L. H. Bryan (Duluth & Iron Range), Mr. D. E. Barton (Atchison, Topeka & Santa Fe), and Mr. E. F. Fay (Union Pacific), all of whom expressed themselves as strongly in favor of the cross-pit arrangement of erecting shops.

Mr. Bryan expressed the opinion that only light boiler work should be done in the machine shop, as heavy work interferes with the work of the machinist, and he believes that the company does not receive the capacity of the shop if the machinists are compelled to work in the continuous noise made by air hammers and general or heavy boiler work.

It is very important that the shops be well ventilated

E. F. FAY, PRESIDENT INTERNATIONAL GENERAL FOREMEN'S ASSOCIATION.

and lighted. Money spent in extra windows is a good investment and gives more returns than figures can tell. Another very important thing is to keep the shops well cleaned at all times.

There should be ample room between the pits for work benches placed parallel with them for it is more convenient to do the work on the engines with benches in this position than if they are placed at one end or against the wall between the doors. The benches should have racks in the center to hang pipes and other material on, and have a suitable number of drawers for the men to keep their tools handy for the work: if the benches are built right, there will be enough shelf room so that all small pieces from the engine can be properly taken care of and kept off the floor, and the very small pieces can be placed in the drawer, properly tagged, ready for immediate use when the time comes. There should be at least four vises to each bench, two on each side, spaced alternately. The lights should be placed in the center of the benches, lengthwise, in clusters. Three four-light clusters on each bench gives a good light. The wiring should be done so that each bench cluster could be turned on or off at will; suitable places provided for attaching extension plugs; these give better satisfaction than candles or torches.

The tool room should be placed in the center of the shop, lengthwise, and a full supply of tools kept constantly on hand, so that no delay would be caused by waiting for tools. A competent man should be placed in charge.

Another very important feature in modern shop construction is to provide the shop foreman, shop superintendent, erecting foreman or by whatever title he may be called, with a suitable office in some central part of the shop and built in such a manner that he could glance from one end of the shop to the other without moving from his work. While this same foreman should spend his time among the workmen, there are times when consirerable office work falls to his lot and this must needs be done in a clean, respectable place. This office should be supplied with telephone connections to all shops, thereby saving the foreman many extra steps and the company many dollars paid out in wages to those who would take advantage of his absence.

"The Apprentice Question—How can we Obtain the Right Kind of Material and How can we Keep Them Interested? The Benefit of Night Schools for Apprentices Maintained at Company's Expense. Does Company Obtain Sufficient Benefit to Warrant this Expenditure?" Four papers on this subject were prepared by Mr. A. O. Berry (Lake Shore & Michigan Southern), Mr. W. Pohlman (New York, Ontario & Western), Mr. W. G. Larmour (Norfolk & Southern), and Mr. W. C. Groening (Pere Marquette).

The sentiment brought out in the consideration of these papers was opposed to night schools, as the average apprentice desires the evening for recreation after working all day. The idea of classes for apprentices held in the morning at stated periods per week on the company's time and maintained at the company's expense, met with general approval. It was also agreed that there should be a regular course of instruction in regard to shop and that apprentices should be changed to different work and different tools at least every six months, if not more frequently.

Mr. Berry considers that railroads have spent large sums in equipping shops with high speed steel and heavy duty machinery, but if the intelligence and efficiency of the mechanics do not progress in a like degree, with mechanical improvements, there is still a lack of efficiency and an unbalanced condition.

It is not so much a question of today as it is of the future and the place to start is with the boys by some rational apprentice system. The old way of hiring a boy out as an apprentice and leaving him entirely to himself to pick up such information relative to his trade as he could or as the foreman was pleased or had time to give him, is entirely inadequate to meet the demands of modern times or prepare for the future.

What the apprentice system does is to give the ambitious apprentice a chance to advance as fast as he is desirous of doing in his four-year course, and through the personal effort of the instructor in charge of the work it brings the slower ones to a higher degree of proficiency than they could ever obtain being left to themselves. A system founded on college methods or even on high school methods will not meet the present demands of the apprentice and interest him. It is necessary to start from the beginning and by a system of development introduce such learning as the apprentice can see the actual need of in his everyday work. By the system of instruction in the shop by a practical mechanic, and a period twice a week, for instance, in a drawing class with personal instruction from someone competent and interested in the work, any body of apprentices should become interested.

Another feature which is important in any apprentice system is systematic and periodical changes in all branches of the trade to be learned.

The benefit of night schools for apprentices is doubtful. It would not give as much benefit to as many apprentices as a school maintained at the first part of the working day. A boy, when through with the day's work in the shop, unless he is a rare case, is ready for recreation of some kind rather than classroom work, and while there is no doubt that night schools do a great deal of good to both apprentices and mechanics who attend of their own accord, they are not practical for the whole apprentice body.

Continuing Mr. Berry said: There is one more point I would like to bring out in connection with interesting the apprentice and that is to try to avoid employing those apprentices who are not naturally inclined to become interested. In order to accomplish this, I have seen a system worked out whereby prospective apprentices are hired as oilers and to run light machinery, such as bolt cutters and nut tappers. By the shop instructor observing such boys for a period of from three to six months, it should be a very rare occurrence to allow a boy to enter the apprentice list who shows no aptness for the trade.

A paper by Mr. G. E. Bronson (Chicago, Rock Island & Pacific) discussed "The Mileage of a Locomotive—Its Relation to Cost of Shop and Running Repairs. Does it Pay to Overhaul an Engine that will Give but 90 Days' Flue or Firebox Service? How could this be Handled? Who should Determine when to Shop an Engine and Who Should Furnish the Work Report?" The author of this report said in part:

The different class of repairs are to be considered in shopping an engine; light repairs should be such that will cost for labor and material from $50 to $400, heavy repairs from $400 to $1,000, and general repairs from $1,000 up. Gangs should be organized with foreman in charge of each to handle the different class of work. Also a floating or extra gang, which could be used to assist in forcing along work which was behind in the schedule, or to take men from to fill out where any were absent in other gangs. It would not pay to overhaul an engine that will give but 90 days' service of flue or firebox. I think the conditions at point of shopping, also the size of power to be overhauled should govern this. If there were local or branch runs where this power could be used for 90 days or the power could be used in yard service for that period, this should be done; if the conditions as mentioned do not exist, then I believe it would be a wise move to repair flues or firebox at the time of machinery overhauling.

The mileage made by engines should, to a great extent, govern the shopping, but in cases where engines have not made their allotted mileage and are unfit for service, continually having failures on the road, then the general foreman and road foreman of equipment should take these cases up with their master mechanic, stating the facts.

Concerning the subject "Why Do Stay-bolts Break More Frequently on Left Side?"; a report was presented by a committee consisting of Mr. A. Bradford (Big Four) and Mr. W. H. Clough (Erie). The general conclusion from the data obtainable is that there is no reason, so far as can be learned, why stay-bolts should break on the left side of the locomotive firebox any oftener than upon the right side. It has been suggested that the practice of using the injector on the left side almost exclusively, that obtains on some roads, might explain in some cases why the condition suggested might prevail. This, of course, would be the result of the widely varying temperatures and resulting stresses set up in the steel, brought about by the frequent injection of cold feed water. It is clear, of course, that the flow of the cold feed water is downward from the point of injection, and then backward along the barrel and around the bottom section of the mud ring. However, it must be said that this reasoning is not conclusive, as the data obtained fails to substantiate the proof.

Papers on "The Quick Dispatching of Engines at Terminals and How to Handle Most Economically" were contributed by Mr. G. W. Keller (Norfolk & Western) and Mr. William Hall (Chicago & North-Western). Mr. Keller said in part: This entirely depends upon the facilities and the condition in which the engineman delivers his engine to the cleaning pit. You may have a modern cleaning pit, coaling and sanding station and an engineman to deliver his engine to the cleaning pit dry and a boiler full of water and when received in this condition, with a modern cleaning pit, coaling and sanding station, the power can be dispatched very quickly and with little cost. But, where you receive an engine at the cleaning pit with flues leaking and with no modern facilities for handling cinders, coal and sand it requires a great deal more time to handle the engine, thus reducing the quick dispatching of this engine and increasing the cost. Again an engineman may deliver his engine to the cleaning pit dry and have but very little water in the boiler. This retards the quick dispatching for this engine should not have the fire cleaned until the boiler has been filled with water for it certainly is injurious to an engine to clean the fire and then pump the boiler full of cold water. This, I think, is the prime cause for so many flues that start leaking on the cleaning pits. All this retards quick dispatching. Another thing which adds to the quick dispatching of power is that the dispatcher and yardmaster and round house foreman are in touch with each other and are working in harmony. Along the line of quick dispatching of power at a terminal I might say that we have to have the co-operation of the engineman and have them take the best care of their engines while on the road. When engines are received at the cleaning pits leaking, it prevents the quick dispatching of power. On the road is where the power must be taken care of if we expect to have good results in the quick dispatching of same. The flue question seems to be the main issue in turning power quickly at a terminal and as before stated engines must be taken care of while out on the road and the engineman may be doing all he can to take good care of his engine and the fireman tearing down all the engineman is trying to hold up.

Mr. Hall laid stress upon advance information, harmony, efficiency, promptness, aggressiveness and well planned and arranged conveniences, as important features that must play a part in quick engine dispatching.

Now, as to the conveniences, these should be so well planned and arranged that there should be no reverse movements of an engine. There should be at least two or more tracks leading from the turn table so that the outgoing engines will not interfere with the incoming engines. The turn table should be operated by air or electricity, as the operation of the table by hand is old fashioned and antiquated. Modern clinker pits should be used and conveniently located, the sand towers and water tanks should be so located, that the engine will be advancing with each operation.

The round house should be well lighted and ventilated, as men will work to better advantage. It would also be a good plan in large and busy round-houses to divide the force so as to work the full 24 hours, thereby taking care of the running repairs promptly and avoid holding the engines over. Engines that need more than is commonly known as running repairs, however, should be held over for the day force, when the round house is backed by the machine shop, blacksmith shop and boiler shop, this work being done more cheaply in the day time than at night.

A hot water plant is a very necessary adjunct to a round house, as by the use of hot water for washing out purposes the boilers are not subjected to such severe strains due to expansion and contraction, as when washing out with cold water.

The hot water could be used for filling up the boilers after they are washed out, so that an engine can be gotten into service in the shortest time possible.

Harmonious co-operation between the mechanical and operating departments, especially during periods of congestion, or when power is in great demand, will facilitate matters greatly, and be a great factor in accelerating the movements of engines at terminals.

A paper discussing "Which is the Cheaper to Maintain—The Piston or Slide Valve?" was prepared by Mr. B. A. Beland (St. Louis & San Francisco). He expressed the opinion that piston valves properly made of good material would last from the time an engine is shopped until it is ready for the next shopping and that it is not an uncommon thing for valves to give this extended service. Mr. Beland also claimed that piston valves operate on one-third less oil than slide valves, because they are more perfectly balanced and have less friction. He also claimed that piston valve engines are smarter than slide-valve engines, because the valves are so perfectly balanced and have larger exhaust capacities, making possible a much freer exhaust.

The election of officers for the ensuing year resulted as follows:

President, E. F. Fay, shop superintendent, Union Pacific, Cheyenne, Wyo.

First Vice-President, J. J. Houlihan, general foreman, Wabash, Ft. Wayne, Ind.

Second Vice-President, G. W. Keller, general foreman, Norfolk & Western, Portsmouth, O.

Third Vice-President, C. H. Voges, general foreman, New York Central Lines, Bellefontaine, O.

Fourth Vice-President, Thomas Zinkam, general foreman, Big Four, Delaware, Ohio.

Secretary and treasurer, E. C. Cook, Chicago.

Railway Storekeepers' Association

Fifth Annual Convention.

THE fifth annual convention of the Railway Storekeepers' Association was held at the Auditorium Hotel, Chicago, May 25, 26 and 27. The meetings were presided over by President John M. Taylor, general storekeeper of the Illinois Central Railroad. The first meeting of the convention was called to order on Monday morning, the 25th, at 10:30. Morning and afternoon sessions were held throughout the convention and the meetings were characterized by large attendance, prompt adherence to schedule and strict attention to business.

The association now has a total membership of 356, as reported by the secretary at the convention, showing a large increase since the convention a year before.

On the evening of May 26th, the annual dinner was held in the Auditorium Annex. President Taylor presided at the dinner, and Mr. J. H. Waterman, Chicago, Burlington & Quincy Railroad, acted as toastmaster. Among the speakers were Mr. Hugh M. Wilson, of The Railway Age; Mr. D. B. Allan, Union Pacific Railroad; Mr. D. A. Williams, Baltimore & Ohio Railroad, and Mr. W. F. Golta, New York Central Lines. The dinner was followed by a very amusing vaudeville entertainment.

The first regular subject taken up by the convention was "Economy in General Operation." Under this heading Mr. N. M. Rice (Atchison, Topeka &

Santa Fe) presented a paper on the subtopic "System." Mr. Rice emphasized the need of daily accounting to make the storekeeper's records of value to his own and other departments and suggested that the efficiency of the storekeeper should be measured by the following standards: (1) Order and neatness. (2) Ratio of actual stock to allotted standard stock, the allotted standard being determined by the average monthly issue and the average time intervening before

JOHN M. TAYLOR, PRESIDENT OF THE RAILWAY STOREKEEPERS' ASSOCIATION.

the regular monthly requisition is completed. (3) Number of delays in filling orders for standard material. (4) Proportion of obsolete material in stock. (5) Proportion of surplus material in stock. (6) Cost of handling. (7) Condition of scrap. (8) General conduct of business and personal record.

Mr. H. E. Rouse (Chicago & Alton) presented a paper on the subtopic "Recommended Practices," in which he advocated the adoption by the association of a standard classification of materials, a standard scrap classification and a uniform method of allowing scrap credit.

Continuing under the main subject, Mr. D. B. Allan (Union Pacific) discussed the "Storekeeper's Function;" "Direct Shipments in Distribution" was discussed by Mr. Charles O'Connor (Delaware, Lackawanna & Western); a paper on "Surplus Material" was prepared by Mr. Thomas A. Fay (Chicago, Burlington & Quincy), and a paper on the general subject "Economy in General Operation," was prepared by Mr. J. M. Gibbons (Missouri, Kansas & Texas).

The subject of "Tools and Supplies Furnished Locomotive and Train Crews: What Can Be Done to Reduce the Expense?" was covered by three papers prepared by Mr. A. T. Sexton (Chicago Milwaukee & St. Paul), Mr. C. L. Warner (Buffalo, Rochester & Pittsburg and Mr. C. B. Foster (Toledo, St. Louis & Western). These papers were reproduced in the June issue of the Railway Master Mechanic.

At the conclusion of this subject the report of a committee representing railways, consumers and dealers, which had formulated a "Standard Classification of Railroad Scrap," was presented and after some modification was adopted.

"The Real Purpose of the Stores Department" was discussed in two papers by Mr. H. C. Pearce (Southern Pacific) and Mr. James Osborne (Canadian Pacific). Briefly expressed, Mr. Pearce's views as to the purpose of the stores department, are:

First: To furnish material when and where it is wanted.

Second: To properly, promptly and economically care, handle and account for it.

Third: Proper inspection and check to see that the railroad gets what it buys.

Fourth: To maintain standards by seeing that the proper name and description is maintained.

Fifth: Classify and place requisitions far enough in advance and in such quantities as to enable the purchasing agent to make judicious purchases.

Sixth: Classify and order material in such quantities as to get the benefit of carload rates of freight.

Seventh: Finance resources by keeping material in as few places as possible, and in such shape that it is ready to move when required.

Eighth: Prompt and certain deliveries only in such quantities as is actually needed.

Ninth: Keep only a minimum amount of material on hand.

I have placed amount of material on hand last, not because I consider it of the least importance, but because it is not first, and if the organization is such that it will fulfill the other requirements, stock minimum will take care of itself. I know this is not in accord with views expressed and understood by many capable storekeepers, and generally opposite to the views of railway officials. The reason for this is simple. All the purposes which I have called attention to are more or less concealed, and may be attributed to other than the real cause, while the matter of stock and payroll is always exposed. Naturally storekeepers in their own interest will conduct their affairs so as to receive the approval of the men who can do them the most good: it is human nature and cannot be changed; but the formation of large corporations and the enormous amount of materials required by some of our large railway systems has opened up a new era which must be faced squarely.

Mr. Osborne wrote: The real purpose of the stores department is:

First: To keep one month's supply of staple articles required by every branch of the railway, on hand.

Second: To keep a ledger account of the supplies issued to each consumer.

Third: To see that consumers are not given more than a sufficient quantity for one month's consumption without receiving a satisfactory explanation, approved of by a responsible officer.

Fourth: To make a careful examination of all supplies received from manufacturers or others, check the quantity or weight with the invoices, and satisfy themselves that the quantity of the goods are up to the standard charged for.

Fifth: To see that supplies are unpacked and shelved, immediately on receipt, and that proper care is taken of all perishable or breakable supplies.

Sixth: To see that regular monthly requisitions are filled on regular dates, and that all emergent requisitions are filled on date of receipt.

Seventh: To have traveling inspectors to see that supplies issued to local stores and to consumers are properly cared for, and that waste and misappropriation are avoided.

Concerning the subject "Is It Practicable and Economical to Operate a Railroad on a Thirty Days' Stock of Materials," papers were presented by Mr. J. H. Callaghan (Canadian Pacific) and Mr. D. A. Williams (Baltimore & Ohio). Mr. Callaghan's paper maintains that to make such a course practicable it would be necessary that the road purchase all material finished ready for issuance, manufacturing nothing, making repairs only, be largely normal in its business and be favored with best market conditions.

When a road is manufacturing—say, as in the case of operating one, two or three foundries—there are a number of obstacles which stand in the way of carrying stock only sufficient to take care of thirty days' requirements. Materials carried for the successful operating of foundries are usually based on three months' limit, and in cases where water or all rail freight rates affect the cost of foundry raws, it is economical practice to carry items of stock in excess of the three months' needs. This same condition would apply where switch material is manufactured, or for the matter of that, any large items of manufactured material; so that while all of the other favorable conditions which go to make the theoretical side of the subject appear practicable, these latter features governing as they do not only railways where manufacturing is gone into, but, manufacturing industries generally would not permit of its adoption in full; hence the benefit of the thirty days' stock can only be arrived at in part.

The conditions under which the thirty days' stock would be altogether impracticable is where not only repairs are taken care of, or manufactured material forms a large item of shop output; but, where construction of locomotives, sleeper, parlor, dining, box and flat cars is gone into on a large scale, this latter situation makes the thirty-day stock of material not only impracticable but impossible.

Mr. Williams seemed to believe that what is meant by a "thirty days' stock" in this subject, is that the monthly issues will equal the balance on hand at the close of the month, or in other words, that the entire stock will be turned over once a month. If my understanding is correct, I think the subject can be fully disposed of by one word, "No." But this opens up the question as to what is a thirty days' stock. There is a big difference between the amount of stock actually issued and the amount necessary to carry in stock to meet actual requirements. If there are ten classes of locomotives on a division and it is necessary for a storekeeper to carry in stock one each of ten kinds of driving axles for those locomotives to meet emergencies, even though his total issues of driving axles might average only one a month, in my opinion he is really only carrying a thirty days' stock, and the actual issue figures do not count; yet at first blush to the officials, when only value is shown, it appears that the stock is excessive.

With regard to "Reclaiming Scrap," Mr. I. J. Custer (Atchison, Topeka & Santa Fe) presented a paper in which he called attention to the fact that the Railway Storekeepers' Association has decided, after careful investigation and thought, that all material, whether new, second-hand or scrap, when not in actual service, properly comes under the jurisdiction of the stores department. Therefore it becomes the duty of storekeepers to handle the work delegated to them, on economical and business-like lines and to carry it to a successful termination. With such ideas in view the author did not attempt to outline how best to handle the work, but simply showed in part along what line storekeepers can work to the end that their respective companies will get full and complete returns for every dollar spent for material.

As 90 per cent of material purchased finally reaches the scrap bins it is important to carefully inspect the scrap to prevent waste of serviceable material scrapped through inadvertence. Division storekeepers should make periodical inspections of shops in company with officers of the mechanical department to reclaim second-hand serviceable material or the material drawn in excess of requirements, which is apt to accumulate in the shop.

In a great many cases material in the storehouses becomes obsolete, the most important cause of which, in the case of mechanical department material, is the transfer of equipment to other territories. On this the mechanical department and the store department should work closely together, so that the storekeeper will have full advice on permanent location of locomotives and car equipment, so that should all of one class be transferred from some one particular division to another, the material, which is standard only for that class of equipment, can at once be transferred to the division where the equipment is permanently assigned. This will avoid the necessity, in a great many cases, of going into the market or having manufactured in the shops material for that particular class of equipment which might possibly be on hand at some division point and be obsolete so far as that point was concerned. Other material becomes obsolete on account of the adoption of new standards. On this class of material when instructions are issued, relative to adoption of new standard, if the instructions do not contain information as to what disposition should be made of the old standard, storekeepers should at once check up their stock and ascertain what disposition should be made of it. A number of roads, when issuing instructions on new standards, invariably incorporate in these instructions what disposition should be made of the old standard, stating clearly whether the stock of old standard articles is to be issued prior to issuing any of the new standard, or whether it is the intention to discontinue immediately the use of the old standard articles. When instructions are issued in this way, it saves considerable delay in getting rid of the material which might otherwise remain in stock for months or years.

Mr. J. H. Waterman (Chicago, Burlington & Quincy) in a paper on "The Student in the Storehouse" advocated the employment of students or special apprentices who should be 16 years of age and have high school diplomas. The work of a 4-year course divided into eight 6-month periods would be divided as follows: (1) Office boy. (2) In storeroom as packer and issue clerk. (3) Assisting stockman. (4) In charge of one, two or three of the stock books under careful supervision by stock clerk. (5) and (6) Subforeman or general foreman. (7) and (8) In the office, advancing from desk to desk. The compensation would be $30 per month at the start increased $5 per month each six months.

Mr. H. H. Vaughan (Canadian Pacific) discussed how best to interest the mechanical department in substituting material where standards are not available.

The paper on "Caring for Electrical Supplies and Material," by Mr. J. Shaw, assistant electrical engineer, Canadian Pacific Ry., emphasized the fact that the recent rapid increase in the application of electricity in a railway system for traction purposes, motor operation of shops, lighting of buildings, yards and cars as well as of locomotive headlights, operation of signals, and other services too numerous to specify, has made advisable the allotment of a special section in a railway stores building for supplies and material required for the maintenance and installation of electrical apparatus.

It is scarcely necessary to mention that the storeman in charge of electrical section should be one who has had some practical experience as an electrician; otherwise, constant trouble will be occasioned through the wrong filling of orders, owing to the distinction between various supplies being so slight. It is also advisable for storekeeper of electrical section to have easy means of communication with the electrical department for the obtaining of information where substitution of supplies may be desired or additional information necessary.

A set of regulations as to the proper storing away, care and shipment of electrical goods is desirable and should refer as specifically as possible to the particular class of material kept. The following show briefly some of the points to be covered:

1. A separate portion of stores should be reserved for electrical material. There must be no possibility of water reaching the supplies which must be kept dry and clean.

2. Armatures, commutators, field coils, and other spare parts must be boxed or otherwise properly protected from mechanical injury.

3. Dry batteries should not be placed near heating coils as otherwise the moisture in them will be evaporated and cell made useless.

4. Great care must be exercised in handling material between cars and store and any damage done in transit must be immediately reported.

5. It is advisable to have local electrician go over material from time to time in order that any defects may be discovered and remedied in time.

Other papers presented were "Detailed Store Department Organization," by Mr. F. D. Reed (Chicago, Rock Island & Pacific), and "Value of Pricing Requisition Before Purchase," by Mr. R. L. Morris (Chesapeake & Ohio).

The election of officers for the ensuing year resulted as follows:

President, J. H. Callaghan, general storekeeper Canadian Pacific, Montreal, Can.

First Vice-President, D. A. Williams, general storekeeper Baltimore & Ohio, Baltimore, Md.

Second Vice-President, J. H. Waterman, storekeeper Chicago, Burlington & Quincy, Lincoln, Neb.

Treasurer, J. P. Murphy, general storekeeper Lake Shore & Michigan Southern, Collinwood O.

Secretary, to be appointed by executive committee.

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AUGUST, 1908

August Conventions

ANNOUNCEMENTS of the annual conventions to be held this month by the Traveling Engineers' Association and the International Railroad Blacksmith's Association are printed elsewhere in this issue. These meetings will bring together a large number of railroad men to discuss questions of efficient and economic operation. Railroad men who have not attended these meetings heretofore and who are eligible to membership in these associations, should make an effort to be present.

The subjects to be considered at the convention of the Traveling Engineers' Association are of especial value to the road foremen of engines because questions pertaining to his duties and the best methods of securing good service are included. The extent of the territory that a road foreman of engines can best cover, the methods that he might use to interest engineers and firemen in locomotive development, the practice that he should follow in instructing firemen in the best and most economical methods of firing are a few subjects upon which committees have been at work for the past year.

The reports to be presented at the meetings of the International Railroad Blacksmiths' Association are outlined in the announcement. Questions of shop practice and control constitute the work of the committees. There are always new and better methods of doing work which originate in the various shops of the country, and the reports and discussions are therefore very instructive to all who attend. If it were not for the betterment work in the shops there would not be a great need for these meetings to diffuse information concerning shop practice.

The Standing of American Machine Tools

THE efficiency and reliability of American machine tools, in general, is evidenced by the large installations in the machine shops of European industrial organizations. Reports of the special agents of the Bureau of Manufacture, United States Department of Commerce and Labor, from France, Germany, Italy and Switzerland show that American tools predominate in the larger machine shops of these countries.

There have been, and there still are, cases where American machine tools are not operated at maximum efficiency, only 60 or 70 per cent of the maximum being obtained. Where an expert machinist, familiar with the operation of these tools, is employed to demonstrate their working possibilities, they speedily rise in favor, however. The same difficulty is often found in this country when a radical change in the design is effected, one that gives increased capacity.

The average machinist is accustomed to operate a machine along certain principles, and it is difficult to make him change his methods without special instruction. When machines can be run at higher speeds or can take heavier cuts, it is essential to show the machinist how far he can go with the new machines and new steels. If new machines are capable of several simultaneous operations, the possibilities of the machine must be demonstrated to him.

In conclusion it can be said that the chief objections to American machine tools arise from an incomplete knowledge of their working possibilities. The minor objections have been repeatedly brought to the attention of our manufacturers and are easily remedied. With the better understanding of the scope of American tools, it is fair to assume that they will hold a prominent position in European shop equipment.

Storage of Coal

IN recent years many industrial organizations have provided for the storage of coal in large quantities to eliminate the possibility of a temporary coal famine, the railroad companies in particular being interested in this problem of coal storage. Storage of coal in large quantities has caused a more thorough study of the weathering of coal, concerning which there were various opinions upon which reliable conclusions could not be based. At this time the subject is still under discussion, but research work is being conducted to determine the best methods of storing coal.

In a bulletin published by the University of Illinois Experiment Station a brief historical review of investigations on the weathering of coal was included. The opinions expressed by authorities gave factors that affect the deterioration of coal, such as size of coal, moisture, temperature, accessibility of oxygen and the composition of the coal. Each of the above mentioned factors has some effect on the weathering of coal, but how and to what extent they influence deterioration is not thoroughly understood.

In the bulletin mentioned above the results of coal storage in small samples of about 100 lbs. were given. It was found that submerged coal did not lose appreciably in heat value and that the loss from outdoor exposure varied from 2 to 10 per cent. Coal in dry storage gave no better results than coal in the open except with high sulphur coals. In most cases all appreciable losses in heat value were in the first five months, and in the following four months losses were comparatively small. The results of the experiments with small samples are thought to be worthy of consideration in the analysis of deteriorating effects upon coal stored in large quantities. It is stated that further study is to be made with reference to actual storage conditions.

The opinions, which have been given in the past, are at variance as to the weathering of coal. It is necessary that further investigations be made in order that the causes and extent of the deterioration of coal in storage will be more accurately determined. The conditions under which storage is made may then be modified in some cases to maintain a greater heating value for the coal.

Coupling Accidents

WHILE the total number of casualties to passengers and employees in the months of January, February and March, 1908, is smaller than in any quarter since the one ending March, 1905, the number of employees killed in coupling accidents for the first quarter of 1908 is smaller than any since July, 1901.

For the quarter ending March, 1908, there were 44 killed in coupling accidents; for the quarter ending December, 1907, there were 77; and for the quarter ending March, 1907, there were 62. Of the 44 there were 13 trainmen, 5 trainmen in yards, 23 yard trainmen (switching crews) and 3 other employees.

In Accident Bulletin No. 27 of the Interstate Commerce Commission, from which the above record is taken, it is stated that the reductions in deaths and injuries are due principally to the reduction in traffic resulting in easier work and shorter hours. The large reduction is an indication of the possible results to be secured through a larger and more efficient force of employees.

The chief causes of accidents, resulting in death, were coupling damaged cars, miscalculated speed, lost footing and mistakes in hand signals. The injuries, not fatal, were due mainly to adjusting coupler with foot, getting fingers or hand caught between uncoupling lever and body of car, uncoupling without using lever, miscalculated speed and unexpected movement of car.

Machine Tool Drive

IN the motor-driven machine tools now built, the motor is usually considered as a part of the machine and not as a mere attachment. Allowance is made for the motor base on the frame of the machine.

In some cases the motor is direct coupled as in the lathe where the spindle forms the motor shaft. With this arrangement speed variation is effected entirely by motor control, and therefore this design is more applicable where constant speed is desired or where the electric power obtainable is direct current.

The more common arrangements are those in which the motors are geared or belted, but still are component parts of the machine tool. Allowance can then be made for speed variation without the use of variable speed motors, and it is also possible to provide for group driving.

The variable speed motor is not, however, a motor to be avoided entirely, but it is sometimes preferable to have other means of varying the speed, that is by mechanical speed-changing devices. Alternating current motors are not generally used where it is desired to have the speed control by motor. Direct current motors give better results because shunt wound motors may be used and the speed varied by shunt field regulation or voltage control.

More attention is being given to the design of motor-driven machine tools because of the well-known advantages of the motor drive, such as elasticity of the system, reliability, cleanliness and maintenance. With the object in mind of making the motor an integral part of the machine, the new designs are improved in appearance as well as construction.

Single Phase Motors

IN considering installations of alternating current motors it is frequently the case that little or no attention is given to the single phase motor. This alternating current motor is not as well known as the polyphase even though efficient and reliable motors of this type have been in use for many years. The single phase motor has been looked upon as a complicated machine involving too many auxiliary appliances to be of practical value. While this motor is not as simple in construction as the polyphase induction motor, it is by no means true that it will not meet requirements in service.

The single phase motor is not difficult to operate. It requires only the closing of a switch as does the polyphase. The cost of maintenance is small and its life is in most cases insured until disintegration of the coils occurs or until the bearings are worn out.

The load which the motor will carry under normal speed is the load which the motor will start under. It has a high starting torque equal to that of the polyphase motor.

Variable speed single phase motors are also built. In fact there are many places where the single phase alternating current motor can be used to advantage. Where only single phase alternating current and direct current are available, it is not necessary to adopt the direct current motor as the only means of obtaining electric power.

Experimental Investigation

IN an investigation along new lines data are very often allowed to accumulate and a whole series of tests is made before anything is done in the way of checking up the data. With such a procedure a risk is taken that the data may not be in proper shape to eliminate doubt as to accuracy. This occurs so often that it seems best to occasionally call attention to the matter.

Before a series of tests is made a complete analysis or outline of the proceedings is, of course, necessary, but such does not guarantee the value of each set of tests. Where the data are deficient in any case, it is just so much time and labor wasted because there must be a doubt as to the accuracy.

Accuracy must be proved not only by presenting a clear outline of the method of obtaining data, thereby assuring practical application, but also by the agreement of data taken. The variations in the data, which are used to arrive at certain conclusions, must be greatly in the minority to indicate that they are due to incorrect records which occur in all experimental investigations.

Steam Motor Car for the Chicago, Rock Island & Pacific Railroad

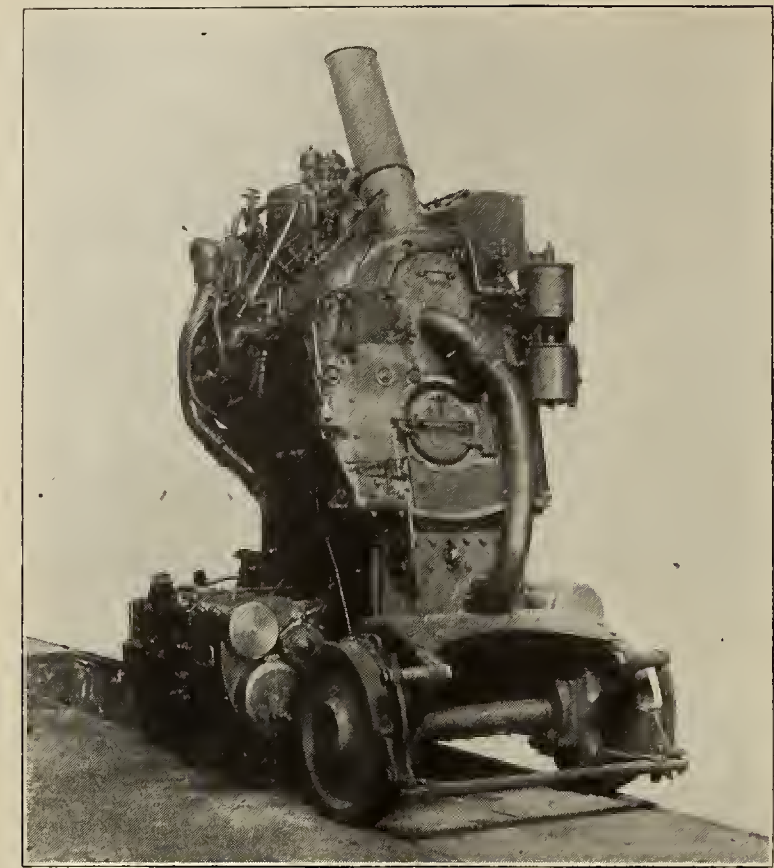
THE Schenectady works of the American Locomotive Company have recently completed a 250 h.p. compound steam motor car for the Chicago, Rock Island & Pacific Railroad, the general appearance of which is shown in the accompanying illustrations. The car body is of steel construction throughout with the exception of the interior finish and is divided into three compartments: an engine room, baggage room and passenger compartment, having a seating capacity of forty passengers. This last compartment also includes toilet facilities. The car is 55 ft. 9 ins. long over platform, and weighs in working order 100,000 lbs. Of this weight 38,300 lbs. is carried on the trailing truck and 61,700 lbs. on the motor truck, of which 32,400 lbs. is on driving wheels. On test runs made on the experimental tracks of the New York Central railroad, the car has shown its capability for high speed; on several of the runs speeds of 60 miles per hour having been attained.

In the design of the car body, which was built by the American Car & Foundry Company, the aim was to make it as light as possible consistent with great strength. With this object in view, therefore, the truss rod construction was employed instead of following the more usual practice in the construction of steel cars of making the side frames below the window plates in the form of a girder or truss of sufficient strength to carry the whole weight of the car. The side posts are rolled steel angles riveted at the bottom to the side sills, and at the top to the side plate angles which extend in one continuous piece the entire length of the car on each side, and are bent at the ends to the shape of the end of the car. The carlines are steel channels bent to conform to the contour of the roof which is of the round type.

The side sills consist of 6x4x1½-in. steel angles reinforced by 1½-in. truss rods and the center sills are 8-in. I-beams. For a distance of 20 ft. back from the front end the side sills are reinforced by 6x4x½-in. angles riveted to the sills in such a manner that the horizontal leg is uppermost, furnishing a bearing surface for the floor of the engine room. The end sills are 8-in. steel channels securely fastened to the side sills by means of wrought iron corner plates and to the center sills by angle connections. A number of steel angles, fastened to the side sills and center sills by angle connections, tie the center and side sills together between the bolsters. These cross braces also serve as supports for the floor.

The bolster at the trailer end of the car is of the built-up type, while that at the motor end is of cast

STEAM MOTOR CAR—CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.



FRONT VIEW OF ENGINE AND BOILER OF STEAM MOTOR CAR.

steel, made in three sections so that the middle section may be readily removed to permit of the boiler and engine being drawn out from the end of the car. The middle section of the front end framing of the car body and the flooring ahead of the engine are also made removable for this same purpose.

The floors of the passenger and baggage compartments consist of two layers of wood, the upper layer being laid diagonally across the car, while the floor of the engine room is of steel with wood covering; the section ahead of the engine between the center sills, being, as before mentioned, removable. The inside sheathing of the passenger and baggage compartments is of mahogany and the head lining is fire-proofed board. Light is provided by five pairs of oil lamps hung from the center of the car, there being four pairs in the passenger compartment and one in the baggage room.

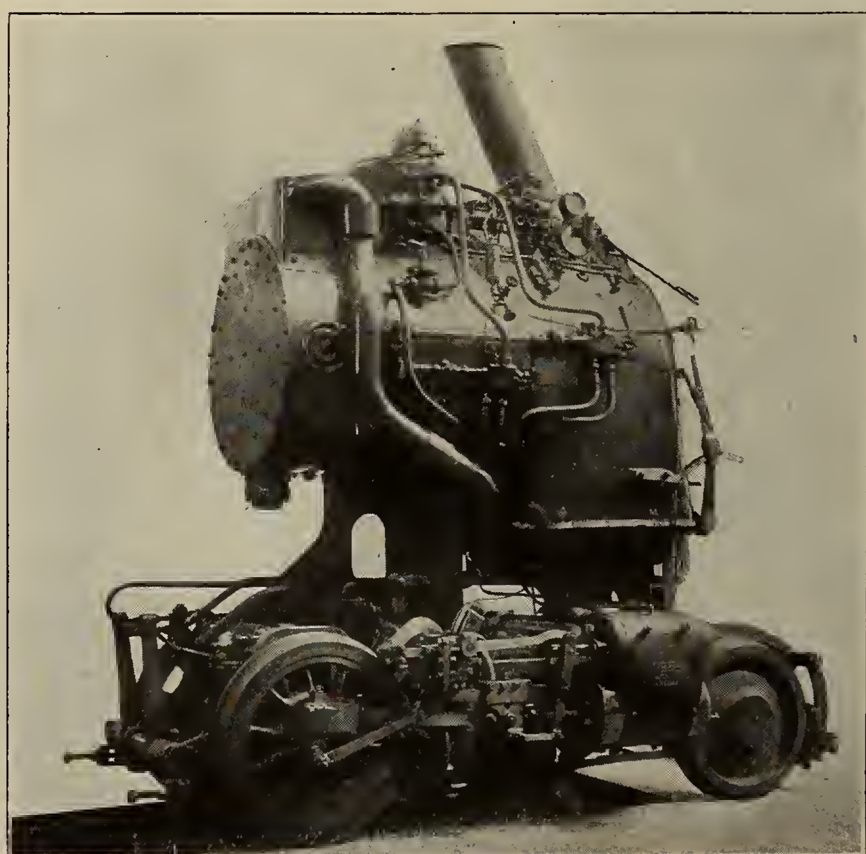
The car is equipped with spring buffer and M. C. B. single spring draft rigging, and Major passenger coupler at the trailer end, and tender coupler at the motor end.

In the design of the boiler the problem of providing the required amount of heating surface within the necessarily limited space available has been very satisfactorily solved. The boiler is of the horizontal return tube type. The fire box and smoke box are at the front end and the gases of combustion pass through the fire tubes to an intermediate smoke box chamber at the back end, and thence forward through the return tubes to the smoke box. The barrel of the boiler, which is in one sheet 61⅜ ins. long, measures 49 ins. in diameter inside at the fire box end and 44 ins. in diameter inside at the intermediate smoke box end. It contains 214 fire tubes 1¼ ins. in diameter and 3 ft. 9 ins. long and an equal number of return tubes of the same diameter, but 3 ft. 11½ ins. long. The total heating surface of the boiler is 624.4 sq. ft., which gives 2.5 sq. ft. per horse power. Of this heating surface, 527.8 sq. ft. is in the tubes and 37.6 sq. ft. in the fire box and the remainder in the superheater.

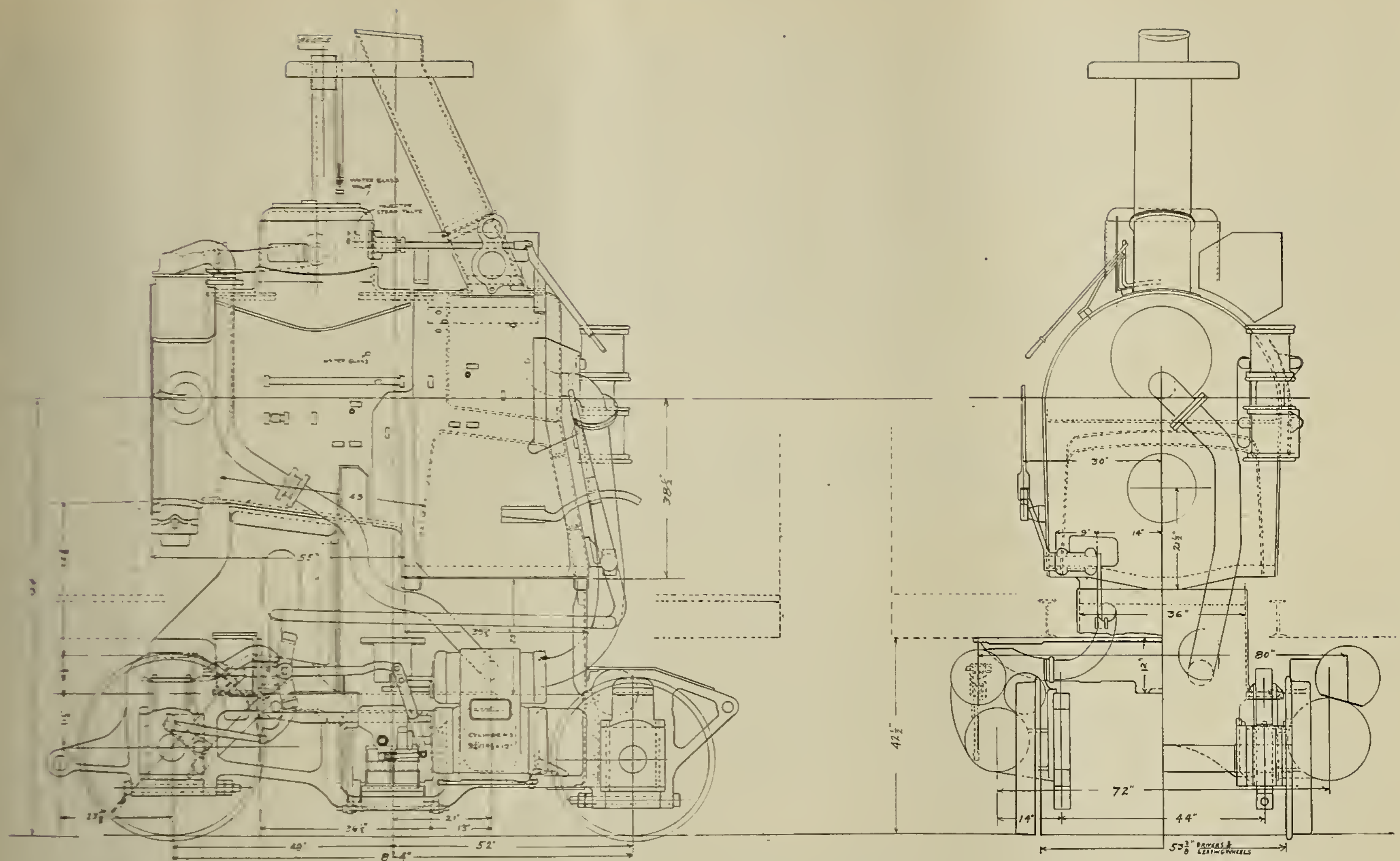
The fire box is 33⅛ ins. long and 43¼ ins. wide and is bricked for burning oil. The oil burner, which is located in the fire door, is of special design and is provided with a fan-shaped deflector which deflects the oil downward toward the hot fire bricks and also spreads it out over the fire box, thereby tending to produce perfect combustion.

The superheater is of the smoke box type and located in the intermediate smoke box chamber where the temperature of the gases is high. The superheater tee head is bolted to a cast steel box saddle casting which in turn is bolted to the top of the boiler and covers the opening cut through the sheet through which the superheater tubes extend down into the smoke box chamber. The tee head is divided transversely into a front and a rear compartment by means of a vertical partition. There are sixteen superheater tubes bent into the shape of a double loop, one end of each loop being connected with the front or saturated steam compartment, and the other end with the rear or superheated steam compartment. Steam flows from the dome through a short dry pipe into the saturated steam compartment, and thence through the superheater loops into the superheated steam compartment, and from thence into the steam pipe to the high pressure steam chest. The boiler is rigidly connected to the motor truck frames, so as to eliminate the necessity of flexible steam joints.

The engine is of the two-cylinder cross compound type, the high pressure cylinder being 9¼ ins. in diameter by 12 ins. in stroke and the low pressure cylinder 14½ ins. in diameter by the same stroke. The Mellin system of compounding is used, the intercepting valve



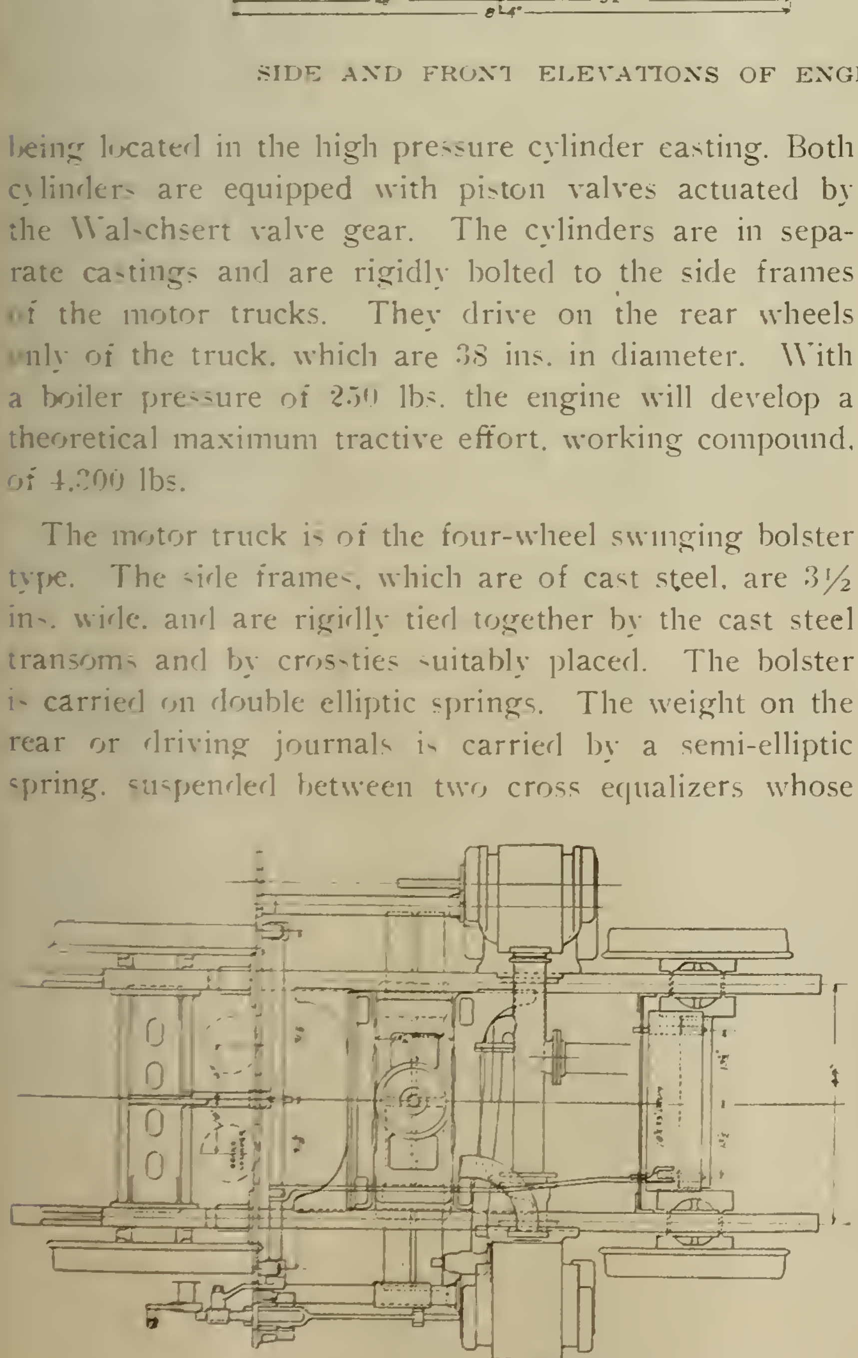
SIDE VIEW OF ENGINE AND BOILER OF STEAM MOTOR CAR.



SIDE AND FRONT ELEVATIONS OF ENGINE AND BOILER OF STEAM MOTOR CAR.

being located in the high pressure cylinder casting. Both cylinders are equipped with piston valves actuated by the Walschaert valve gear. The cylinders are in separate castings and are rigidly bolted to the side frames of the motor trucks. They drive on the rear wheels only of the truck, which are 38 ins. in diameter. With a boiler pressure of 250 lbs. the engine will develop a theoretical maximum tractive effort, working compound, of 4,200 lbs.

The motor truck is of the four-wheel swinging bolster type. The side frames, which are of cast steel, are 3½ ins. wide, and are rigidly tied together by the cast steel transoms and by cross-ties suitably placed. The bolster is carried on double elliptic springs. The weight on the rear or driving journals is carried by a semi-elliptic spring, suspended between two cross equalizers whose



PLAN OF TRUCK OF STEAM MOTOR CAR.

ends rest on top of the journal boxes; while the weight on the forward journals is carried by coil springs, one on top of each journal, this giving a three point suspended truck.

The trailer truck is of the four-wheel, two-bar equalizer type, with solid wrought iron top frame swinging bolsters of the built-up type, channel iron transoms and cast steel transom gussets. The wheels are 34 ins. in diameter and the journals are 4¼x8 ins.

Both motor and trailer trucks are equipped with New York Air Brake Co.'s air brakes operated by an 8-in. Westinghouse pump. New York air signal equipment and Gold steam heating equipment is also provided.

The oil for fuel is carried in a tank located in the engine room and having a capacity of 100 gals. The water supply is carried in three tanks, suspended beneath the car midway between the trucks, having a total capacity of 1,000 gals.

The principal dimensions of the car are as follows:

Total weight	100,000 lbs.
Weight on leading truck	61,700 lbs.
Weight on drivers	32,400 lbs.
Weight on leading wheels	29,300 lbs.
Weight on rear truck	38,300 lbs.
Total wheel base	45 ft. 10 ins.
Distance between truck centers	38 ft. 3 ins.
Wheel base of drawing truck	8 ft. 4 ins.
Length of car body over sheathing	52 ft.
Length of car body over platform	55 ft. 9 ins.

Diameter of cylinder, high pressure	9¼ ins.
Diameter of cylinder, low pressure	14½ ins.
Stroke	12 ins.
Valves	Piston
Valve gear	Walschaert

WHEELS.

Driving, number	2
Driving, diameter	38 ins.
Leading, diameter	33 ins.
Rear truck, diameter	34 ins.
Journals, driving	6x18
Journals, trailing truck	4¼x8

BOILER.

Type	Horizontal return tubular
Working pressure	250 lbs.
Outside diameter at intermediate smoke box end	44 ins.
Firebox, length	38⅛ ins.
Firebox, width	43¼ ins.
Tubes, diameter	1¼ ins.
Tubes, number and length	214, 3 ft. 9 ins.; 214, 3 ft. 11½ ins.
Heating surface, tubes	527.8 sq. ft.
Heating surface, firebox	37.6 sq. ft.
Heating surface, superheater	59 sq. ft.
Heating surface, total	624.4 sq. ft.

New Thirty-Stall Roundhouse at East Buffalo, N. Y.

New York Central & Hudson River Railroad

THE New York Central and Hudson River Railroad recently completed the erection of a new 30-stall roundhouse at East Buffalo, N. Y. It is located west of the old 28-stall West Shore roundhouse. On the site of this old 28-stall roundhouse it will be possible to erect in the future a 50-stall roundhouse to be used in connection with the new 30-stall roundhouse.

In the accompanying plan the proposed future extensions of all buildings are shown in broken lines. The coal handling plant will be enlarged and another depressed ash pit will be built.

The present buildings are located between the main line tracks of the West Shore Railroad and the Pullman Parlor Car Works. Provision is made to turn outgoing engines either to the east or west, as desired, the tracks leading in both directions from the turntable pit of the new roundhouse. Incoming engines enter from the east on tracks parallel to the West Shore main line tracks and pass over the depressed ash pit shown on the plan.

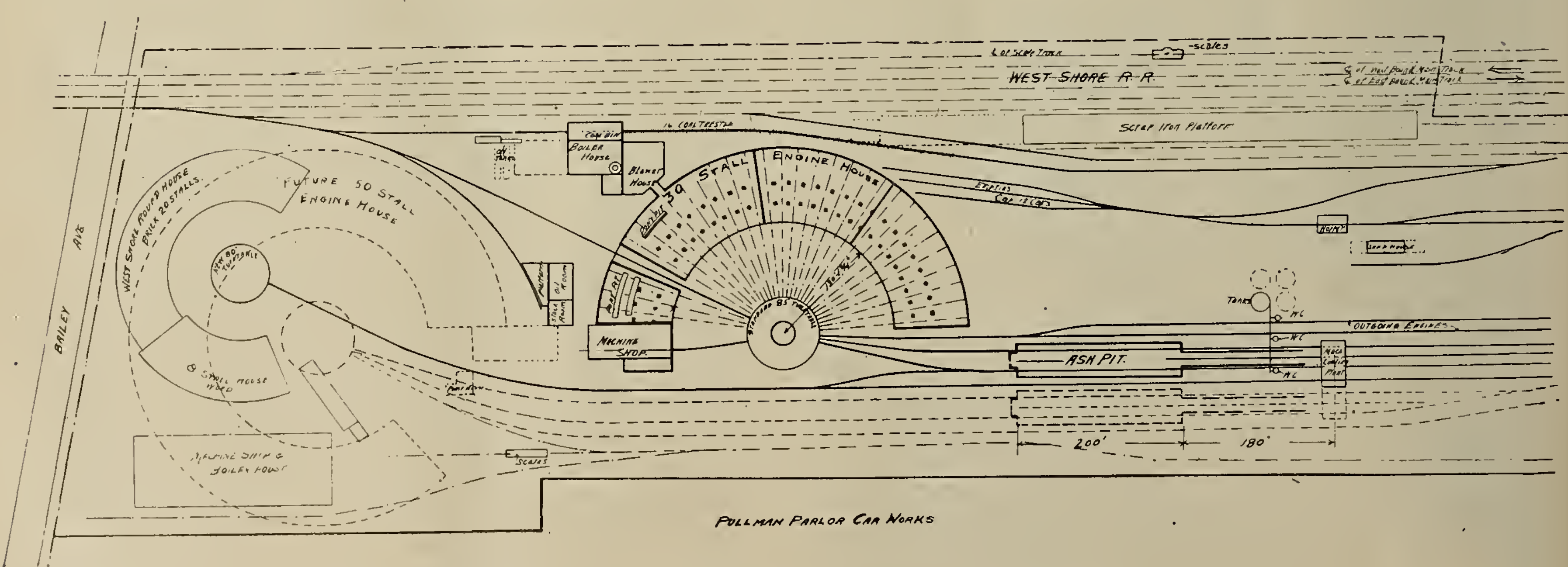
A mechanical coaling plant is located about 650 ft. from the turntable. Between this plant and the roundhouse is the depressed ash pit. Between ash pit and coaling plant and to the north of the tracks for outgoing engines is a 50,000 gallon water tank. Water columns are located between tracks opposite the tank.

ROUNDHOUSE.

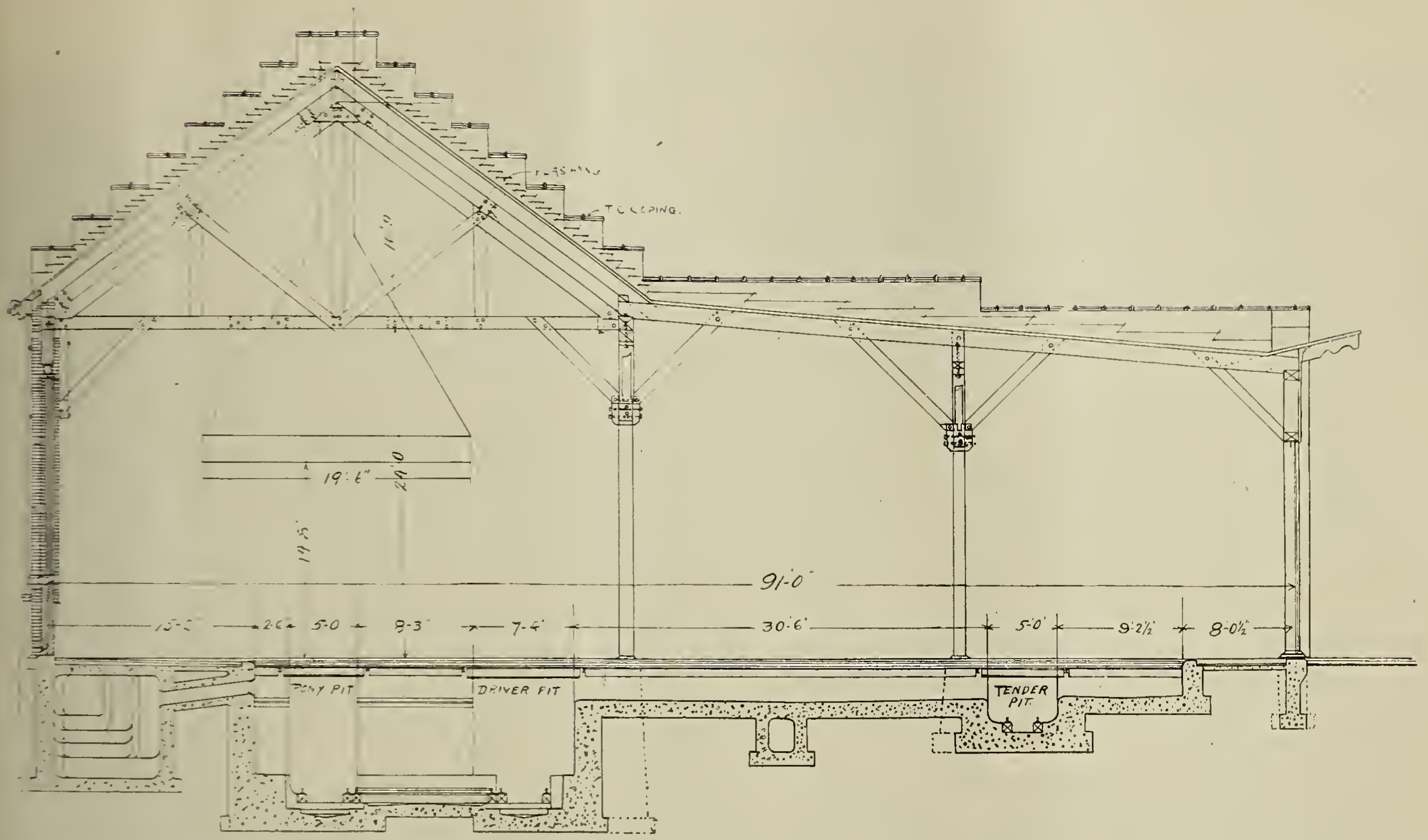
The roundhouse is of the standard New York Central design. A typical cross-section through the locomotive and drop pits is shown herewith. The building has a depth of 90 ft. and the distance from inner wall to center of turntable pit is 130 ft. 1¾ ins. An 85-ft. turntable turns engines to tracks radiating at an angle of 5° 44′ 52″ from center of pit.

The principal dimensions of the roundhouse are shown in the drawing. The wall columns are of cast iron and the interior columns are of 10x10-in. or 12x12-in. timbers. The floor and also the column and wall footings are of concrete. The roof is constructed of rafters, supported by wooden truss and columns, on which 2x10-in. planks are laid.

The working pits are 67 ft. 9½ ins. long, being 15 ft. 2 ins. from the outer wall and 8 ft. ½ in. from the inner wall. Three stalls in the west wing of the engine house are separated by fire walls from the main



GENERAL LAYOUT OF LOCOMOTIVE TERMINAL AT EAST BUFFALO WITH POSSIBLE FUTURE EXTENSION SHOWN IN BROKEN LINES, NEW YORK CENTRAL & HUDSON RIVER RAILROAD.



NEW THIRTY-STALL ROUNDHOUSE AT EAST BUFFALO, NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

building. These three stalls are provided with pony, driver and tender pits. Three end stalls in the main building are also provided with pony pits. The truck wheel and driver drop pits are connected by tunnel, in which there is a narrow gauge track for the transfer carriage.

The machine shop adjoins the engine house, as shown on the plan. It is connected with the wing of the house, which is provided with drop pits. One track leads from the turntable to the machine shop. The floor space is about 4,500 sq. ft.

Mr. Frank M. Steel was appointed master mechanic at East Buffalo in March, 1908. For the previous year he had been road foreman of engines.

Association of Car Lighting Engineers

AT a meeting held in the office of Mr. E. W. Newcomb signal engineer, Oregon Short Line Railroad, at Ogden, Utah, May 20 and 21, 1908, an organization was formed to be known as the Association of Car Lighting Engineers. The following officers were elected to hold office for one year from date:

President, A. J. Farrely, electrical engineer, C. & N. W. R. R.; first vice-president, E. M. Cutting, signal supervisor, S. P. system; second vice-president, A. J. Collett electrical engineer, U. P. R. R. Co.; secretary and treasurer, G. B. Colgrove, chief electrician, I. C. R. R.

Executive Committee: H. C. Malloy, chief electrician, L. S. & M. S. R. R.; O. W. Ott, chief draftsman, O. S. L. R. R.; G. W. Murray, chief electrician, S. P. L. A. & S. L. R. R.; C. W. Terry, chief electrician, Soo Line.

Membership in this association is to be divided into active and associate members. For active membership all men directly or indirectly in charge of electric car lighting on any railroad in the United States or Canada to be eligible. For associate membership, all men who have been engaged in electric car lighting work for a period of over one year on any railroad in the United States or Canada on recommendation of their superior, to be eligible, and representatives of all companies engaged in the railway supply business to be also eligible to associate membership.

At the first meeting a general discussion of train lighting matters was indulged in and it was moved, seconded and carried that the president assign a list of subjects upon which papers will be prepared by the different members, as designated by the president, for discussion at the next meeting.

The object of this association is to further the interests of car lighting and particularly electric car lighting and try to bring about standards covering interchanged equipment on the various railroads of the United States and Canada. It is the intention to hold meetings once a year, or oftener, at which subjects pertaining to train lighting will be discussed in a similar manner to that now in vogue at the various railway clubs.

The next meeting of the association will be held in Chicago some time in October.

Notes on the Roundhouse

THE roundhouse is a repair shop for the maintenance of locomotives in service. As such its efficiency depends upon the facility, with which locomotives may be received, turned, repaired and dispatched with minimum detention. A number of variable conditions affect the movements of locomotives at a terminal and for this reason a consideration of the roundhouse should include the general layout of the auxiliaries in the yard tributary to the roundhouse.

Roundhouse and engine terminal yards now in service on American railways represent many different degrees of development. It is a matter of very common knowledge that as a general thing engine house and terminal facilities have not kept pace with locomotive development and growth. At the same time, however, a number of terminal plants have been placed in commission within recent years which include roundhouses of excellent design, containing the best and most complete equipment and yard facilities arranged to move locomotives with quickness and precision.

The variable conditions affecting the arrangement of locomotive terminals and the difference of opinion among officers and designers, have produced types of roundhouse buildings and arrangements of terminal yards, that are very unlike in point of detail. In the main, the different designs and arrangements follow certain general principles; but beyond these, individual ideas have been followed to such an extent that it is impractical to attempt to outline a precedent according to which roundhouses have been designed and terminal yards have been arranged.

LAYOUT.

Locomotive terminals are either in connection with main or division shops, or constitute isolated plants in close proximity to a large terminal yard or passenger station. Where the roundhouse forms a part of a shop plant, its location is naturally as near as possible to the point at which locomotives are needed for road work. The presence of a roundhouse at a shop plant frequently influences the entire arrangement of the shop buildings and equipment. The layout of the shops is sometimes restricted by locating some of the buildings to serve the interests of the roundhouse, instead of arranging them in locations which advance the most economical and productive movement of material.

The roundhouse is commonly in close proximity to the locomotive shop where the delivery of wheels and other parts requiring machine work will be over the shortest route. It is also essential to provide access from the boiler and blacksmith shops.

In recent years several main shops have been built from which the roundhouse has been excluded. In some of these instances the roundhouse is near the shop plant, but is in no way a component part of it. Where this condition prevails a small shop plant is built in connection with the roundhouse to supply its immediate needs and the main shop is not called on to do roundhouse work, except on driving wheels or on emergency repairs which are too large for the roundhouse shop equipment. At some isolated roundhouses driving wheel lathes are included in the machine tool equipment.

With the development of freight terminal yards a number of isolated roundhouses have been built in close proximity to the yards to provide improved engine handling facilities near the points where the engines are required for service, thereby reducing the delay which frequently occurs between engine house and train, a feature of no small moment where a large number of engines are turned in 24 hours. A practice now becoming more and common is to locate a roundhouse, with its necessary locomotive terminal facilities, between two freight classification yards handling cars for opposite directions.

Several railway companies have developed standard roundhouse and other facilities to meet the requirements of their various terminals. Even these, however, are subject to variation to meet the local conditions. In many of the details and in the equipment for handling work the general design of the standard system may be adhered to.

It is not only very common for a roundhouse terminal to handle engines from several divisions, but s single terminal frequently cares for the engines of several different railroads running into the same center. Separate terminals are often provided for freight and passenger equipment, but it is very common practice to handle both at the same terminal.

There are many different arrangements for meeting these various conditions, but none of them are governed by any general rule. At Clinton, Iowa, the terminal is arranged to care for engines of two divisions and a separate house is provided for engines of each division. The Elkhart terminal of the L. S. & M. S. Ry. cares for both passenger and freight engines of two divisions terminating at that point. A roundhouse of 34 stalls is provided for freight engines and one of 16 stalls for passenger engines. A similar provision is made for freight and passenger engines of the Baltimore & Ohio terminal at Baltimore. The Union Terminal in Washington, D. C., cares for the passenger equipment of five different roads. It is very necessary to provide for the rapid handling and dispatching of all locomotives of the several roads, and as a single roundhouse with one table would hardly be capable of handling the power without detention, even under most favorable conditions, two semi-circular houses, of 25 stalls each, are used, each house being served by an individual turntable. To meet the demands of the large passenger traffic centering at St. Louis during the exposition in that city, a large terminal was erected which included three square engine houses served by transfer tables. Engines are turned on a Y near the passenger station.

Where two houses serve the same terminal the most convenient location of the small auxiliary shops is between the two roundhouses to provide for the movement of material, supplies and equipment, over the shortest possible distance. This practice is not always adhered to, as the layout is often governed by conditions requiring relative locations of the houses which will not permit such an arrangement. Both houses are sometimes served by the same cinder pits. Frequently, however, individual pits are provided for each house. A single coaling station commonly provides for all locomotives at a terminal regardless of the number of houses.

At the most modern roundhouses the arrangement of service auxiliaries is devised to expedite the movement of locomotives as much as possible. This provides for the location of the coaling station, sand house, cinder pits, water plugs, etc., in such relation to each other and to the roundhouse, that incoming and outgoing engines will not interfere and that an engine requiring an unusually large amount of cinder pit work will not block others which should be run into the house without loss of time. Comparatively recent innovations are outside inspection pits and locomotive storage yards. The former provides for the inspection of an engine as soon as it reaches the terminal in order that necessary repairs may be anticipated and arranged for before an engine enters the house. By the use of the storage yard the roundhouse maintains its true function as a repair shop and not as a storage space, and engines requiring no repair work may be placed on the storage tracks as soon as their fires are cleaned and coal, water and sand have been taken.

COALING STATION.

Coaling stations are generally constructed of wood throughout. According to the requirements of the railroad they are made with small individual pockets or large storage pockets. The latter type are provided sometimes with automatic weighing devices, which have improved this type of chute. An example of the small-pocket type is the station erected by the Chicago Great Western Railway at Oelwein, Iowa. It consists of 280 feet of level trestle and 696 feet 6 inchs of incline, giving a total length of 976 feet 6 inches. There are 14 pockets in all, seven on each side. The chute is designed to use hopper-bottom cars, which are pushed up by switch engines. The outside aprons are pressed steel and counter-balanced. The gates are of very heavy construction, so that when released they will fall and stop the flow of coal at any desired point.

Another plan is that which has been used considerably by the Chicago & Alton Railway. The coal, ashes and sand are all handled in the one plant. Water cranes are located so that water may also be taken at the same time, and all the outside work on the engines can be done at one time and at one place. One man can take care of such a plant as this. The details of the plant consist of large pockets capable of holding from 60 to 100 tons of coal, which are suspended on scales. Autographic records of the amount of coal delivered from these pockets are made for the attendant and the engineer. A large storage pocket is also provided. Two tracks are covered, one for the receipt of coal and the other for the use of the locomotives. The coal is received in the underground hopper from the cars and delivered to the delivering pockets or storage bin as may be desired. The same conveyor takes the ashes from the ash hopper to the ash storage bin, from which they are delivered to cars. The sand, after being dried out, is elevated to the dry sand bin, from which it is passed to the locomotive. Small gasoline engines of from 15 to 20 horse power are used with these plants.

SAND HOUSE.

For the drying of sand, small houses are often specially provided, but a tendency is noticeable in all recent construction to combine the sand apparatus with the coal chute, as in the Chicago & Alton stations. The general method of drying the sand is to use a stove of heavy cast-iron construction around which the sand is held by a suitable hopper. The wet or green sand is fed into this hopper, and the dry sand passes out of holes provided at the bottom. After drying, it is screened and is then ready for the storage bin. Steam driers are used to some extent; especially where some steady supply of exhaust steam is available. They usually consist of some sort of hopper through which a large number of pipes are passed, and so located that the sand cannot pass through without being thoroughly dried and roasted. Steam sand driers have not been found to give the same satisfaction as the stoves for the reason that the sand is said to be more thoroughly dried by the stoves and gives less trouble in operation on the road. Some good results in drying sand have been had with an adaptation of the rotary mineral roaster.

The sand house at Oelwein, C. G. W. Ry., is at the extreme end of the station, and so arranged that the green sand is shoveled from the car into an inclined hopper, from which it is let into the heaters by the operator. From the heater it drops to a lower tank, and is then raised by air pressure to the dry-sand bin at the end of the trestle. From the latter it discharges by gravity to the engine sand-box through a 4-inch pipe and controlling valve.

CINDER PIT.

The method most widely used for handling ashes from locomotives is by means of the depressed track cinder pit. It is thought by many to be more satisfactory for the general requirements than any form of more elaborate equipment, provided it can be made long enough to handle a sufficient number of engines at one time. The amount of depression and the depth of the ash pit are almost invariably controlled by the problem of drainage. Both are made as low as possible so as to avoid any excessive lifting of the ashes. Air hoists are used in some cases for raising the ashes from the pits and depositing them in the cars. Electric cranes also are used, and a special form of traveling hoist is found at some points. This latter is so arranged in its relation to the coal supply cars and ash pits that it can with its clam-shell dipper coal up the engines directly from the cars as well as take the ashes out of the pits. These special forms of ash-handling devices are ordinarily adopted only when the space allowable will not permit the use of a suitable depressed pit. Their details also are specially adapted to the individual plant.

At some roundhouses there are short cinder pits in out-bound tracks for cleaning ash pans of out-bound engines and for cleaning fires of switch engines.

The most desirable location for the cinder pit is as near the roundhouse as possible in order to reduce to a minimum the movement of locomotives after the fire has been knocked out.

At the 1906 convention of the Traveling Engineers' Association the committee reporting on the care of locomotive boilers suggested that on arrival at terminals the fire should not be knocked out on an outside pit; but that cinder pit buggies should be provided in every roundhouse pit, so that if it is necessary to knock the fire, the engine can be run into the desired pit and the fire knocked into the buggy. After knocking the fire the ash pan dampers should be closed, the stack covered and the engine allowed to stand until wanted.

STAND PIPES.

The proper location of stand pipes is at points where they may furnish water to engines on both in-bound and out-bound tracks.

INSPECTION PITS.

At several large terminals elaborate inspection pits have been installed to provide an opportunity for engineers and inspectors to examine all parts of a locomotive immediately upon its arrival at the roundhouse tracks. This method provides for promptly forwarding reports to the roundhouse foreman, in order to eliminate unnecessary delay in making repairs while preparing a locomotive for its return trip. A pneumatic system provides a means of sending reports from the inspection pits to the roundhouse foreman's office.

STORAGE TRACKS.

A comparatively recent innovation is the provision of engine storage tracks on which locomotives that do not require boilers to be washed or repairs to be made, are held under steam and awaiting orders, thereby relieving congestion in the roundhouse and reserving the roundhouse as a repair shop and not as a storage shed. Where space permits the most satisfactory arrangement of storage tracks is in a gridiron form and so connected with lead tracks that any desired engine may be run out without disturbing the others.

TURNTABLES.

In addition to the turntable serving an individual roundhouse an outside turntable is sometimes installed at one end of an engine terminal yard for the purpose of heading engines in the direction desired and thus relieving the roundhouse turntable.

The report of the committee on locomotive terminal facilities, presented before the American Railway Master Mechanics' Association, in 1905, recommended a turntable not less than 85 feet long. The turntable installed at the Elkhart roundhouse of the L. S. & M. S. Ry. is 85 feet long, and that at the East Altoona terminal of the Pennsylvania Railroad is 100 feet long. The standard length of turntable adopted by the Erie and the Baltimore & Ohio Railroads is 80 feet.

A table of ample length facilitates the movements of engines in and out of the house, in that the hostler in charge of an engine has greater freedom in balancing an engine on the table regardless of the height of water in the tank, and therefore will "spot" the engine more quickly. A long table further facilitates movement over the table by providing room for a small yard engine when necessary to handle a dead engine.

Where electric power is available both day and night electric motors are most satisfactory as providing motive power for a turntable. Where electric power is not available, good results have been obtained with both gasoline motors and air motors. Push bars for revolving a table by hand are provided in case of accident to the motors or to the mains providing power.

Tracks leading to the turntable are so arranged that those at opposite ends of the table, at any position of the table, are in true alignment. It is generally agreed that frogs are unsatisfactory around a turntable and are expensive to maintain.

CONSTRUCTION OF ROUNDHOUSE.

Roundhouses have been built most commonly with brick outer walls; wooden posts on the inner circle with wooden doors, and with wooden intermediate columns supporting the roof. In recent years concrete has been used extensively in the construction of roundhouse walls and in several instances the walls and roof have been made of concrete with the steel supporting structure entirely protected by concrete against the action of gases common to the roundhouse. While the roof structure has sometimes been built of steel, it is generally believed that wood is preferable as all material subject to corrosion should be avoided unless thoroughly protected, as in the case of concrete construction. When steel construction is used cast-iron door posts have been recommended as liable to cause least damage to the structure in the event of an accident to the door column. An accident to the cast-iron columns will merely carry away a portion of the column, whereas a bend in a steel column would tend to drag down a portion of the roof.

CROSS SECTION.

The best cross section of a roundhouse is far from being determined. The end to be attained is to provide good ventilation; but this has been sought by so many different ideas that there are many cross sections recommended for each of which certain advantages are claimed.

The cross section of the roundhouse at Elkhart has met with much favorable comment and the experience of several winters with this roundhouse has proved its design very practicable in providing against the accumulation of gas and smoke. The outer circle of the house, in which the smoke jacks are located, a space 45 feet wide, is spanned by a roof in which the ridge pole is 41 feet above the rail and the bottom of the roof truss is 24 feet above the rail. The slope of the roof in both directions from the ridge pole is at an angle of about 35 deg. The roof over the inner circle, a space 45 feet wide, is nearly flat and has a gradual slope from the point at which it joins the higher roof to the door columns. The roof is supported by the brick outer wall, two rows of intermediate cast-iron columns and cast-iron door columns. The distance from the door columns to the inner face of the wall is 90 feet.

At the East Altoona roundhouse, the single row of intermediate columns divides the building into two bays. The main bay, nearer the turntable, is 65 feet wide and the outer bay is 25 feet wide. The steel structure supporting the roof of the inner bay is 35 feet 6 inches above the rail, and the bottom of the roof truss is 30 feet above the rail. The roof of this bay has a gradual slope in each direction from a monitor above the center of the bay, which encircles the entire house. The bottom of the roof truss in the outer bay is 18 feet above the rail and the roof has a gradual slope from the outer wall, a point 26 feet above the rail, to the structure of the inner bay joining it at a point about 2 feet below the bottom of the roof truss.

The Baltimore & Ohio Railroad standard roundhouse is 95 feet wide with a roof supported by three intermediate columns. The roof has a gradual slope from the outer wall toward the door columns. At the outer wall the roof is about 30 feet above the rail and at the door columns, the roof is about 22 feet above the rail. The smoke jacks extend through a monitor encircling the roof on a center line 25 feet from the inner face of the wall.

The cross section of the Erie standard roundhouse is similar to that of the B. & O. However, the slope of the roof is reversed and the height of the roof at the door is 25 feet 5 inches and at the outer wall 19 feet 6 inches. This arrangement was provided to drain the roof toward the outer wall in order that drippings from the roof would not accumulate and freeze in such a manner as to obstruct the movement of doors. There is a ventilator over each pit at about the center of the roof span.

This design reverses general practice, as the more usual custom is to build a high wall with windows extending almost to the roof in order to admit light in that portion of the roundhouse in which the forward part of the engine is standing when headed away from the turntable. In order to avoid the accumulation of ice at the doors, drainage from the roof is generally provided for by a gutter around the inner edge, connecting with a down spout leading down inside of the house and connecting with drain pipes leading from the pits.

A cross section representing a design which has been followed on several roads and which seems to meet with favor, provides for the main portion of the roof to slope gradually upward from the outer wall to a point just back of the cab of the average locomotive when standing with its stack under the smoke jack and headed away from the turntable. The roof over the inner portion of the house in which the tanks stand, is lower than the main portion and slopes toward the doors. The vertical portion of the structure between the two sections of the roof is equipped with swinging glass sashes, thus admitting light at a point above the cab and adding to the means of ventilation.

LIGHTING.

A roundhouse has been described as "a semi-circular structure with a questionable roof, surrounded by all walls and no light." Doubtless such a description applies to many roundhouses. Nevertheless, the necessity of good natural lighting, and the added efficiency to be gained thereby, has been duly recognized and roundhouses may now be seen in many parts of the country where ample provision has been made to admit natural light.

Where proper provision is made for natural light, the greater amount is admitted through windows in the outer wall. It is general practise to head engines away from the table when standing in the house and light admitted through windows in the wall has its greatest effect near the forward part of the locomotive and around the machinery. Light admitted through the upper portion of the windows is diffused over a greater distance and the most satisfactory results are obtained from those windows which extend almost from one pilaster to the next.

At some roundhouses the doors contain as much glass as is consistent with good construction and where there is wall space above the doors this space is fitted with glass as well. Monitors in the roof frequently have glass sides and there are occasional examples of skylights in the roofs parallel with the pits.

Concerning the best arrangements of roof lights, and proper ratio of light area to floor surface, the committee on "Buildings" reporting at the last convention of the American Railway Engineering and Maintenance of Way Association, says:

"While roof lights have been considered almost a necessity in most buildings having a width of ninety feet or more, experience has shown that the conditions obtaining in roundhouses are not favorable to their use. Steam and smoke render them almost useless, and leakage around the frames and through broken glass makes them a source of annoyance and discomfort to the roundhouse attendants."

"Your committee does not believe there is any proper ratio between light area and floor surface in roundhouses, but recommends the largest light area practicable in inner and outer circles, excepting that glass is not deemed desirable in the doors themselves."

Artificial light in the up-to-date roundhouse is provided by electric lamps. A common custom is to provide arc lamps in the outer circle near the wall and to suspend three incandescent lamps between pits throughout the house. Objection has been made that arc lights cast a shadow which tends to throw a portion of the house in darkness, and to obviate this it has been suggested to light the outer circle with clusters of incandescent lights arranged at intervals along the wall. An additional advantage claimed for this method is that a greater portion of the wiring could be carried along the outside of the walls, with leads to the several clusters passing through pipes inserted in the wall.

Portable lamps are used extensively in fireboxes and other points where light is inaccessible and suitable connection plugs are located on posts between the pits.

Inasmuch as an engine terminal is as busy during the night as in the day time, the yards, coaling station, cinder pits, etc., are lighted artificially by arc lamps.

HEATING.

The method of heating roundhouses which has received greatest favor is the system of delivering hot air through ducts. The air supply is taken from the exterior of the building; is heated by passing through a system of steam coils and is delivered from the point of supply by a fan. The coils are usually heated by exhaust steam from the engine operating the fan. The delivery ducts are usually carried around the house beneath the floor and just within the outer wall. From the main ducts lead connections are made between every alternate pair of pits and hot air is delivered to each pit through two openings in one side, so located that the blast will strike an engine where it will work to best advantage in melting ice formed on the machinery. Dampers placed in the openings at the pits serve to regulate the flow of air at each pit. The circulation of hot air through the house results from the heated air rising and escaping through ventilators and smoke jacks. This is considered more satisfactory than attempting to secure a horizontal movement of the air by mechanical means. The report of the committee on recommendations relative to the requirements of a modern roundhouse, presented at the annual meeting of the American Railway Engineer and Maintenance of Way Association in 1905, particularly specifies that "no re-circulation of air should be allowed."

Many roundhouses are heated by direct radiation from coils of steam pipe arranged along the sides of the pits, and the Parsons roundhouse of the M. K. & T. Railway is heated by a gas furnace and direct air heater in connection with a fan system.

VENTILATION.

Ventilation is provided for in roundhouses according to various methods. In some houses ventilators for disposing of steam and gases are placed in the roof immediately above and parallel with the locomotive pits; in others a monitor in the roof encircles the entire house, about midway between the two walls; in still others the entire roof or a portion of the roof is built with a high pitch in order to provide a large volume of space with high head room so that gases will readily rise away from the floor and escape through monitors or specially designed jacks.

The smoke jacks in the Elkhart roundhouse of the L. S. & M. S. Railway are of wood and rectangular in form. Around that portion of each jack that extends above the roof, is a box with a space of about 6 inches between the box and the jack on all sides. This space is open at the point of juncture with the roof and the draft caused by this chimney around the jack tends to remove all smoke and gas which accumulates in the upper portion of the house.

By delivering air in the pits either by direct radiation or by hot air ducts, the heated air is not only directed where it will do most good in melting ice on a locomotive, but the hot air naturally rises and the tendency is to carry the gas, smoke and steam with it. The exterior air entering beneath the doors, etc., naturally tends to rise toward the jacks and ventilators with the air inside of the building.

DOORS.

Roundhouse doors are generally made of wood with a portion of the door including an area of glass sash for the admission of light. Wooden doors are considered preferable, both on account of cost and resistance to corrosion, when compared with steel doors on either the rolling or ordinary type. Swinging doors are usually hinged to swing toward the turntable, though there are instances of doors swinging inward. The swinging door is subject to damage from wind and storm and in the event of its not being properly fastened it is liable to damage from moving engines.

Lifting doors are neater in appearance than the swinging doors, but are more susceptible to minor accidents and are frequently out of order. Lifting doors require a greater height of the house at the inner circle, and an additional height of the house seems unnecessary inasmuch as the tank ordinarily stands near the doors, and there is comparatively little work done in this portion of the house. Door openings are at least 12 feet wide and 17 feet high.

PITS.

In a modern roundhouse capable of caring for large engines of present day service working pits are 65 feet long. The outer end is about 14 feet from the wall and the inner end about 11 feet from the door posts. The pit tracks extend within about 10 feet of the wall in order that an engine may be moved over a portion of a revolution of a driving wheel if necessary in making repairs. The pit is usually about 3 feet 11 inches wide and 2 feet 6 inches deep at the outer end, sloping to a depth of 3 feet at the end toward the turntable. The best drainage of the bottom of the pit is obtained with a convex floor so arranged that water will run off along the sides of the pit. The bottom, sides and ends of the pit are usually of concrete with a wooden beam along each side to which the rails are spiked.

Each roundhouse has one or more sets of tracks arranged for dropping driving wheels and truck wheels. Driving wheel drop pits and truck wheel drop pits are usually in connection with different working pits, though the same working pits are sometimes equipped for dropping both truck and driving wheels.

Truck wheel drop pits are usually at the end of the repair pits toward the outer wall and the pits are connected by a tunnel. On the bottom of this tunnel is a light, narrow gauge track on which the transfer carriage and jack travel so as to provide for lateral movement when removing and replacing wheels. At Elkhart the truck wheel drop pits are toward the turntable end of the pit and engines requiring wheel work are backed into the house from the turntable. Smoke jacks are placed above both ends of the pits equipped for dropping wheels. At principal roundhouses on the C., M. & St. P. Ry. a pit is put in which is capable of dropping a complete engine truck. The pit is 8 feet 8 inches by 10 feet.

The arrangement of driving wheel drop pits whereby one drop pit includes three repair pits is considered with greatest favor. By this arrangement wheels dropped from engines standing on either of the outer pits may be moved transversely on the jack carriage and delivered to the center track, instead of running the wheels over the floor between pits.

Drop pits constructed on circular lines, on a radius with the center of the turntable as a center, are looked upon with greater favor than those built on straight lines.

At the East Altoona roundhouse of the Pennsylvania four drop pits are installed in the house next to a through running track leading out past the machine shop. One pit is 55 feet long for removing an entire set of wheels under an engine; two have double tables 8 feet 6 inches long for removing a single pair of drivers by dropping the wheels on one table and running them along the bottom of the pit to be raised by the other table; and the fourth is 24 feet long for work on engine trucks, tenders or use in emergency. In addition to these pits a fifth is fitted with removable rails for removing tires without dropping the wheel centers. The tables are lowered and elevated by elevating screws, the operating mechanism being driven by electric motors.

CRANE SERVICE.

Within recent years several roundhouses have been constructed with provision for installing traveling cranes. While the construction of the houses has been arranged for this purpose, the cranes have not always been installed. At the East Altoona roundhouse of the Pennsylvania Railroad provision is made for traveling cranes to span the inner bay—toward the turntable. With this arrangement the crane would not be interfered with by the smoke jacks. The design of the roundhouses built at Pueblo and Denver on the Denver & Rio Grande Railroad, provides for one section of each house to be equipped with a traveling crane. According to this design the crane section is so constructed that the roof over the bay next to the outer wall is higher than the remainder of the roof to provide room for the crane. The flare of the smoke jacks is within this bay and the jacks are so offset that for a short distance they are parallel to the floor and extend upward to the roof in the next bay.

Telescoping smoke jacks have been designed to provide for crane service, and the lower portion of the jack may be lifted sufficiently to allow a crane to pass beneath.

Swinging jib cranes are usually suspended from columns of the outer row in order to serve the forward portion of a locomotive for the purpose of handling steam chest covers, pistons, rods, etc.

At the Rennsselaer roundhouse of the New York Central Lines an air hoist is used to remove driving wheels from the drop pit and place them on cars for delivery to the shop.

Frequently a swinging jib crane is suspended from a column near a door for use in loading material upon a locomotive tank for shipment to an outlying point.

FLOORS.

Roundhouse conditions require a good, substantial floor that may be readily drained. Dirt floors are filthy and unsatisfactory. Floors of wooden planks have long been used with success and are still looked upon favorably. Concrete floors have been installed in many roundhouses within recent years and flooring of vitrified brick set on edge in tar has given very satisfactory results. To insure good drainage floors are elevated to a height of two inches above the rail midway between the pits and slope gradually toward the pits.

The report of the committee on up-to-date roundhouses presented before the American Railway Master Mechanics' Association in 1905 suggests "a good floor, adopted by the New York Central for roundhouses, is prepared as follows: Upon a level sub-grade an 8-inch bed of cinders is placed and thoroughly rammed. Upon this is placed a 5-inch layer of concrete, consisting of one part of Portland cement, four parts sand and seven and one-half parts of broken stone. Upon this is a top dressing, one inch thick, composed of one part Portland cement and one part of sand. This is deposited simultaneously with the concrete to insure a perfect bond. The top is surfaced true with long straight edges and is floated to be smooth. Drainage is secured by raising the floor to a height of two inches above the rails, midway between the pits."

SMOKE JACKS.

The many different designs of smoke jacks in use and the difference of opinion regarding certain makes renders it difficult to determine upon a jack that meets with general favor. To allow flexibility in placing engines as required for different details of repair work it is very essential to provide a smoke jack with a long base in order to increase the scope of its usefulness.

In a paper before the American Society of Civil Engineers, Mr. R. D. Coombs says: "Smoke jacks have been constructed of a variety of materials. Wood, cast, iron, tile and asbestos have given satisfactory results. Smoke jacks of thin rolled plate have a very short life and, in the writer's estimation, are not worth installing. Wood lasts rather better than might be expected and, in connection with a fireproof roof, should prove economical and safe. It is not necessary to sand the interior, though the exterior should be well painted.

"Cast iron, if heavy, has a fair length of service. Tile is more expensive, and its weight and liability to break, if detachable, are objectionable features. Asbestos is light in weight and is fireproof, but is more expensive in first cost.

"A telescoping jack, provided with a bell having a diameter of about 4 feet, would be the writer's preference."

TRACK STOPS.

Track stops to provide against engines running beyond the ends of the tracks are wise provisions and have prevented accidents which might have caused damage both to locomotives and roundhouses.

PIPING.

Piping for water, air and steam in the more recently constructed houses is usually carried in ducts encircling the house just within the door columns or within the outer wall. Where the house is heated by hot air delivered by a fan, the hot air duct is utilized for carrying the pipe lines. From the duct the pipes are led to convenient connections on columns between the pits.

BOILER WASHING SYSTEMS.

Several systems of washing and refilling locomotive boilers with hot water and of blowing off boilers without filling the house with steam have been developed. Some of these systems have proven very economical in the expense of washing boilers and in reducing the necessary detention of locomotives at terminals. In addition, they have improved working conditions in roundhouses by eleminating fog and steam and further tend to lengthen the life of metal structures by doing away with the presence of moisture liable to cause corrosion.

RECOMMENDATIONS OF THE A. R. E. & M. OF W. ASSN.

The report of the committee on buildings presented before the annual meeting of the American Railway Engineering and Maintenance of Way Association in 1905 recommends that a modern roundhouse be designed and equipped as follows:

(1) That in a circular roundhouse the locomotives should stand in the house normally, with the tender toward the turntable.

(2) That distances from center of turntable to the inner side of roundhouse shall be determined by the number of stalls required in the full circle.

That length of stall along center line of track should not be less than 85‡ feet in clear.

(3) That clear openings of entrance doors should be not less than 12 feet in width and 17 feet in height.

That the angle between adjacent tracks should be an even factor of 180 deg., so that the tracks at the opposite ends of the turntable will "line up" with it.

(4) The turntable should be not less than 75* feet in length. The table should be operated by power, preferably electric.

(5) The material used in construction of the house should be non-corrosive, unless proper care be taken to prevent corrosion.

(6) Engine pits should be not less than 60† feet in length, with convex floor, and with drainage toward the turntable. The walls and floors may be of concrete, and proper provision should be made in construction for the support of the jacking timbers.

(7) Roundhouse doors should be made of non-corrosive material.

(8) Smoke jacks should be fixed, having large hoods; constructed preferably of non-corrosive material and supplied with dampers. The cross-section of the stack should be not less than 30§ inches in diameter.

(9) The floor should be of permanent construction on a concrete foundation and grouted. It should be crowned between pits, and that part adjacent to pits within jacking limits should be of wood.

(10) Drop pits should be furnished for handling truck wheels, driving wheels and tender wheels. These can be most economically constructed in pairs.

(11) If the building be heated with hot air it should be by the indirect method, and the supply should be taken from the exterior of the building (no re-circulation of air should be allowed). The air should be delivered to the pits under the engine portion of the locomotive.

Air ducts should be located under the floor and special precaution should be taken to keep them dry.

(12) As much good light should be obtained from exterior of the building as good construction will allow.

(13) There should be an arc light, and a plug outlet for incandescent lights in each space between stalls.

(14) The contents of boilers should be taken care of and discharged outside of the building in a suitable receptacle and the heat units used as may be deemed best.

(15) Cold water should be supplied at each alternate space between stalls from an outlet not less than 2½ inches, located at a point about opposite front end of firebox; the water pressure should be not less than 80 lbs. The hydrants should be located below the floor in properly constructed pits amply drained.

Modern practice requires the use of hot water in the maintenance of boilers.

(16) Compressed air is used for mechanical hoisting and blowing* operations. Overhead outlets should be furnished in each space between stalls opposite front end of firebox. The pressure should be from 80 to 100 lbs.

(17) A roundhouse should have facilities for the location of a few necessary machine tools, preferably electrically driven.

(18) Air hoists, or portable goose-neck cranes with differential blocks on wheels, should be furnished for handling heavy repair parts.

(19) The turntable pit side walls should be of concrete with wooden coping not less than 6 inches thick, and the ties under the circular rail should be supported on concrete walls. Pivot masonry may be of concrete with stone cap.

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*More recent practice indicates 85 ft.—Editor.

†More recent practice indicates 65 ft.—Editor.

‡More recent practice indicates 95 ft.—Editor.

*Steam is considered more economical for blowing.—Editor.

§Unless jack is made to lower and fit over stack a minimum of 42 in. is considered necessary.—Editor.

Consolidation Locomotive, Southern Railway

THE Pittsburgh Works of the American Locomotive Company have recently completed an order of four consolidation engines for the Southern Railway, one of which is illustrated herewith. These engines are intended for the St. Louis and Louisville division and will be used in fast freight service. In working order they have a total weight of 190,500 pounds, of which 165,000 pounds is carried on the driving-wheels. The cylinders are 21 inches in diameter by 28 inches in stroke and with a boiler pressure of 200 pounds and driving wheels 63 inches in diameter, these engines will deveolp a maximum tractive power of 33,300. This, with a weight on driving wheels, as before stated, of 165,000 pounds, gives a factor of adhesion of nearly 5, which is somewhat higher than ordinary practice. The cylinders are equipped with balanced slide valves, having a one-inch steam lap and no exhaust lap or clearance. The valves have a maximum travel of 5½ inches and are actuated by the Walschaerts valve gear. As the center of the valve chambers are three inches outside the center of the cylinders, the motion of the eccentric is transmitted direct to the valve stem without the use of rocker arms. The link is carried in a bracket bolted to the back of the guide yoke to which the reverse shaft bearing is also bolted; the radius rod being connected with the backward extending arm of the reverse shaft by means of a link. As the valve is outside admission the radius bar connection with the combination lever is below the valve stem. The boiler is of the radial stayed straight top type and has an outside diameter at the first ring of 70 inches. It contains 295 tubes 2 inches in diameter and 15 feet 6½ inches long. The total heating surface is 2,546.3 square feet, of which the tubes contribute 2,387.7 square feet and the firebox the remainder. The firebox is 107 inches long and 71½ inches wide with sloping back head and throat sheet and provides a grate area of 54 square feet. This gives one square foot of grate area for every 47 square feet of heating surface, which is a greater proportion of grate area than is usual in this class of engine. The large proportion of grate area to heating surface is due to the fact that in order to obtain large water spaces between the tubes, a smaller number of tubes have been provided than is the usual practice in a boiler of this size. In ordinary practice from 11/16 to ¾ inch spaces between tubes are provided, but in this design the tubes are spaced 2⅞ inches between centers, giving a water space of ⅞ inch.

The principal dimensions and ratios of the design are given below:

Type of engine	Consolidation
Service	Freight
Fuel	Bituminous
Tractive force	33,300 lbs.
Gauge	4 ft. 8½ ins.
Cylinders	21x28 ins.
Valve gear, type	Walschaerts
Valves, kind	Balanced slide
Valves, steam lap, 1 in.; exhaust lap	0 in.
Valve, travel in full gear	5½ ins.
Ratios.	
Weight on drivers ÷ tractive force	4.95
Tractive force × diameter drivers ÷ heating surface	823
Total heating surface ÷ grate area	47.1
Tube heating surface ÷ firebox heating surface	15.05
Weight on drivers ÷ total heating surface	64.8
Volume of cylinders, cubic feet	11.2
Total heating surface ÷ volume of cylinders	217.3
Grate area ÷ volume of cylinders	4.82
Boiler.	
Type	Straight top
Working pressure	200 lbs.
Diameter first ring	70 ins.
Staying	Radial
Firebox.	
Length, 107 ins.; width	71½ ins.
Thickness of sheets, sides, ⅜ in.; back	⅜ in.
Thickness of sheets, crown, ⅜ in.; tube	½ in.
Water space, front, 4½ ins.; sides, 4½ ins.; back	4 ins.
Tubes.	
Material	Charcoal iron
Wire gauge	No. 11 M. M. D.
Number	295
Diameter, 2 ins.; length	15 ft. 6½ ins.

CONSOLIDATION LOCOMOTIVE—SOUTHERN RAILWAY.

Heating Surface.

Firebox	158.6 sq. ft.
Tubes	2,387.7 sq. ft.
Total	2,546.3 sq. ft.
Grate area	54 sq. ft.

Driving Wheels.

Diameter, over tires	63 ins.
Diameter, wheel centers	56 ins.
Journals, main, diameter and length	9½ ins. x 11 ins.
Journals, others, diameter and length	9 ins. x 11 ins.
Material, centers	Cast steel

Engine Truck Wheels.

Diameter, engine truck	33 ins.
Journals, engine truck, diameter and length	5½ ins. x 10 ins.

Wheel Base.

Driving	17 ft.
Total engine	25 ft. 6 ins.
Total engine and tender	57 ft. 8¼ ins.

Weight.

On driving wheels	165,000 lbs.
On engine truck	25,480 lbs.
Total engine	190,480 lbs.
Total engine and tender	332,710 lbs.

Tender.

Style	Southern Ry. Standard
Wheels, diameter	33 ins.
Journals, diameter and length	5½ ins. x 10 ins.
Water, capacity	7,500 gals.
Coal capacity	12½ tons

Observations from a Shop Foreman's point of view

THE following observations, which were kindly submitted to us, will no doubt interest many readers:

1—The man who goes after what the other fellow is waiting for is the one who gets results.

2—Study your men.

3—Deal fairly with all.

4—An honest pat on the back, or its equivalent in plain language, hurts nobody.

5—Look out for the interest of the man as well as the employers. One is just as important as the other.

6—Don't let the position swell your head. The larger the head the worse the fall which will come sooner or later.

7—Don't criticise your superior officer, he is no doubt following out his orders.

8—Obey orders without asking questions, using good judgment in the same, remembering "It's a good soldier who can obey orders."

9—Look out for the little things. They count up at the end of the year.

10—If you don't have a good word for your fellow man, don't say anything. A thought not expressed hurts nobody.

11—Handle work in rotation where possible. Results at the end of the year will speak for themselves.

12—Wherever you can do so, give the other fellow a boost. You don't know when he may be able to do the same for you.

13—Don't be a quitter.

L'Envoi.

"Do unto others as you would have others do unto you" is a good old rule to go by.

The Traveling Engineers' Association

THE sixteenth annual convention of the Traveling Engineers' Association will be held at Detroit, Mich., commencing Tuesday, Aug. 25, at 9:30 a. m. The Hotel Cadillac will be the headquarters of the association.

"The Pullman people will extend to persons attending the convention, and dependent persons of their families the same courtesy as heretofore, viz., persons to pay full fare en route to convention and upon presentation of receipts showing fare paid, together with proper credentials of the association, to Mr. C. J. Segar, district superintendent, Detroit, Mich., passes will be issued for return trip to persons who are properly identified as bona fide employes of railway companies, in active service, and legally entitled to reduced rates under the provisions of the Interstate Commerce law.

"The committees have been hard at work and their reports on the several subjects are very interesting indeed, and it is believed that this will be one of the most interesting conventions yet held."

The secretary of the association is Mr. W. O. Thompson, New York Central shops, East Buffalo, N. Y.

International Railroad Master Blacksmiths' Association

THE sixteenth annual convention of the International Railroad Blacksmiths' Association will be held at the Grand Hotel, Cincinnati, O., on Aug. 18, 19 and 20, 1908.

The subjects for the committees and the chairman of each committee are as follows: "Flue Welding," George Lindsay, chairman; "Tools and Formers for Bulldozers and Steam Hammers," G. M. Stewart, chairman; "Case Hardening," W. V. Laizure, chairman; "High Speed Steel, and the Results Obtained," J. S. Sullivan, chairman; "Piece Work," T. J. McCann, chairman; "Frogs and Crossings," T. F. Keane, chairman; "Subjects for 1909," S. Uren, chairman; "Locomotive Frame Making and Repairing, Steel and Iron; and Your Experience on Both Steel and Iron," J. T. McSweeney, chairman; "Thermit Welding of Locomotive Frames and Other Work," G. W. Kelly, chairman.

It is thought that the reports, which have been carefully prepared, will be especially interesting to the members of the association and others who attend the meeting. Mr. A. W. Woodworth, Lima, O., is secretary of the association.

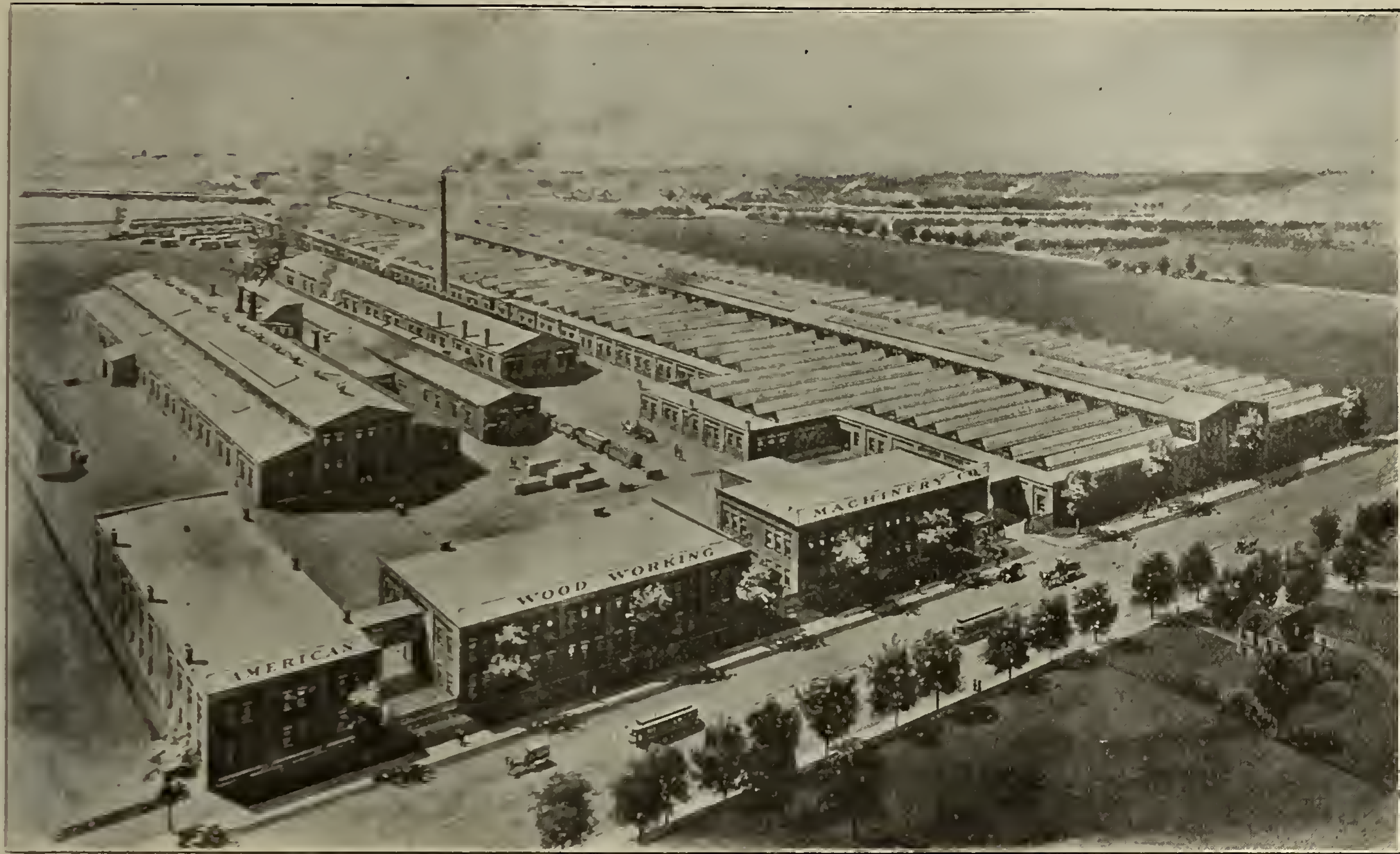


FIG. 1—GENERAL VIEW OF THE ROCHESTER WORKS.

Shops of the American Woodworking Machinery Company

A GENERAL view of the Rochester works of the American Woodworking Machinery Company is shown in Fig. 1. All buildings are constructed with brick.

Looking from left to right, facing the street, the first building is the pattern storage, in which the various patterns used in the construction of the machines are located. In the next (or second) building, on the second floor, is the pattern shop, where the patterns are made; the first floor being devoted to a carpentry or general woodworking department. The third building is the office building, the first floor of which is devoted to the office of the works, as well as offices for the purchasing agent, chief of construction, superintendent and general engineering department; the second floor being used exclusively for the executive offices of the company. The long building to the extreme right is the general machine shop.

FIG. 2—SECTION "U" OF THE ERECTING FLOOR FOR VARIETY SAW BENCHES.

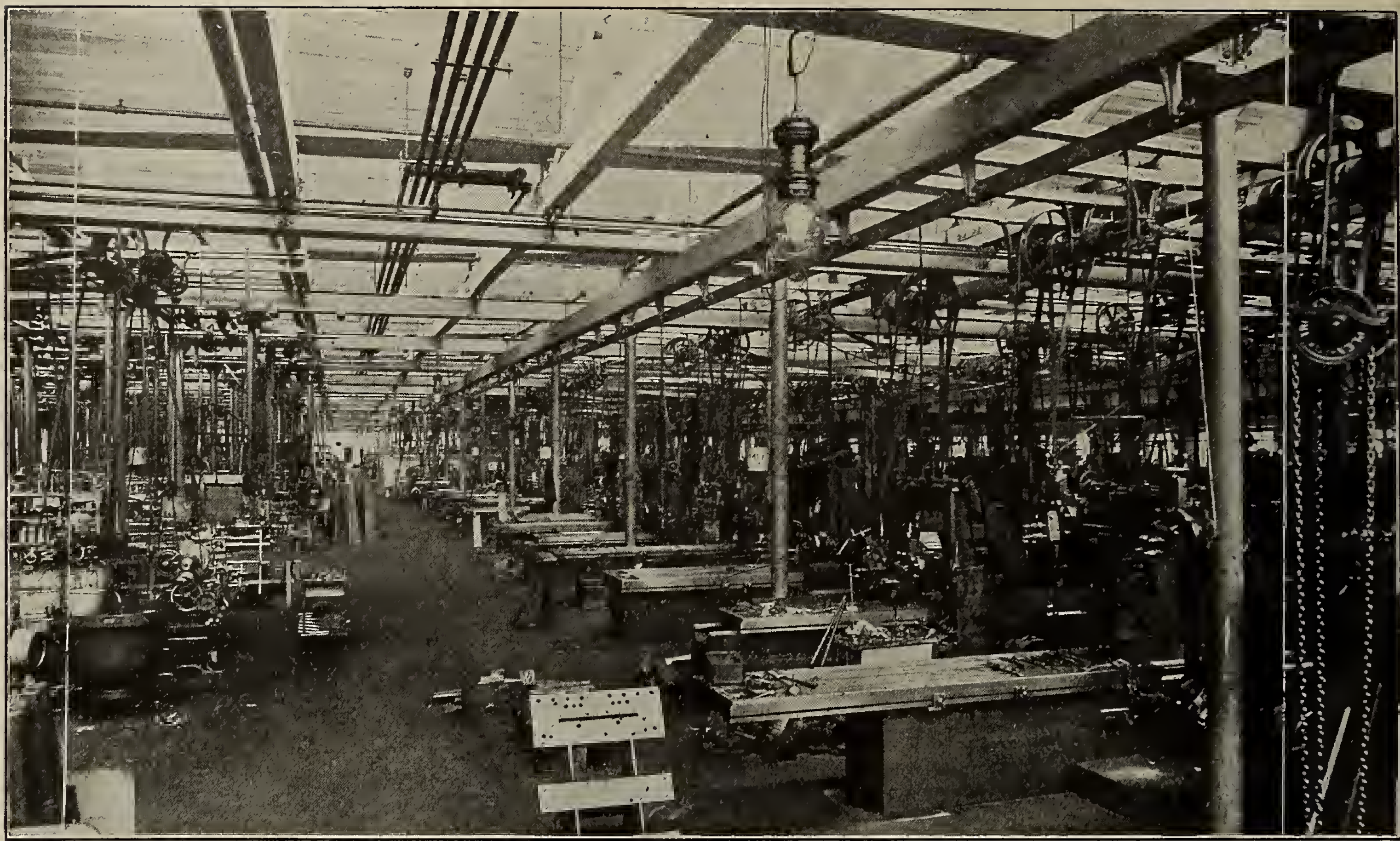


FIG. 3—GENERAL VIEW OF MACHINE SHOP PROPER.

Beginning at the left again, the first rear building is the flask shed for the storing of the wood and iron flasks. Next comes the foundry proper, and the third building is the supply house in which is contained all the iron, coke, sand, coal, wood, etc., that are used in the foundry; then, immediately in the rear of the office building are the power house and blacksmith shop.

The foundry, power house and blacksmith shop are fireproof buildings and the other buildings are provided with automatic sprinkling systems. The machine shop, power house, foundry and supply house are of steel frame construction reinforced by concrete and brick. The entire plant covers ten acres of ground with ample room allowed for expansion in any direction.

Fig. 3 gives a general view of the machine shop proper. On the left is the lathe department, divided into groups of from eight to ten lathes, each group driven by an independent motor. On the right is the planer department, three rows deep, divided into groups and also driven by independent motors.

The smaller planers, as shown in the picture, have hand cranes to assist in placing and removing the smaller

FIG. 4—GENERAL VIEW OF MAIN BAY—SHIPPING DEPARTMENT, TESTING FLOOR AND ERECTING FLOORS.

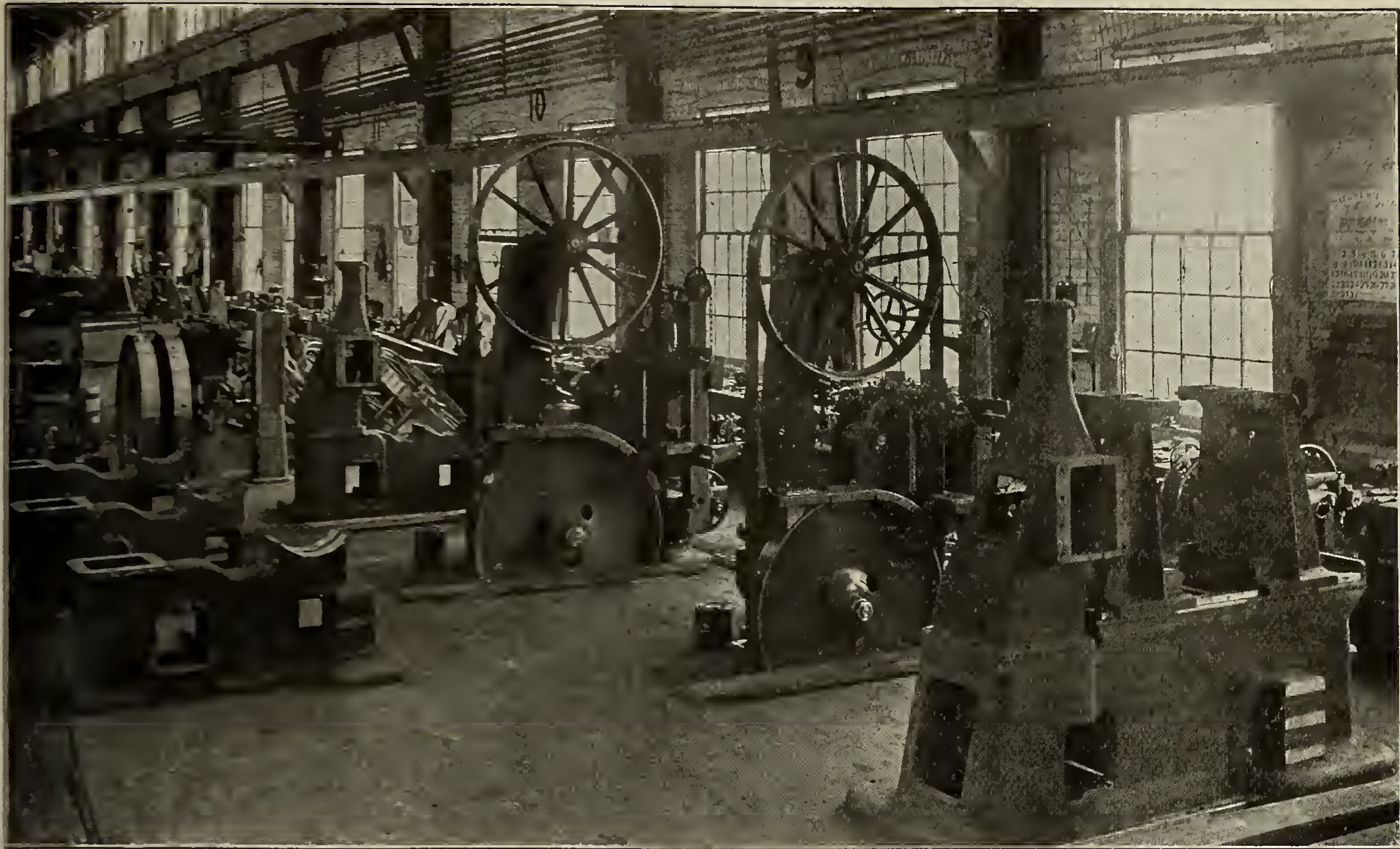


FIG. 5—THE BAND RE-SAW ERECTING FLOOR.

parts on the machines, while the larger planers are located at the extreme right, upon which are placed the heavy frames of the machines. Two traveling cranes, located in the main bay, one of 12,500 lbs. capacity and the other 25,000 lbs. capacity, assist in placing and removing the heavy castings on the machines.

Fig. 4 shows a general view of the main bay, taken from the top of a box car at the end of the factory. In the foreground is located the shipping department, and following this comes the testing floor; further on are the erecting floors for the timber sizers, planers and matchers, inside moulders, hand re-saws, surfacers and other heavy machines.

Two traveling cranes run the entire length of this bay and carry the heaviest machine built, from one end of the shop to the other, as well as assisting in lifting the heavy parts in the erecting of the machines, and in placing the heavy castings on the planers.

Attention is called to the system of heating, which is shown in this view; radiators being placed on both sides of the steel girders, as well as pipes that run along the walls between the upper and lower line of windows.

FIG. 6—SMALL SURFACER FLOOR AND DOWEL MACHINES.

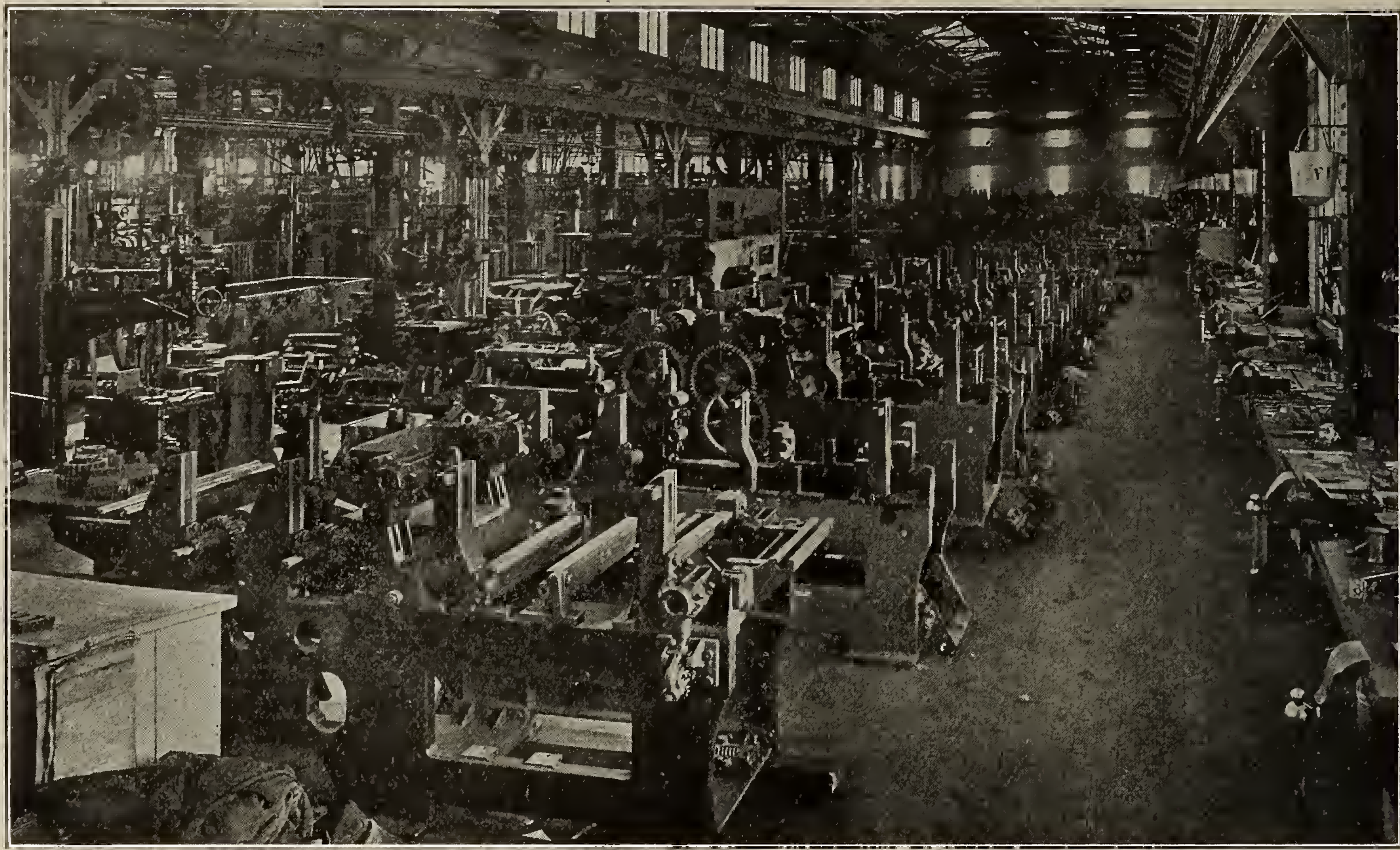


FIG. 7—INSIDE MOULDER ERECTING FLOOR.

Fig. 2 shows section "U" of the erecting floor, where are built from fifty to one hundred Variety saw benches at a time. This floor is in charge of a foreman with assistants. Each man has his work laid out for him and, starting in at the beginning of the line, one man succeeding another goes through doing his special work on each machine, so that the men become expert each in his own particular work, which not only greatly facilitates the output, but also makes accuracy more certain in regard to details and fitting.

Fig. 5 shows the band re-saw erecting floor. Fig. 6 shows the small surfacer floor, as well as the dowel machines. Fig. 7 shows the inside moulder erecting floor. Fig. 8 shows the No. 4½ and No. 6½ surfacers erecting floors.

Only a few of the many erecting floors in this shop are shown, but they, however, give a fair idea of the vastness of the plant. One of the important features of the plant and one that impresses the visitor, besides its immensity, is its finely diffused light, as there is not a dark corner or shadow in any building.

For the proper handling of in-coming and out-going

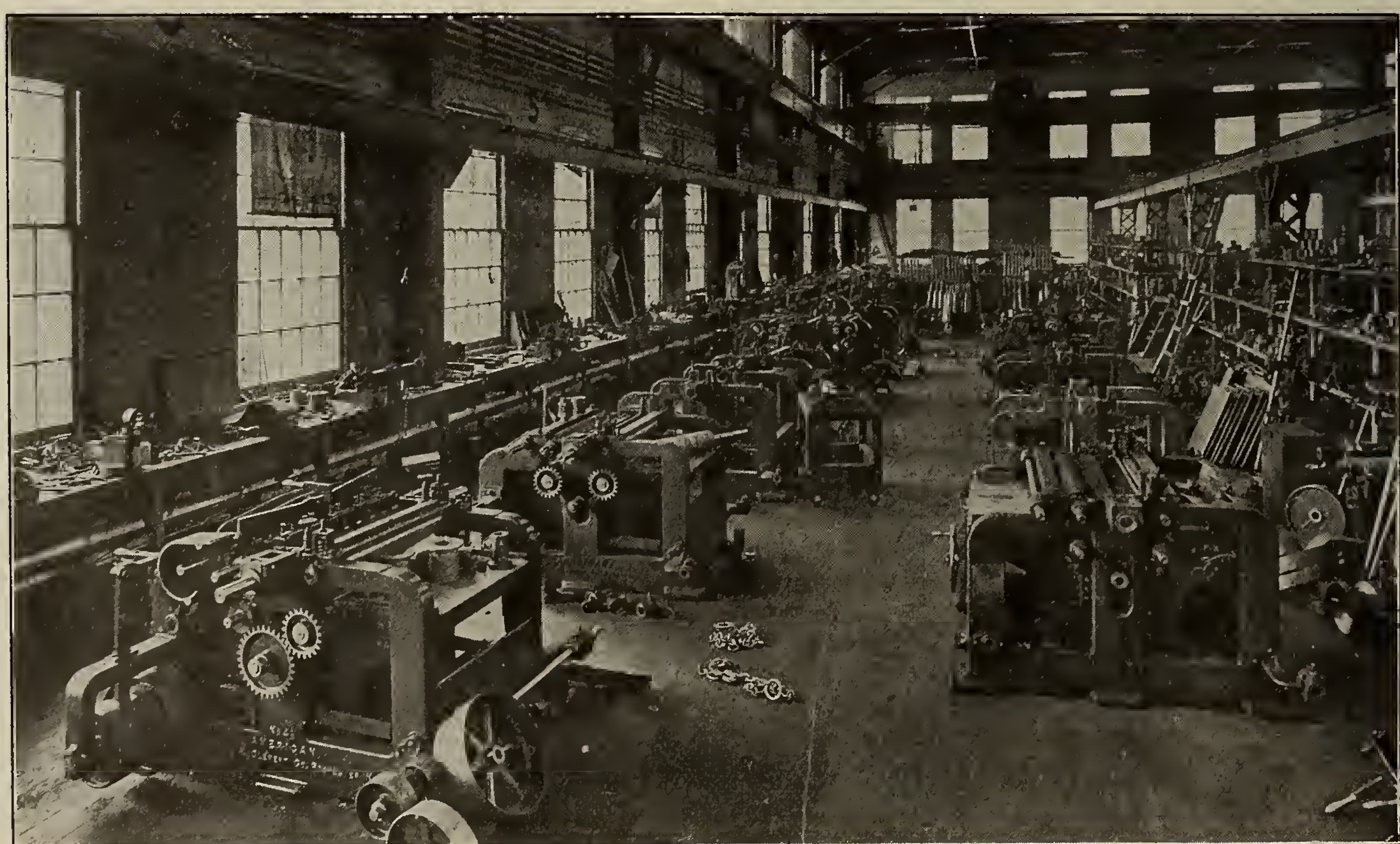


FIG. 8—NOS. 4½ AND 6½ SURFACERS ERECTING FLOORS.

freight, there are three spur railroad tracks, branches of the New York Central, going to different parts of the plant. All of the buildings are also connected by industrial railroad track, which facilitates the handling of the many parts that enter into the manufacture of the machines.

In addition to the Rochester works the company also has five other plants, two at Williamsport, Pa., one at Montgomery, Ala., one at Aurora, Ill., and one at Green Bay, Wis. It has sales offices located in New York, Rochester, Chicago, New Orleans and Portland, Ore.

Locomotive Blow-Off Tanks

VARIOUS places about some locomotive terminal yards bear evidence that instructions to blow off before locomotives leave the terminal have been persistently observed. The appearance of these places, however, is hardly pleasing to an admirer of neatness and cleanliness.

In order to prevent the spread of "whitewash" over a wide area as a result of blowing off boilers and to drain the water discharged during the blowing-off process, blow-off tanks or receptacles have been designed to catch and dispose of the discharge. A tank for this purpose, designed and used by the Chicago and Northwestern Railway, is illustrated by the accompanying line drawing, Figure 1.

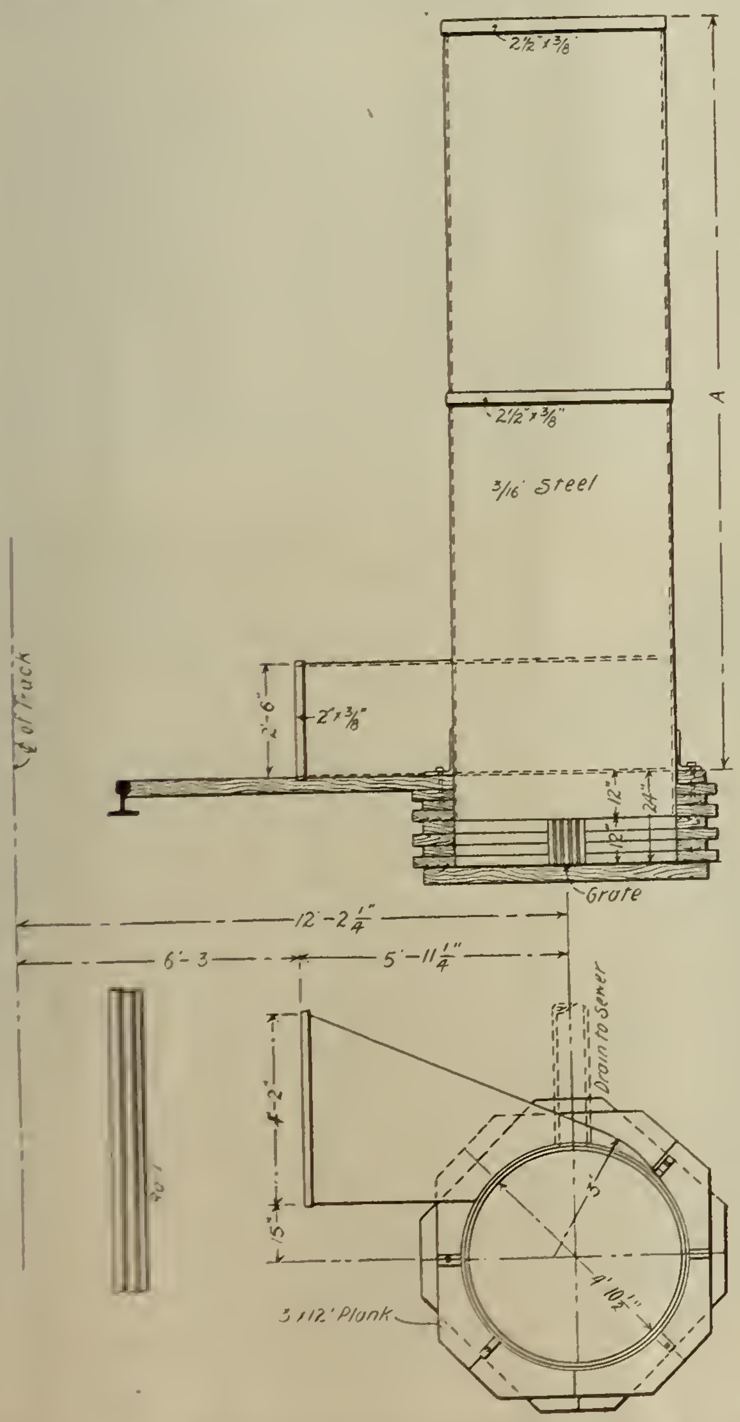


FIG. 1—LOCOMOTIVE BLOW-OFF TANK—C. & N. W. RY.

To direct the steam and water blown off, toward this tank, the blow-off cock at the throat discharges through a pipe leading to T at the proper height above the rail. One branch of the T is plugged and the other is connected to a pipe discharging between the driving wheels. With this arrangement all locomotives blowing into the tank must be headed in a given direction.

A blow-off box for the same service, devised to accommodate engines headed in any direction, has been designed by the Chicago, Milwaukee and St. Paul Railway. This box is illustrated by Figure 2.

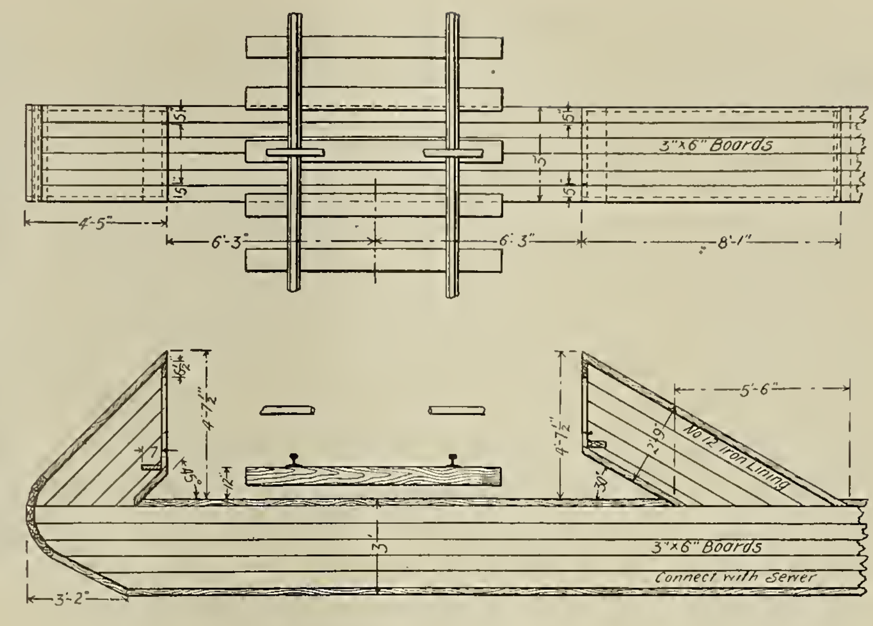


FIG. 2—LOCOMOTIVE BLOW-OFF BOX—C., M. & ST. P. RY.

Non-Union Men Debared as Inspectors of Safety Appliances

ACCORDING to a rule of the Interstate Commerce Commission in exercising its power to appoint inspectors under the safety appliance act relating to railroads, non-union men will not be employed. No person will be appointed inspector unless he is a member of some railway union, but in addition to that he must have the indorsement of the chief officer or officers of that union. The commission's excuse for this radical departure is that by virtually transferring the appointing power to the unions themselves, the commission expects to make each railway organization responsible in a measure for the men appointed from the ranks of the organization. There are 23 inspectors now holding offices. Each is paid $125 a month and is allowed $4 a day for expenses. To be eligible for appointment an applicant must have been within one year preceding the date of application an engineer, fireman, conductor, train man or yard man in active railway service, and have been in such service for at least six years. There are now on file the applications of 1,200 trainmen who desire to be inspectors. No vacancies exist. It is desired that congress will authorize additional inspectors.

Emergency Hospital for Shop Plants

MUCH good can be accomplished among employes whose work entails more or less risk of personal injury from accident by maintaining an effective medical equipment and by systematically observing the care which is given an employe after sustaining an accident, no matter how slight. Unfortunately the employes in some grades of work are lacking in sufficient intelligence to lead them to appreciate humane efforts made in their behalf. Persons of this type are negligent in the proper care of themselves; they frequently expose themselves to infection and often fail to obtain proper nourishment. These and other causes sometimes result in complications developing from a slight wound, which would heal in a short time under proper medical supervision.

Since the employe will not always care for himself, or is sometimes led through poor judgment or unfortunate influence to obtain inferior attendance, there is good reason why corporations should make a strong effort to provide, or at least assist in securing, competent treatment for employes who have suffered injury while in their service.

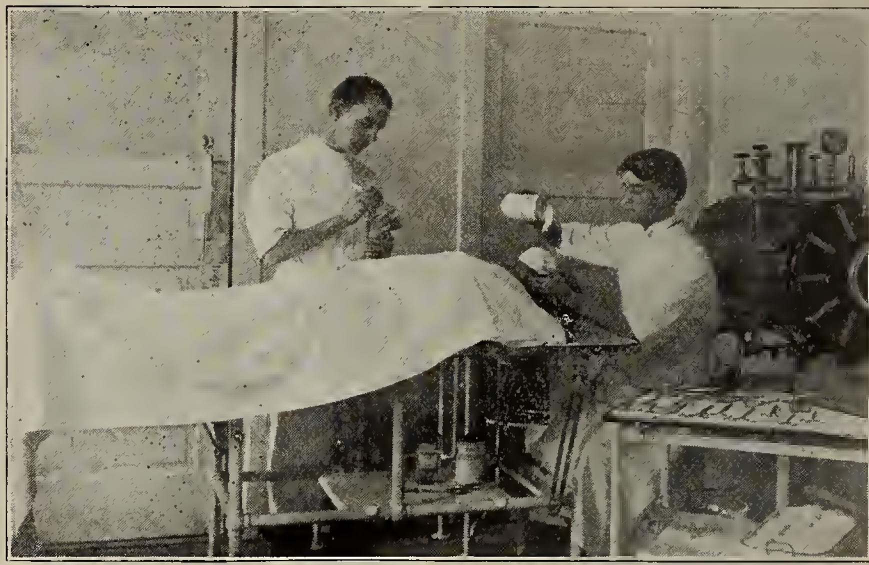
In more than one instance lives have been saved by prompt action after an accident, supplemented by proper treatment and careful observation. Past experiences of concerns equipped to cope with such emergencies, as well as the experience of those not so equipped, have taught valuable lessons and the moral conveyed by these should not be overlooked.

In view of the benefit which has been derived both by corporations and employes where systematic medical departments have been maintained, a description of one of these departments should prove interesting.

The Armour Car Lines maintain a well equipped emergency hospital system. In the office building at the car shops at the Union Stock Yards is a room equipped for giving first aid to the injured. This contains a couch, basin with running water, both hot and cold, hospital table and cabinets containing sterilized bandages, antiseptics, dressings, etc. This room is under the care of a member of the office force who is thoroughly trained in the course of treatment for first aid to the injured by the company's surgeon.

All employes in the shop or repair yard who sustain injuries, no matter how slight, are required to report at this room, where the wound is thoroughly cleansed and properly dressed. If an employe in injured about the car shop he is taken by the foreman to the office for proper attention. Such care avoids the possibility of infection, preventing the development of anything more serious and further tends to insure a prompt record of all cases of injury which occur.

In case of injury no preliminary formality is observed and no questions are asked before relief is given. After an injured man has been cared for, however, he is thoroughly questioned as to the cause of the accident, nature of the work on which he was engaged at the time, condition under which he worked, etc. All such information is carefully recorded upon form blanks, also the statements of witnesses, foreman and attending physician.



OPERATING ROOM—ARMOUR HOSPITAL.

Should the injury be any more serious than to require cleansing and bandaging, the injured man is sent to the company's emergency hospital near by, where the doctor is always in attendance, or the doctor comes to the patient if necessary.

Armour & Co. maintain a well equipped emergency hospital at their packing house plant in the Union Stock Yards, Chicago. This is under the immediate supervision of a competent physician and surgeon who gives personal attention to all cases brought to the hospital. Patients requiring continued hospital service are transferred to one of the Chicago hospitals (as the small hospital maintained at the yards is for emergency work only), and the company's doctor being upon the staff, looks after them there until well.

The emergency hospital at the yards is maintained for the benefit of all departments of Armour & Co. alike and not alone for the employes of the Armour Car Lines. Nevertheless it serves as a striking example of the benefits derived from such a system and is an institution containing many advantageous features worthy the consideration of the railways. Most cases can be operated upon successfully at the emergency hospital. However, a more serious case is sent to one of the city hospitals where all expense is bourne by Mr. Armour.

In addition to the accident report made at the car shops emergency hospital, a history sheet is made out and filed. This records the name of the employe, his check number, address, age, family, department, position, foreman, injury, date, doctor and assistant. Record is made of a statement by the injured, together with the result of the examination, as well as such additional remarks as may be necessary and this report is signed by the doctor. A clinical record is also made out and filed, which shows the condition and progress of the patient day by day.

Injured employes are given attendance by the company's physician until they have thoroughly recovered. An injury which does not require continued service is carefully observed and examined regularly until all danger of infection has passed. An employe receiving treatment is instructed to return after a consistent interval for examination by the physician and if he fails to report of his own accord, a notice is sent to his foreman requiring the employe to report. This is done as a necessary precaution for the reason that many employes fail to realize the danger of infection which sometimes results even from slight wounds and consequently will not give themselves ordinary care. Other employes stay away from work and for that reason do not see the doctor. Consequently if the foreman reports the man not working the doctor calls upon him at his home and continues treating him.

While not of large proportions, the emergency hospital at the packing house plant is complete in its equipment and modern in every detail. The operating room is bright, airy and immaculate. An adjacent room contains two beds for emergency use and for patients recovering from the effect of an anaesthetic. Adjoining this room is a bath room. The company has its own ambulance for conveying patients to the hospital or home, as the doctor sees fit.

A feature apt to be overlooked and yet worthy of highest commendation, is the practice of giving treatment promptly and without formality, leaving the preparation of all records and "winding of red tape" until after the injured man has been given relief. Unfortunately there is knowledge of instances where railway company physicians have required formal statements and orders from foremen before undertaking to render assistance, thus wasting valuable time and causing unnecessary suffering.

Ryerson Flue Welding Machine

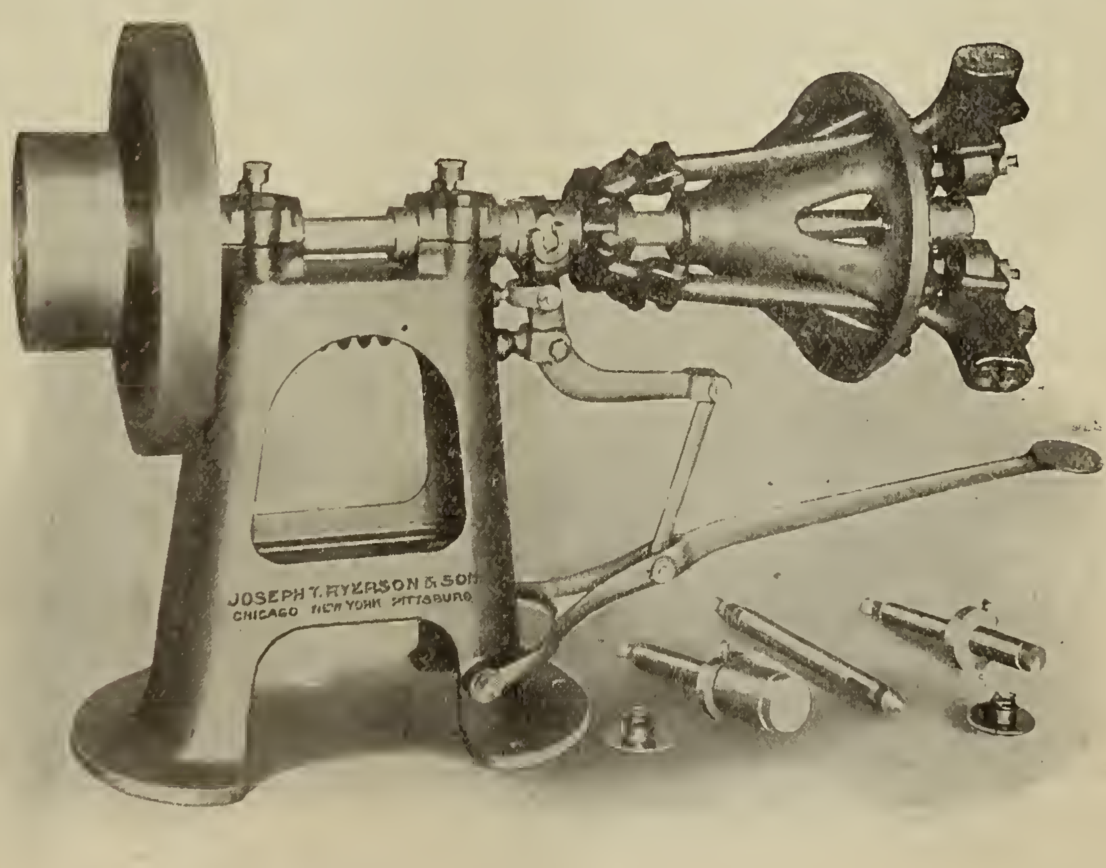
It is now generally conceded that the most satisfactory flue welding is done on the so-called roller type of machine, in consequence the greatest development has been along that line and many welders of more or less merit have been designed and used in the various railroad and contract boiler shops throughout the country. A careful search or study of the many types and designs of machines in use supplemented by the opinion of leading railroad mechanical men, has resulted in placing on the market the flue welding machine which is illustrated and described herewith.

The Ryerson flue welding machine consists of a heavy substantial base on which a revolving shaft is mounted in suitable bearings. This shaft carries the driving pulley and fly wheel at one end, while at the other end and continuous with it is an internal roller carrying mandrel. This mandrel much resembles the ordinary roller type of flue expander and it is designed to roll the inside of the tube during the welding process. These mandrels are made in all sizes and are interchangeable by simply screwing the threaded end into the end of the driving shaft. A steel head and arms carrying large adjustable rollers revolve with the shaft, the rollers being disposed equidistant and in the same vertical plane with the mandrel rollers. By pressing the foot treadle, shown in the illustration, the outside rollers are brought down toward the mandrel rollers until they are only separated from them by the thickness of the tube wall. From this short description it will be readily seen that the weld must of necessity be true in gauge and absolutely smooth. The arrangement of the four rollers is such that they can be accurately and quickly adjusted by any one and as this is the only adjustment necessary, this machine is very easy to operate.

The following advantages, which are claimed, will doubtless appeal to every one interested in flue welding:

First, the Ryerson flue welding machine is driven entirely from the pulley (or gear if motor drive), and no air or steam is necessary to exert the pressure on the welding point. This does away with all connections, leaks, etc., as well as the expense attendant upon the operation of pneumatic machines. It further, to a considerable extent, makes the machine portable.

Second, this machine is the only machine which rolls the lap of the weld on the inside. Rollers are set in the mandrel and so arranged that the outside rollers carried



RYERSON FLUE WELDING MACHINE.

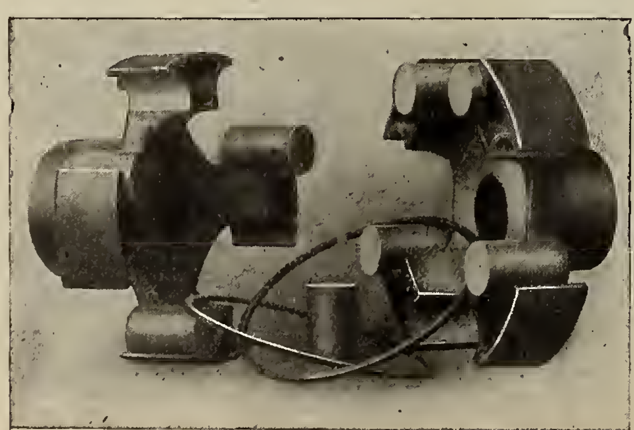
at the same time and at the same speed. Rolling the tube from the inside and outside while welding is a new departure, and one that absolutely insures a smooth weld, true to gauge and practically invisible.

Possibly the greatest advantage, which this machine has, is in the simple and accurate adjustment of the rollers. To set this machine the cold tube is placed upon the mandrel and the arms of the machine are brought down and adjusted to the thickness of the cold tube. This requires no skill whatever and can be accomplished in less than five minutes. The adjustment of these rolls is so perfect that they can be set to roll within a hundredth of an inch. The mechanism is so arranged that it is absolutely positive and, when once set, every tube welded will be of exactly the same size. The rolls cannot be brought closer together by the foot lever than the point at which they are adjustable and locked.

The Ryerson flue welding machine is free from gears of every kind. There is practically nothing about the machine to wear out or get out of order. All fast running parts are arranged so that the slightest wear can be taken up. It is a flue welding machine which runs noiselessly. Many of the principal railroad and contract shops are now using this machine and it is everywhere giving excellent satisfaction. It is claimed that it will do more rapid and better work than other flue welders now on the market.

This machine, in addition to welding, will scarf, spread or cut off tubes as desired. This is accomplished by simply removing the roll mandrel and substituting the proper scarfing rolls, spreading device or cutting wheels. Such a change can be made in a very few minutes.

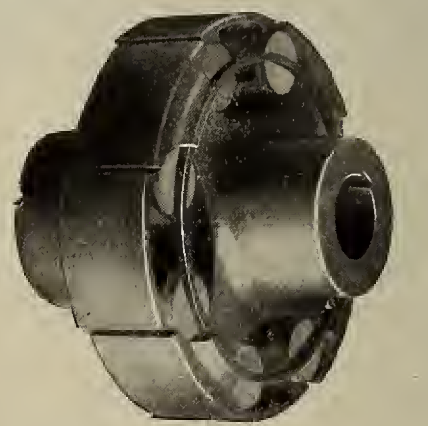
While welding with this machine both hands are free to handle the tubes. A small light pair of special tongs, furnished with the machine, are used in one hand to prevent the tube from turning around while being welded. A suitable stand is also furnished with each machine. This stand is provided with an adjustable fork and spool roller and can be located in front of the machine to hold up the tube at one end while the other is being welded. The shipping weight complete is 1,200 pounds.



UNASSEMBLED VIEW OF INSULATED COUPLING.

Flexible Insulated Coupling

THE accompanying illustrations show an improved flexible insulated coupling manufactured by the R. D. Nuttall Company, Pittsburg, Pa. The coupling consists of two interlocking spiders of cast iron construction which are insulated by means of solid rubber cylinders. Outside of these the only other parts are two steel rings used to hold the rubber cylinders in position. The rubber members provide ample insulation and at the same time give the desired flexibility. It is furnished in sizes from 5 h. p. up.



NEW FLEXIBLE INSULATED COUPLING.

This flexible coupling is especially desirable where electric motors are direct connected to machinery which is subject to vibration, as, for example, a tube mill or a coal pulverizer in a cement plant, where the coupling relieves the motor from the shocks and jars of the machine. In addition, the end thrust of the crusher is overcome and the motor bearings run without heating.

Gisholt Double Emery Grinder

THE double emery grinder, illustrated herewith, represents one of the latest machines brought out by the Gisholt Machine Company, of Madison, Wis. This machine is enclosed as much as is possible with a grinder of this type and is supplied with a fan water pump and large water reservoir, thus insuring an abundant supply of water. The water nozzle, instead of being in the usual position on the upper side of the work rest, is in the back or wheel side of the work rest on this machine; thus the water, instead of coming from a nozzle directly over the wheel and rest, follows the wheel and comes around in a fine spray meeting work and emery wheel at point of contact. The work is always in plain view. This method of water supply does away very largely with splashing and is a material assistance in keeping dry the floor about the machine.

In addition to this the machine has a large water pan so flared on the sides and front that a piece of work up to 14 ins. in length comes entirely within the pan and therefore any drip from it will go directly into the pan, from which it drains into the tank instead of going onto the floor.

The machine is supplied with two 1½-in. face by 14-in. diameter emery wheels, mounted on a spindle running in adjustable self-oiling boxes. Furthermore any end

DOUBLE EMERY GRINDER.

play in the spindle may be very easily and effectually taken up by adjusting two screws in face of spindle driving pulley. The machine may be either belt or motor driven.

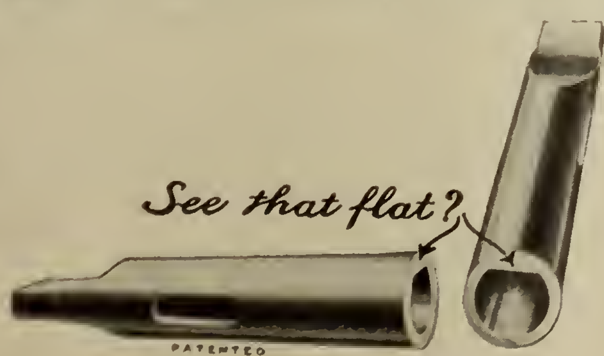
The spindle pulley is so protected that the belt is kept entirely shielded from water and emery, thus materially increasing the life of the belt. This machine is very heavy and was originally designed by this company for its own use.

Machines such as this are of great convenience in a shop and the provisions made for keeping dry the floor about the machine will be appreciated, as will also the manner in which the emery wheels are enclosed, thus reducing to a minimum the emery dust that is likely to fly from a machine of this type.

A Special Drill Socket

THE drill socket shown below is termed the "Use-'Em-Up" socket because the drill can be used as long as an inch of shank remains. It is made in one solid piece and is consequently durable. The socket is the same as the standard Morse except that it has a flattened side on its interior tapered surface and has a longer drift slot to facilitate the driving out of tangless drills.

The width of the flat surfaces varies with the size



"USE-'EM-UP" DRILL SOCKET.

of 5-16 in. for the No. 1 to 11-16 in. for the No. 4. In grinding a flat surface on a drill it is not necessary to secure the exact size of the flat in the socket, but only a flat place so that the tool will enter. It takes no longer to taper new drills for socket than those having broken shanks or twisted tangs.

The drill socket is manufactured by the American Specialty Company, Harvey, Ill.

Automatic Gear Hobbing Machine

A GEAR hobbing machine of very simple and rigid form is being placed upon the market by The Adams Company, Dubuque, Iowa. The system of cutting spur gears by the use of a hob has proved to possess so many advantages over the old method of milling one tooth at a time that the gear hobbing machine is certainly destined to entirely displace the ordinary automatic gear cutter. The rapidity of the work is far ahead of any system of milling or planing gears. It is a continuous cut from start to finish up to the full capacity or strength of the hob teeth.

The accuracy of the work and the smooth, quiet running of the gears produced on the gear hobbing machine can be approached only, but not equally, by the generating gear of the gear planer. The gear hobbing machine generates the teeth theoretically correct and all the teeth are exactly the same thickness and form.

The builders of the Farwell automatic gear hobbing machine claim that it will cut accurately and economically a large percent of the gears used in manufacturing and its cost is only a fraction of that of other machines of the same capacity. By equipping it with a full set of change gears and a full set of hobs it is complete for all sizes and pitches of gears up to its capacity of 12 ins. diameter and 5 ins. face. This capacity will cover nearly all of the requirements for automobile transmission gears, lathe, boring mill, milling machine and other machine tool change gears, drill press and other back gears.

It requires one hob for each pitch desired. One hob of the desired pitch will cut gears with any number of teeth up to the full swing of the machine table (12 inches). The same hob will also cut worm gear wheels —only one hob for each pitch desired.

The spindle is driven by a 4-in. belt on a 15-in. diameter pulley from a swinging cone pulley shaft and the drive belt is kept taut in all positions of the spindle head by a distance rod provided with turn buckle for adjusting. Three hob speeds are obtained by the three step cone pulleys for 2½-in. belt on the swinging shaft and countershaft.

The countershaft is provided regularly with one 4x 10-in. friction clutch pulley. Two pulleys may be provided where more spindle speeds are desirable, but as the hobs do not vary greatly in diameter three spindle speeds are deemed sufficient to take care of the requirements.

The spindle head is swivelled upon the saddle so that the hob may be set at the proper angle for cutting spur gears with different pitches or for cutting worm gears. This saddle is gibbed to the side on the column for providing vertical feed.

The hobs for cutting spur gears are regularly right hand, single thread, 3-in. diameter, 3 ins. long, with 1¼-in. arbor hole and ¼-in. keyway. Other sizes, of course may be used. The hob may be moved lengthwise so the entire length of hob can be used before requiring sharpening.

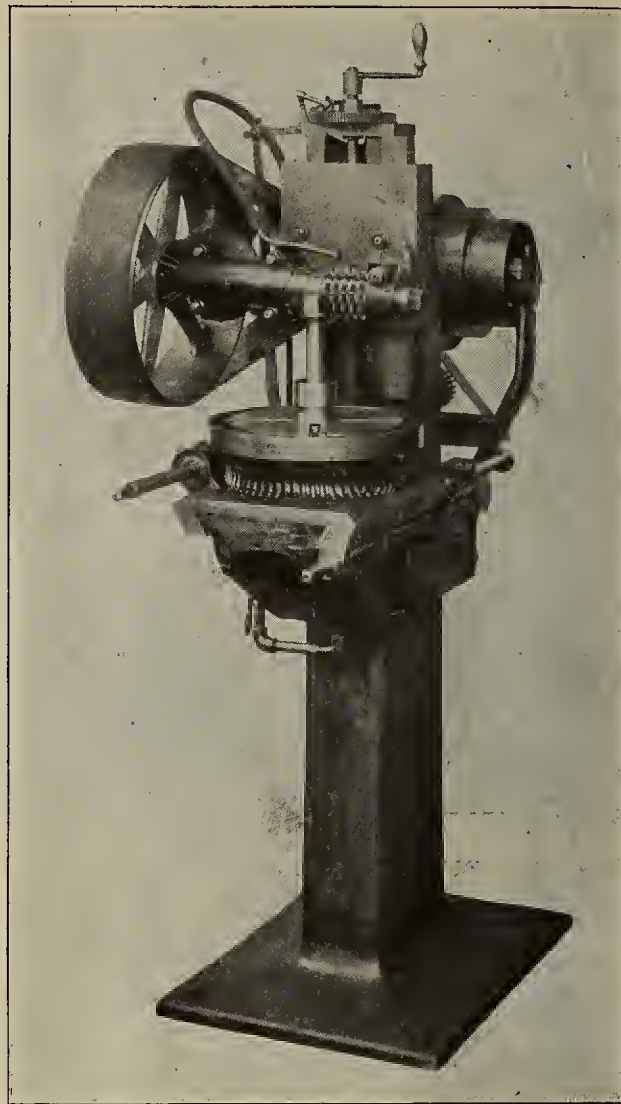
The table revolves upon a wide angular surface that gives the table great rigidity. A small plunger pump forces a stream of lubricant upon the cutter and work when desired. The knee that supports the table saddle is hollow and forms a tank or reservoir for the lubricant. Holes through the table hub conduct the lubricant back to this reservoir.

The table is revolved at the proper speed (varying according to number of teeth in gears to be cut) by means of one pair of bevel gears at the spindle head, one worm gear at the table and one pair of spur gears connected to bevel gear by universal jointed rod.

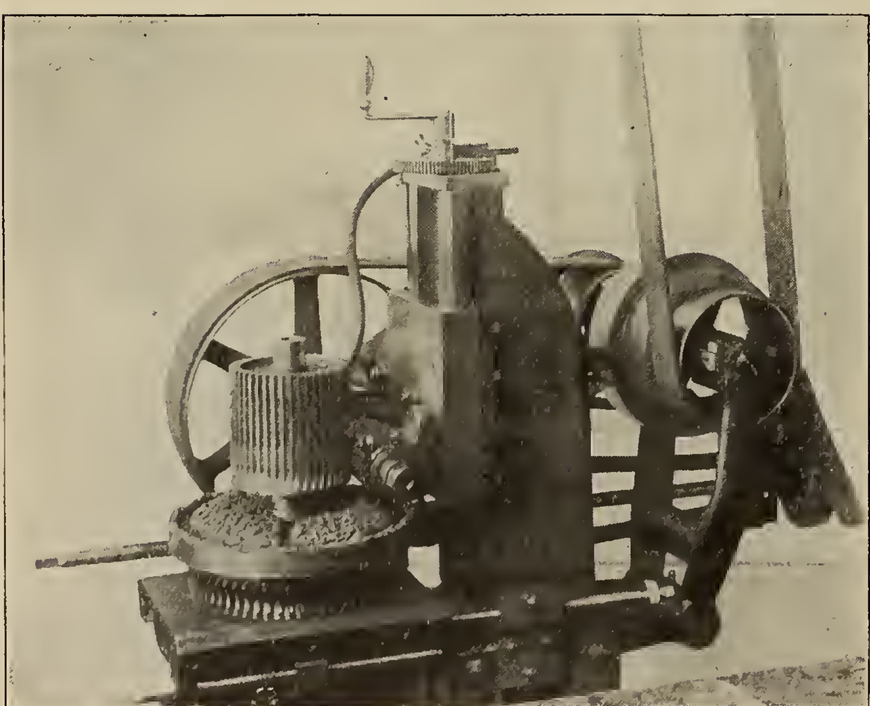
There being a small number of joints and all gears and shafts being large, insures a very steady positive drive of the table in unison with the cutter, which is very essential for accurate work. Usually one only of the spur gears is changed when the number of teeth to be cut is changed.

The vertical feed is by means of a pawl and ratchet operated through a reducing gear by an eccentric on the worm shaft. The feed may be changed without stopping the machine by shifting the button on the bell crank at the top of the machine. A trip automatically stops this feed when the hob has finished the gear.

No attention is required by the operator other than putting on blanks and taking off finished gears. One operator may run several machines or attend this gear cutter while operating other tools.



FARWELL AUTOMATIC GEAR HOBBING MACHINE.



FARWELL AUTOMATIC GEAR HOBBING MACHINE.

A rigid stop is provided, against which the table saddle may be run, to give the proper depth of the teeth. Instead of setting this stop by micrometer graduations which require much care in setting, a hardened steel gauge is provided which is of a thickness equal to the depth of the teeth of the pitch desired. To set the stop, the table is advanced until the blank contacts the hob. The stop is then screwed up against the gauge block. When the gauge block is removed and the table is advanced to stop, the correct depth is obtained. After the stop is set for a given diameter any number of gears of same size are cut the proper depth by simply moving table to this rigid stop. A careless operator cannot spoil work, as is often done when depth is set by micrometer gauge.

The spindle is 1¾ ins. in diameter and has a bearing 6¾ ins. in length. Provision is made for taking up wear and end play. The spindle is driven by a 15-in. pulley for 4-in. belt. The arbor has an outward bearing 1¾ ins. long and 1⅝ ins. in diameter. These supports for the cutter hob are very rigid and overhang only enough to swing a 3-in. hob.

The saddle bearing is 8½ ins. long upon the housing and is very heavily gibbed thereon. The swivel head is 8½ ins. in diameter and is secured to the saddle by three T-head bolts. The head is counterbalanced by weights in the column.

The table is supported and revolves on a cone surface 9½ ins. in diameter at outer edge and is 2½ ins. wide. In addition to this there is a center hub bearing 3½ ins. in diameter extending through the saddle with adjusting ring nut below. The table saddle is 12½ ins. long and is heavily gibbed to the knee which is 8 ins. wide. The feed screws for the head and for the table are both ⅞ in. in diameter with square thread. The stop screw is ¾ in. in diameter and has hardened steel contact points in screw end and in saddle. The countershaft furnished has 10-in. pressed steel hangers. 1 7-16 ins. shaft, 4x10-in. clutch pulley and three step cone for 2½-in. belt. The countershaft should run 130 r. p. m.

Personal Mention

J. J. Waters has been appointed superintendent of machinery of the Mexican Central, with headquarters at Aguascalientes, Aguas., Mex., succeeding Ben. Johnson, resigned.

J. E. Libby has been appointed master car builder of the Swift Refrigerator Transportation Company, succeeding O. M. Stimson, resigned.

H. F. Grewe has been appointed general foreman of the mechanical department of the Wabash Pittsburg Terminal in charge of locomotive work, with headquarters at Rook, Pa. G. H. Davis, master mechanic of the Clarendon & Pittsford, has been appointed general foreman of the car department, of the Wabash Pittsburg Terminal, with headquarters at Rook.

Mr. W. T. Fitzgerald, formerly master mechanic of the Wisconsin & Michigan Ry., at Peshtigo, Mich., has been appointed superintendent of motive power of the Idaho & Washington Northern R. R., succeeding Mr. W. J. Spearman, resigned.

Mr. Frank Maher, of the motive power department of the Toledo, St. Louis & Western, at Delphos, O., has been appointed master mechanic of the Chicago & Alton at Kansas City, Mo.

Mr. Dennis S. Dockstader, formerly for many years general foreman of the car department of the Erie R. R., died at Jamestown, N. Y., on July 13. Mr. Dockstader retired from railroad service 12 years ago.

Mr. Charles E. Fuller, assistant superintendent of motive power of the Union Pacific R. R., has been appointed superintendent of motive power and machinery, with headquarters at Omaha, Neb., effective July 20. Mr. Fuller succeeds Mr. W. R. McKeen who has resigned to assume the management for Harriman interests of the motor car shops which have been established at Omaha.

Mr. A. C. Miller, acting master mechanic of the Texas Midland R. R., has been appointed master mechanic, in charge of all motive power and equipment.

Mr. John Burns, the oldest engineman in point of service on the Chicago & Northwestern Ry., died in Chicago July 3. Mr. Burns was in active service on the road for 41 years, retiring on a pension in 1904. His career was associated with railroad engineering from the days when he ran the "Pioneer" engine, now held as a relic in the Field museum at Chicago, until, at his retirement, he drove the heaviest passenger locomotives on the road. The first test of the air brake in practical railroading was made on a locomotive which he ran to Geneva in April, 1870, under the personal supervision of Mr. George Westinghouse.

Mr. John L. Shick has been appointed storekeeper of the New York, Susquehanna & Western R. R. with headquarters at Stroudsburg, Pa., succeeding Mr. F. C. Pearce, resigned.

Mr. G. W. Hedge has been appointed assistant master mechanic of the Canadian Northern Ry., at Winnipeg, Man., to succeed Mr. G. S. McKennon.

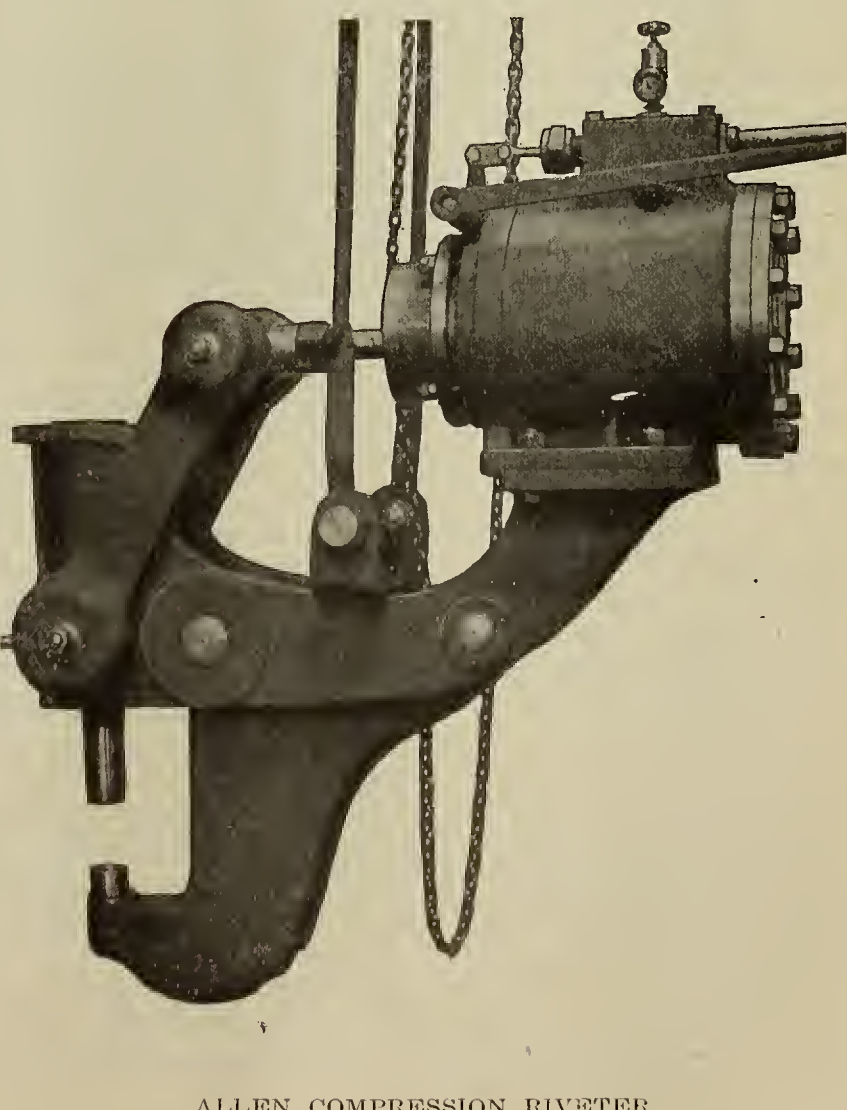
Allen Compression Riveter

The name "Allen" is synonymous with "Standard" the world over where riveting machines are known or used. John F. Allen, of New York City, was the pioneer in the manufacture of power riveters and the first machine of this kind was built by him over thirty years ago, and met with great success.

The Allen tools have from that time kept pace steadily with the varying demands of their ever widening field of usefulness, improvement following improvecent, and the quality constantly set at a higher mark, all making for continual progress in the development of the perfect power riveter.

The design and operation of various types of riveters built by John F. Allen today at his large works, 370-372 Gerard avenue, New York, is generally well known, and it is the quality of these tools for boiler, tank and structural iron working purposes that is now of especial interest.

Often machines of different makes and of apparently equal merit as far as performance is concerned, will be found to differ widely in durability, workmanship and air consumption, thus



ALLEN COMPRESSION RIVETER.

making the use of one well-nigh prohibitive in comparison with another.

The builder, John F. Allen, has recently been making some experiments with the Allen riveters in the line of pressure, the improvements resulting in same, marking a new status in riveting machines.

The items of pressure, stroke and air are of special interest in connection with the Allen tools, as the following data shows:

	8-in. Cyl.	10-in. Cyl.	12-in. Cyl.
Pressure at 90 lbs.	30 tons	45 tons	65 tons
Pressure at 100 lbs.	35 tons	50 tons	75 tons
Stroke	3½ ins.	3½ ins.	4 ins.
Air consumption per rivet, at 80 lbs.	2 cu. ft.	4 cu. ft.	6 cu. ft.

Mr. Allen says: "We are prepared to prove it in a contest with any other tool or before a jury of experts, that on a given size of cylinder our tool will far excel in pressure. In recommending our tool we always aim to give surplus pressure rather than just enough. For example: where a ⅞-in. rivet is the maximum to be driven, statistics show that 45 tons pressure is required to do it. In offering for such work our 10-in. cylinder riveter with 50 tons pressure, a surplus pressure exists that surpasses a uniform pressure at the end of the stroke."

Trade Notes

The C. W. Hunt Company, 45 Broadway, New York, issue a pamphlet describing and illustrating coal handling machinery, conveyors, industrial railways and "Stevedore" rope. The pamphlet is termed an introduction to the general line of labor-saving machinery manufactured by the company.

Mr. Jas. B. Norris has been appointed general foreman of the iron department of the Southern Atlantic Car and Manufacturing Company, Waycross, Ga. He was formerly foreman of machine shop.

At a meeting of the board of directors of the Dearborn Drug & Chemical Works, held at the general offices of the company on July 8th, Mr. W. A. Converse, assistant secretary and chemical director of the company, was elected to the position of secretary and chemical director; and Mr. Ralph R. Browning, assistant treasurer, was elected to the office of treasurer of the company. Both Mr. Converse and Mr. Browning have been connected with the Dearborn company for many years.

The Gisholt Machine Company, Madison, Wis., recently issued a booklet in which Gisholt methods as applied to railroad shops are described and illustrated. The booklet also includes illustrations of various Gisholt tools.

The Whiting Foundry Equipment Company, Harvey, Ill., issue a bulletin in which numerous installations of cranes and other equipment furnished railroads are illustrated. Electric traveling cranes, gantry cranes, transfer cranes, transfer tables, pillar cranes, jib and bracket cranes are shown in operation in various railroad shops and yards. The illustrations indicate the designs best adapted for specific purposes.

E. H. Smith, formerly master mechanic of the Boston & Albany Railroad, has accepted the position of railroad representative for the American Steam Gauge & Valve Manufacturing Company. He will make his headquarters at the company's general offices, 220 Camden street, Boston.

The July issue of "Graphite," published by the Joseph Dixon Crucible Company, Jersey City, N. J., is a special number, containing a number of interesting articles.

The Independent Pneumatic Tool Company, First National Bank building, Chicago, received during the first two weeks of July more orders for their Thor pneumatic tools and appliances than in any similar period since last October. They also received a large number of inquiries from railroads, foundries, boiler shops and bridge works. This indication of an improvement in the market has caused them to increase the force of workmen at their plant in Aurora, Ill.

The Electric Storage Battery Company, Philadelphia, Pa., issued a new catalog entitled "Car Lighting Cells," which describes the several types of "Chloride Accumulators" and Tudor Accummulators." Complete data on this subject is also included.

The Metal Hardening Solution Company, Rochester, N. Y., manufacture the "Kalux'" steel hardening solution, a liquid product. By using "Kalux" it is claimed that the life of carbon steel tools can be prolonged to give from one and a half to twice the service as the same tools could give by the ordinary method of hardening.

The toolmaker of one firm wrote the company in regard to the solutions as follows: One of the most important merits noticed, is that while it hardens the steel to almost Diamond hardness, it also toughens it. This, combined with the fact that the tool can be hardened at a lower temperature than is customary, thus minimizing the danger of de-carbonizing the steel, appeals to me as being the most thoroughly practical and up-to-date method of hardening and tempering carbon tools that I know of. One of the tests made was on threading tools which I hardened in your solution according to directions, and found they would do more work at higher speed than with anything I have ever used: One tool made of ¼-in. stub wire cut twelve taps with one sharpening. The taps were made of Jessop tool steel and with heavy threads. This, with many other special tests and the knowledge of the price of "Kalux", convinced me that it is the cleanest, most economical and efficient method of hardening and tempering carbon steel tools that I have come in contact with, in all my experience in making and handling steel tools.

Technical Publications

AIR BRAKE CATECHISM, by Robert H. Blackall. Published by The Norman W. Henley Publishing Company, New York. Cloth binding, 380 pages, 5x7 ins., illustrated. Price, $2.00.

The 1908 edition of the Up-to-Date Air Brake Catechism has just been issued. This twenty-third edition has been revised and enlarged. It contains over 2,000 questions with their answers, covering the subject of air brakes in detail. The No. 5 and No. 6 ET locomotive brake equipments, the K (quick service) triple valve for freight service and the cross-compound pump, manufactured by The Westinghouse Air Brake Company, are treated in detail in the last four chapters of the book.

LOCOMOTIVE ENGINE RUNNING AND MANAGEMENT, by Angus Sinclair. Published by John Wiley & Sons, New York. Cloth binding, 438 pages, 5x7 ins., illustrated. Price, $2.00.

The twenty-second edition of this valuable book for the locomotive engineer and fireman has just been issued. It instructs engineers in the handling of the modern locomotive and its parts, in the principles of locomotive engineering and in the best methods of overcoming and preventing the many trying problems on the road.

The last chapter, covering 100 pages, is devoted to questions and answers used in the examination of engineers for promotion. It is an excellent book for the young and also the experienced engineer.

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SEPTEMBER, 1908

Motor Capacity for Shop Tools

DATA on motor capacities for railroad shop tools are of especial value because of the variation in power requirements of machine tools in manufacturing plants and railroad repair shops. The chief difficulty is the approximate determination of the normal power requirements of a machine for a given class of work. Motors are usually designed to carry temporarily a load from 25 to 50 per cent in excess of normal rated capacity and therefore some leeway is had for special cases where unusual cuts are necessitated.

An appendix to an article by S. R. Pomeroy which appeared in the proceedings of the Central Railway Club contains a number of curves giving the capacity of motor requisite for various machine tools under definite conditions. These curves cover lathes, planers, shapers, drill presses and other machines used in the railroad repair shop.

Such data, as are given in the above-mentioned curves, are often of service to the shop man. It is good policy to have the material at hand for the occasion.

Coal Briquets

IN recent years coal briquets have become an economic consideration and therefore investigation has been conducted with an object of determining more definitely the commercial possibilities of the fuel in the form of briquets. The difference in cost between lump and slack coal makes possible the competitive marketing of coal briquets.

One important question which must be considered is the total cost of manufacture of the briquet, including the cost of the binder particularly. In Bulletin 343 of the United States Geological Survey entitled "Binders for Coal Briquets," the cost and efficiency of various organic and inorganic binders are discussed by James E. Mills, the basis for his statements being the tests made at the fuel-testing plant at St. Louis, Mo.

The investigation referred to above indicated the commercial possibilities of certain binders, at the same time showing the necessity of further consideration along broader lines. The cost and supply of the binders are the more vital points upon which the availability of the briquet will depend.

Engine Supplies at Terminals

THE equipment of tools and supplies for locomotive crews has been discussed in the May and June issues of the RAILWAY MASTER MECHANIC with reference to economical methods of maintenance. It is readily appreciated that tools and supplies are frequently lost even when the engine crew is particularly diligent, unless assistance is rendered the engine crew in safeguarding its property.

In the May issue, opinions of a number of road foremen of engines are given. Various methods of handling the equipment, reviews of past experiences and suggestions in the way of betterment are included in the comments. In the June issue, there were published several papers presented at the Railway Storekeepers' Convention on the subject of locomotive and train crews' tools and supplies. The latter papers also described systematic methods of handling the equipment.

Elsewhere in this issue there are two communications on the subject of engine supplies. The individual outfit is favored and in one case a decided saving was shown at the end of a year's service. It is not so much the responsibility of the engine crew but the personal interest instilled that tends to keep the complete outfit intact.

Railroad Extension

AN abstract of statistics from the Interstate Commerce Commission report on the railways for the year ending June, 1907, shows a large increase in mileage, equipment and employes. Both gross earnings and operating expenses increased heavily.

The total single track mileage on June 30, 1907, was about 230,000, or about 5,600 miles more than the previous year. Particularly in the southern and western states railway extension was in progress. The mileage, including all tracks, was about 328,000, an increase of about 10,900 miles.

There were in service on June 30, 1907, about 55,400 locomotives, the increase being 3,716. The total number of cars was about 2,126,600, the increase being 167,682. The average number of locomotives per 1,000 miles of line was 243 and the average number of cars per 1,000 miles was 9,350.

On June 30, 1907, there were on the pay rolls about 735 employes per 100 miles of line. The increase over the previous year was about 51 employes per 100 miles of line. The total number of employes was about 1,672,000, and the total wages paid about $1,072,386,-000.

The number of passengers carried during the year ending June, 1907, was about 874,000,000, an increase of about 76,000,000. The passenger mileage was about 27,719,000,000. The tons of freight carried was about 1,796,000,000, the increase being about 165,000,000. The ton-mileage was about 236,600,000,000. The average revenue per passenger per mile was 2.014 cents and per ton per mile was 0.759 cent.

The above figures indicate the prosperous condition of the country as well as the railroads in the year previous to the financial stringency. There is no doubt that in a comparatively short time the business of the railroads will approach the mark of the year ending June, 1907, and that railroad construction will be as extensive, if not more so.

On Co-operation

THE address of B. W. Frauenthal, secretary of the St. Louis Railway Club, before the Society of Railway Club Secretaries of America, presents clearly the principles which should guide railway officials in the conduct of their work. The subject of the paper was "Compensation and Its Law." In one place co-operation between railway men is mentioned as follows:

"Much has been said on the need, the advantages and the beneficial results of co-operation in railroad work. Co-operation is only a change in form but not in substance of compensation. Does the departmental head, while keenly seeking to maintain the highest possible state of efficiency with the expenditure of only such an amount as will in justice make this possible, bear in mind that other departments are being conducted on similar lines and that mutual advantages can be reaped by co-operating under certain conditions, and set the examples for his assistants and employes, the entire staff follows in his wake and the work of the department, as well as the result for the company, shows that compensation is the co-ordinate of co-operation. The official willing to assist his co-worker, who guides others over treacherous paths that are known to him through the wisdom of experience, reaps a rich reward by the affection in which he is held by rank and file."

That the example, set by the official in seeking harmony and co-operation between men and departments, is essential to successful results, is not doubted. That the official must set the example should always be remembered by the departmental head and should form the basis of his policies.

The Machine Tool Industry

THE manufacturers of machine tools are devoting more time just now to the development of their standard machines. It is only natural that they should take advantage of a quiet market in this way because, when the shops are worked to the utmost to handle orders in busy times, it is not always policy to attempt the introduction of new designs.

With the advent of high speed steel machine tools were of necessity redesigned for greater power and strength. The old designs could not stand the wear and tear which were caused when machines were run up to the limit of the new cutting steels.

The elimination of cone pulleys and shifting belts is another important step. Variable speed motors are used to some extent, but the constant speed motor is preferred with gears to change from driving to spindle speed.

Improvements are now being made in details of construction so as to give durability to the machine. The strength of parts and the wearing qualities of the materials used in the machines are being studied carefully.

In this period when the construction of a new design of machine tool does not hamper or delay the operation of the plant, manufacturers can afford to make changes in their standard lines of machine tools. Buyers were unable to secure many stock machines in 1907, but today most manufacturers have a good stock of their standard machines, which condition of affairs was made possible by the decrease in sales and cancellation of orders. It is the intention of most builders to maintain a good stock and to supply the trade as far as possible with stock machines.

When greater time was required to supply a machine with improved features, one which was not a standard tool, an objection was usually entered by the buyer. Having used the standard machine with satisfactory results, the buyer preferred a duplicate if time could be saved in filling the order.

The quiet market of the past months has at least placed the machine tool builders in better shape to handle the heavy business which is prophesied for the next four years or more.

Our Coal Supply

AN address delivered before the annual convention of Smoke Inspectors by R. T. Randall, engineer in charge of tests, Fuel Testing Plant, United States Geological Survey, treated of the solution of the smoke problem and the relation of the government to its solution. The present rate of coal consumption and its relation to the decreasing coal supply are the serious problems to which attention is called in the address. It is noted that less than 5 per cent of the total heating value of coal is converted into useful work in the ordinary manufacturing plant, only about 10 per cent in the best power plants and only from 3 to 5 per cent in locomotives. The utilization of the by-products resulting from the manufacture of coke and also the gas from the blast furnaces of the country is becoming more general.

The object of the government investigations in progress is to reduce the waste in the fuel supply. A determination is being made of the amount and quality of the nation's fuels and best uses for the different fuels. A fuel may be of little value for steam boiler work and yet give good results when used in the gas producer. An analysis and test of coals from the various fields is being made to serve as a basis of information and a means of utilizing low-grade fuels is being studied. The abatement of smoke with all kinds of equipment is also being investigated.

The data secured thus far point to a more economic use of fuels and a considerable saving in the fuel supply. The scientific and thorough government investigations have already made possible the more efficient use of many fuels and found means for the successful adaptation of certain low-grade fuels heretofore almost valueless. While many bulletins have already been issued by the U. S. Geological Survey there are others now in preparation which deal more specifically with certain phases of fuel consumption.

Pacific Type Locomotives

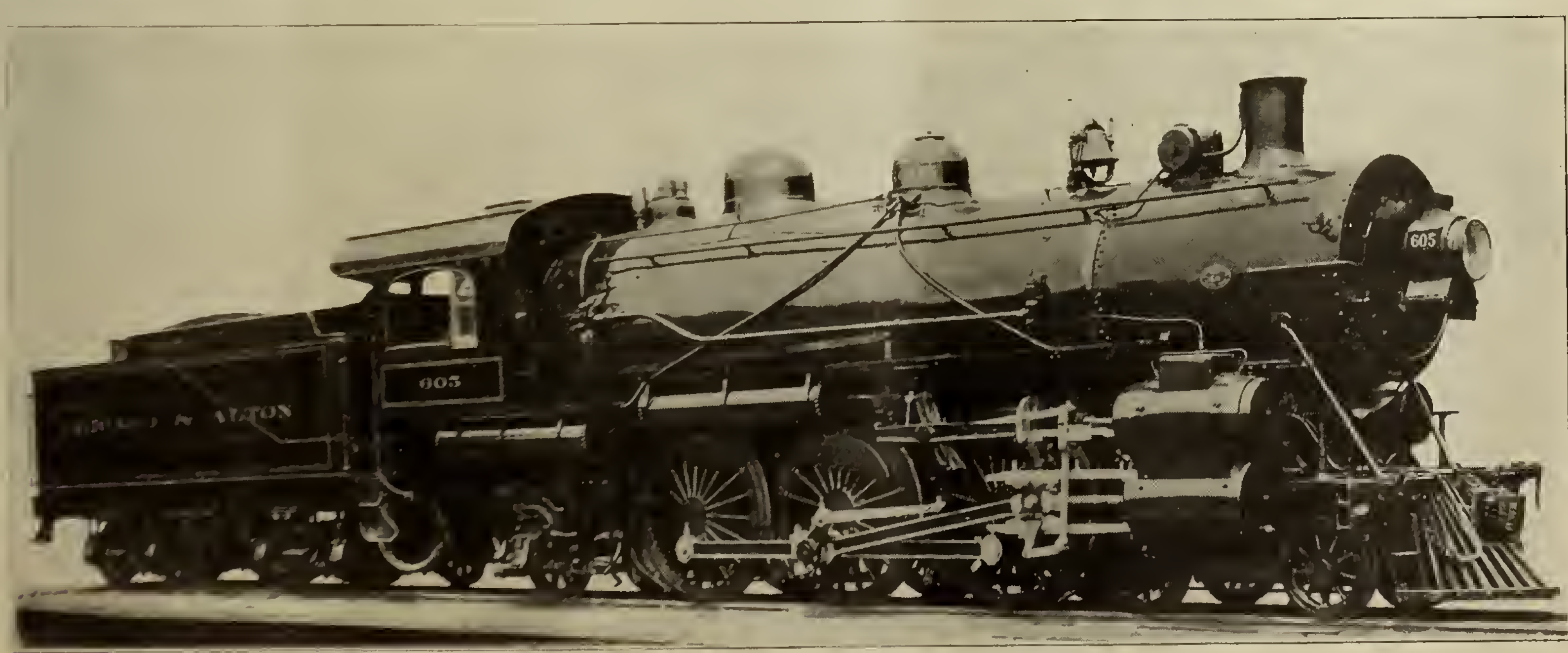
THE first standard gauge Pacific type locomotives built by the Baldwin Locomotive Works were completed early in 1903 for the Chicago & Alton Railroad. These engines were two in number, having driving wheels respectively 73 and 80 inches in diameter. Otherwise they were similar throughout, with cylinders 22x28 ins. In the following year three additional Pacific type locomotives were supplied to this road by the same builders. These engines, although built (with the exception of the tenders) to associated lines standards, were in many respects similar to those delivered in 1903. They had driving wheels 77 ins. in diameter and the same sized cylinders as the previous locomotives.

The Baldwin Locomotive Works have recently completed five additional Pacific type locomotives for the Chicago & Alton R. R., the design being illustrated by the accompanying photograph. The principal differences between these locomotives and those above referred to, lie in the use, on the new engines, of Walschaerts valve gears and wagon top boilers with narrow fire-boxes. This form of firebox was applied to a number of Atlantic type locomotives built for the same road by the Baldwin Locomotive Works in 1906.

The new locomotives have cylinders 23 ins. in diameter by 28 ins. stroke. With 73-in. driving wheels and a steam pressure of 200 lbs., the tractive force exerted is thus 34,500 lbs.

The cylinders are spaced 90 ins. between centers, while the piston valves, which are 16 ins. in diameter, are 98 ins. between centers. The maximum width over the assembled cylinder castings is 10 ft. 2 ins. The saddle is comparatively low, and the castings are securely fastened together by double rows of bolts in the vertical flanges and two heavy tie bolts 2¼ ins. in diameter, enlarged to 2½ ins. at the threaded ends. The piston valves have cast iron bodies and L-shaped packing rings, and the drifting valves are of Pennsylvania R. R. style with flat plates over the relief ports. Vacuum relief valves are placed in the live steam passages and a safety valve, set for 225 lbs. pressure, is screwed into each cylinder head. The cylinder heads are of cast steel and the steam chest heads of cast iron.

The frames, where they are secured to the cylinders, are in the form of single rails, 5 ins. wide by 10 ins. deep, and each cylinder casting is secured to its corresponding frame by nine horizontal bolts 1½ ins. in diam-



PACIFIC TYPE LOCOMOTIVE FOR THE CHICAGO & ALTON.

eter, and four vertical studs 1¼ ins. in diameter. The cylinders are keyed at the front only. The frames are of forged iron, and are continuous from the front bumper to a point back of the rear driving pedestals, where they are spliced to the rear sections. The main frames are 5 ins. wide, while the rear sections are in the form of slabs, 2½ ins. wide. The splice between the main and rear frames is secured by 20 bolts, 1⅛ ins. in diameter, and by two keys which are driven, with their tapered faces in contact, into a single key way having parallel sides. The pedestal binders are of cast steel and are lugged and bolted to the pedestals.

Substantial transverse frame bracing is provided in these locomotives. In addition to a cast steel foot plate at each end, cross ties of the same material are placed back of the cylinders; between the first and second pairs of driving wheels; above the main driving pedestals, and in front of the firebox.

The valve gear details include built-up links, having side plates and end filling blocks of cast steel. Each link is supported by two longitudinal cast steel bearers. These are bolted in front to the guide yoke and at the back to a cross-tie, which also serves to support the reverse shaft bearings. The valve stems are driven through crossheads which are mounted on suitable guides, thus forming a strong and rigid connection for this important part of the gear. The valves are set with a maximum travel of 6 ins. and a constant lead of ¼ in. The steam lap is 1 in. and the exhaust clearance 1-16 in.

The leading truck is of the usual swing bolster type with heart shaped links, and the rear truck is of the Rushton radial type with outside journals. The rear truck supplemental frames are bolted to steel castings which also serve as furnace bearer supports. In this way the firebox is carried, on each side, by two sliding bearings of ample length. The rear truck is equalized with the driving wheels in the usual manner. All the driving springs are placed over the boxes, and are mounted on cast steel saddles.

The engine and tender truck wheels have cast steel spoke centers and were made by the Standard Steel Works Company. The driving wheel centers and boxes are also of cast steel, and the driving tires are secured by retaining rings. Grease lubrication is provided on all driving axle and crank pin journals. The guides are of the two-bar type, of forged steel, and the crossheads are of cast steel.

As has been mentioned, the boiler is of the wagon top type, with a narrow firebox. The center line is placed 9 ft. 5 ins. above the rail, and the diameter is 72 ins. at the front end and 83 ins. at the dome ring. The longitudinal seams in the barrel have diamond welt strips inside and are located on the top center line. On the dome ring the seam is welded throughout its length on either side of the dome opening.

The front end is of the self-cleaning type, without spark hopper. It is equipped with a high single exhaust nozzle and double petticoat pipes. An adjustable plate is located in front of the nozzle and ample netting area is provided.

The firebox has a sloping back head and roof sheet, and is radially stayed. Four rows of sling stays support the crown in front, while a total of 573 flexible stays are disposed in the sides, back and throat. The crown and sides of both the inside and outside fireboxes are each made in one piece. The fire door opening is formed by flanging both sheets outward and uniting them with a sleeve. The mud ring is of cast steel, double riveted and reinforced in thickness at the corners. As almost the entire firebox is placed back of the driving wheels, with the mud ring above the trailers, large radii can be used in the curvature of the side water legs, thus avoiding abrupt changes in direction.

The entire grate is located in one horizontal plane and is rocked in three sections. A drop plate is provided at the back. The ash pan is of the hopper type with cast iron bottom pans.

This boiler is liberally supplied with means for washing out. Five blow-off cocks are provided—two in the waist, one in each side water leg, and one in the front water leg. The safety valves are mounted on an auxiliary dome, and the whistle is screwed into the roof sheet immediately in front of the cab. The injectors are located in front of the cab, and they feed through checks placed right and left, 18 ins. back of the front tube sheet.

The tender is constructed in accordance with Chicago & Alton standards. The frame is built of 13-in. steel channels, and the trucks are of the arch bar type with cast steel bolsters.

The table of dimensions shows that these are high powered machines for passenger service, and as the design has been worked out in the light of experience with locomotives built some time ago, the performance should be satisfactory.

The principal dimensions and specifications are as follows:

Type of engine	Pacific
Service	Passenger
Fuel	Soft coal
Tractive force	34,500 lbs.
Gauge	4 ft. 8½ ins.
Cylinder, diameter and stroke	23x28 ins.
Valve, kind	Balanced Piston
BOILER.	
Type	Wagon Top
Working pressure	200 lbs.
Diameter first ring	72 ins.
Material	Steel
Staying	Radial
FIRE BOX.	
Length	120⅛ ins.
Width	40¼ ins.
Depth, front	82½ ins.
Depth, back	78½ ins.
Thickness of sheets, sides	⅜ ins.
Thickness of sheets, back	⅜ ins.
Thickness of sheets, crown	⅜ ins.
Thickness of sheets, tube	½ ins.
Water space, front	4½ ins.
Water space, sides	4 ins.
Water space, back	4 ins.

TUBES.

Material	Iron
Wire gauge	No. 12
Number	357
Diameter	2 ins.
Length	20 ft.

HEATING SURFACE.

Fire box	206 sq. ft.
Tubes	3,721 sq. ft.
Total	3,927 sq. ft.
Grate area	33 sq. ft.

DRIVING WHEELS.

Diameter, over tires	73 ins.
Diameter, wheel centers	66 ins.
Journals, main, diameter and length	10½ ins. x 12 ins.
Journals, others, diameter and length	9 ins. x 12 ins.

ENGINE TRUCK WHEELS.

Diameter, front	33 ins.
Journals, front, diameter and length	6½ ins. x 12¼ ins.
Diameter, back	42 ins.
Journals, back, diameter and length	8 ins. x 14 ins.

WHEEL BASE.

Driving	13 ft. 9 ins.
Rigid	13 ft. 9 ins.
Total engine	32 ft. 8 ins.
Total engine and tender	65 ft. 8½ ins.

WEIGHT.

On driving wheels	146,500 lbs.
On front truck	47,600 lbs.
On back truck	49,100 lbs.
Total engine	243,200 lbs.
Total engine and tender	about 405,000 lbs.

TENDER.

Wheels, diameter	36 ins.
Journals, diameter and length	5½ ins. x 10 ins.
Water, capacity	8,250 gals.
Coal capacity	12½ tons

Kirk Yard, Gary, Indiana

C., L. S. & E. Ry.

THE Chicago, Lake Shore & Eastern Railway has terminal shops under construction at Gary, Ind. The new shops are located west of and adjoining the new plant of the Indiana Steel Company.

The layout of the terminal is shown in Fig. 1. The roundhouse is located at the east end and arranged so that an extension may easily be made. Adjoining the roundhouse is a 100x125-ft. machine shop which has a passage way between the roundhouse and shop that is continuous with the structure.

The material yards, woodworking shop and car repair shop are located to the north of the tracks leading to the roundhouse. All buildings are placed so as to limit to the smallest amount the switching of cars and engines and the transfer of materials. In this layout a transfer table is unnecessary.

ROUNDHOUSE.

There are twenty tracks radiating from the 70-ft. turntable, the center of turntable being about 150 ft. from the inner wall of roundhouse. The depth of roundhouse is 85 ft., the pit being 21 ft. from the outer wall and 10 ft. from the inner wall. The floor of the roundhouse is of brick and the pit floor is of concrete.

The roof of the roundhouse is supported by 10x14-in. beams on 10x10-in. columns. The joists are 3x14 ins. and are placed 4 ft. 1⅜ ins. on centers. The joists carry 2x6-in. M. & D. roof boards which are covered with asbestos roofing.

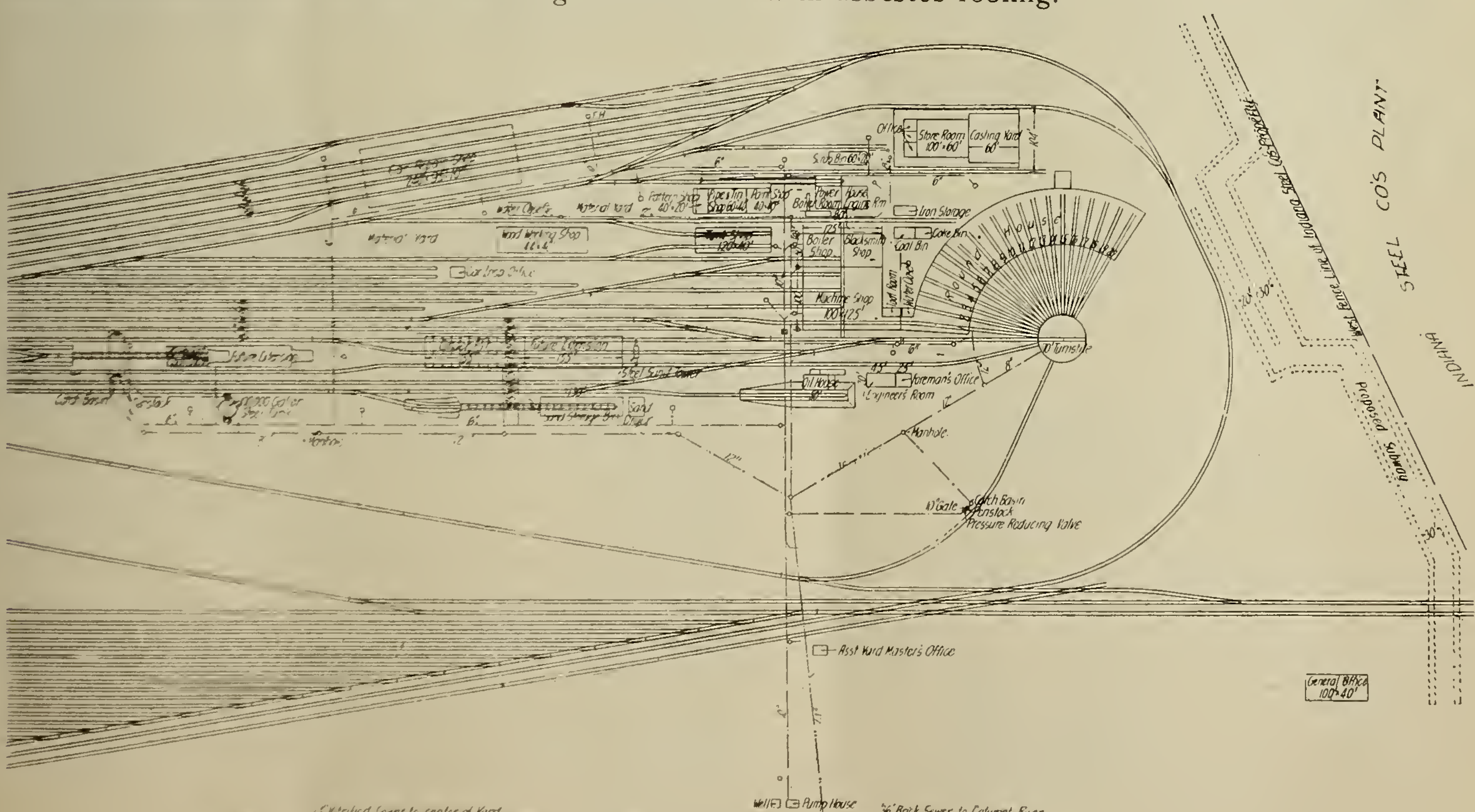


FIG. 1—GENERAL LAYOUT OF TERMINAL SHOPS AT GARY, IND.—C., L. S. & E. RY.

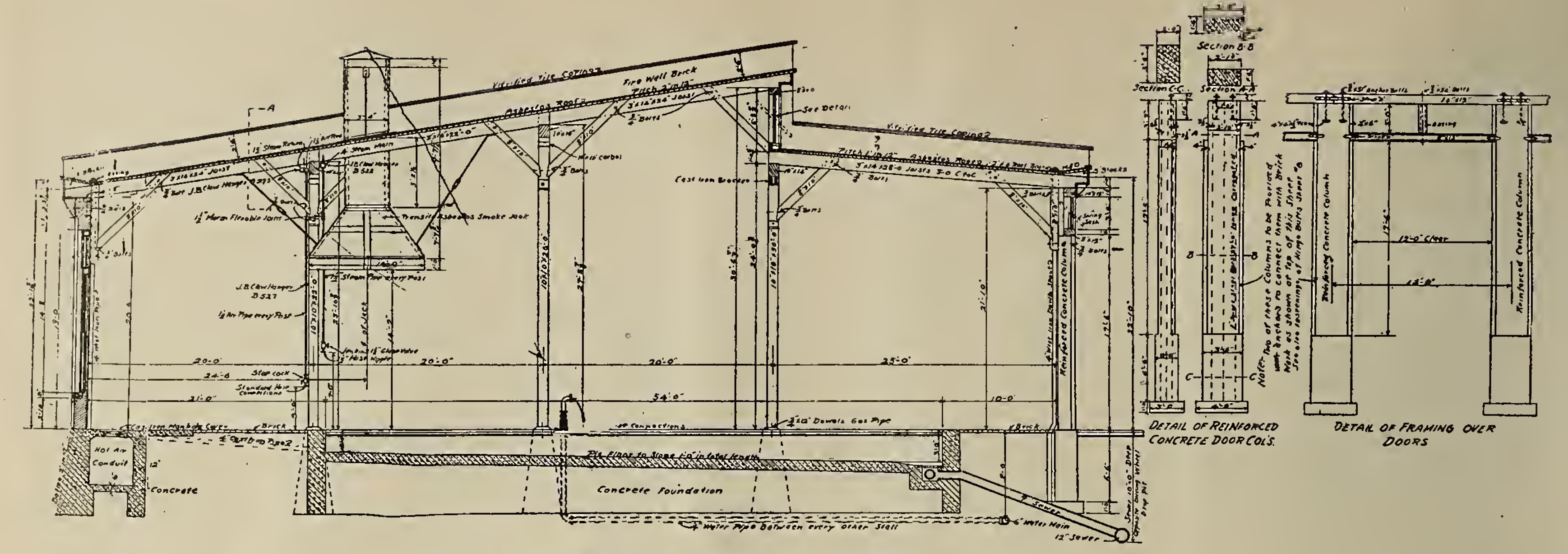


FIG. 2—SECTION OF ROUNDHOUSE—C., L. S. & E. RY.

The door columns are reinforced concrete. A detail drawing of the columns is shown in Fig. 2 which also gives a cross-section of the roundhouse.

There is a 1½-in. air pipe and a 1½-in. steam pipe at each post. A 4½-in. water pipe with a 2½-in. hose connection is placed between every other stall. The hot air conduit is shown at the outer end of the building.

SMOKE JACK.

The smoke jack, shown in Fig. 3, is made of Transite asbestos board, manufactured by the H. W. Johns-Manville Company. The distance from rail to jack is 14 ft. 2 ins. and the height of jack is 19 ft. 6 ins. The hood measures 2x14 ft. and the cross-section of the stack is 1 ft. 6 ins. by 3 ft. 4 ins. The jack is made of ⅜-in. Transite plate and is held by four ⅜-in. round rods to the joists.

MACHINE SHOP.

A floor plan of the machine shop is shown in Fig. 4. The building is 150x125 ft., but the north end is used for the boiler and blacksmith shops. There are four 40-ft. pits in the machine shop and one in the boiler shop. The track at the south end of the building extends through a passage way into the roundhouse.

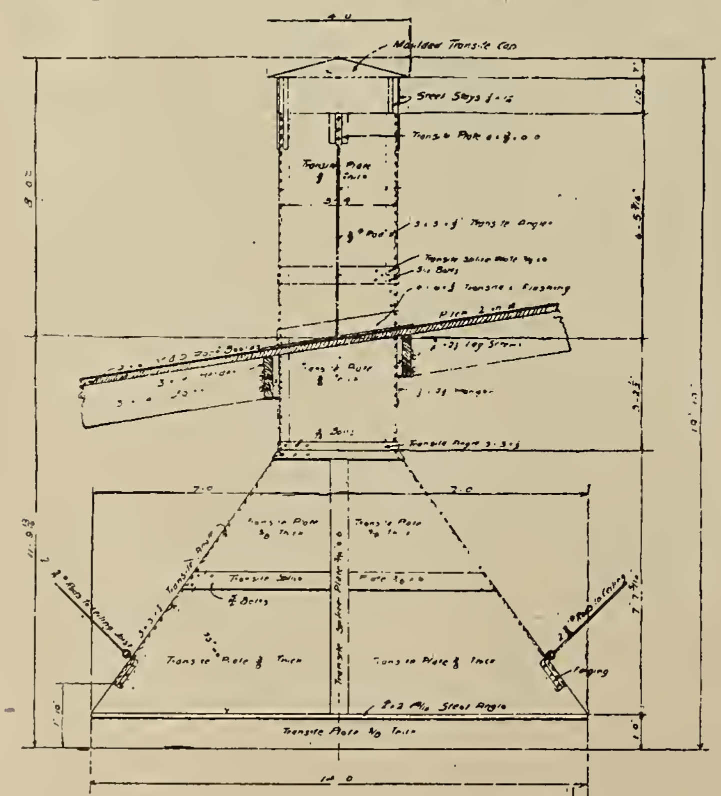


FIG. 3—SMOKE JACK—C., L. S. & E. RY.

The floor of the machine shop is made of 1⅛x3¼-in. face matched maple laid diagonally on 2-in. hemlock plank, dressed on one side and laid longitudinally or transversely. Sleepers, 3x4 ins., are placed 4 ft. apart. Below the 2-in. plank is 4 ins. of tar concrete (distilled coal tar and gravel). The floor in boiler and blacksmith shops is made of cinders well tamped.

SAND TOWER.

The sand tower, shown in Fig. 5, is located east of the cinder pit between the tracks leading to the turntable. The bin is 5 ft. wide, 20 ft. long and 7½ ft. high, and the bottom of bin is 23 ft. 8 ins. above the rails. The bin is supported on four steel columns bolted to concrete piers. The bracing consists of angle bars placed as shown in the drawing.

A detail drawing of the sand valve is shown to the right of the sand tower in Fig. 5. A spout is located on each side to supply locomotives on either side.

CINDER PIT WITH GANTRY CRANE.

The cinder pit with gantry crane is shown in Fig. 6. The pit is 156 ft. in length and provision is made for a future extension of 155 ft. Three tracks pass over the pit, two being used by locomotives and the center one being used for cinder cars. The crane, extending over the three tracks, is 55 ft. center to center of rails and is provided with a 54 cu. ft. automatic bucket to load cinders into the cars on the center track.

The cinder pit has a sand bottom which is 10 ft. below base of rails. The distance between centers of the outer tracks is 38 ft. The center piers, side and end walls are built of reinforced concrete.

OIL HOUSE.

The oil house, shown in Fig. 7, is 24 ft. wide and 50 ft. long. It is located south of the machine shop at the side of the tracks leading to the roundhouse turntable. On the south there is an elevated track for tank cars and the oil is to flow into the steel tanks in the basement of the oil house by gravity. There are two steel tanks, 7 ft. in diameter and 30 ft. long. Each of these tanks has three compartments. One tank holds car oil, signal oil and valve oil, and the other holds

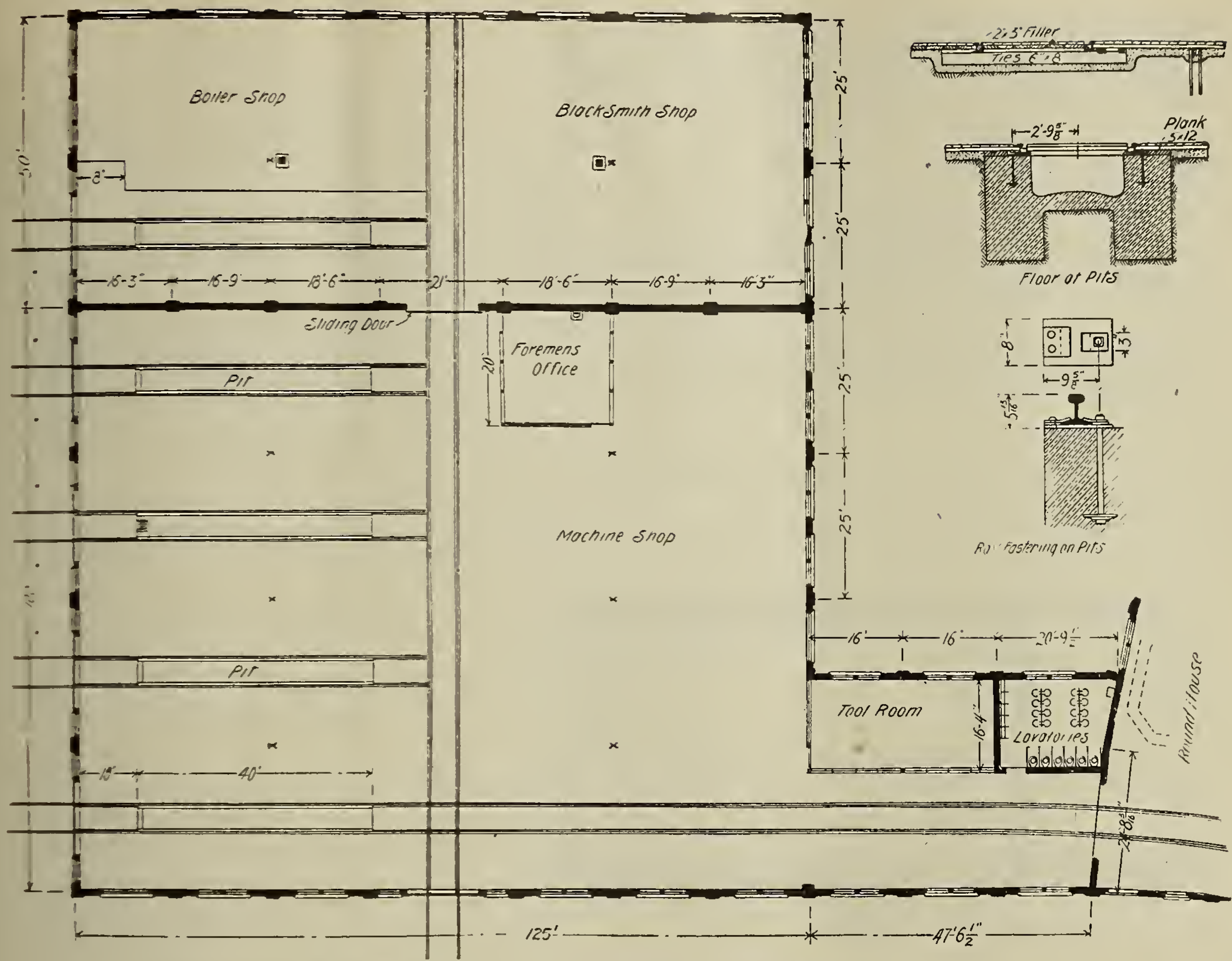


FIG. 4—PLAN OF MACHINE SHOP AND DETAIL OF PITS—C., L. S. & E. RY.

gine oil, kerosene and fuel oil. The relative sizes of e compartments are shown in the drawing.

The walls of the building are of brick. The interior lumns consist of steel I-beams upon which is carried 12-in., 40-lb. I beam. The floor is of concrete, reinrced with 8-in., 18-lb. I beams with ¾-in tie rods. A eel truss carries a reinforced cement roof upon which laid roofing tile.

Water Softener on Pennsylvania Lines West

EXPERIMENTS are now being made with a new 30,000 gallon per hour water softener, designed Mr. A. R. Holmen, Chief Draftsman of the Motive Power Department, and built by the Southwest System of the Pennsylvania Lines West of Pittsburg, at their shops in Indianapolis, Ind.

The softener consists of the following parts: One settling tank or clear well, one mixing drum, one solution tank with lime slaking tank above, one adjustable solution pump, one water motor and necessary piping.

To the water motor shaft is attached, by chains and sprockets, stirring apparatuses mounted in the mixing drum and solution tank, also by adjustable crank arm, the solution pump.

The operation of the softener is as follows: When the valve at the raw water inlet is opened, the water passes through the motor and sets the same in rotation. Through

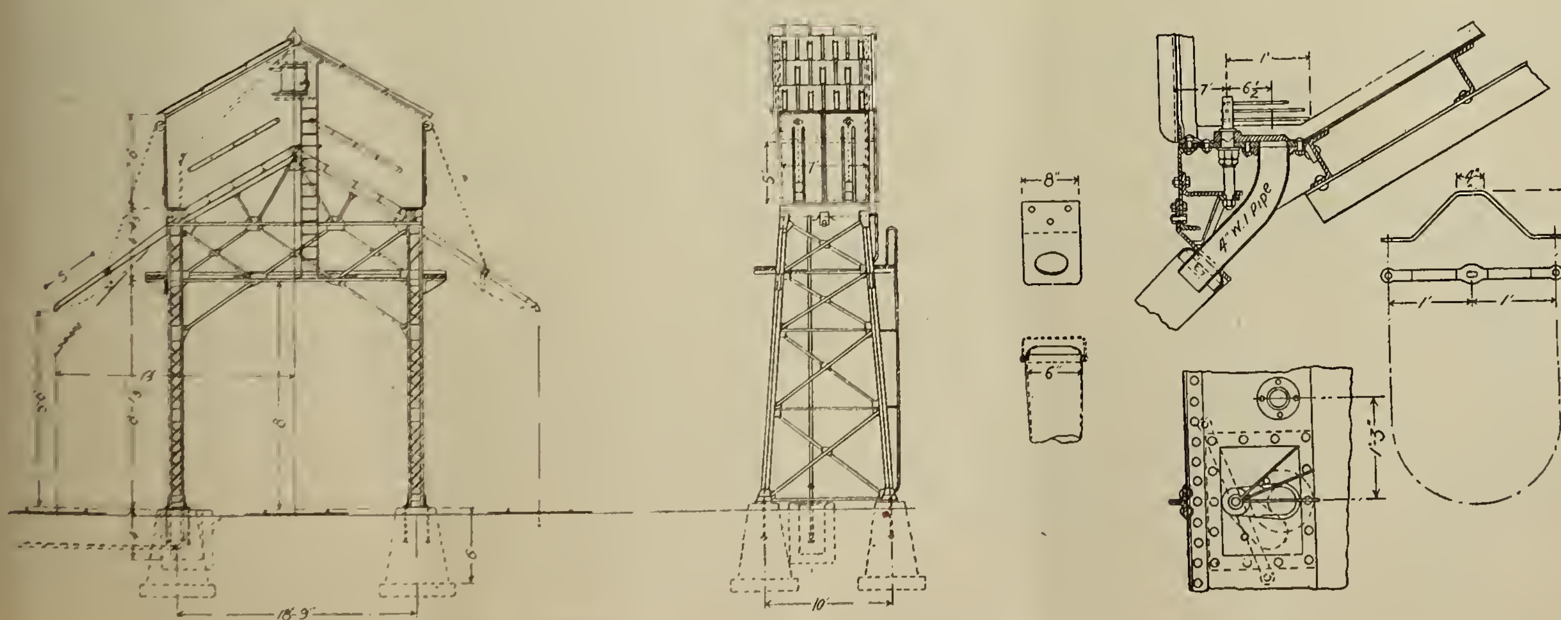


FIG. 5—SAND TOWER AND DETAILS OF SAND VALVE—C., L. S. & E. RY.

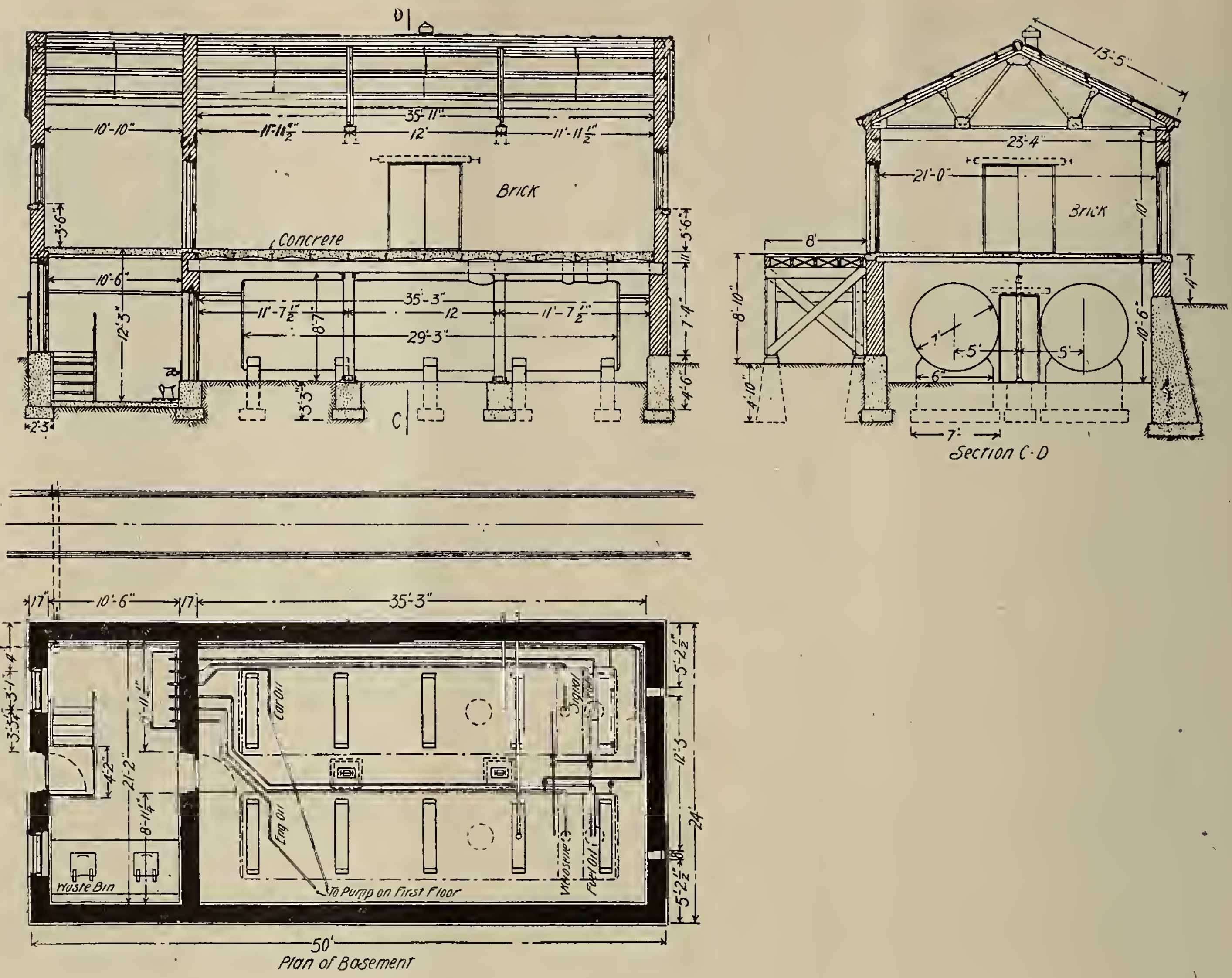


FIG. 7—PLAN AND SECTIONS OF OIL HOUSE—C., L. S. & E. RY.

the motor shaft the motion is transmitted to the stirring apparatuses and solution pump.

For each revolution of the motor, the solution pump makes one stroke. The length of the stroke and the strength of the solution, which at Indianapolis contains lime and soda ash, are so adjusted that the necessary amount of chemicals, required for the proper softening, are pumped into the raw water. The chemicals meet the raw water in the pipe connecting the motor to the mixing drum and flow together into the same, where the water is agitated for about one minute before flowing through the pipe to the bell in the settling tank. Under the lower edge of the bell, the water passes into the settling tank, where it rises to the top and flows to the storage tanks through the overflow pipe.

The thorough mixing of the water and chemicals, under pressure, hastens the chemical action so that it is completed before leaving the bell, also crowds together the precipitate in a more compact form, resulting in a quick and more complete clarification.

For removing the sludge, a system of pipes are located in the bottom of the settling tank and connected to the waste discharge. The raw water inlet and sludge pipe are connetced with a by-pass pipe, having necessary valves, by which water can be let directly into the settling tank, for stirring up the sludge, or, when necessary, to make any repairs to the machinery.

The softener is not supplied with filters, as it was thought, for reasons given above, that the settling of the precipitate would be complete, but pipe and floor space in the building are provided, so that sand filters can be put in if so desired.

The softener having all machinery on the ground, and being of few parts and simple design, requires little work for the operation and maintenance, and has given a most satisfactory result during the eight months it has been in operation.

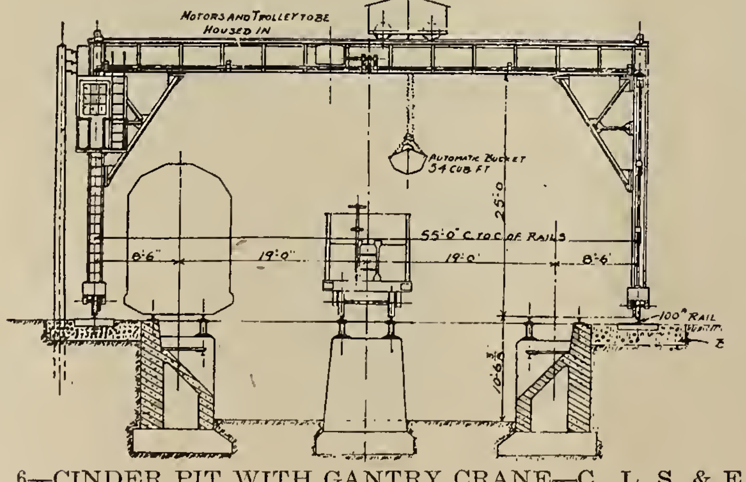


FIG. 6—CINDER PIT WITH GANTRY CRANE—C., L. S. & E. RY.

Western Railway Club

Volume No. 30 of the official proceedings of the Western Railway Club for the club year, 1907-1908, has recently been issued. Papers and discussions on the following subjects are included: Car Lighting, Steel Tires, Railway Fuel Cost, Education of Young Men, Car Wheels and Heating, Structural Timber, Rules of Interchange and Freight Car Efficiency.

Interchange Car Inspection

By S. Skidmore

WHAT is the best method and system for handling cars in interchange, so as to reduce the detention and switching to a minimum? In my opinion and from past experience in different methods of interchange I find the points giving the most satisfactory service are points that have a chief interchange inspector. There are a large number of benefits to be derived from having a man in that position at interchange points. One of the most important is the saving of delay and unnecessary switching, as any car, that inspectors or foreman cannot agree on as to the fitness or the responsibility for defects, is decided by the chief interchange inspector without delay or extra switching; which you cannot say for points working without a chief interchange inspector.

I recall a recent case of cars held about four months on account of a dispute as to the responsibility for the defects at a point where no chief interchange inspector was employed. A case of that kind would have been settled under our chief interchange inspector in a few minutes, avoiding considerable correspondence and unnecessary delay to the cars, and the cars would have got back into service.

In interchange inspection with a chief inspector it is absolutely necessary that a man is employed for that position with the necessary qualifications. He should be a man of force, possessing tact, executive and practical ability, one who can and will accomplish the desired results. He should be a man that has had years of practical experience in interchange inspection, car repairs and car building; one who is qualified to pass judgment fairly, fearlessly and impartially to all concerned. When you have a man of this kind it is necessary that he has the support and confidence of his superiors, as his duties are many and complicated and his decisions will not always be satisfactory to both parties to the dispute.

When interchange inspection has once been installed with a chief interchange inspector, no one would be satisfied with any other.

We have had inspection with and without a chief interchange inspector and worked at this point under several different methods, of which I will explain their workings and the reasons for changing or, I may say, keeping up with modern improvements in inspection of cars in interchange.

The first method was without a chief interchange inspector and cars were delivered to a connection in the receiving yards, where they were inspected. All cars found defective had the defects marked upon the side of the car and were sent back to the receiving line for repairs. Some of these cars would be in dispute and would be switched back and forth several times before they would be disposed of or accepted. It would be necessary to call in the master mechanic or master car builder before the car would be accepted or properly repaired. This you can readily see caused a vast amount of extra switching and detention to the cars. A large number of points are still doing inspection in that manner.

A chief interchange inspector was then employed, a system of records and cards was established, car inspectors were placed in the delivering line's yards, and cars were inspected and repaired before delivery. If a car was in dispute, the chief interchange inspector was called in who settled the dispute and his decision was final, until a bill, if any, was presented, when an appeal could be taken to the standing committee on interchange inspection. There have been very few appeals ever taken to his decisions. This method, you can readily see, avoided the delay to cars and much of the extra switching. The inspection was handled in that manner with changes from time to time for the better until the enormous business of the past few years necessitated more speedier methods of handling cars through large interchange points.

The twentieth century inspection was then put into effect. All car inspectors, that were in the delivering line's yards employed by the receiving lines, were taken out and inspection was made by the delivering line's inspectors. Under the following rules the receiving line makes their inspection when cars are delivered in the receiving line's yard:

Rule No. 1—All cars loaded or empty offered in interchange that are safe to haul to the repair or transfer tracks of the receiving line must be accepted by them except as hereinafter provided.

Rule No. 2—For the protection of the receiving line, the delivering line must not offer any car with safety appliances that do not conform to the requirements of the safety appliance act.

Rule No. 3—The receiving line shall make such repairs as the service requires under the protection of the M. C. B. rules, or transfer at the expense of the delivering line as follows:

A—Cars having physical defects that they do not wish repaired.

B—Cars on which the lading is in bad order and needs adjustment.

C—Overloaded cars if necessary to transfer.

D—Cars too large for tunnels.

E—Non-air cars.

F—Cars on which they have published restrictions.

The delivering line is not responsible for the cost of transfer of any cars that can be repaired with 24 hours of one man's time working; a shortage of material being no excuse for not being able to make repairs within the specified time.

This method or twentieth century inspection resulted in some saving on inspection, but not of any large amount. The saving to terminals in the handling of cars and the facilitating of the movement of freight was something enormous. Cars, that had to be previously switched out in the delivering line's yard and suffered a delay causing them to miss their connection, began to go through without any delay as by running them to the receiving line's yard they as a rule could be repaired and go forward on the first train out, which could not be accomplished under the old method.

I believe to obtain the desired results in the interchange of cars at large terminals that a first-class chief interchange inspector should be employed, one who thoroughly understands M. C. B. rules and arbitration decisions and can be impartial in all his decisions.

Have a meeting of car foremen once each month where the best of feeling will prevail and all subjects and rules can be thoroughly discussed and disposed of.

When you get to working under conditions of this kind you will be surprised how freely cars will move without friction between inspector, foreman and others.

To obtain these results and keep them one will have to watch things closely and keep up with the times, never allowing an opportunity for bettering the conditions to pass by without giving it a trial; that is our motto here and from which we get the desired results.

What we now need is a standard method of inspectoin at all points so each one will have the same understanding of the rules. This can be accomplished by having meetings where the rules can be discussed and each one get the same understanding of the rules.

Oil Burning Locomotives

THE Brooks Works of the American Locomotive Company has recently completed an order of 24 10-wheel locomotives for the Harriman Lines, which were part of a total of 125 locomotives under order with the company for that system.

The order included 43 consolidations, 30 moguls, 10 Atlantic type, 18 switchers and 24 10-wheelers. Of the 10-wheel engines eighteen are equipped for burning oil and six consigned to the Oregon Railroad and Navigation Company were arranged for burning coal.

Five of the eighteen oil burning engines were consigned to the Central Pacific Company, six to the Galveston, Harrisburg and San Antonio Railway, two to the Oregon & California Railway, and five to the Southern Pacific company, one of which is illustrated herewith.

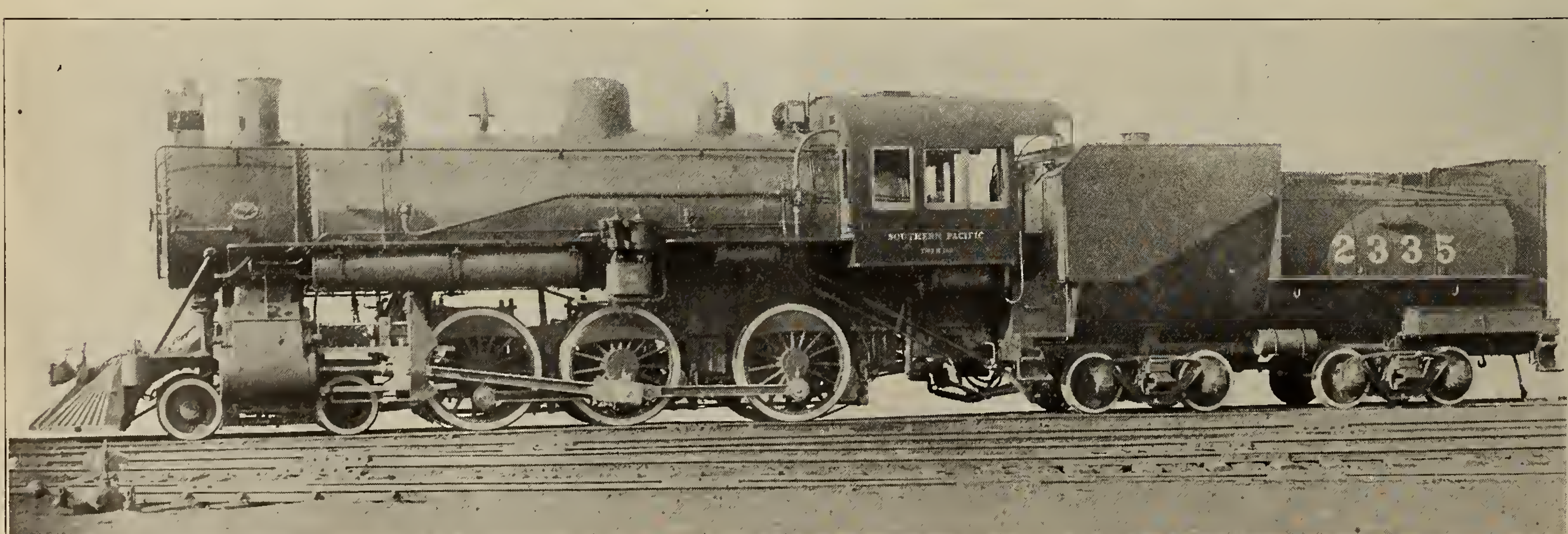
These engines are intended for passenger service and were built to drawings and specifications furnished by the railroad company and represent the design which has been adopted as standard for this type of engine for all the Harriman lines.

In working order they have a total weight of 207,000 lbs., which places them among the heaviest engines of this type ever built by this company. Of this total weight 162,000 lbs., or 78.6 is carried on the driving wheels. The cylinders are 22 ins. in diameter by 28 ins. in stroke and with a boiler pressure of 190 lbs. and driving wheels 63 ins. in diameter, these engines will develop a maximum tractive effort of 34,740 lbs. This gives a factor of adhesion of 4.68.

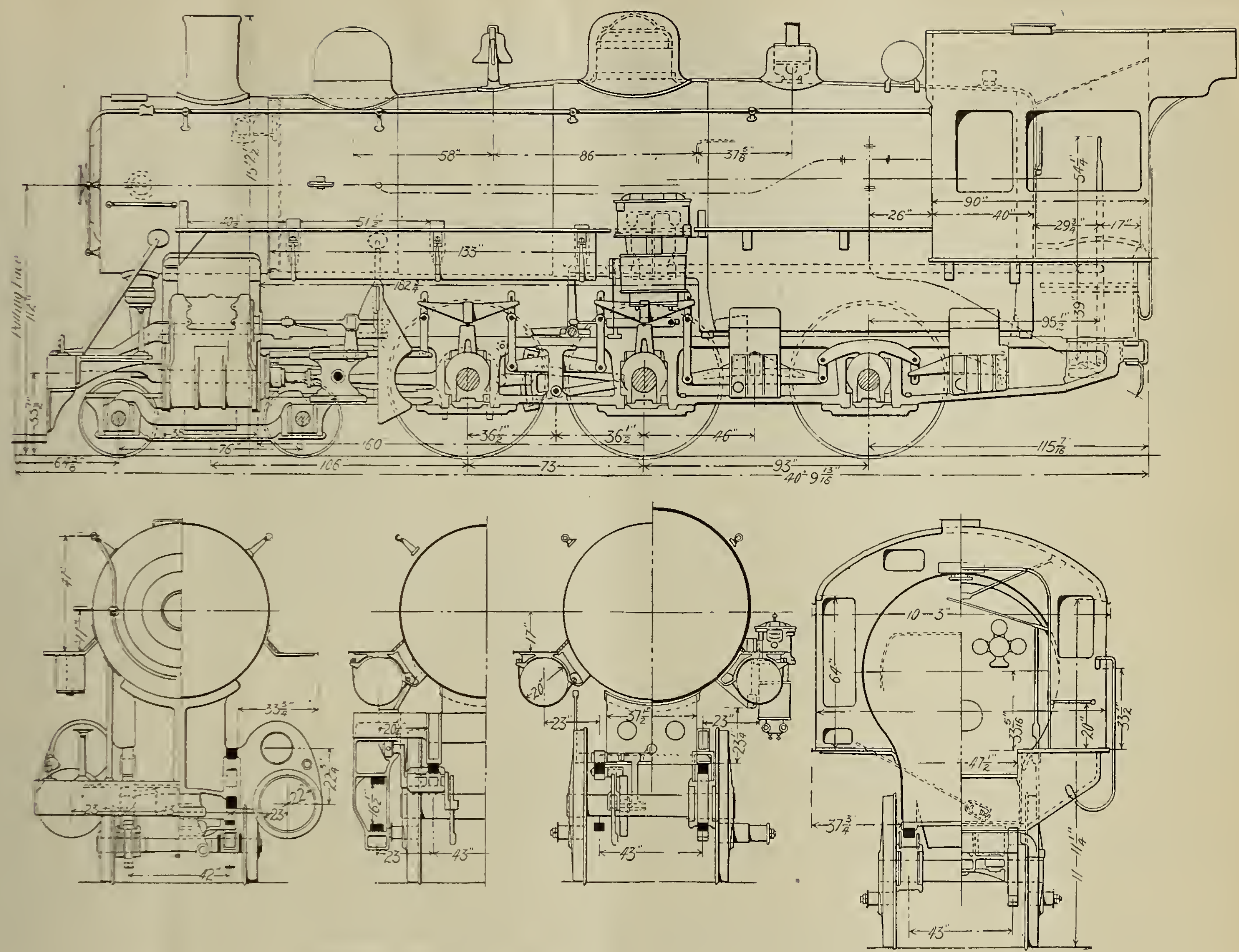
The cylinders are equipped with piston valves having a maximum travel of 6 ins. and 1 in. steam lap and 1-16-in. exhaust clearance. The valves are actuated by the Stephenson shifting link motion and are set for 1-32 in. lead in full gear. The main frames are of cast steel with double front rails and are 4½ ins. wide.

The boiler is of the wagon top, crown bar type with vertical backhead and throat sheet. The barrel is built up of three courses, the outside diameter of the first course being 72 ins. It contains 355 tubes, 2 ins. in diameter spaced so as to provide ⅞ in. bridges in accordance with the standard practice of the Harriman lines. The total surface of the boiler is 2,994 sq. ft., of which the tubes contribute 2,788 sq. ft. and the firebox the remainder.

The firebox is 124 ins. long and 37¼ ins. wide. The crown sheet is supported by T-iron crown bars attached by sling stays to curved T-irons riveted to the roof.



OIL BURNING TEN-WHEEL LOCOMOTIVE FOR THE SOUTHERN PACIFIC.



ELEVATIONS AND SECTIONS OF OIL BURNING LOCOMOTIVE.

The crown and sides of the firebox are in one sheet, as are also the sides and roof of the boiler. Ample water spaces are provided around the firebox, the mud ring being 5 ins. wide on all sides and the water spaces increasing in width at the crown sheet.

The tender is of the Vanderbilt type with cylindrical tank, having a water capacity of 7,000 gals. The oil for fuel is carried in a tank located in the coal space of the tender and having a capacity of 2,940 gals. The tender trucks are of the Andrews cast steel side frame type; the wheels being of rolled steel 33½ ins. in diameter. The principal dimensions and specifications are as follows:

Type of engine	Ten wheel
Service	Passenger
Fuel	Oil
Tractive force	34,740 lbs.
Gauge	4 ft. 8½ ins.
Cylinders, diameter and stroke	22x28 ins.
Valve gear, type	Stephenson link
Valves, kind	Piston
Valves, steam lap	1 in.
Valves, exhaust lap	clearance 1-16 in.
Setting	1-32 in. lead in full gear

RATIOS.

Weight on driver ÷ tractive force	4.68
Tractive force × diameter drivers ÷ heating surface	731
Total heating surface ÷ grate area	93.2
Fire box heating surface ÷ total heating surface (per cent)	6.8
Weight on drivers ÷ total heating surface	54.3
Volume of cylinders, cu. ft.	12.32
Total heating surface ÷ volume of cylinders	243
Total weight ÷ tractive effort	5.95
Total weight ÷ total heating surface	69.1

BOILER.

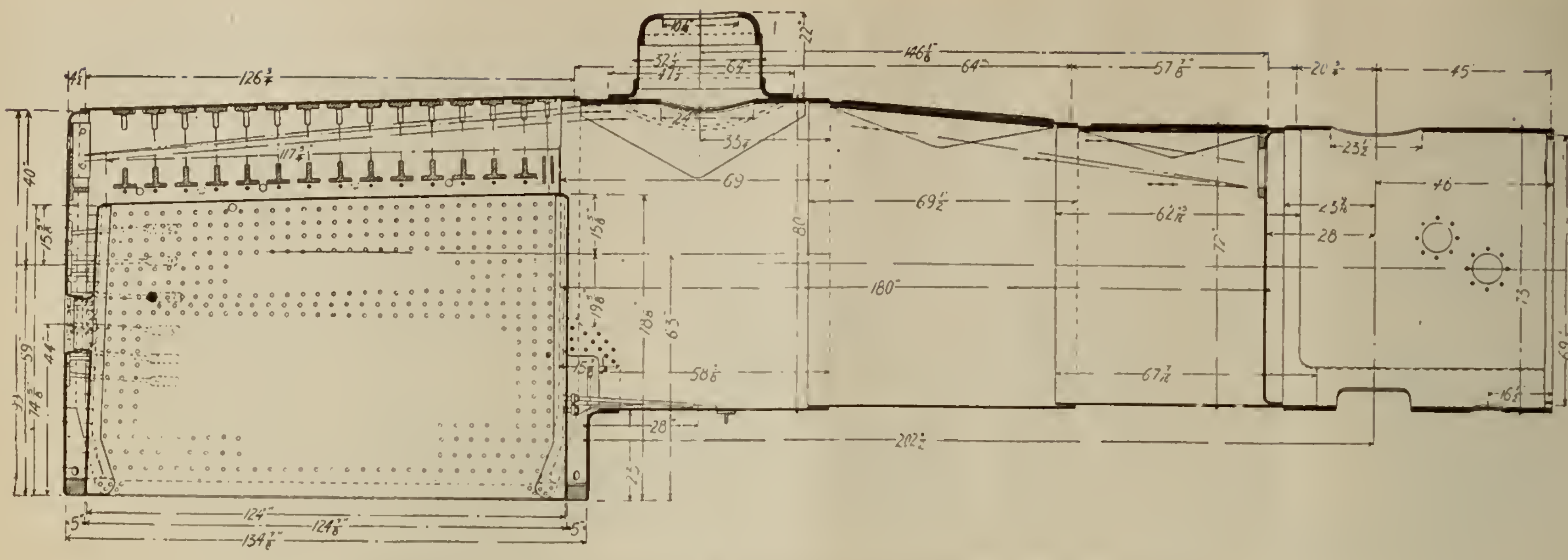
Type	Crown Bar, Wagon Top
Working pressure	190 lbs.
Diameter first ring	72 ins.
Staying, crown	T-bars

FIRE BOX.

Length	124 ins.
Width	37¼ ins.
Thickness of sheets, sides	⅜ in.
Thickness of sheets, back	⅜ in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, tube	½ in.
Water space, front	5 ins.
Water space, sides	5 ins.
Water space, back	5 ins.

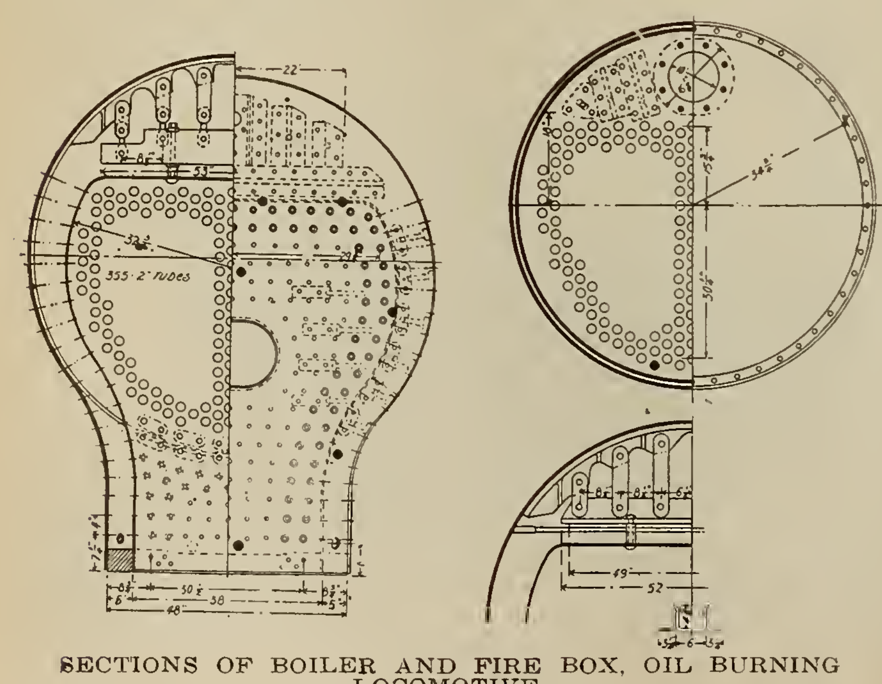
TUBES.

Material	Steel
Gauge	0.125
Number	355
Diameter	2 ins.
Length	15 ft.



LONGITUDINAL SECTION OF BOILER, OIL BURNING LOCOMOTIVE.

HEATING SURFACE.	
Fire box	206 sq. ft.
Tubes	2,788 sq. ft.
Total	2,994 sq. ft.
Grate area	32.1 sq. ft.
DRIVING WHEELS.	
Diameter, over tires	63 ins.
Diameter, wheel centers	56 ins.
Journals, main, diameter and length	10 ins. x 12 ins.
Journals, others, diameter and length	9 ins. x 12 ins.
Material, centers	Cast steel
ENGINE TRUCK WHEELS.	
Diameter, engine truck	30½ ins.
Journals, engine truck, diameter and length	6 ins. x 10 ins.
WHEEL BASE.	
Driving	13 ft. 10 ins.
Total engine	25 ft. 10 ins.
Total, engine and tender	58 ft. 3-16 in.
WEIGHT.	
On driving wheels	162,800 lbs.
Total engine	207,100 lbs.
Total, engine and tender	349,000 lbs.
TENDER.	
Type	Vanderbilt
Wheels, diameter	33½ ins.
Journals, diameter and length	5½ ins. x 10 ins.
Water, capacity	7,000 gals.
Oil, capacity	2,940 gals.



SECTIONS OF BOILER AND FIRE BOX, OIL BURNING LOCOMOTIVE.

Brake Shoes

IN a recent consular report, William Whittam, Jr., formerly a special agent of the Department of Commerce and Labor, makes certain suggestions regarding the introduction of brake shoes of American manufacture into Great Britain. His statement is as follows:

Railroads in the United States have neglected no opportunity to secure every means for economizing in rolling stock. The good and effective work done by their Master Car Builders' Association can not be overlooked. With active committees that watch closely development of every kind, supported by the manufacturers of railway material, who specialize in every direction, they have largely succeeded in bringing about a much-desired reduction in the annual expenditures of railroads. Concentration of efforts have established standards for material.

The ever-increasing speeds and loads on railways necessitated a thorough investigation of the brake-shoe equipment, for which millions of dollars are annually expended. In this feature a splendid system has been developed, its simplicity showing at a glance its advantages, of which I recently witnessed a striking illustration. An engineer on one of the largest railways in the states was just about ready to pull out of the yard. Before doing so, he once more made an examination of his engine to make certain that everything was in running order. Happening to glance at once of the brake shoes on the drivers of his locomotive and seeing that it was nearly worn to the limit, he decided to replace it by a new one. Although there was scarcely a minute's time to spare, he accomplished the change in even half the time. This fact, and a scrutinizing of the worn-out brake shoe he threw away, which was a mere shell, aroused my interest in the brake-shoe industry.

Obtaining an introduction to the manufacturers of this material, I found that the manufacture of their product, as well as of their means of providing railways with brake shoes especially suited for the conditions of the various services, was of considerable magnitude. The output of one of the manufacturing plants was close to 125 tons per day. A careful study of the iron used in their product is made in a well-equipped laboratory. There are special departments which cover certain requirements in the production of these shoes and which have minute attention in order to furnish the railroads with the best brake-shoe material at the lowest cost, which is fully appreciated and recognized among American railroad interests.

The time taken in replacing a worn-out brake shoe in the United States is only a part of a minute, while the changing of a brake in Europe takes many minutes. Altogether, there would seem to be an excellent opening for American enterprise in this direction. It is clear that a wonderful opportunity exists in Great Britain and Europe for the export of the American type of brake shoe. In Europe the solid shoe is common, yet this type became practically obsolete in the United States many years ago. With this solid shoe a waste of 15 to 20 pounds of material occurs, against a "scraping" of but 6 to 7 pounds on the American plan.

Cristobal Shops, Panama Railroad

CRISTOBAL SHOPS, like other shops on the Isthmus, are a development of a small mechanical plant left by the French. They were opened for work by the Commission on October 1, 1904, when the old French machinery, which had been left in good condition, carefully coated with oil and white lead, was put in operation. Power was furnished by a French compound engine built in 1884, which is still doing economical service in the planing mill. From the first the plant was inadequate to the demands made on it, although its work was confined almost exclusively to repairs for the floating equipment of the Commission and the Panama Railroad Company, and to overhauling pumps and making supplies for the sewer and water systems under construction at that time. Extensive additions were begun in 1905 and, by the end of the fiscal year 1906, there had been completed a new blacksmith shop, a 9-pit erecting shop with platform and transfer table, a 6-track car erecting shed, and a wood machine shop and sawmill, while a new power plant with four boilers and two new engines had been installed.

On November 16, 1906, the plant was turned over to the Panama Railroad Company, and its principal work since then has been the maintenance of the railroad rolling stock. It also does the repair work for the shipping in Colon harbor, maintains the construction equipment for the canal work from Gatun to the Atlantic; and operates the Brown hoist at Dock 14, in Cristobal.

All coal brought to the Isthmus is unloaded by this crane, the amount handled in the fiscal year 1908 being 360,000 tons.

In the past fiscal year the work for the Panama Railroad included the manufacture of two first-class passenger coaches, eight second class coaches and two baggage and mail cars, all 68 feet long; and the maintenance of 34 road engines, 26 switch engines, four special cars, 16 first-class coaches, 22 second-class coaches, three baggage coaches, five baggage and mail cars, two hospital cars, 996 box cars, three steam pile drivers, two 75-ton steam wreckers, one 25-ton crane, one 10-ton crane, and ten refrigerator cars.

New equipment erected for the Isthmian Canal Commission for the fiscal year included 164 Western dump cars of 80,000 pounds capacity, completing an order or 300 cars; two Bay City pile drivers, one Model 20 Marion steam shovel, 10 earth spreaders, thirty-five 4-yard narow-gauge dump cars, four 25-ton Bay City cranes, three 20-ton Browning cranes, two 10-ton Bay City cranes, three hundred 40-ton wooden flat cars, five hundred 12-yard steel dump cars. Work on the maintenance of the Canal construction equipment varies from month to month. In June it included repairs on 55 locomotives and 187 cars. The work for steamships consists largely of repairs to the engines, boilers and other machinery, and is limited more by the short time the vessels remain in port than by the capacity of the shops. Repairs amounting to $500 or over are not unusual.

On June 30, 1905, the Cristobal shops employed 313 men, of whom about one-fourth were white artisans and clerks, the remainder being West Indian negroes in the helper class. The present force is 936 men, of whom 730 are in the helper class. In the shop proper are 180 "gold" and 500 "silver" employes; in the roundhouse, 22 "gold" and 130 "silver," the latter including the crews of the switch engines; and at the coal hoist, four "gold" and 100 "silver" employes. Practically all the work is done under cover. Filtered water is supplied throughout the plant, and a wash room and latrines are located near the center of the group of buildings.

As soon as the burners can be installed and the oil supplied, crude oil will take the place of coal for fuel. At present the power plant consists of four boilers, two new compound engines, a large engine in the machine shop and a small one in the boiler shop, and an old French compound engine in the planing mill. The car shed, 400 feet by 100 feet, with seven tracks, can accommodate seventy cars, and has adjoining it a kiln and dry house. In the roundhouse are twenty stalls for locomotives, and adjoining it are twelve tracks, recently added. The erecting shed has nine pits, each with an overhead crane. The coal chute contains twenty pockets, and from fifty to sixty locomotives are supplied with coal every day. The paint shop is equipped with three tracks, on which nine cars can be handled at one time.

The blacksmith shop is 73 feet by 118 feet, and contains two steam hammers, one bolt-heading machine, one No. 1 blower, and Bradley hammer.

The machine shop is 91 feet by 116 feet, and is equipped with machinery and tools to handle all kinds of work. Included in the equipment are: One No. 2 turret lathe; one 26-inch lathe; one centering machine; one radial drill press; one horizontal boring mill; three shapers, 12, 18 and 24 inch; one triple-spindle drill press; one 12-inch drill press; one 14-inch power saw; one 36-inch vertical boring mill; two compressors, type 10; one French compound stay engine; two planers, 24 inches by 10 feet; one planer, 36 inches by 9 feet; one axle lathe; one 48-inch hydraulic press; one 48-inch wheel-boring mill; two 3-inch pipe machines; two double head bolt cutters; one triple head bolt cutter; one blower engine; one blower engine, 102 inches by 10 inches; two drill presses, 16 inch and 18 inch; one 26-inch circular sawing machine; one 30-inch slotter; one 14-inch slotter; three wheel lathes, 48, 60 and 42 or 78 inch; one 18-inch drill press; one 24-inch lathe; four 18-inch lathes; one 14-inch emery wheel frame; two lathes, 16 and 24 inch; one cylinder boring machine; one cylinder boring machine bar; one crank-pin turning machine; two valve-seat facing machines; one mortising machine; two pumps; one 6-inch spindle nut tapper; one compound Westinghouse pump; one large drill press, and one small wheel press.

The boiler shop is a new building and is equipped with one punch and shear; one punch and shear No. 305; one roll, 12 feet by 12 inches; one stay engine; nine pairs 1-inch rollers; fifteen pairs 2-inch rollers; five pairs 1¾-inch rollers; one 5-inch roller; one 4-inch roller; two 3½-inch rollers; three 3-inch rollers; three 2½-inch rollers; eighteen sectional beading expanders, 2-inch; five large forges; eleven air-rivet forges; one hand-rivet forge; one large drill press; one small drill press; two 8-foot swinging cranes, and twenty-four air hammers.

In the tool-room are one 18-inch lathe; one 12-inch lathe; one 14-inch drill press; one No. 2 Universal grinder complete; one power hack saw; one Universal milling machine; one cold saw grinder; one twist drill grinder, and one wet tool grinder.

The mill department is equipped with machines and tools for doing all classes of wood work, including one timber sizer; one double cylinder Victor planer; one small molding machine; one automatic ripping saw; one small ripping saw; one automatic cut-off saw; one small cut-off saw; one spindle boring and mortising; one spindle horizontal boring; two Barnes saws; one scroll saw; one rip saw; one surface planer; one automatic hollow chisel; one No. 3 spindle vertical boring machine; one small rip saw, and one stay engine.

The pattern shop contains two turning lathes and one automatic engine.

The shop and roundhouse of the Panama railroad at Panama are run under the direction of the master mechanic of the Cristobal shops, P. G. Baker. They are equipped with machinery to make light repairs, and employ two "gold" and sixty "silver" men. The equipment consists of one stay engine; one planer; one Acme bolt-cutting machine; two drill presses; one portable B. S. forge; one shaping machine; one lathe; two stay boilers, and one pump.

Communications

Individual Outfits for Enginemen

Editor, Railway Master Mechanic:

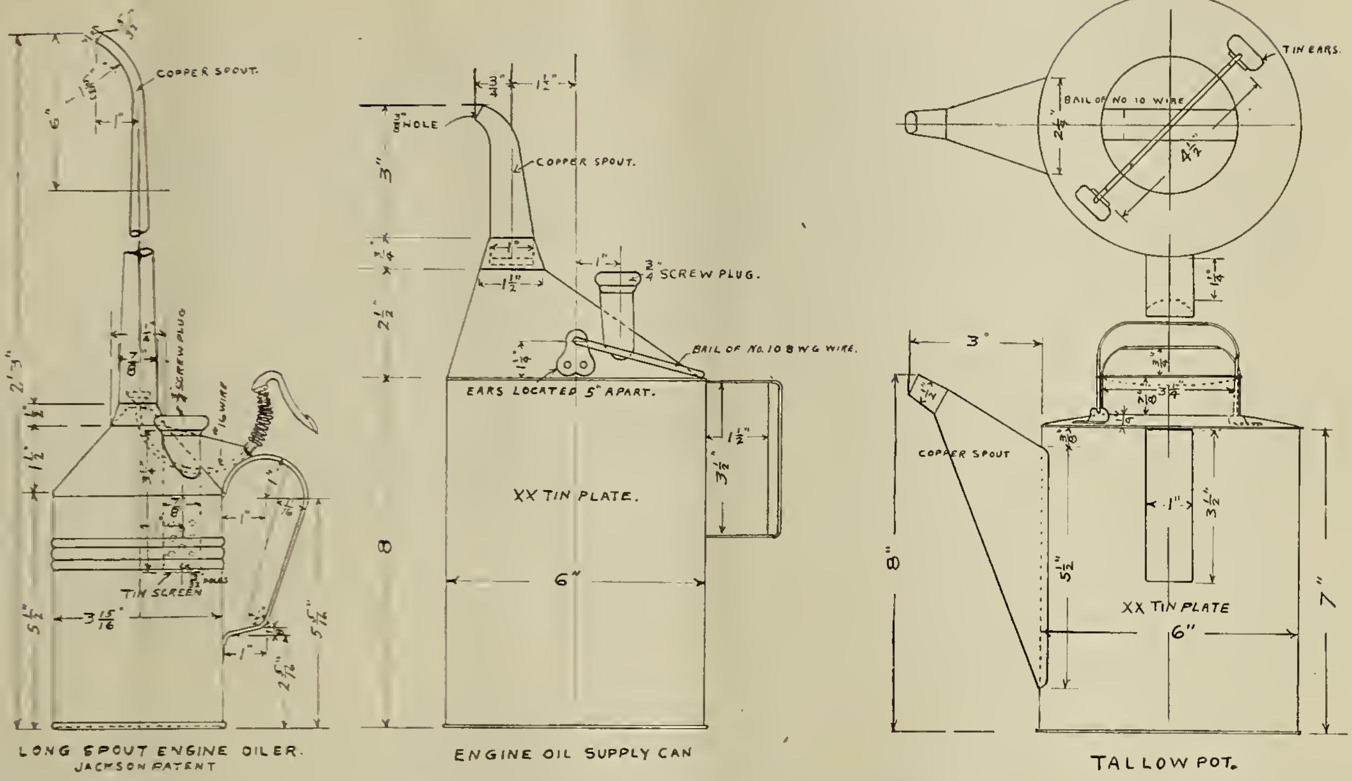
In view of the recent interesting discussion in the Railway Master Mechanic, regarding tools and oil cans issued to enginemen, I believe your readers will be interested in some individual outfits recently issued to enginemen by Mr. J. E. O'Hearne, master mechanic of the Wheeling & Lake Erie R. R. It has been a year now since the first trial sets were issued and they are in as fine shape today as the day they were first given out.

Each box, can and lantern is marked with the engineer's name. All, except the tool box, have a brass tag with name securely soldered thereto. The box has the engineer's name painted in yellow on the box. We have found that, in addition, the engineer's name should be stenciled with steel letters upon the tool box. The lanterns, in addition to the name tags, are also painted an Indian red to prevent trainmen from trading or misappropriating them. In addition to the above precautions, the tool box has lantern hooks on the ends, so that when the boxes are locked the lanterns cannot be removed. Each engineman is furnished with a six-lever lock and key. This is the only key, except an extra one in the office. This outfit with the key is assigned individually to one man and he, therefore, can be held personally responsible.

The outfit consists as follows:

One two-pint stop hand oil can.
One eight-pint supply oil can.
One seven-pint valve oil can.

INDIVIDUAL OUTFIT FOR ENGINEMEN.



INDIVIDUAL OUTFIT FOR ENGINEMEN.

One grease tube 2x12 ins.

One galvanized iron torch.

One tank bucket 12¾ ins. in diameter by 9 ins. high.

All of the outfit, except the lanterns and tool box, are made to group conveniently into the tank bucket.

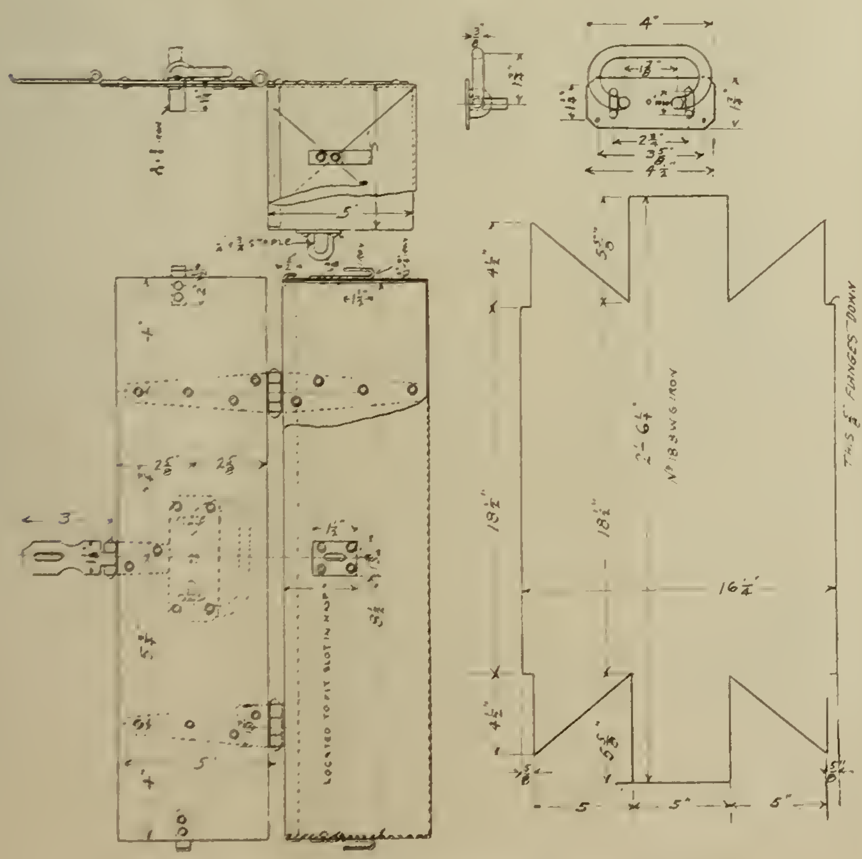
Burlington engineer, Robert Freeland, used to carry his cans in this way when the writer was running with him in the pool, out of Lincoln, Neb., in 1899 and to him is due the credit for this idea.

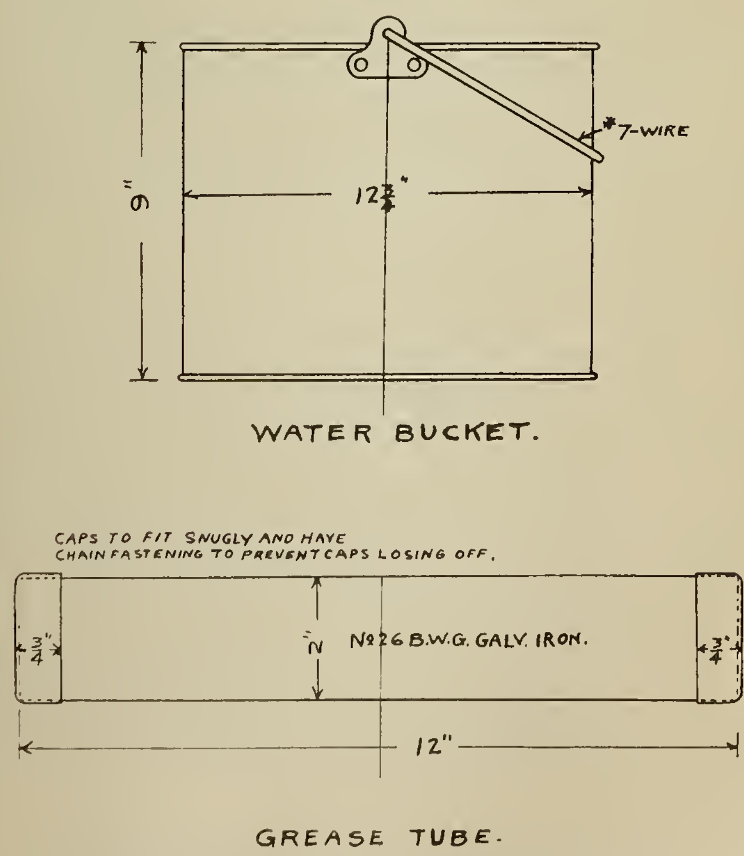
You will note the handle of the valve oil can is set on the side 90 degs. from the spout. This is a suggestion by W. & L. E. engineman, Jas. Taylor. This is very convenient in filling the lubricator, besides making the cans group to better advantage in the tank bucket.

The suggestion regarding the lantern hooks and the locking the lanterns to the tool box, was made by fireman C. V. Piatt of the W. & L. E. R. R., and is the

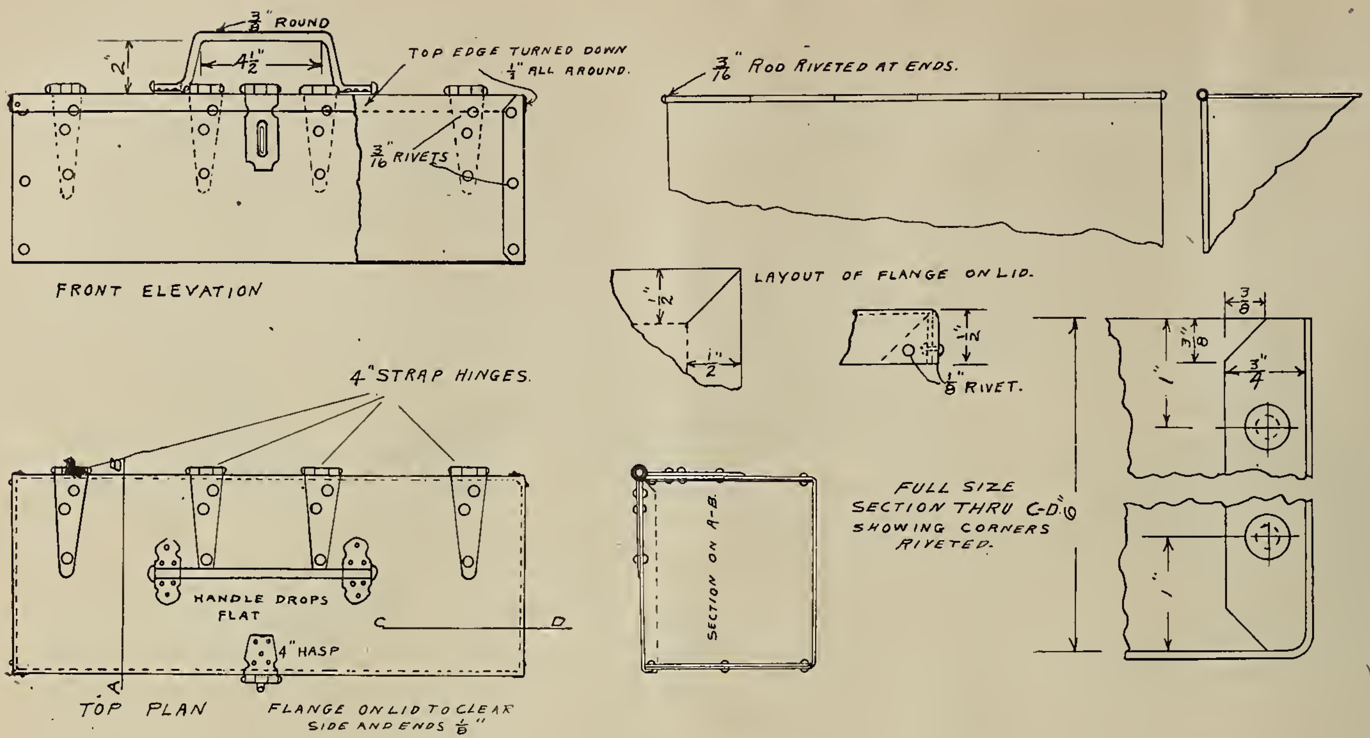
Where engines are pooled this is certainly the best individual outfit and works the best of any scheme I best solution of the engine lantern question I have so far seen.

have ever known. We realize fully that there are a few more cans and lanterns in use, but the saving in spite of this is very great as compared with the other tried methods. In the great majority of cases, any articles lost are found and returned to the proper engineman. With 86 sets in use for an average period of six months, the actual money value of parts lost that have not been found and returned is $2.58, or about 1 per cent. per annum. If this loss went to 10 per cent. per annum it


INDIVIDUAL TOOL BOX FOR ENGINEMEN.



INDIVIDUAL OUTFIT FOR ENGINEMEN.



TOOL BOX, CARE OF ENGINE SUPPLIES.

would be a great improvement over the old method of trying to keep pool engines supplied with tools, lanterns and cans.

Yours truly,
M. E. Wells, Asst. M. M.

Massillon, O.

Care of Engine Supplies

Editor, Railway Master Mechanic:

I have just read an article in your journal "Care of Engine Supplies at Terminals." Would say that all division points on our line are supplied with cupboards to receive oil cans and tool boxes and on arrival of engines the oil cans and tool boxes are taken off the engines and put back when wanted. This is the best way to take care of engine supplies. Herewith is a drawing showing the kind of boxes we have furnished. Each box is fitted with a full complement of necessary tools and all engineers are furnished with a Yale lock for their own personal use. When this is done careless engineers can very soon be discovered and a remedy applied. There is no need of severe remedies and it is time enough to talk of bribery when you find it. Neither of these matters are very hard to handle.

The individual boxes are the engineer's property and extra boxes are kept at different points for use of extra men. We hold a receipt for the box and contents from each engineer who receives a box. I do not consider the extra kit of tools only in the light of a bank account, you will have them when you need them and you will find by the use of personal tool boxes that all theft and losses are dispensed with and you have only repairs of tools to contend with.

With all this accomplished the trouble, as referred to in your article about pooled engines, will be dispensed with. As to dead-heading, that is taken care of with the extra boxes at all points.

If as much brain power were used to overcome and make a success of rules and regulations as there is against the introduction of all improved methods, better conditions would exist and more improved methods would be brought about.

We paint the name of the engineer on each box in large letters and each box is numbered. I think that the introduction of the personal boxes for enginemen will be the means of a very large saving in the expense of engine supplies which we will give an account of to your journal in due time.

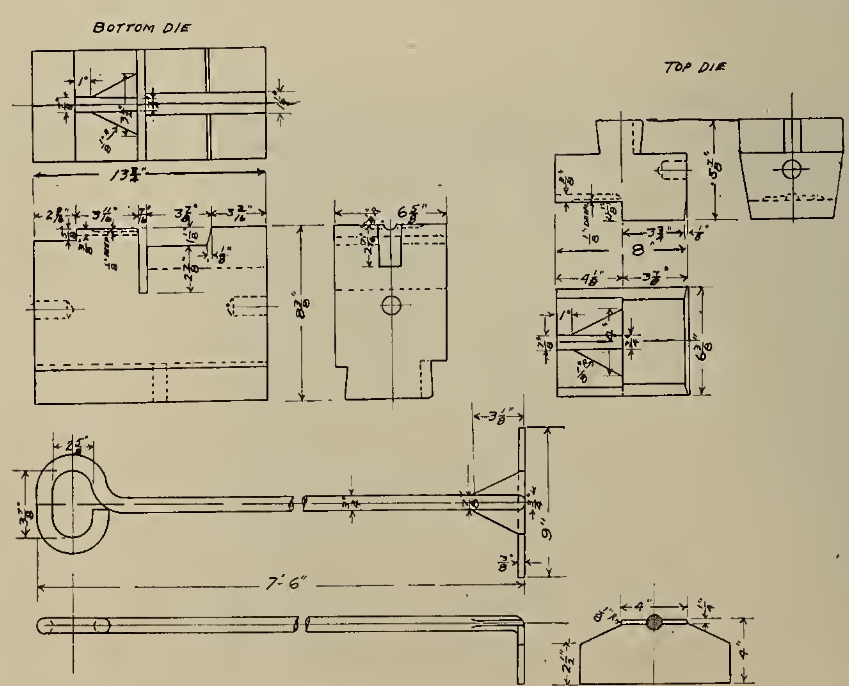
Yours truly,
John Tonge, M. M.

M. & St. P. R. R.

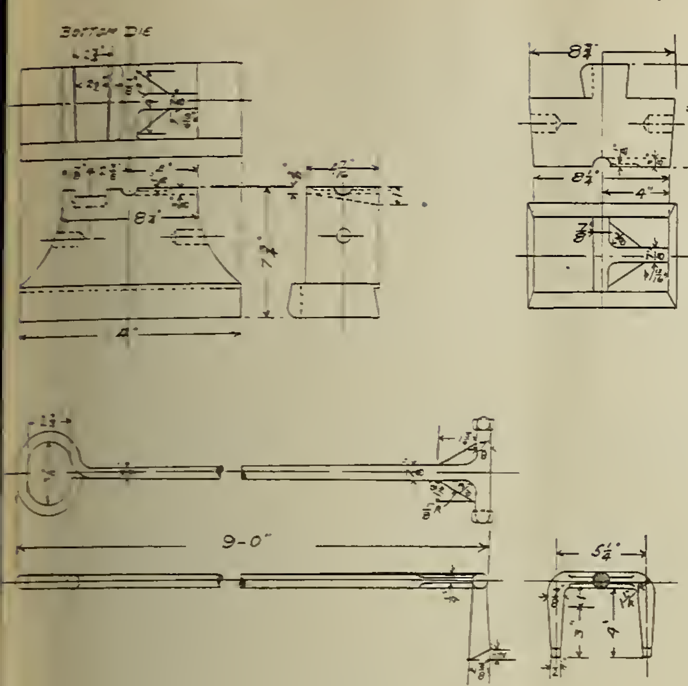
Fire Hoe and Rake

THE new designs of fire hook and ash scraper, together with hammer dies for making same, were made by A. W. McCaslin, foreman blacksmith of the P. & L. E. McKees Rocks shops. You will notice that these tools are made with a web at the junction of the handle and the hook or scraper, which makes them with ordinary usage unbreakable at that point.

The various kinds of these tools in use on locomotives are frequently consigned to the scrap pile after



ASH SCRAPER.



FIRE HOOK.

one or two trips over the road. These tools can be made as cheaply with a web as the ordinary kind can without a web. The turning of the eye on the handle rod and upsetting the other end to 1-in. diameter, 3 ins. long, is done on a small pneumatic machine. The handle is welded on full length and the hook bent down over the die at the same heat, completing the work.

The die for making the scraper was made so as to weld the handle down over the back of the scraper, in addition to the web, making a half-round brace at that point, but the web, having a surplus of strength for the purpose, the extra brace was discarded. These designs and tools are money savers.

Reduction in Cost of Freight Car Repairs

TO reduce the cost of freight car repairs and increase the usefulness of each car, the Pennsylvania Railroad is seeking anew to impress upon brakemen, repairmen and inspectors the fundamental principles of the coupling of cars in yards, the care of air brakes, and the making of minor repairs to cars. A "General Notice" has just been issued to all such employes, going into the matter in great detail.

Bumping cars together with a severe impact must be stopped, it is declared in these instructions; the speed of cars must not exceed two miles per hour. Brakes must be handled carefully so that cars going over "humps" in yards will not exceed the two miles per hour when coupling. Records will be kept of all cars damaged in shifting, and these are to be carefully followed up by general foremen and master mechanics. Repairs to air brakes and the replacing and tightening of bolts must be done in the yard by repairmen, to avoid greater damage that results from neglect.

Each repairman at work in the yards is to be required to carry a kit of tools for making all manner of minor repairs. It is expected that the results from this campaign of education will be to cut down the necessity for so frequent repairs to freight cars and other equipment.

Scholarships of the Master Mechanics' Association

THERE are four scholarships at Stevens Institute of Technology, Hoboken, N. J., under the direction of the American Railway Master Mechanics' Association, none of which were filled at the June examinations. The constitution provides if there are not a sufficient number of applicants from the members of the association for the June examinations, then applications will be received from other railroad employes or the sons of other railroad employes for the fall examinations. In extending the privilege outside of the families of members, preference shall be given to employes or the sons of employes, or the sons of deceased employes of the mechanical department. Candidates for these scholarships should apply to Jos. W. Taylor, secretary of the association, 390 Old Colony building, Chicago, and if found eligible will be given a letter to that effect for presentation to the institute authorities, which will entitle the candidate to attend the preliminary examinations. If more than one candidate passes the preliminary examination, the applicant passing the highest examination shall be entitled to the scholarship, the institute authorities settling the question. The successful candidates will be required to take the course in mechanical engineering. The fall examinations will be held Sept. 7 to 12. Any person proposing to become a candidate should advise promptly and, if eligible, the necessary letter of introduction will be forwarded.

Engines on Bad Water District

WHEN an engineer and a fireman are assigned to a regular engine they handle it as their own property. They want to haul as many tons per train and also cross the district in as short time as any other engine in the same class of service.

To do this it is necessary to keep the internal friction reduced. An engine with dry valves and cylinder packing will not do so well as if they were properly lubricated. Hence in bad water districts the water level in the boiler must be kept low and every precaution taken for preventing it from rising, knowing that it is easier to keep the water down than to get it down after it has risen.

Ideas differ in this respect, although they all center in good service. We notice that some try to get their trains under headway as soon as possible; others do just the reverse. Some, when they get a train over a hard pull, keep the reverse lever down in the same notch and ease off on the throttle; others keep the throttle in the same position and pull up on the reverse lever. Some while at the water tank fill the boiler to the top of the water glass and blow it down to the bottom nut; others do not put so much water in the boiler and blow away less. Again, some do not blow off at all but use boiler compound to hold the water down.

There are so many grains of foaming matter to a gallon of water. Boiler compound will keep down so much of it; after that it will foam unless the blow-off valve is used.

Instructions are to have the injector closed when the blow-off cock is used and to use the blow-off cock for six seconds at a time, first on one side of the boiler and then on the other, until the water is brought down to the desired level, and not to wait until the water gets bad before using the blow-off cock. Commence at the first water tank if possible, and at the return trip do so before taking the engine to the train. Good results are thus obtained without much blowing out.

It is good policy in starting a train not to use any more steam than necessary, with the reverse lever in full gear, and hook it up as the engine moves off, using more steam then to suit conditions. On coal burners be careful not to pull the fire away from the fireman. On oil burners give the brick walls a chance to get hot.

On hard pulls the reverse lever has to be down with a tonnage train. When an easy grade is reached hook up the reverse lever. Keep the throttle in the same place unless the speed of the train increases too fast. It takes less steam to fill the space in the cylinder when the valves are cutting off at sixteen inches than it does at twenty inches. The water level in the boiler varies with the steam pressure. There is more work in steam at 220 pounds than at 200 pounds. Keep up the pressure if possible.

On approaching a summit or a place where the throttle must be closed care should be taken to have enough water in the boiler to close the injector also.

The mileage made and tonnage pulled by engines working under adverse conditions speak well for the men in charge of them.—Santa Fe Magazine.

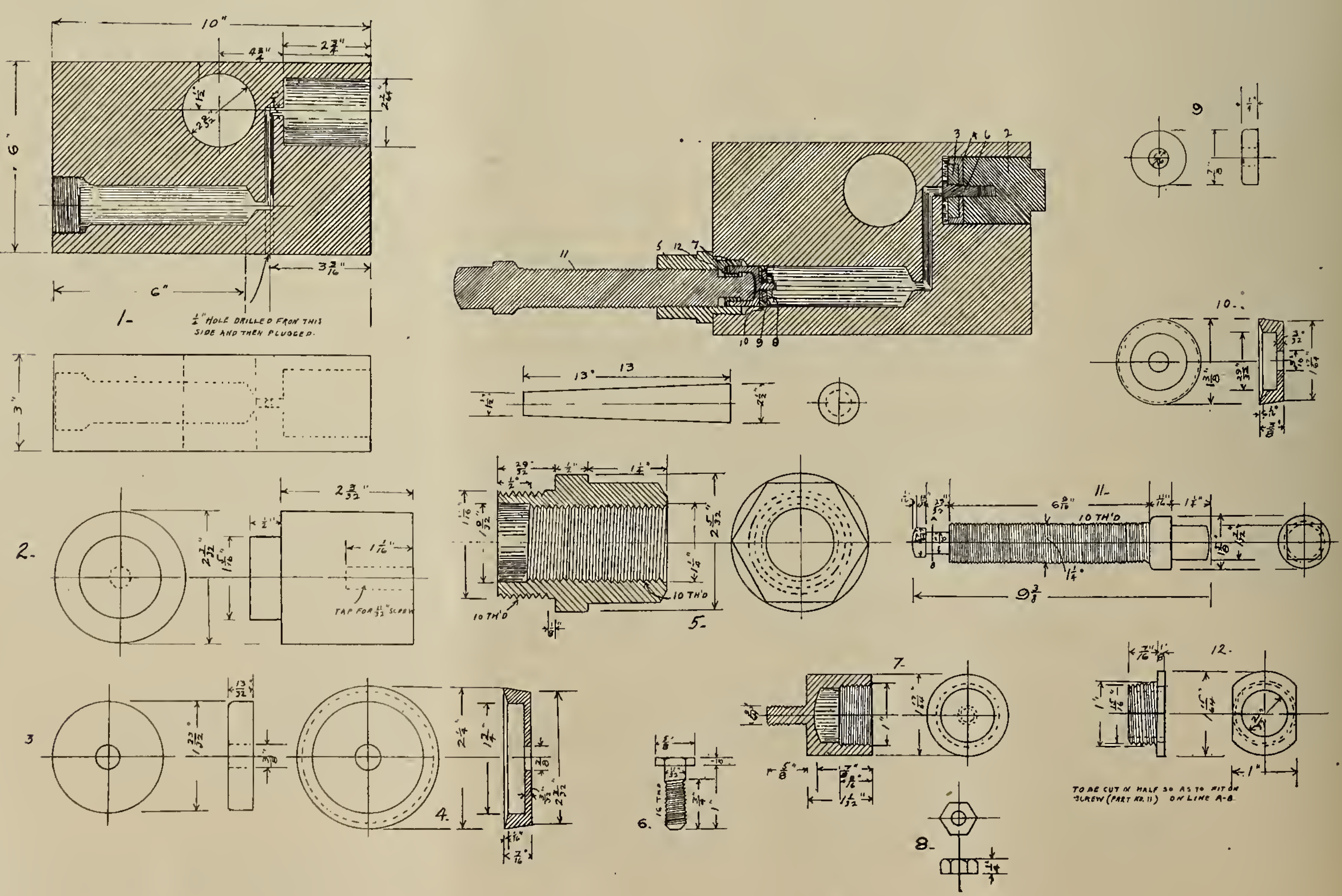
Petroleum for European Locomotives

UNITED STATES Consul-General Norman Hutchinson, of Bucharest, reports that several high officials of the Austrian railways have arrived in Roumania for the purpose of studying the question of petroleum as a railway locomotive combustible. The consul-general adds: "If it is found that the use of petroleum as a locomotive combustible is working satisfactorily upon the Roumanian railways, it is intended to introduce the use of petroleum upon the Austrian railways. It appears to the writer that petroleum seems to answer the purposes for the making of sufficient steam, and does away with coal dust and cinders; on the other hand, the odor of the smoke issuing from the locomotive is offensive to many persons, while others consider it more or less healthy."

Hydraulic Piston Jack

THE hydraulic piston jack, shown in the accompanying drawing, was put up by Jas. Stanfield, tool maker of the Chesapeake & Ohio Railway. It has proved satisfactory.

On the assembled view all parts are numbered, the numbers referring to the detail drawings below. The jack is simple in construction. All parts are easily made and assembled. The body of the jack measures 3x6x10 ins., and has the compactness requisite for the work. We are indebted to E. A. Murray, general foreman, Chesapeake & Ohio Railway, for the drawing of the jack.



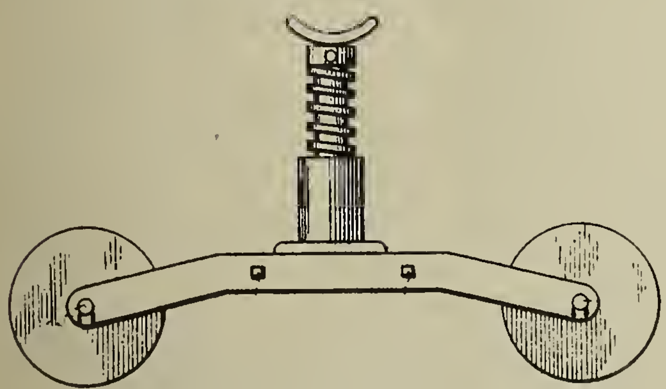
HYDRAULIC PISTON JACK, CHESAPEAKE & OHIO RAILWAY.

Combined Jack and Truck

THE combined jack and truck consists of a pair of rollers, a platform secured between the rollers and a jack mounted on the platform. It is simple, strong and durable in construction and at the same time light in weight.

In removing and replacing car wheels the device may be used in any position. It is usually placed, however, in a pit under the car.

By jacking up the car sufficiently, the weight is removed from the car truck and the wheels may be taken from under the car. The jack and truck are placed at the end of arch bars, and when the wheels are rolled out they come directly over the jack in the truck. A plank is placed under the truck.



COMBINED JACK AND TRUCK.

When the wheels are jacked up, they can be turned in any position to facilitate removal and replacement and pulled out from under the car.

The best evidence of the advantage of this device is the fact that a roundhouse foreman borrowed the jack and truck from the repair gang in order to replace the inside wheels under a tender. The device was invented and patented by Oscar F. Sandberg, Willmar, Minn.

Master Car and Locomotive Painters' Association

THE thirty-ninth annual convention of the Master Car and Locomotive Painters' Association will be held at Atlantic City on Sept. 8, 9, 10 and 11, 1908. The subjects for committee reports, essays, and questions to be discussed are as follows:

Subject No. 1—Cracked, painted and varnished surfaces. Can they be treated successfully without burning off? By what methods?

Essay—What benefit has been derived by the use of so-called Chinawood Oil in the manufacture of paints and varnishes?

Subject No. 2—What advancement has been made in the painting of steel cars?

Essay—Hustling locomotives through the shop.

Subject No. 3—What system of "ordering in" cars for shopping is recommended as productive of best results as to paint and varnish?

Essay—A talk on varnish. Some pertinent remarks adapted to present day conditions.

Query No. 1—Has any substitute been produced that can be safely used in place of turpentine in painting?

Query No. 2—Is it good policy to leave the sash and doors in cabs while locomotives are passing through the shop for general repairs?

Query No. 3—What fire precautions are best adapted for the railway car and locomotive paint shop?

Query No. 4—What basis of measurement is best adapted to the piece-work operations performed on railway passenger train cars?

Communications may be addressed to A. P. Dane, secretary, Reading, Mass.

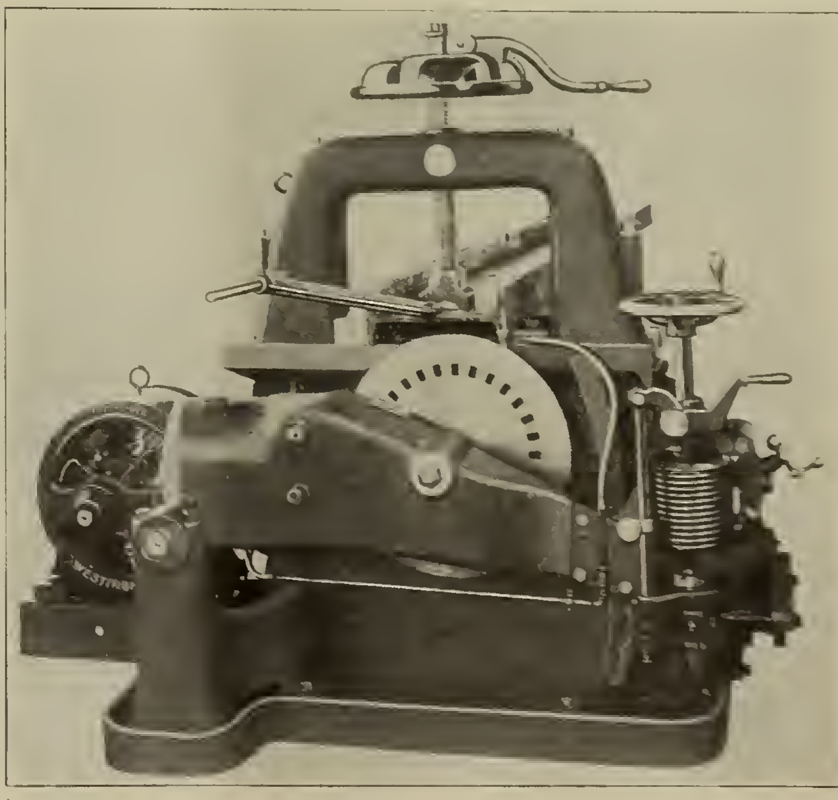
Motor Driven Cold Metal Saw

THE use of small cold saws for cutting off all sizes and shapes of metal work has become very general in a great variety of establishments, not only because of the utility of the saw itself, but also because of the fact that individual motors have been most successfully fitted to the saws.

In a great many establishments it would be almost impossible to locate the saw so that it could be conveniently used by the workmen. In the average machine shop one or more saws are required in the stock room or some other equally inconvenient place for mechanical drive. Here the use of a small motor on the saw permits the location to be selected without reference to any requirements except the convenience of putting work through.

In structural iron works the self-contained unit of motor and saw can be picked up by a crane and carried to any part of the building or yard. Similarly the use of the motor driven set is found very advantageous in a great many plants.

The cold saw, illustrated, which is one that does not require a bevel gear, is especially adapted to motor drive. The saw is manufactured by the Lea Equip-



MOTOR-DRIVEN COLD METAL SAW.

ment Company, of New York City, and is fitted with a Westinghouse shunt motor. The size shown requires a 2½ h. p. motor and is capable of cutting 8-in. round stock. A Morse silent chain is used to connect the motor to the saw, in preference to gearing, as experiments have shown the former to be more satisfactory.

It is necessary to be able to adjust the speed of the saw in order to cut different metals with maximum efficiency. For instance, experiment has shown that the peripheral speed of the saw should be 52 ft. per minute with a very coarse feed for structural iron, machinery steel and metals of this class. For annealed tool steel a lower speed of but 37 ft. per minute is the most efficient. This same speed is also used on Krupp's chrome nickel steel. In order to obtain these speeds an adjustable speed motor with speed range of 1 1-3 to 1 is used, with a speed controlling rheostat. It is only necessary to move the handle of the controller to obtain any desired speed.

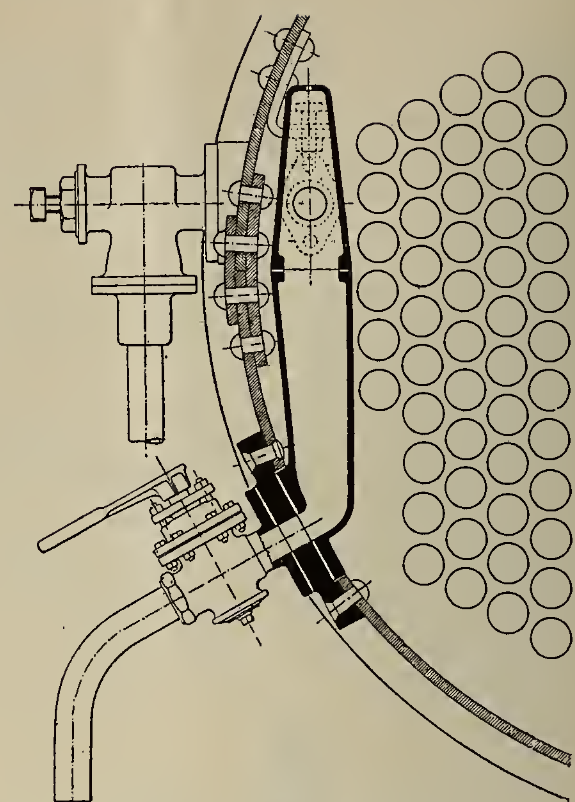


FIG. 2—APPARATUS FOR PREVENTING SCALE IN BOILERS.

Apparatus for Preventing the Formation of Coherent Scale in Boilers

CONSIDERABLE amounts of scale are always deposited in boilers at the places where the feed water enters, no matter whether it enters directly into the boiler after going through the feed valve, or whether it first passes through a certain length of tube after going through the valve. At these places the water coming from the injector suddenly loses the greater part of its velocity, and its temperature is very quickly raised from about 212 deg. F. to nearly 392 deg. F.

There is no doubt that the deposit of scale is due to the combined effect of the two phenomena mentioned, and it may logically be proposed to increase the effect of both so as to make the water, as soon as it enters the boiler, precipitate the greater part of the impurities it contains. This would make it possible to collect the precipitate in a receptacle easy to clean.

Figures 1, 2 and 3 show an appliance which has been fitted to several express locomotives of the Austrian State Ry. (series 206). Two cast-iron receptacles, each made in two pieces for convenience of fitting, are placed one on each side of the set of tubes, so as to be completely immersed in the water; rectangular openings are provided in the upper side opposite to the opening through which the feed water enters.

At the end of each run (about 100 miles), the mud-cocks at the bottom are opened, the injectors having previously been turned on so as to keep up a strong pressure in the receptacles and blow out the deposits.

The following results have been obtained with this device:

The water used for the locomotives of series 206 is such that, in order to prevent priming, the boilers had to be washed out every eight days; the locomotives fitted with this appliance run 14 days before it is necessary to clean the boilers. Hard scale is no longer formed, but only soft mud which is removed without difficulty.

The first trials were made at Mr. Alex. Friedmann's works at Vienna, on a stationary boiler of the locomotive type, having a heating surface of 36 square meters (387.52 sq. ft.). The appliance used consisted of a tube 1 meter (3 ft. 3⅜ ins.) long, of oval section; the vertical axis was 170 mm. (6 11-16 ins.) and the horizontal axis 80 mm. (3 5-32 ins.) in length. Fig. 3 is the reproduction of a photograph showing the deposit found below the rectangular openings through which the water passes, after 30 hours' use of the trial apparatus.

The examination of this deposit showed that the apparatus had not only induced the separation of the solid particles suspended in the water, but had also caused the

*By M. Golsdorf, chief councilor, Austrian State Railway. From the Bulletin of the International Railway Congress Association, October, 1907.

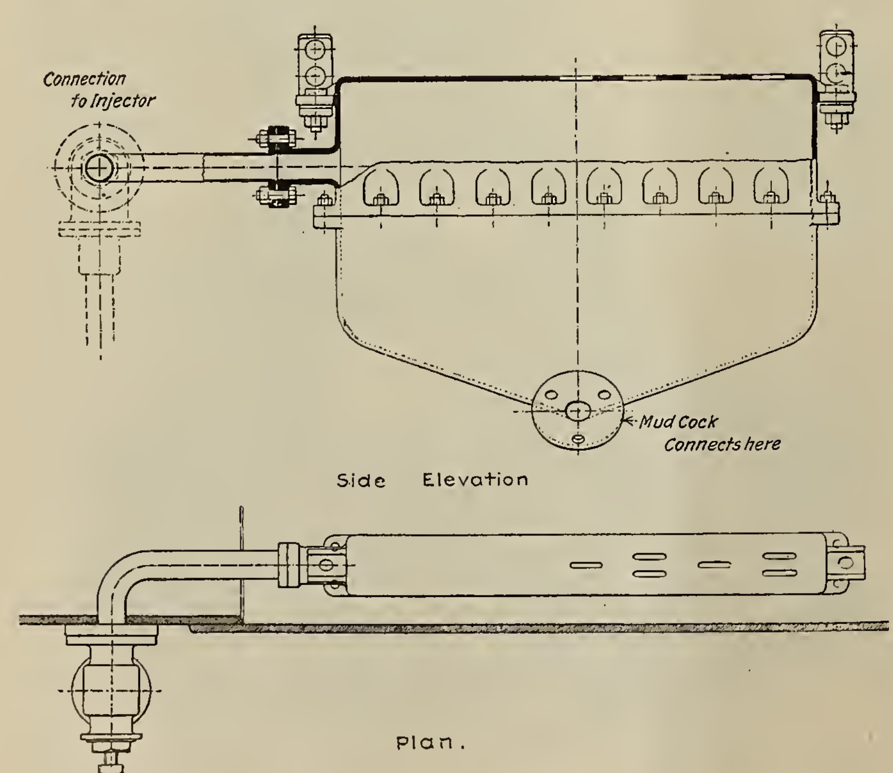


FIG. 1—APPARATUS FOR PREVENTING SCALE IN BOILERS.

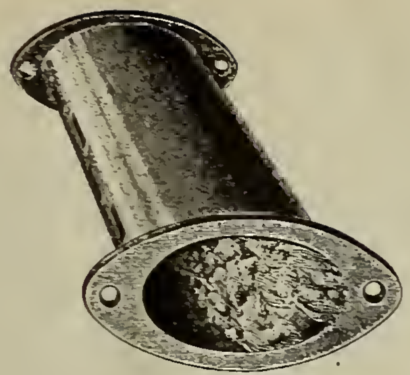


FIG. 3—APPARATUS FOR PREVENTING SCALE IN BOILERS.

precipitation of the dissolved salts which produce scale, such as calcium and magnesium carbonate and calcium sulphate. Chemical analysis showed that these three substances were present in the deposit in about the same relative proportions as in the feed water.

The most important point is the precipitation of the magnesia; which no previous water-softening apparatus was able to remove; now it is well known that it is the presence of this substance which induces the calcium salts to form a hard and coherent scale.

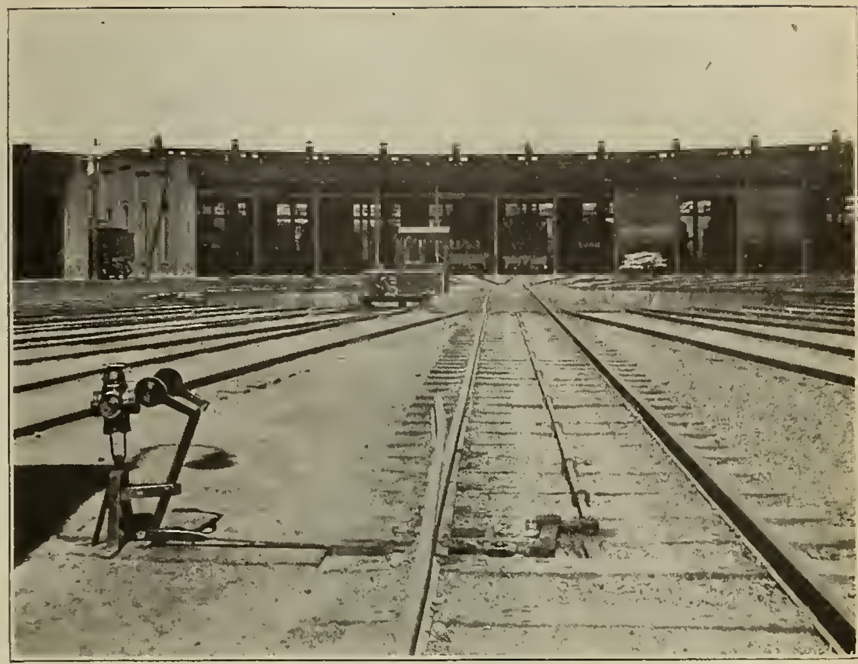
Derail for Turntable

IN the accompanying illustrations a derail is shown both in the open and closed positions. The device consists of a split switch point at a distance of 30 to 75 ft. from the turntable, the distance depending on conditions. The point is operated by the solid connecting rod in the center of track back to the turntable.

The point is held open by a heavy coil spring and is closed by the turntable itself when the roller contact on the turntable strikes the bearing in center of track connected with the switch point. The switch point is then forced against the stock rail. As the table moves out of line of the track, the switch point opens.

This device is known as the Ogle Turntable Derailer. It makes it impossible for an engine or car to be run into the turntable pit as it is a positive derail until the turntable is lined up for the track when the derail is automatically closed. When the table is moved out of line even slightly, the derail is open, making every track leading to the turntable inoperative. This derail prevents the running of engine or cars into the turntable pit, which might tie up every engine in the roundhouse for a long time.

DERAIL FOR TURNTABLE IN OPEN POSITION.



DERAIL FOR TURNTABLE IN CLOSED POSITION.

Universal Cutter and Tool Grinder

A NEW universal cutter and tool grinder has been placed on the market by the R. K. LeBlond Machine Tool Co., Cincinnati, O. It was designed in view of the fact that sharp cutters and tools are absolutely necessary for rapid and economical milling.

The machine is absolutely universal and will grind anywhere on any shape of cutter, grind any angle, taper or face. It is adapted for grinding all kinds of cylindrical, internal face and angular work, face mills, end mills, reamers, counter bores, circular saws, snap gages, gear cutters, rose reamers, flat surfaces and all other tool room work. The general principle of design is analogous to that of the universal milling machine, consisting essentially of a column, knee, saddle, swivel carriage and table. This gives the greatest rigidity and is well adapted for taking the large inserted tooth cutters so frequently met with in modern milling practice. Combined with this may be noted the absence of all stems, posts, split bearings and joints common in most grinders.

The arrangement of the levers for operating is novel, and so disposed as to be convenient to the operator in any position which he may be in relation to the machine. This admits of close observation of the action of the wheel on the work, and allows the operator to so arrange himself that he can give the work his closest observation and still have all adjustments before him. This is illustrated very clearly. It will be seen that the cross feed and quick traverse levers for table extend through

FIGURE 1—UNIVERSAL CUTTER AND TOOL GRINDER.

the machine and have a crank at both ends respectively, and can be adjusted to suit the position of the operator. All adjustments are provided with a fine feed through hand-wheel at front of the machine. Fixed clamping handles are on all parts for locking them in any position.

The most careful consideration has been given to the thorough lubrication and protection of all cylindrical and flat bearings. All oil holes have dust proof covers and all bearings are lubricated through felt pads. The spindle bearings have dust proof collars. The saddle and table bearings are provided with covers and are never exposed. The knee bearing on column has felt wipers.

The wheel spindle has taper boxes and is driven by a single pulley for 2-in. belt. Three spindle speeds, 3,175, 4,200 and 6,365 r. p. m. are obtained with the countershaft, permitting the correct surface speed for various size wheels. One end is bored for LeBlond S. A. collet, and enables wheels to be removed and replaced without the necessity of truing up. The spindle is eccentric with the column and with the cross movement; the minimum and maximum train of cutters that can be taken in is greatly increased.

The knee is of box section and swivels on a supplementary sleeve upon the column through an arc of 360 degs. It has a vertical adjustment of 8¼ ins. below the center of wheel spindle, and formed cutters, hobs, reamers, etc., can be ground on their radial faces without the use of drop centers.

The saddle has an apron cast completely around it that forms a cover for the knee as well as the cross feed screw at all times; it has a cross movement of 6¼ ins.

The table swivels through an arc of 90 degs. on either side of the center and has a fine screw adjustment throughout this range for accurately setting to any taper. The base is graduated and is clamped rigidly with two clamping bolts in any position. It has a working surface of a longitudinal movement of 17 ins. A quick traverse through a lever and rack and a fine feed for circular and internal grinder with a hand wheel, can be obtained.

The head and foot stock centers swing 8 ins. and take 18 ins. between centers. The headstock spindle, which is tapering, revolves in a removable sleeve, which can be clamped in the V-block of the universal attachment. The front end is threaded to receive chuck. The foot stock has a spring center actuated by a thumb lever. This center can be removed and a special center for grinding reamers inserted.

A complete set of stop and tooth rests are provided for all classes of work. The journal boxes are provided with ring-oiling bearing, and need be filled only once a month. The countershaft is arranged to give three wheel-speeds, has tight and loose pulley and should run 425 revolutions per minute.

ATTACHMENTS.

The universal attachment is shown to the left of the grinder in Fig. 1. Next to this attachment there is a universal vise and in front of it there is an attachment for internal grinding. To the right of the grinder there are shown a chuck and rest for spindles, etc., in which taper holes are to be ground, and between them is shown a gear-cutter grinding attachment.

The universal attachment is also shown in Fig. 2 with a tooth milling cutter mounted upon it. This attachment is completely universal in all its movements. The head swivels upon the base and the V-block can be swiveled completely around through a vertical plane. It will hold work mounted directly upon arbors, straight or taper shanks. The headstock sleeve and spindle can be clamped in the V-block and can be used for grinding work held in the chuck, such as cones, cups, collars, etc. The work is clamped by an adjustable jaw. Two thumb screws at either end admit of delicate adjustment to the proper position. A floating center attached to an adjustable bar can be set for any length and diameter of work. The head has vertical adjustment and will, therefore, take work of large diameter.

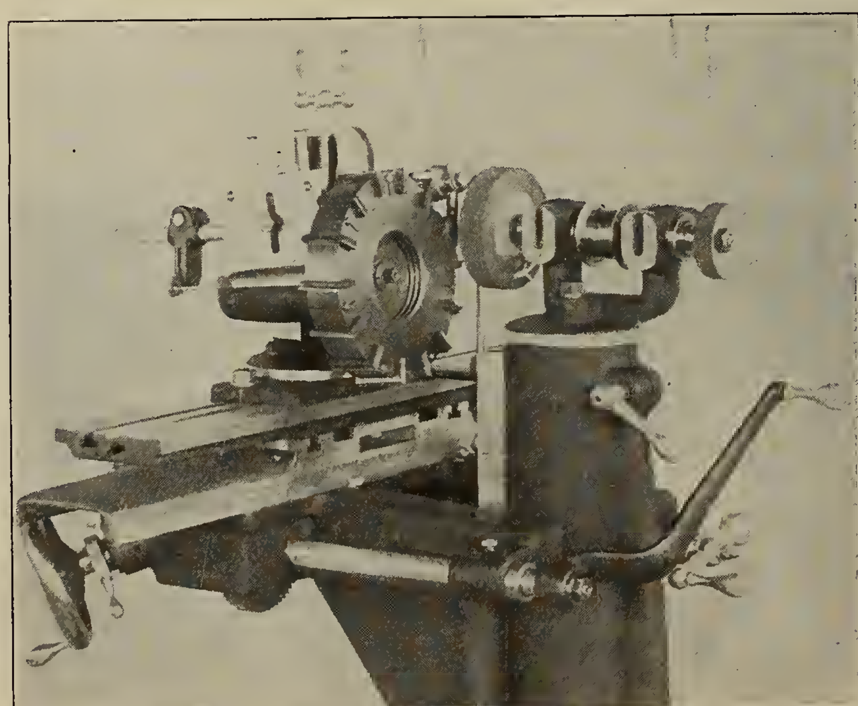


FIGURE 2—SHOWING A TOOTH MILLING CUTTER.

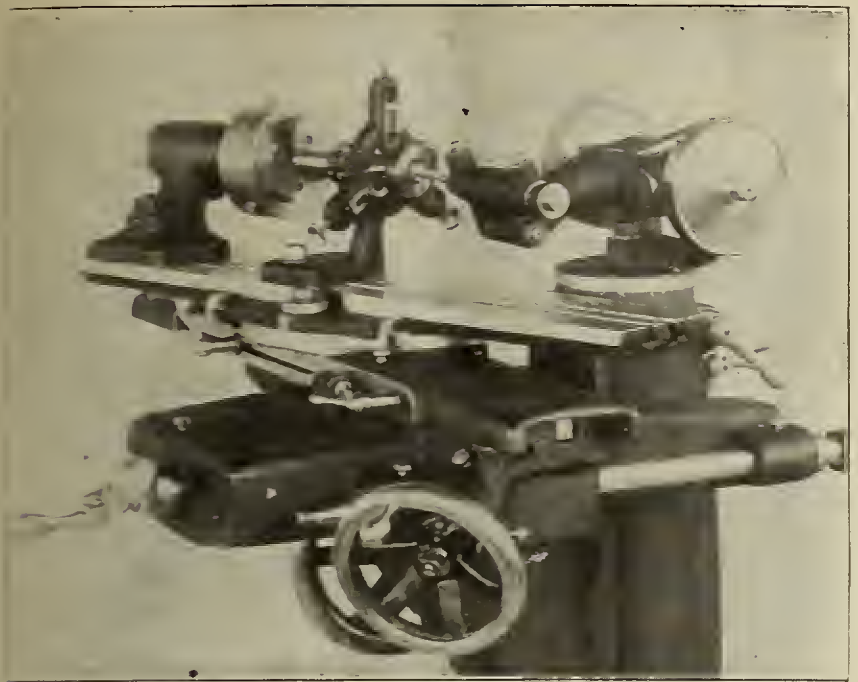


FIGURE 3—SHOWING INTERNAL GRINDNG ATTACHMENT.

The internal grinding attachment is mounted as shown in Fig. 3, being driven by belt from a pulley on the wheel spindle. The chuck and rest mentioned above are also shown.

The gear-cutter grinding attachment is made for grinding the teeth of gear cutters radial. If ground otherwise the shape of the tooth cut by them will not be correct. A spring pawl can be adjusted to bring the radial face of the tooth against the gage which swings over the cutter and then clamped in position. The gage can then be swung back clear of the cutter. The table is provided with stops for regulating the depth of the cut. The attachment will take in cutters up to 6-in. diameter.

Finishing Cross Head Pins—Lathe Job

THE economical production of various parts usually turned out in railroad repair shops has been a troublesome problem because of the comparatively few pieces that are run through at a time. Repair shop methods are necessarily slow because it does not pay to rig up specially for the various jobs, and therefore the wider the range of a machine tool and the greater the ease with which it may be adapted to various classes of work, the more valuable it is in repair shops.

Knowing of this condition in general with relation to work in railroad shops, the Gisholt Machine Company commenced, a number of year ago, to study these problems with relation to the work to which their lathe is specifically adapted. The matter of chucked work was a comparatively simple problem to solve because of the experience of this company covering a number of years on this class of work. To adapt the Gisholt Lathe to bar work and make tools that would have a large range and still be easily changed from one piece to another, was a little different problem. It seemed desirable to have the machine a combination bar and chucking lathe for the work in railroad shops so the machine could be kept going all of the time. If it so happened that there was not a sufficient amount of bar work to keep the machine busy it merely required a change of tools to produce chucked work. Thus a machine was brought out that has been especially popular in railroad shops, this machine being adapted to such work as liners, brasses, pistons, piston centers, front and back cylinder heads, piston follows, bull rings, eccentric and strap rings, cross heads, pipe flanges, steam chest covers, and work off the bar such as cross head pins, valve motion pins, brake hanger pins, etc. As compared with other methods work of these two general classes may be finished in lots of as few as 6 or 8 of a kind at a time with a result in saving of from 50 to 80 per cent and upwards. Naturally the bringing out of this machine has caused a considerable revision of production methods in many of the railroad shops.

These machines are known as the Gisholt Big Bore lathes owing to the increased spindle capacity, and the most popular size is the 24-in. lathe, which is built with a spindle hole of either 5 or 6¼-in. A 28-in. machine is also built with a 7½-in. hole through the spindle for especially large work.

Owing to the fact that the various pins above mentioned may be made from bar stock the expense of forgings from which these pins have been formerly made is done away with. In addition to this, because of the manner in which the work is chucked, there is no time lost in centering, as with the older methods.

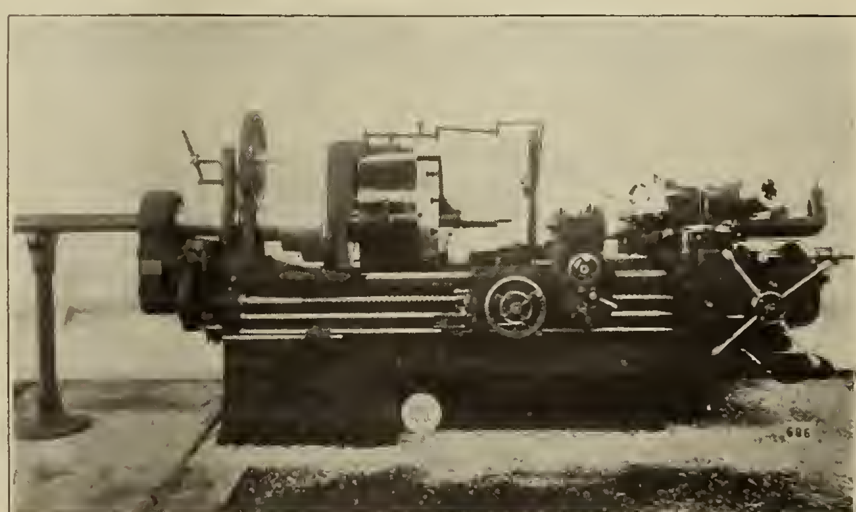
In some of the shops such parts as knuckle and cross head pins are finished complete, except the tapered surfaces which are left large, and as wanted are finished to size as required.

To give a general idea of the method of finishing work from the bar a description is given of finishing a cross head pin on the Gisholt Big Bore lathe with 5-in. spindle hole.

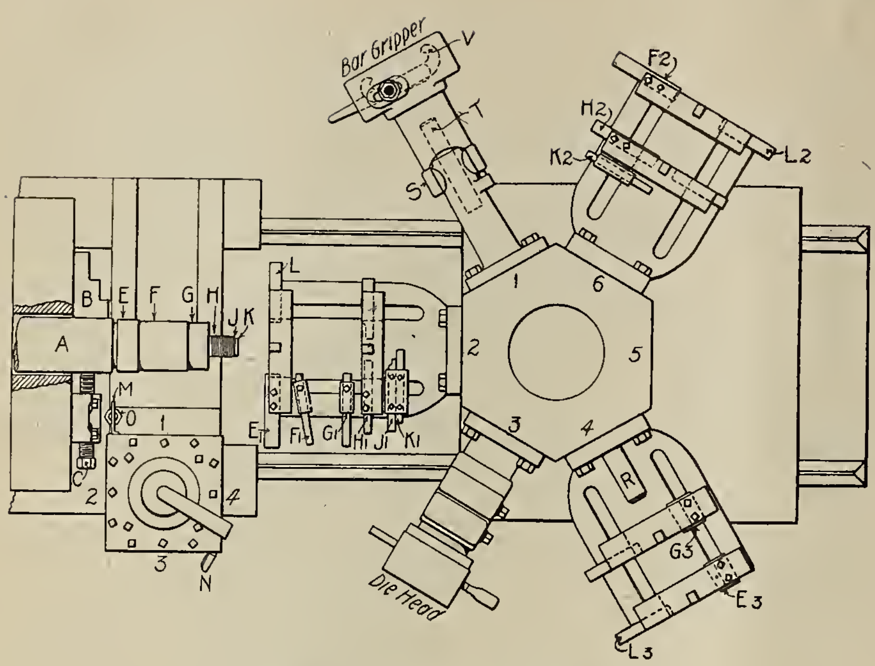
FINISHING CROSS HEAD PINS.

The piece of bar stock is shown at (A) and is held in the three-jawed scroll chuck by hard chuck jaws at (B), and also by three chuck blocks at (C).

The first operation consists in removing the major portion of the stock and bringing the pin approximately to size. This roughing operation is completed by the cutters shown in the box tool attached to face (2) of



BIG BORE LATHE—FINISHING CROSS HEAD PINS.



FINISHING CROSS HEAD PINS.

the main turret, the cutters (E_1), (F_1), (G_1), (H_1), (I_1), (J_1) and (K_1) removing the stock on the surfaces indicated by the corresponding letters on the piece itself. Just before starting this roughing head, the tool post tool (N) is used for truing up the end of the bar.

The piece thus being approximately to size, the next operation consists in bringing surfaces (F) and (H) to exact size. This is done with the cutters (F_2) and (H_2) in box tool on face (6) main turret. Cutter (K_2) faces the end (K) of the piece and at the same time gauges the length of the pin; (L_2) acts as a back rest for supporting.

Next the box tool on face (4) of main turret is swung into position and the cutters (G_3) and (E_3) bring surfaces (E) and (G) to correct size and taper; the arbor (R) is arranged as a gauge to determine the proper location of the tapered surfaces, thus insuring duplicate work when cutters (E_3) and (G_3) are once properly set; (L_3) is a back rest.

All surfaces on the pin having thus been brought to size, the next operation consists in cutting the thread, which is done with the die head on face (3) of the main turret. This completes the piece and the tool post cutting off tool (M) supported by post (O) is then used for cutting off.

After the piece has ben cut off, the jaws and blocks are loosened and bar gripper shown on face (1) of main turret is swung into position. This bar gripper consists of a pair of self-acting jaws shown at (V) for gripping the piece and drawing it out, and an arbor at (T) for pushing the piece back to the desired length. The operation is as follows: Through rapid traversing device the bar gripper is brought rapidly to the piece and through the self-acting jaws (V) grips the stock firmly. Then by operating the turret rapid traversing device the bar is drawn out to approximately the proper length. The jaws (V) are then released and the forward half of the bar gripper is swung upwards at right angles on the hinge (S), thus exposing the arbor (T) which is used to push the piece back to proper length for the next pin.

Milling Machine Operations

THE accompanying illustrations show two very interesting milling machine operations, made possible on the standard milling machine through an improved Circular Milling Attachment just produced by the Kempsmith Manufacturing Company, Milwaukee, Wis.

Fig. 1 shows the attachment used in milling the faces of 12-in. pulleys. The rough pulley is mounted firmly on the attachment, and through the power feed, is revolved against the inserted tooth milling cutter screws on the spindle. The table is adjusted slightly off-center longitudinally, which results in a convex cut, thus providing for the desired crown on the pulley face. It is not claimed that the milling machine in this job is the equal of a special car or automatic machine designed for this purpose; the main advantage is that, in addition to the wide range of work possible on the standard miller, the use of this attachment accomplishes satisfactorily and almost automatically, this character of work which would otherwise require a more specialized and more expensive equipment. The extent of the cut and the consequent strain involved give an idea of the rigidity of the attachment.

Fig. 2 shows the attachment employed in cutting a gear, 6 pitch, 18 ins. diameter, which is far too large to swing in the dividing head. It is mounted horizontally on the attachment, and the power vertical feed on the miller is used in cutting the teeth. The worm shaft of the attachment is arranged to readily receive the index plate mechanism, as regularly furnished with dividing heads, and since the ratio of worm and worm wheel is the same as on the dividing head, the full range of divisions is obtainable. The very large diameter of the worm wheel insures the highest accuracy. This makes the circular attachment in effect a dividing head, especially valuable in cutting large diameter gears, which could not be handled easily in any other manner without the use of a specialized machine. Either of these jobs is such as might be encountered in any general repair or jobbing shop.

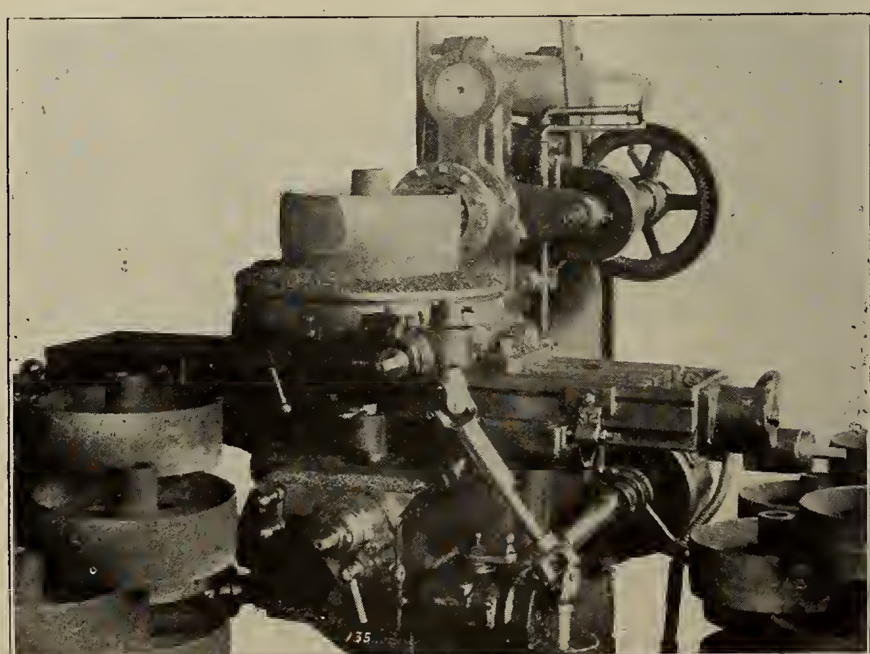


FIG. 1—MILLING FACES OF 12-IN. PULLEYS.

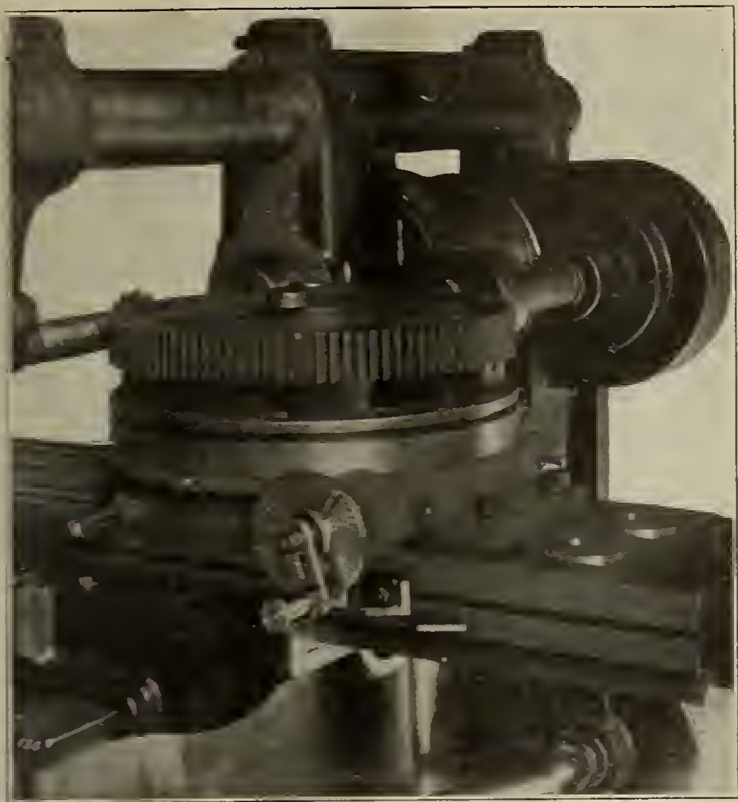


FIG. 2—CUTTING A GEAR, 6-PITCH, 18-IN. DIAMETER.

The attachment is built in two sizes, with 14-in. and 18-in. tables. The table has a solid bearing for almost its whole extent on the attachment base, and is clamped at any angle through 360 degrees through the same patent ring clamping mechanism as is used on the universal millers. The table can be released from worm wheel for quick revolving.

Personal Mention

Mr. Peter H. Peck has received a leave of absence from his position as master mechanic of the Chicago & Western Indiana Ry., which practically terminates a term of 21 years service with that company. During that time Mr. Peck has been prominent in the Western Railway Club of which he was president in 1893, and of which he has been treasurer for 12 years. He was honored with the presidency of the American Railway Master Mechanics' Association for the years 1905-6. He has been a member of the arbitration committee of the Master Car Builders' Association for the last seven years and was reappointed this year. This is an honorable record which has reflected credit upon his employers as well as himself. It is not generally known that Mr. Peck once dipped into politics a little and was mayor of the town of Brookfield, Mo., in 1886 and 1887. At that time he was division master mechanic of the Hannibal & St. Joseph Ry. He became master mechanic of the Chicago & Western Indiana in 1887.

Mr. E. F. Jones has been appointed acting master mechanic of the Chicago & Western Indiana R. R., in place of Mr. P. H. Peck, who has been granted a leave of absence.

Mr. G. H. Davis, master mechanic of the Clarendon & Pittsford R. R., has been appointed general foreman of the car department of the Wabash Pittsburg Terminal, with headquarters at Rook, Pa.

Mr. R. B. Smith has been appointed foreman of motive power and equipment of the Cincinnati, Lebanon & Northern Ry., at Rendleton, O., succeeding Mr. John Sutter, resigned.

Mr. R. E. Fulmer has been appointed master mechanic of the Trenton Gulf Ry., with office at Eros, La.

Mr. J. A. Mitchell, locomotive foreman of the Grand Trunk at Stratford, Ont., has been appointed locomotive foreman of the Grand Trunk Pacific, with office at Rivro, Man.

Mr. C. E. Gossett, master mechanic of the Chicago, Rock Island & Pacific at Armourdale, Kan., has been appointed master mechanic of the Iowa Central, succeeding T. M. Feeley, resigned.

Mr. H. E. Lind, storekeeper of the Erie at Kont, Ohio, has been appointed storekeeper at Susquehanna, Pa., succeeding T. H. Keffor, resigned to engage in other business.

Mr. L. C. Brody has been appointed roundhouse foreman of the Pennsylvania at Phillipston, Pa., succeeding F. B. McKelvy.

Mr. W. C. Hayes, superintendent of the Erie at Susquehanna, has been appointed superintendent of locomotive operation, with headquarters in New York.

Mr Henry Gardner, apprentice instructor at McKees Rocks shops at Pittsburg, Pa., has been appointed assistant superintendent of the apprentices of the New York Central Lines.

Mr. W. B. Russell, assistant superintendent of apprentices of the New York Central Lines, has resigned to become director of a new technical school, the Franklin Union, at Boston, Mass.

Mr. G. W. Taylor has resigned as division master mechanic of the Atchison, Topeka & Santa Fe Ry., at Newton, Kan., to become superintendent of motive power of the San Antonio & Aransas Pass Ry., with headquarters at San Antonio, Tex., succeeding Mr. G. W. Butcher, resigned.

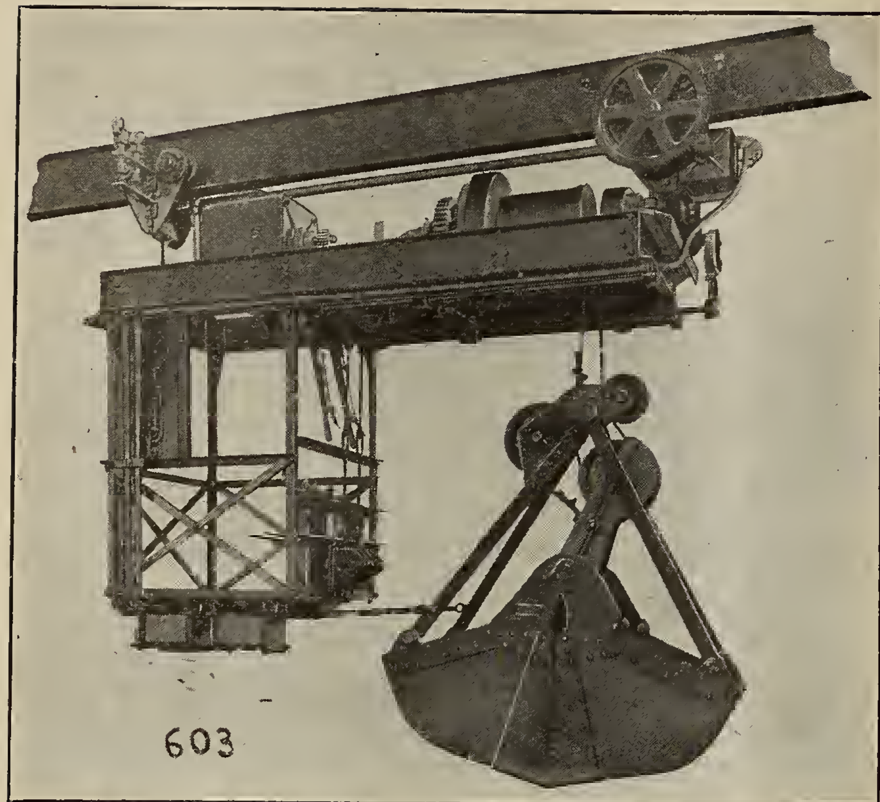
Mr. William Henry, assistant master mechanic of the St. Louis & San Francisco R. R., at Memphis, Tenn., has been appointed master mechanic, with headquarters at Sapulpa, Okla.

Mr. E. V. Lea, instructor of apprentices at the Hornell, N. Y., shops of the Erie R. R., has been appointed assistant supervisor of apprentices of the entire Erie system, with headquarters at Meadville, Pa.

Grab Bucket Mono-Rail Crane

The mono-rail crane illustrated herewith is for use on an I-beam runway and is provided with swivel trucks so as to enable it to go around a curve of short radius. It is regularly furnished with a two-line grab bucket and is very simple and durable.

Especial attention is called to the fact that both hoist and holding drums are operated by one motor, by means of friction clutches controlled from the operator's cage. The lowering of the bucket and the operations of opening and closing same are effected by gravity; this method being preferable to



GRAB BUCKET MONO-RAIL CRANE

a crane having a separate motor for the hoist and holding line, since the rotative speed of the armature of a series motor in lowering the load will not exceed twice the hoisting speed, where as with the gravity fall any speed of lowering can be attained as the motor is inoperative when the bucket is being lowered or opened. This is an important item, especially on high lifts and its virtues are apparent.

After the bucket has been lowered to the stock pile or cars the clutch is closed, after which time the clutch for the holding drum is engaged and the two are utilized for lifting the load. When the bucket has reached its highest position it is sustained by a self-lubricating mechanical brake brake of the double friction type, thus eliminating the necessity of the constant care of the operator and the liability of dropping the bucket should his attention be interrupted at any time.

In order to relieve the hoisting clutches of undue wear during the process of lowering the bucket, the hoisting drums are provided with band brakes controlled by foot levers from the operator's cage The friction clutches used for raising the load act as safety devices in case of overhoisting, since the clutches are so designed that they would slip before the stresses had reached a dangerous point.

The intermediate hoisting shaft is extended to the rear end of the operator's cage and is provided with a drum that rotates at about twice the peripheral speed of the hoisting drums. This drum has attached to it a rope which extends to the grab bucket and is used for steadying same not only while it is being elevated, but after the bucket has reached its final position and is being carried to its destination. The rope is always kept taut by means of a friction drum revolving between two discs keyed to the shaft with feather keys and held against the drum by means of spiral springs made adjustable for wear and also to vary the pressure between the friction services. The strength of the springs is such as to exert a pull on the steady rope from two hundred and fifty to three hundred pounds as the bucket is being raised or lowered.

A racking motor is attached to the driving truck and its speed is regulated by a drum type controller located in the operator's cage. The travel of the hoist may be made to suit almost any condition, but in ordinary practice a speed of from three hundred to five hundred feet per minute will be found sufficient for coal handling plants, especially where there is a curve or bend in the I-beam along the runway.

The treads of the track wheels for the driving and trailing trucks are made spherical instead of cone-shaped as is sometimes done, the object being to eliminate friction as far as possible. It is well known that a cone shaped wheel running on the lower flange of an I-beam will have rolling contact along one diameter only, while the other parts of the wheel will be in sliding contact and subject to undue wear as well as imposing an excessive load on the racking motor.

While compactness is desirable it was considered by the designer to be of secondary importance to accessibility, and although the first has been obtained satisfactorily it was at no sacrifice of the second characteristic. In fact, the result s a very creditable combination of the two features.

None of the points so far mentioned are of any greater importance than ample strength and reliability, and no hoist, however ingenious, convenient or commendable in other particulars, will be a success unless it is mechanically sound and sufficient for its work. Since a coal handling crane of this type is designed principally for light and medium loads and is intended to be operated by unskilled workmen, it must be capable of withstanding without injury larger overloads and inconsiderate handling. The design of the mono-rail hoist is claimed to be favorable to the making of all parts of unusual strength This and the making of all wearing surfaces larger than is usually considered necessary has been found possible without exceeding the dimensions and weight that is considered the standard for hoists of the same capacity. The hoist of the type shown herewith was designed to handle from twenty to thirty tons of coal per hour from a car or stock pile about one hundred and fift yfeet distant from the power house, with a vertical lift of about sixty feet.

The advantages claimed for this class of coal handling machinery are: Low cost of handling material, as only one man is used to load the bucket, carry it to its destination, empty it and return it to the point of starting; low cost of installation; a low maintenance charge on account of the small number and size of the working parts; large area served and low power consumption.

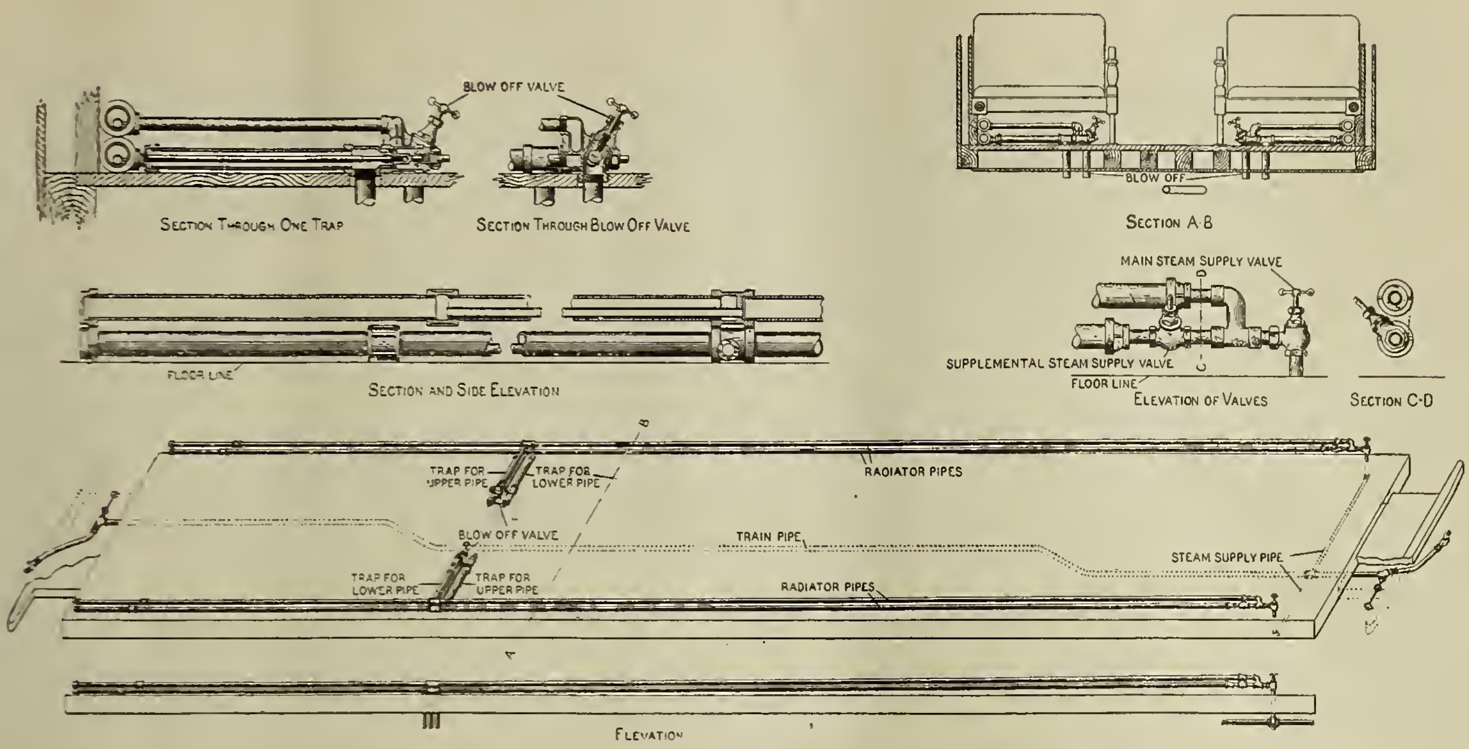
The mono-rail hoist was designed and built by the Cleveland Crane & Car Company of Wickliffe, Ohio, under the direction of Mr. Thos. B. Davis, M. E., chief engineer.

Regulating Direct Steam Heating System

A regulating system of direct steam heating has been developed by the Safety Car Heating & Lighting Company in order to carry out the desire of railroads for a steam heating system which is capable of easy adjustment to meet the varying conditions of outside temperature and, while avoiding the overheating of cars in mild weather, still insures adequate heat during extremely cold weather.

The only practicable and successful method of accomplishing this result is by so arranging the system that the amount of radiating pipe in service may be varied at will. It is not possible to secure this result by maintaining a constant radiating surface and varying the steam pressure, as there is not sufficient difference in its tendency to heat the surrounding air between a pipe containing steam at, say, 45 pounds (290 degrees Fahr) and one at two pounds pressure (218 degrees Fahr.). This allows a possible reduction in temperature of the radiating pipes of 72 degrees, or but 25 per cent. Neither can this result be accomplished by maintaining steam in the radiators at atmospheric pressure, as it is then neither possible to increase nor diminish the temperature of the radiators, and no control whatever is had of the amount of heat delivered to the car

In the "Regulating System" there is a total of four radiating pipes running the length of the car, two being located on each side of the car, and each pipe being supplied with independent admission valve and automatic trap for taking care of the water of condensation. It is thus possible to use either one, two, three or four pipes, at a time; or, considering four pipes as the maximum, to reduce the heating effect either 25, 50, or 75 per cent, as may be desired.



REGULATING DIRECT STEAM HEATING SYSTEM.

By reference to the drawing it will be seen that steam is taken from the train pipe by means of a cross, passing through a 1-in. pipe to the admission valves located on opposite sides of the car. When both valves on each side are opened wide, steam will enter both the upper and lower pipes of the system, and the maximum heating effect will be obtained. It will be noted, however, that the valve which controls the lower pipe, is arranged to be operated by a key or wrench, the object being to keep this valve closed the greater part of the time, thus avoiding overheating the car. This will also very materially assist in preventing the rear cars from being robbed of steam when first heating up long trains. In very cold weather, however, if more radiating surface is desired, the valve for lower pipe is opened on either one or both sides of the car.

It will be readily appreciated that the use of the "Regulating System" will not only result in a substantial saving in steam consumption while the car is in actual service, but will also considerably reduce the cost of keeping cars warm at terminals and yards, as ordinarily a car which is not moving and whose doors, windows and ventilators are closed may be kept sufficiently warmed by the use of but one of the four radiating pipes, with a consequent saving in the amount of steam consumed.

By reference to the cut it will be seen that at a point about two-thirds the length of the car from the steam inlet, a special 2 x 1-in. eccentric tee is located in each radiating pipe. This tee is cast with a vertical web or wall in which are two openings, one tapped with ¾-in. pipe thread and the other being a small hole for the purpose of facilitating drainage. A ¾-in. pipe which is screwed into the larger opening lays along the bottom of the 2-in. radiating pipe and extends to a coupling located a few feet from the end of the 2-in. pipe. One-inch pipes connect these special tees on each side of the car with a fitting, in which are incorporated a blow-off valve and two horizontal traps, and constructed in such a manner that each of the 1-in. pipes is independently connected through a separate passage with its corresponding trap. The blow-off valve is so arranged that it may be used to operate both the upper and lower pipes. Into the outlet of each trap and of the blow-off valve is screwed a 1½-in. drain pipe, passing down through the car floor.

In order to understand the operation of this system, suppose all valves to be closed. Now, if either of the main valves be opened, steam will enter and pass along the upper 2-in. radiating pipe on one side of the car until it reaches the special tee. It will then pass through the ¾-in. pipe (which is introduced to prevent air being pocketed in the dead end of the radiator), expand and fill the remainder of the 2-in. pipe, and pass through the 1-in. connection to the inlet of one of the automatic traps in the fitting. This trap consists of a brass pipe extending horizontally nearly to the radiator and containing a small iron rod permanently attached to one end of the brass pipe, the other end being free to slide and carrying an adjustable disc which seats against the end of the brass pipe. When the car is first put into service, this trap is opened wide and steam is allowed to blow through it until it is thoroughly hot. It is then closed by turning up the projecting stem with a key or wrench and permanently securing it by means of the locknut shown. Thereafter the trap will require no further adjustment, as, on account of the difference in contraction or expansion between the iron rod carrying the valve disc and its surrounding brass pipe, the valve will tend to open when the trap cools, or close when it becomes warmer, thus automatically allowing the water of condensation, but no steam, to pass out through the drain pipe.

It will be noted that the traps are adjusted and the entire system operated from within the car, making it unnecessary to get under the car for any purpose.

The operation of each of the other three radiating pipes is, of course, identical with that of the one referred to above, and any of the radiators may be turned on or off at will without the necessity of touching the traps or blow-off in any way.

On account of the traps being wholly within the car it is practically impossible for them to freeze; but even should either of them become frozen after steam has been cut off from the car, it could still be readily thawed out by simply turning steam on the remaining pipes.

Trade Notes

The Niles-Bement-Pond Company, 111 Broadway, New York, issued a pamphlet on Niles boring mills, which are well illustrated and described.

The Rockwell Furnace Company, New York, recently issued catalogs on their lines of melting furnaces and portable heaters. The catalogs contain illustrations, specifications and prices.

The Templeton, Kenly & Co., Ltd., of Chicago, recently issued a pamphlet, descriptive of "Simplex" jacks and including illustrations of and prices on jacks and parts thereof.

The Independent Pneumatic Tool Company, Chicago, appointed the firm of H. W. Petrie, Ltd., 131 Front street West, Toronto, Ontario, and 22 Victoria square, Montreal, Canada, and Vancouver, B. C., as exclusive agents for the sale of the "Thor" pneumatic tools and appliances in the Dominion of Canada. The company mentioned will carry a complete stock of pneumatic tools and appliances in their stores, and will therefore be able to make immediate delivery.

A new machine shop and foundry is under construction for the Goldschmidt Thermit Company, of 90 West street, New York City. The building occupies a site, 94 x 90 feet in size, just back of their present factory in Jersey City, and it is to be fitted up for the purpose of handling to better advantage, the extensive repair work which is now being carried on at these works. Traveling cranes will be provided, and no expense will be spared to make the building the most complete Thermit repair shop in the country. Special attention will be paid to the rapid execution of the repair to electric motor cases, truck frames, cast steel gear wheels, crank shafts, and, in fact, any wrought iron and steel sections not exceeding 2,000 lbs. in weight.

H. L. Mills, formerly in the sales department of the Whiting Foundry Equipment Company, has resigned to accept the presidency of the American Specialty Company, 1440 Monadnock building, Chicago, which is marketing the "Use-m-Up" drill socket.

The Michigan automatic drain valve is designed largely to eliminate the waste of oil due to former practice in draining the water from locomotive lubricators. The new oil saving device is the feature which accomplishes this end. The Michigan Lubricator Co., Detroit, Mich., is the manufacturer of the device.

A new car wheel is being tried out on the Toledo, Port Clinton & Lakeside electric road, the experimental set of four wheels having been made by the C. E. Sutton Co. of Toledo, Ohio. The wheels are in sections of five pieces—the body, the tire, the disk, the flange and the collar.

The Sargent-Hollingshead Co., 1616 Fisher building, Chicago, has been organized by two well-known railway supply men, George H. Sargent and A. G. Hollingshead. Mr. Sargent was identified with the Sargent Co., and in 1900, with Mr. Manchester, organized the Railway Appliances Co., which later became the Quincy-Manchester-Sargent Co. Mr. Hollingshead is a former railroad official and is well known through his connection with the Standard Railway Equipment Co. and the Ralston Steel Car Co. Among the specialties for which the Sargent-Hollingshead Co. is exclusive agent are the Ironclad water glass protectors and the Breakless flexible staybolts.

The Harlan & Hollingshead Corporation, Wilmington, Del., all of the stock of which is owned by the Bethlehem Steel Corporation, New York, is to build a plant in Wilmington for the manufacture of steel passenger coaches and steel freight cars. The Harlan plant will be rebuilt and enlarged.

George Wagstaff, supervisor of boilers of the New York Central & Hudson River, has resigned, to go to the Railway Materials Co., Chicago, Ill.

R. E. Masters, formerly with the Marshall Car Wheel & Foundry Co., Marshall, Tex., has been elected manager of the Houston Car Wheel & Machine Co., Houston, Tex. The latter company is the new name for the Waterman Car Wheel & Foundry Co., which recently amended its charter.

The Ralston Car Works, Omaha, Neb., is now being organized and will be incorporated during the coming week with a capital of $300,000. C. A. Ralston, of the firm of Ralston & LeBaron, Chicago, has given a contract to Fred Peterson, of Omaha, Neb., for grading the site of the proposed car shops. Work will be commenced upon the construction of the buildings as soon as the plans have been completed.

R. B. Kadish & Co., 503 Fisher building, Chicago, dealers in railroad supplies, are the Chicago representatives of the Niagara Forged Steel Co., manufacturer of improved track equipment, and the Niagara Device Co., manufacturer of Niagara paint spray, sand blast machines and car movers. In addition to these supplies the company handles general car forgings, brake-shoes, brake-shoe keys, air-brake pins and gray iron journal boxes.

F. P. Van Horne has been appointed assistant treasurer of the Pressed Steel Car Co., New York. He was formerly secretary to President Hoffstot, which position will be filled by J. H. King.

The Ostermann Manufacturing Co., West Pullman, Ill., reports that its business of freight car construction and repairing and rebuilding freight cars shows a marked improvement and that more men are now employed than at this time last year.

An attractive little booklet of envelope size entitled "Dixon's Ticonderoga Flake Graphite" has been received from the Joseph Dixon Crucible Company of Jersey City, N. J. It is printed in two colors, black and red, and this color scheme is carried out on the cover by using a black cover stock and red ink for printing the cover design which shows a title in the form of a seal. Inside the matter is arranged page for page, each page dealing with some particular phase of the graphite subject. At the bottom of the page is given "third party's testimony bearing whenever possible on the particular phase treated on that page. Anyone who is interested in machinery of any sort will probably find in this booklet some matter to interest them. It is not lengthy, quite the contrary, but some interesting and valuable information is given. Any of our readers desiring a copy of his new Dixon booklet may secure it by writing direct to the company.

The American Blower Company, Detroit, Mich., has recently issued a pamphlet which illustrates and describes the "A B C" fan system for heating and ventilating roundhouses, other shop buildings, power stations, tunnels and subways, depots and office buildings.

Richard Voges, who was connected with the Gold Car Heating & Lighting Company for many years, has resigned from that company to take a position with the Ward Equipment Company, 141 Broadway, New York, as chief inspector of materials in their car heating department.

Technical Publications

LOCOMOTIVE BRAKE EQUIPMENT. Published by the Westinghouse Traction Brake Co., Pittsburg, Pa.

The pamphlet is descriptive of the No. 12 E L Locomotive Brake Equipment and is Instruction Pamphlet No. T5037. The above mentioned equipment is an adaptation of the E T Steam Locomotive Brake Equipment to electric locomotive practice. It contains a description of the equipment and rules for operating.

HIGH SPEED DYNAMO ELECTRIC MACHINERY, by H. M. Hobart and A. G. Ellis. Published by John Wiley & Sons, New York. Cloth binding, 500 pages, 6x9 ins., illustrated. Price, $6.00.

The volume is an excellent and thorough treatise on the design of high speed dynamo electric machinery. The book has over 350 illustrations and contains specifications for about 50 designs.

The first part deals with general considerations such as design coefficients, criteria for heating and for temperature rise and materials of construction. The second part is devoted to alternating-current generators and includes chapters on the general procedure in design and factors entering into the design and construction. The third part covers the design and construction of continuous current generators.

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Loss of Bolts and Nuts

THE loss of nuts from column and oil box bolts is always a cause of anxiety because of the difficulties encountered in the prompt and effective handling of such repairs and the prevention of a continual recurrence of these losses. The absence of such nuts, of bolts and oil box covers can be observed on any train of freight cars in numbers that are surprising. To anyone who does not know how easily these nuts and bolts are displaced and how difficult it is to reach cars that are not set at the houses and repair tracks, it would appear that such repairs were not given any attention.

The continual jarring of the cars gradually loosens the nuts. To prevent this, it has been suggested that nut locks or bolts with a slit key or a wedge key be used. There are also trucks made in which the column and even the oil box bolts are eliminated, indicating a tendency toward simplicity in design.

In order to handle these repairs efficiently, several men are required at each yard. In one case two men work outside of the repair yard. handling outgoing and incoming trains, while one man works in the yard. When they replace a nut they burr the first thread back of the nut so that it does not work off. It is said that the number of oil box covers used per month was reduced from about 500 to less than 200.

As it will always be a difficult matter to make these repairs promptly and keep the freight moving, the best remedy will be in the use of nut locks or other suitable devices in order to reduce the losses. Then if the requisite number of men are employed to inspect the cars and make the necessary repairs, it may be supposed that very few trucks will be without bolts and nuts.

Output of the Machine Shop

WHILE the output of the machine shop depends upon the machines in use, the arrangement of machines, the facilities for handling material, etc., it is largely affected by the handling of the men. The man does not work automatically like the machine and for this reason he must be dealt with by a foreman who has qualified in the art of handling men.

The construction of a machine or appliance often requires more time for the hand-work than for the machine work. Therefore an increase in the efficiency of machine work does not affect the total output of the shop as much as an increase in the efficiency of the hand-work. While the facilities for carrying on the hand work must necessarily be of the best as they bear directly upon the output, it is very important that the men should be conscientious workers. In order that they may be so, they should be treated in such a manner that they respect the rights of the company and have its welfare as well as their own in mind. The most important task of the foreman and the one upon which his success depends lies therefore in his method of handling men so that there shall be no dissatisfaction among them.

A striking example is afforded in the comparison of two competing manufacturing shops. The superintendent of one shop managed to secure only a small net profit for the year and so wondered how his competitor, whose shop represented a smaller investment and whose gross earnings were therefore smaller, was able to continue his business successfully. He did not appreciate the fact that the total efficiency of the smaller shop, including machine and hand work, was considerably higher on account of the harmony between employer and employes. He forgot that there was a personal factor in successful shop operation.

It is very often said that the machinist, who has been trained in the railroad shop, can not compete successfully with the men in the manufacturing shop. In many cases this statement is true because the railroad machinist has not acquired the speed, although he may be just as expert in handling the machines.

Improvements in Machine Tool Design

THE improvements in machine tool design, which are constantly being made, present a problem in economy. This problem which must be met is the proper disposition of machine tools which are still in first-class condition but which are not capable of economical production when compared with later designs.

The capacities of machine tools are increased from time to time by various improvements in construction and operating mechanisms. The new machine tool may either cut down the time for a job or have a greater scope of operation. Then again a combination of more rapid production and of a larger number of operations is possible. The tendency is to increase the efficiency of the machine as well as the capacity.

Attachments are also made which in some cases offset the necessity of securing new tools, but such attachments and fixtures seldom obtain the results which a new design of machine tool effects, especially where a radical change in design has been made.

There are numerous shops in which a machine tool manufacturer could point out where decided changes might be made to advantage in the machine tool layout. Arguments are often very convincing because the question is sifted down to a matter of dollars and cents. At first thought economy is not always evident when machines in good condition must be replaced, but careful estimates usually indicate that the extra outlay of capital is warranted.

Co-operation between the railroad official and the manufacturer also results in devising improved machine tools. The manufacturer may then build the machine to meet the special requirements. In such cases the chances are better that the machine tool will have a life of usefulness until it is relegated to the scrap heap due to wear and tear.

The Traveling Engineers' Convention

THE sixteenth annual convention of the Traveling Engineers' Association was held at the Cadillac Hotel, Detroit, Mich. The committee reports were very explicit in outlining the duties and responsibilities of the road foreman of engine and should result in the betterment of this branch of railroading.

The first report dealt with the territory advantageously covered by a road foreman of engines and the number of engines and crews that he should have jurisdiction over. It was explained that a road foreman should be acquainted with all the engineers and firemen, riding each engine once a month, in order to secure good results. The conclusion of the committee was that a road foreman should neither be assigned more engines than he could ride once a month, nor more crews than he could supervise personally. It is evident that the efficiency of the road foreman is decreased when the territory is beyond his control. A thorough investigation along these lines with the object of regulating territories would, no doubt, result in economy of operation at the present time.

The method pursued in interesting enginemen and firemen in the progress of locomotive development was the subject of a committee report. The valve-motion model was highly recommended in that it was readily understood, proving of benefit in explaining the various functions of the valve to enginemen and particularly firemen when preparing for promotion. Colored charts are preferred instead of blueprints, because the average locomotive man cannot read the blueprint easily. The use of an old locomotive for instruction purposes would be satisfactory, but the valve model serves the purpose equally as well and besides is more easily handled and moved from place to place. Class meetings for enginemen and firemen are favored, and reading rooms are suggested as a means of interesting them. Instruction by road foremen through class meetings is not only advantageous in securing better results directly from the enginemen and firemen, but also in increasing his efficiency through a better acquaintance with the men. The class meeting also engenders ideas and makes the men think of their problems with an added interest.

Demonstrating to firemen the economical methods of firing, so as to produce more perfect combustion and creating an interest in fuel economy for all concerned was treated in another report, which is printed, in part, elsewhere in this issue. It will be noted that progress can be made in this field, only by actual demonstration, because firemen are, in most cases, adverse to reading instructions which in any case cannot be made perfectly clear to them in words. The employment of an assistant road foreman of engines, who shall give such demonstrations, is strongly advocated. A general education of all, who have to do with the handling of fuel, in the economy that can be secured, is deemed necessary to secure successful and lasting results. A definite understanding to the effect, that more efficient handling or less waste of fuel is looked for, may be the first step in securing economy in this direction.

A very commendable report was submitted on the methods to be followed by road foremen in increasing the net earnings. There were many suggestions given which road foremen would do well to keep in mind, or better, to incorporate in an individual set of rules governing their actions. Where co-operation is necessary between departments, the policy should be to make the most of it. One of the most difficult tasks for a road foreman is to instruct enginemen how to prepare intelligent reports and, while progress must be slow in this work, it will be encouraged by developing the proper consideration of reports as one of the chief duties from the standpoint of economy. If the engineman is made to see that the time and labor spent in repairs reflects upon his ability he will be more apt to give explicit reports. This report is published, in part, in this issue.

Questions were submitted to railroads operating superheated locomotives with reference mainly to operation and maintenance of superheaters, but partly to economy and construction. The report on this subject contained, besides a discussion of the replies with recommendations as to superheated locomotives, a description of the Toltz superheater. When the superheater is used, economy in coal consumption is shown and also an increase in haulage. The report shows that 594 engines are equipped with superheaters, 485 being used on the Canadian Pacific and 59 on the Atchison, Topeka & Santa Fe. The report which was presented by Max Toltz, formerly mechanical engineer of the Great Northern, is printed, in part, elsewhere in this issue. Last year's report contained descriptions of the Schmidt, Cole, Vaughan-Horsey and Baldwin superheaters.

The influence of a thorough education in producing higher efficiencies in enginemen and firemen was discussed by C. B. Conger in an individual report. The combination of a practical and theoretical education was advocated as the means. It is natural that a knowledge of the principles of design, in so far as it effects operation and construction, gives the engineman more confidence and a clearer insight into engine troubles, causes and remedies. The engineman will then be able to keep the locomotive out of the repair shop a greater length of time mainly through his more definite understanding of the causes of engine troubles and, when repairs are necessary, his report will be more exact in its recommendations. Safety is given as the first requirement and economy as the second, correct knowledge being essential to both.

In an individual report by J. A. Talty on the air pump exhaust pipe, it was stated that most railroads favor the placing of exhaust pipe in the exhaust passage of cylinders to secure a reduction in coal consumption. A 2-in. pipe from the air pump to the smoke-box with a small reservoir in the discharge pipe of the air pump is preferred by the writer of the paper. Tests have been made to confirm his opinion.

A committee report, "Terminal Tests of New Types of Locomotive Brakes To Locate Defects, and Remedies for Defects," gave instructions for testing new types of locomotive brakes before the engines leave the terminals, the Westinghouse No. 6 ET and No. 5 ET and the New York air brake being treated and fully illustrated.

An individual paper was presented by F. P. Roesch in which steam reversing gears, formerly used on the Central Railroad of New Jersey, Southern Pacific and Philadelphia & Reading, and now used on the Mallet compounds of the Great Northern, were described and illustrated.

Kirk Yard, Gary, Indiana

C., L. S. & E. Ry.

THE terminal shops of the Chicago, Lake Shore & Eastern Railway at Gary, Ind., were described in the September issue, which also contained plans for the layout and important structures. The accompanying photographs are published to show more clearly the construction adopted and the present status of the work.

The interior view of the roundhouse shows the arrangement of facilities and several important features. The brick floor with concrete pits and method of supporting the rail will be noted. Steel slips placed at intervals secure the rails directly to the concrete walls of the pit. The air, steam and water pipes are also shown. The smoke jacks are constructed with Transite asbestos plates, angles, etc., after designs furnished by the engineering department of the railroad. This material was used with the idea of preventing corrosion common to smoke jacks. The roundhouse is well lighted, the available outer wall area being fully utilized and swing sashes being used between the two sloping sections of the roof and also above the doors in the inner wall.

INTERIOR OF ROUNDHOUSE, C., L. S. & E. RY.

The car repair shop is shown in the course of erection. This shop, which covers an area of 95 ft. 10 ins. by 240 ft., will be devoted to the repair of steel car equipment. The construction of the roof with monitor windows, together with the windows in the side and end walls, affords an abundance of natural light. Besides, a concrete roofing tile with inserted panes of glass was

CAR REPAIR SHOP, C., L. S. & E. RY.

used for a section of the roof to give additional light. If the latter construction is a success, as far as freedom from breakage of glass and tile and freedom from leakage is concerned, it will be highly approved because its lighting advantages are recognized.

The coal chute, which is of frame construction, has a coal capacity of 100 tons, not including the 20 pockets. In the view the 100,000 gallon steel water tank is shown at the right. The cars are pulled up the 20 per cent incline by a cable and hoist operated by an electric motor.

COAL CHUTE AND WATER TANK, C., L. S. & E. RY.

and the coal is dumped into the large bin from which it falls into the Williams & White pockets by gravity. The tracks on either side lead directly to the roundhouse turntable and pass over the cinder pit.

The construction of the cinder pit and the arrangement of tracks is clearly shown in the accompanying photograph. The gantry crane, which travels the full length of the pit, is not shown in the view, but it will be noted how easily cars on the center track can be loaded with the clam shell buckets. Only one man is required for loading the cinder cars. An engine is shown on one of the two outer tracks, where the ash pans are dumped. The method of supporting and fastening the rails on the concrete piers is plainly shown. The side walls are sloped so as to throw the cinders toward the center of the pit.

The sand tower was constructed as shown to span one track on account of the limited space as well as a matter of convenience. Locomotives receive sand from either of the tracks on the side, these tracks leading to the roundhouse turntable. The sand is lifted into the 7 x 7½ x 20-ft. bin by air pressure.

The general arrangement of these shops and the designs of the various structures point to economy in operation. Details of construction have not been overlooked and many improved features are therefore evident.

Superheated Steam, Results from Engines in Service

A LIST of twenty-one leading questions relating partly to economy and construction, but mainly to the operation and maintenance of superheaters, were sent to all roads operating superheated locomotives, and it is gratifying to mention that with only a few exceptions full and explicit answers have been received by the committee. Accordingly it can be reported that the economy in coal consumption runs from 10 to 20 per cent, the highest being attained on Great Northern freight engines which show 20 per cent saving in coal. These figures were taken from the monthly performance sheets. The saving of water averages between 12 and 25 per cent.

*Extracts from committee report to the sixteenth annual convention of the Traveling Engineers' Association.

The superheat obtained in the smoke flue superheater ranges from 100 to 150 degrees Fahrenheit, which gives a maximum steam temperature of 500 degrees Fahrenheit in the valve chest, while in the Baldwin or Vauclain only from 30 to 50 degrees Fahrenheit are maintained with a correspondingly lower temperature of the steam in the valve chests.

The steam pressure on all superheated engines has been reduced from 20 to 45 lbs. below that of the pressure of the sister engine worked with saturated steam. In consequence the cylinders have been enlarged proportionately.

It is admitted by everyone that the superheated steam engines not alone handle trains better, and in passenger service especially, pick up the train quicker, but they can haul a better tonnage than the saturated steam engines of same size and type. The average of this increase in haulage is 10 per cent, while the maximum has been recorded to be 17 per cent.

There has been no trouble in regard to lubrication. On all superheated engines, except one, hydrostatic lubricators are used successfully, by which the oil is fed directly to the valves and to the cylinders. One engine on the New York Central is equipped with an oil pump, which is connected to and actuated by the cross-head and is reported to work satisfactorily.

The amount of valve and cylinder oil used for superheated engines is slightly more than for saturated steam engines, the average being 5 per cent, yet some of the roads claim as high as 20 per cent, but every report states that no exact figures in this respect have been recorded. Only the Santa Fe reports that the superheated locomotives show a saving over corresponding saturated steam engines in the use of valve and cylinder oil, due to reduction in amount of water of condensation in the cylinders.

On the Canadian Pacific more or less trouble has been encountered with the piston rings as well as with the valve rings, which have to be renewed almost every two months. When the piston rings were removed they were worn almost to three-eighths of an inch, but the cause of this trouble can be laid to the fact that the piston is only

CINDER PIT, C., L. S. & E. RY.

SAND TOWER, C., L. S. & E. RY.

supported by the cross-head. On the engines of the Great Northern, Northern Pacific and Burlington Roads, equipped with the German or Schmidt superheater, the piston is supported at both ends and the piston rings have not been changed for fourteen months. On the latter engines the rings for the piston valve have not shown any wear. At each end of the valve only one wide ring is used, which has several circular grooves with numerous small holes for the purpose of leading any steam that may leak through from the admission side to the back of the ring, so that it can act as a spring to give the ring a closer contact.

The large smoke flues fill up with cinders, ashes, etc., and are blown out every second or third round trip, but in some instances where very soft coal is used it was necessary to do this every round trip. The blowing out is done with air from the fire-box end. On one road, due to a certain grade of coal, clinkers were formed on the ends of the superheater elements nearest to the fire-box flue sheet. These clinkers are removed with a special tool or hook from the fire-box end. At any rate it is very important that these large smoke flues and the superheater tubes should be kept clean, so that the degree of superheat will not be decreased. On the Boston & Maine a flue blower is installed in the smoke box in connection with a Schenectady superheater, but the committee has not as yet been able to obtain the details of same.

On some engines the large smoke flues are screwed in the fire-box sheet and could not be kept tight except by rolling and expanding. In all engines equipped during the last year with smoke flue superheaters, both ends of these flues were rolled and expanded into the flue sheets and have given less trouble due to leakage than the ordinary boiler flues. The Great Northern state that the large flues act at the same time as stays and assist in preventing especially the fire-box flue sheet from bulging out.

In a few cases some of the tubes of the superheater elements have burst or split where they are connected to the U-bent castings near the fire-box. This was partly due to insufficient care having been taken in making the pipes to correct length, and partly it has been traced to using lap or butt welded tubing instead of cold drawn seamless steel tubing.

Particular attention must be paid to the connections of the superheater elements to the steam headers so as to insure perfectly tight joints, because in case of leakage not alone high costly steam is wasted, but such steam cuts grooves into the castings and makes it therefore difficult to tighten the joints, which only can be done by plugging the grooves.

Next—attention must be given to the dampers which are used in connection with the German, Schenectady or Cole and C. P. R. or Vaughan-Horsey smoke flue superheaters. They should be inspected at least once a week to see that the hinges and also the levers connected therewith have free movement. Particular care should be paid to the packing of the small steam cylinder which is located on the outside of the boiler shell and which actuates the levers and the dampers. Some of the roads have had no difficulty whatever with the dampers by using ordinary roundhouse methods.

In some instances superheater headers were broken, but it was found that it was either due to defective material or defective design.

In the Baldwin smoke box superheater the failure occurs in some of the outside superheater tubes being worn through by the cutting action of the cinders in the front end.

So far the addition of a superheater has not increased the cost of engine repairs per mile. The few mechanical defects which have been found have been remedied and it is expected that in a short time the defects in the existing types of superheaters will be practically eliminated so that the engine can go from one shopping to another without any special repairs being made to the superheater proper.

Your committee's recommendations can be summed up in the following:

1. Every traveling engineer should make himself familiar with the design and construction of the superheaters now in use on locomotives.

2. In the operation of the superheaters the following suggestions should be carried out:

(a) When working steam, open throttle valve fully and regulate with cut-off.

(b) Keep water level in boiler as low as in saturated steam engines.

(c) Ascertain that dampers (where equipped) in smoke box are working properly, also that the small steam cylinder actuating these dampers is not leaking through stuffing box.

(d) Be sure that oil is carried from lubricator to each end of valve and also to cylinder.

(e) Any leaky steam joints at cylinder or valves should be tightened, and if connections or joints of superheater proper should be found leaking, report at once at end of run.

3. The work of maintaining and taking care of the

superheater in the roundhouse is enumerated in the following:

(a) Keep all steam joints and connections of superheater, as well as cylinders and valves, tight.

(b) Piston and valve rings should have a close fit to cylinder walls and valve-bushings respectively.

(c) Clean or blow out large smoke flues whenever necessary. The more attention paid to this work the more economy will be attained with the engine.

(d) The ends of the large smoke flues which originally were screwed in the fire-box flue sheet and have given trouble by leaking, should be rolled and expanded.

(e) In renewing tubes of superheater elements, cold drawn steel tubing has been found to give satisfactory results. See that they are put in correct length, otherwise, due to contraction and expansion, the connections in the U-bent castings will work loose and leak or tubes will split.

(f) The ends of the superheater elements nearest to the firebox are supported by lugs or legs of the U-bent castings. Due to the expansion and contraction of the elements, these lugs ride or chafe the bottom of the large smoke flues. Ascertain if this riding or chafing has weakened the large tube. If so, renew the tube.

(g) Pay attention to the dampers, their lever connections and the small steam cylinder. Pack the latter one whenever necessary, as any leakage will be detrimental to operating the dampers. See that all hinges of dampers, also the lever connections, are in good working order.

(h) The lubricator should be tested whenever necessary.

(i) The injectors must be connected with saturated steam. They will not work properly with superheated steam.

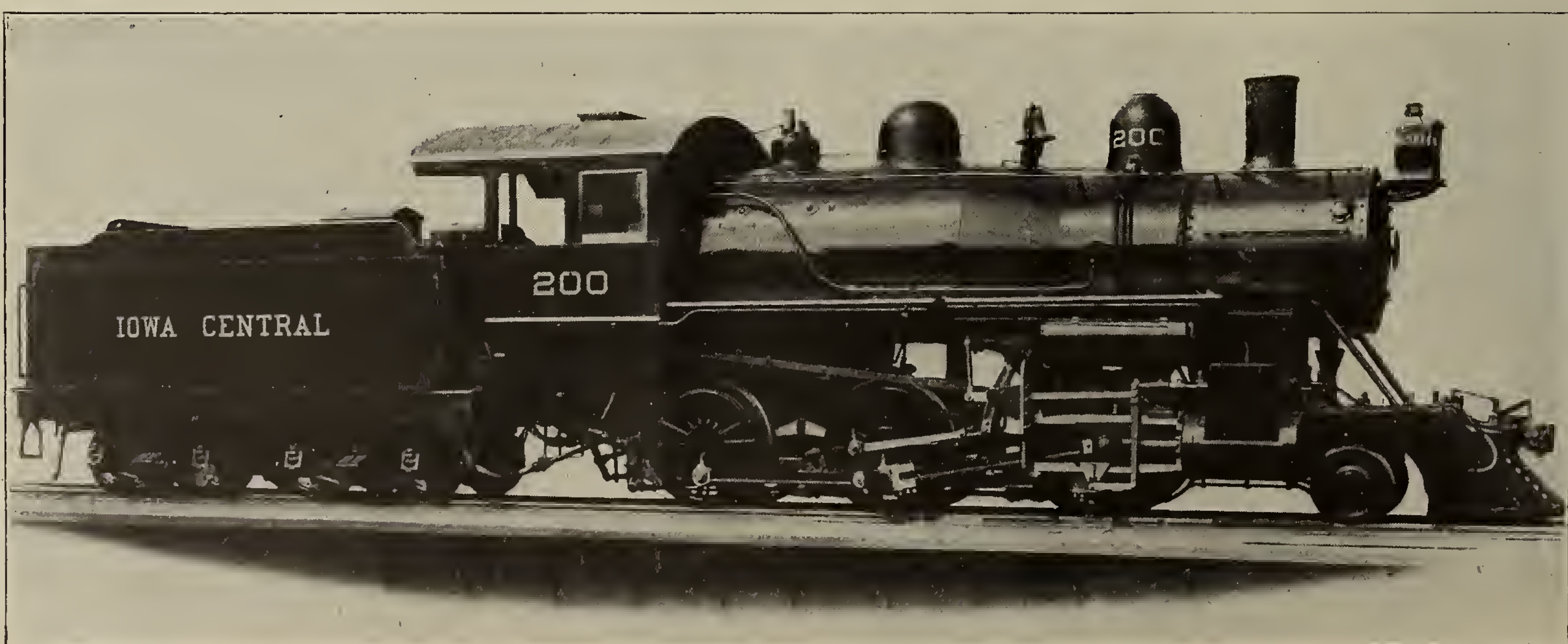
Mogul Locomotives for the Iowa Central Railway

THE Baldwin Locomotive Works have recently built six Mogul type locomotives for the Iowa Central Railway Company. These engines are designed for freight service, and exert a tractive force of 33,400 lbs. The general plans were prepared in accordance with drawings and specifications furnished by the Railway Co., although many of the details were designed by the builders.

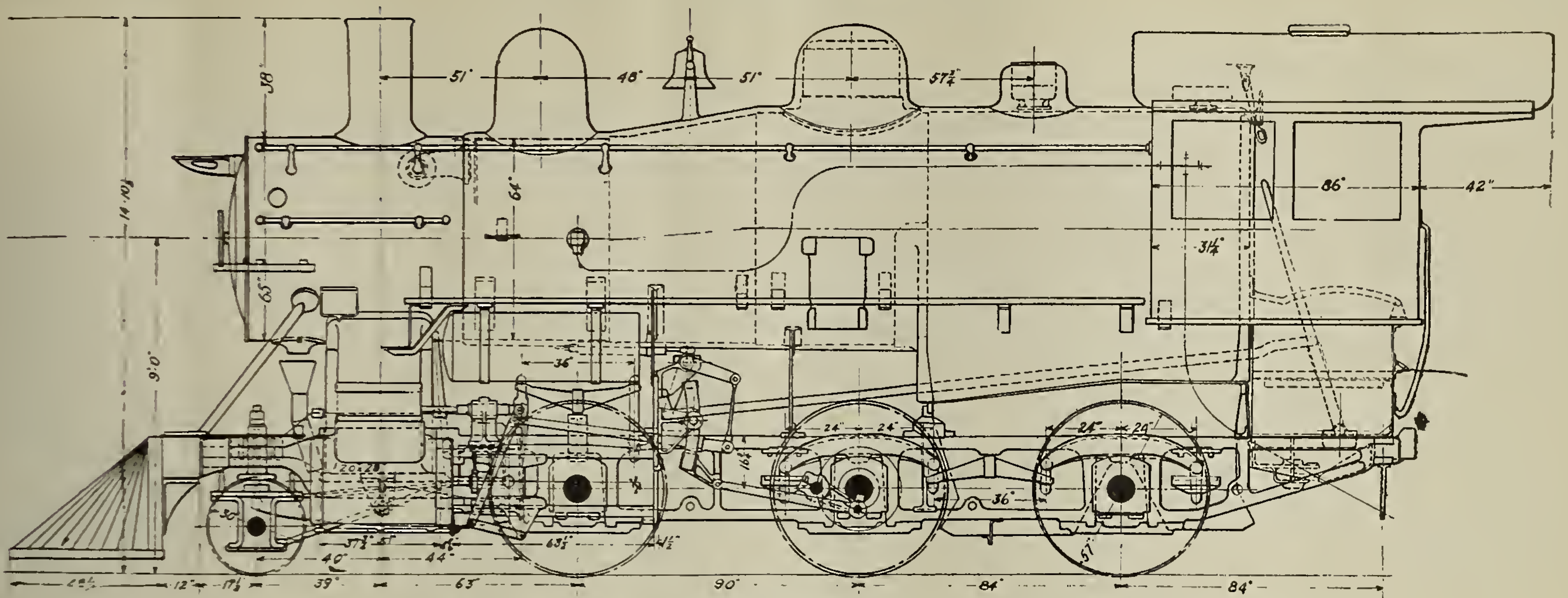
During recent years, the Mogul type has been largely superseded by locomotives having more elaborate wheel arrangements and greater steaming capacity, in proportion to their tractive force. For general freight traffic, however, where the requirements are not too exacting, this class of engine is particularly suitable, and is still performing efficient service.

The new Iowa Central locomotives are equipped with single-expansion cylinders. The steam distribution is controlled by balanced slide valves, which are driven by the Walschaerts motion. The cylinder castings are of the usual design, except that the steam chest center lines are placed 2½ inches outside the cylinder center lines. In addition to the usual cylinder cocks, a third cock is placed on each side for the purpose of draining the live steam passages.

The location of the steam chests and the spacing of the wheels on these locomotives makes possible a simple arrangement of valve action with all moving parts in practically one plane. The link bearings are bolted to the guide yoke, which also supports the reversed shaft bearings. The valve rods are coupled directly to the combining levers, and are supported by suitable bearings which are bolted to the top guide bars. Cast steel links and return cranks are used. The valves are set with a maximum travel of 5½" and a constant lead of 3/16".



MOGUL LOCOMOTIVE FOR THE IOWA CENTRAL RY.

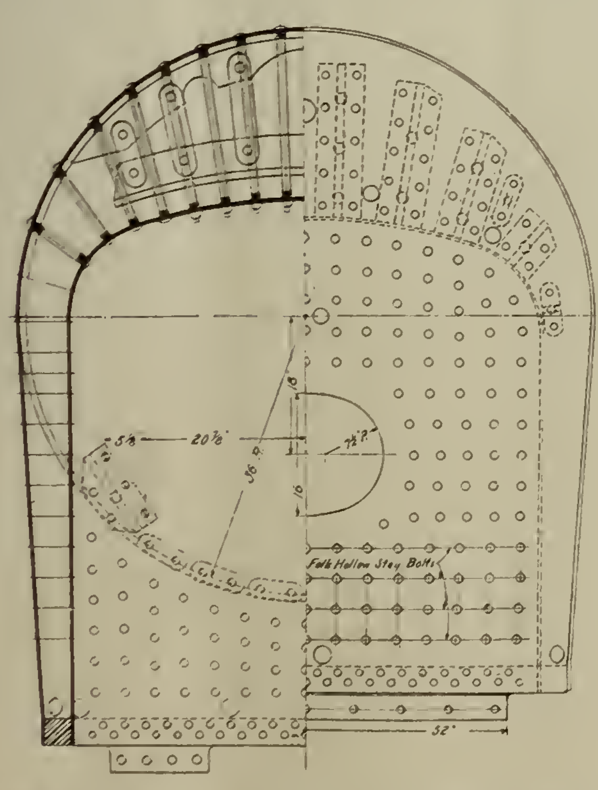


ELEVATION OF MOGUL LOCOMOTIVE, IOWA CENTRAL RY.

The guides are of hammered iron, casehardened, and the guide yoke is also of hammered iron. It is made in three pieces, the bearers for the bottom guide bars being securely bolted to the yoke proper. This form of construction has been used on a number of heavy locomotives recently built by the Baldwin Locomotive Works.

As is usual in locomotives of this type, the first pair of driving wheels is equalized with engine truck, while the loads on the main and rear driving wheels are separately equalized. The truck is equipped with "Standard" forged steel wheels, with rims three inches thick. Cast steel is used for the truck frame, main engine frames, driving wheel centers, driving boxes and crossheads.

The boiler is of the wagon-top type, with a wide firebox having a vertical throat sheet and back head. The shell construction presents no peculiar features, but the arrangement of the tubes is somewhat unusual. As shown on the boiler drawing, the tubes are arranged in vertical rows, and the horizontal spacing is used in both the front and back tube sheets.



FIREBOX OF MOGUL LOCOMOTIVE, IOWA CENTRAL RY.

The firebox is radically stayed, with two tee irons supporting the front end of the crown. The side water legs slope outward slightly as they rise. The mud ring is a steel casting, double riveted to the firebox shell, and supported on sliding shoes in front and a buckle plate at the rear. The shoes bear on a steel cross-tie which forms a substantial frame brace under the front end of the firebox.

The construction of the tender calls for no special comment. The frame is built of 13-inch steel channels, and the trucks are of the arch car type with cast steel bolsters and double elliptic springs. The tank is U-shaped, with a sloping floor in the fuel space.

The principal dimensions and specifications of these locomotives are as follows:

Type of engine	Mogul
Service	Freight
Fuel	Coal
Tractive force	33,400 lbs.
Gauge	4 ft. 8½ ins.
Cylinder	20x28 ins.
Valve gear, type	Walschaert
Valves, kind	Balanced Slide

BOILER.

Type	Wagon top
Working pressure	200 lbs.
Diameter	64 ins.
Material	Steel
Staying	Radial
Thickness of sheets	⅝, $\frac{11}{16}$, ¾ in.

FIREBOX.

Material	Steel
Length	96 ins.
Width	60 ins.
Depth, front	71 ins.
Depth, back	61½ ins.
Thickness of sheets, sides	⅜ in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, back	⅜ in.
Thickness of sheets, tube	½ in.
Water space, front	4 ins.
Water space	front, 4 ins.; sides, 3½ ins.; back, 3½ ins

TUBES.

Material	Steel
Wire gauge	No. 11
Number	318
Diameter, 2 ins.; length	12 ft. 3 ins.

HEATING SURFACE.	
Fire box	153 sq. ft.
Tubes	2,026 sq. ft.
Total	2,179 sq. ft.
Grate area	40 sq. ft.
DRIVING WHEELS.	
Diameter, outside	57 ins.
Diameter, inside	50 ins.
Journals, main, diameter and length	9x12 ins.
Journals, others, diameter and length	9x12 ins.
ENGINE TRUCK WHEELS.	
Diameter, engine truck	30 ins.
Journals, engine truck, diameter and length	6x10 ins.
WHEEL BASE.	
Driving	14 ft. 6 ins.
Rigid	14 ft. 6 ins.
Total engine	23 ft.
Total engine and tender	50 ft.
WEIGHT.	
On driving wheels	128,900 lbs.
On engine truck	26,300 lbs.
Total engine	155,200 lbs.
Total engine and tender	about 265,000 lbs.
TENDER.	
Wheels, diameter	33 ins.
Journals, diameter and length	5x9 ins.
Water, capacity	5,500 gals.
Coal, capacity	9 tons

Instructing Firemen in Methods of Locomotve Firing and Fuel Economy

KNOWING that all members are vitally interested and bending their energies in this direction, we issued the following circular letter in order to learn by what methods the best results had been or are being obtained.

1—Does your experience lead you to believe that firemen study carefully and use to advantage books and pamphlets provided them, treating of the principles of combustion and firing, or of best results in giving instruction obtained by actual demonstration made by capable and intelligent firemen?

2—Do you advocate the employment of a traveling fireman or an assistant road foreman of engines, whose duties shall be the instruction of firemen? If so, give your reasons.

3—Please state if you require firemen before starting on a run to see that all openings to ash-pans are unobstructed, in order to permit free access of air beneath the fire.

4—What are your instructions to firemen in regard to putting in coal when engine is starting train? Are your instructions that doors shall be kept closed when the engine is working hard to force the train into speed?

5—When should grates be shaken? Is it your practice to insist on grates being shaken when the engine is drifting or working steam very light, with light draft on fire?

6—Is it the practice on your road to compare the heating value of the coal used on the various divisions before comparing or criticising the performance of engine crews on a certain class of engine in different districts?

*Extracts from committee report to sixteenth annual convention of the Traveling Engineers' Association.

7—Do you instruct firemen in the functions of the various front end appliances and demonstrate their form and arrangement by actual tests?

8—Do you approve of inducing economy in fuel consumption by offering a premium on fuel saved, and if so, how is it determined, per ton mile or per engine mile?

9—From what source do you obtain firemen, and what early training do you give firemen before placing them on an engine?

10—Do you approve of student trips, and if so, how many? Are your firemen given progressive examinations?

Although our circular was gotten out rather late, we must state, in justice to the members, that their replies were very prompt and very gratifying, and we take this opportunity of returning thanks.

A synopsis of the replies received, boiled down, results in the following conclusions: That fuel economy can only be effected through education; but that this education must not be confined to simply teaching the firemen how to fire or the engineer how to work his engine economically, but must extend from the bottom to the top, that is, from the man at the mines to the highest officer of the road, so that all will know and realize the importance of the subject and by their help and cooperation assist us to bring about the desired results.

The efforts of the traveling engineer seldom extend down as far as the men at the mines and not often as high or higher than the office of the superintendent of motive power, but are confined principally to the men in the cab, and while very effective so far as they go, do not by any means accomplish all that could be, were he granted full, absolute and extensive support.

While granting that the traveling engineer is given a certain amount of support from the upper quarters, yet candor compels us to say that this support, except in a few notable instances, is of but an intermittent and perfunctory nature, and therefore as a whole not lasting and of little actual value. This, however, is not through any spirit of laxity or indifference on the part of the higher officials, but is brought about by conditions and the fact that the average official on the American railroads is saddled with so many duties or has such an extensive territory that it becomes a hard matter to give each specific duty the attention that it deserves.

With the mechanical man fuel economy is subordinated to maintenance of equipment and with the transportation man it is ranked by moving traffic, and, consequently, between the two the traveling engineer often fails to accomplish his ends simply for lack of proper support.

Fuel economy and the results that can be obtained are of sufficient moment to warrant any railroad in putting on a special man to look after this one feature alone.

Referring now to the replies received to the questions in their proper order:

1—Do firemen study? The replies would indicate that firemen as a rule do not study to advantage. The free literature distributed by the various railroad companies on the subject of fuel economy is appreciated, but the men are more inclined to absorb the information through oral instructions and practical demonstrations.

This, however, must not be taken as an argument against written or printed instructions. It simply proves the necessity of education along that line. The average fireman does not at first realize that he is simply an apprentice engineer and that when he reaches that position more will be required of him that simply 200 pounds of steam, and therefore does not care to puzzle his cranium with the problems of combustion, but takes his knowledge in the easiest form and less troublesome doses.

It has been noticed, however, that where firemen have through study mastered the principles of combustion they usually stand at the head of the list of firemen, and likewise after promotion to engineers they have learned the art of mixing brains with CO_2 in the process of combustion, and so can do their work easier and better than their less educated brothers. The habit of applying brains to their work formed when firing remains to their after-advantage as engineers. As the future fireman will use his head as much as his back, we urge that all study be encouraged and to aid him to master what to many is a difficult lesson, that teachers or instructors or demonstrators (whatever you may call them) be employed to help the willing firemen over the rough places. The unwilling man has no place on an engine.

2—Assistant road foremen. This question is closely related to the first question and is the natural sequence of the argument.

We most emphatically advocate the employment of comptent instructors, but would not call them traveling firemen, but assistant traveling engineers or assistant road foremen. He should have authority over the engineer as well as over the fireman, as without this authority, unless possessed of infinite tact, he might do more harm than good.

The assistant traveling engineer should be recruited from the ranks of engineers and should be a young, active and energetic man, one who can take the scoop when necessary and demonstrate to the fireman the correct way to handle it and get results—namely, the maximum amount of steam from the minimum amount of coal.

In addition, however, to being young and active and a first-class fireman, he should also be a first-class engineer, one who can, if necessary, demonstrate to the man on the right side of the engine how he can handle the engine to better advantage and, by so doing, help himself, the fireman and the company.

Such a man must needs have brains, but on every railroad there are many of this class, as we all know. This man would naturally fall in line for the position of traveling engineer when the latter is promoted.

He should be subordinate to the traveling engineer and should either work directly under or else in harmony with him.

3—Inspection of ash-pans, etc. Most roads require this and all intelligent firemen naturally do it. A few trips with the air openings stopped up soon convinces the fireman of the advantage of keeping them open, and the lesson once learned is not soon forgotten.

4—Instruction to fireman to keep the door closed, etc. This is another lesson that is soon taught by a little experience, but it is always advisable to teach it direct, instead of letting the fireman find it out for himself, as the opening of the door and leaving it wide open while the engine is forced to the limit in lifting the train to speed, is apt to cause other damage: leaky flues, etc. This practice should be discouraged, therefore, as it not only makes extra work for the fireman, but wastes coal and injures the boiler.

5—When should grates be shaken? This depends largely on local conditions, the nature of the coal, etc.; all are agreed, however, on the manner in which the grates should be shaken; namely, by short, quick jerks, and not a slow, rocking motion.

All are also practically unanimous that as a rule it is much better to shake the grates when the engine is drifting or working light than when being worked hard.

6—Comparison of heating value of coal. This is a refinement in comparison, men and engine efficiency that is practiced by but few roads. We recognize the fact that it is not always practical on all roads and, except for a basis of comparison, is unnecessary. We believe, however, that comparison should not be made between two different divisions, unless all conditions are exactly similar, not forgetting density of traffic.

The comparison should only be made between similar engines in the same class of service on the same divisions, but even that comparison cannot simply be made between passenger and freight, work and yard engines, on a ton-mile basis, with fairness, where regular engines are assigned to and kept, through and local passenger service. fast, slow and local freight, etc., as in that case, to be absolutely fair, comparison should be on a ton-mile-per-hour basis. Time is the one important consideration that is often lost sight of in making any comparison.

7—Instruction of firemen on front end appliances, etc. Too much information on any part of the locomotive cannot be embodied to the fireman or, for that matter, to any one else whose duties throw him in contact with engine service. Where it may not be practical to move a draft sheet up or down in order to give the fireman ocular demonstructions to its effect on the burning of the fire, yet the information to the effect and also the object of the different front end arrangements should be carefully explained, as the fireman knowing this can at once tell by the action of the draft on the fire if anything has become loosened or misplaced in the front end, in which case repairs can often be made before failure results.

8—Premiums. It is the sense of this association that monetary premiums do not have the desired effects; in fact, quite the contrary seems to be the case, as it has been found to lead more toward sharp practice on the part of the men than actual economy, and consequently the company is little if any the gainer.

It is our opinion that it is more preferable to encourage a spirit of friendly rivalry among the men and to hold out advancement and promotion as a premium, instead of a small financial remuneration. We further believe that comparison between the efficiency of engines and men should be made on a ton-mile basis between those in absolutely similar service, and a monthly bulletin posted, showing the standing of different men. This bulletin can show the standing in dollars and cents, showing how much more one man cost the company to perform a certain amount of work than another. In addition to this bulletin, however, we favor giving letters of commendation to those at the head of the list, and friendly letters of admonition to those at the foot. If it is finally found that letters of admonition have no effect on the latter, it is well to drop them from the service, as it has been found that any man who cannot be reached through his pride cannot be reached in any other manner, consequently he is unfit for railroad service.

9—Where firemen are obtained. As one of our past presidents so aptly expressed it, "You would not hesitate to pick a $20.00 gold-piece out of the mud," so it makes little difference where you get your firemen, provided they are the right material. This is governed largely by local conditions and environment. My experience has been that the best men are recruited from the rural districts. As for early training, the common practice seems to be to let the applicant make student trips on freight engines, usually without pay, with experienced firemen and continue to make these trips until competent to go alone. This is usually a good tryout, as any man who will follow a modern engine for twenty or thirty days for nothing in order to learn to fire evidently wants the job and will no doubt stick.

10—Student trips. For examination, as mentioned above, student trips appear necessary, and there should be as many as required to win the approval of the traveling engineer or, in his absence, of three competent engineers with whom the applicant has made student trips.

Progressive examinations are heartily endorsed, as they appear to be the only way in which the majority can be induced to study and perfect themselves, but also a very moral way of getting rid of undesirable men when conditions justify. In conclusion, we find the entire matters resolves into a campaign of education, and therefore every one should be encouraged to acquire knowledge.

We must not forget, however, that as a fireman becomes better educated he becomes more observant and consequently we cannot with very good grace keep hammering him to save coal, etc., while at the same time we let him see that for each scoopful he saves on the road a ton is wasted about the roundhouse and coaling stations. He will be apt to say, "Why don't you practice what you preach?" showing that there are others who need education on fuel economy besides the fireman.

Above all, however, when you find an engine crew or, in fact, any one trying hard to make a showing or a saving, don't forget to encourage them.

Art and Enterprise in Convention Exhibits

IN the earlier days of the exhibiting of railway specialties at the Master Mechanics' and Master Car Builders' Convention a borrowed table or an old box for displaying the device and a cheap sign showing the name of the manufacturer was all that was deemed necessary. What a difference between the exhibits shown in the court of Congress Hall at Saratoga and the magnificent display last June on the million dollar pier at Atlantic City!

One of the first attempts at anything in the way of artistic booths was made at Saratoga in 1901 by the Honorable George A. Post. That year the Standard Coupler Company were "at home" to their many friends and held all day receptions in a very attractive little booth in the big yard of the Grand Union. During the several years following that convention many artistic booths made their appearance.

In 1907 was inaugurated the scheme of uniform exhibits built under the direction of an architect. So suc-

McCONWAY & TORLEY BOOTH AT ATLANTIC CITY.

BETTENDORF STEEL CAR AT ATLANTIC CITY.

cessful were the uniform exhibits that the same plan was followed at our last convention of June, 1908. Probably never in the history of our convention were there so many individual artistic exhibits as were shown last June at Atlantic City.

Among these exhibits will be remembered that of the McConway & Torley Company, of Pittsburg, Pa. We reproduce herewith a photograph of their exhibit as illustrating art in exhibiting.

The photograph of the Bettendorf exhibit well illustrates enterprise in exhibiting. Art was not here considered, but there certainly was every appearance of enterprise. There on the pier, surrounded by exhibits of specialties, stood the Bettendorf steel car complete in every particular.

The value of our annual convention exhibits is unquestioned. They are valuable to both the manufacturer and to the railway official. It would seem that an exhibit should be either artistic or enterprising and the displays of both the concerns above mentioned were certainly most excellent examples of art and enterprise in convention exhibits.

Master Car Builders' Report

A CIRCULAR was issued by the secretary of the M. C. B. Association which gives a list of standing and special committees and instructions for the 1909 convention.

INSTRUCTIONS TO COMMITTEES.

In order to expedite the work of the convention of 1909, the following instructions regarding the preparation and presentation of the reports of committees were adopted by the executive committee at a meeting held in Chicago, Ill., on July 15, 1908:

1. That all active, representative and associate members of the association, immediately on receipt of this circular, transmit to the chairman of the respective committees all the information they may have on each subject, which they consider will be of assistance to the respective committees in preparing their reports.

2. That the chairmen of all standing and special committees prepare their circulars of inquiry and submit the same to the secretary for printing and issuing prior to September 1, 1908.

3. That prompt replies be made to the circulars of inquiry as issued by the different committees.

4. That the chairmen of all standing and special committees must have their reports in the office of the secretary not later than April 1, 1909, in order that the same can be printed and advance copies issued by May 1, 1909.

5. Committee reports which do not reach the secretary in time for printing and issuing by May 1, 1909, will be referred to the executive committee to decide whether the report shall be submitted to the convention.

6. That abstract only of all reports of standing and special committees be read by the chairman of same before the convention, together with whatever additional data may have been accumulated after April 1, 1909, to the date of the convention.

7. That the members of standing and special committees who may individually or collectively submit a minority report, must prepare the same so that it can be issued with the report of the majority of the committee, and substituted for the majority report in the event the convention should so decide.

8. That each member of a standing or special committee sign either the majority or minority report.

STANDING COMMITTEES.

Arbitration—J. J. Hennessey, chairman, M. C. B., C., M. & St. P. Ry., West Milwaukee, Wis.

Standards and Recommended Practice—T. S. Lloyd, chairman, S. M. P., L. & W. R. R., Scranton, Pa.

Train Brake and Signal Equipment—A. J. Cota, chairman, M. M., C., B. & Q. R. R., Chicago, Ill.

Brake-Shoe Tests—W. F. Goss, chairman, University of Illinois, Urbana, Ill.

Coupler and Draft Equipment—R. N. Durborow, chairman, S. M. P., Pennsylvania R. R., Altoona, Pa.

Rules for Loading Materials—A. Kearney, chairman, A. S. M. P., N. & W. Ry., Roanoke, Va.

Car Wheels—William Garstang, chairman, S. M. P., C., C., C. & St. L. Ry., Indianapolis, Ind.

Safety Appliances—C. A. Seley, chairman, M. E., C., R. I. & P. Ry., Chicago, Ill.

SPECIAL COMMITTEES.

Freight Car Trucks—A. Stewart, chairman, G. S. M. P., Southern Ry., Washington, D. C.

Splicing Sills—R. E. Smith, chairman, G. S. M. P., A. C. L. R. R., Wilmington, N. C.

Freight Car Repair Bills—J. F. Deems, chairman, G. S. M. P., N. Y. Central Lines, New York, N. Y.

Air Brake Hose—Le Grand Parrish, chairman, S. M. P., L. S. & M. S. Ry., Cleveland, Ohio.

Side Bearings and Center Plates—R. D. Smith, chairman, A. S. M. P., B. & A. R. R., Boston, Mass.

Painting Steel Cars—G. E. Carson, chairman, M. C. B., B. & L. E. R. R., Greenville, Pa.

Side and End Door Fixtures—C. S. Morse, chairman, M. C. B., W. & L. E. R. R., Toledo, Ohio.

Tank Cars—A. W. Gibbs, chairman, G. S. M. P., Pennsylvania R R., Altoona, Pa.

Train Pipe and Connections for Steam Heat—C. A. Schroyer, chairman, S. C. D., C. & N. W. Ry., Chicago, Ill.

Classes of Cars—J. E. Muhlfeld, chairman, G. S. M. P., B. & O. R. R., Baltimore, Md.

Salt Water Drippings from Refrigerator Cars—M. K. Barnum, chairman, Ass't to V. P., C., B. & Q. R. R., Chicago, Ill.

Revision of Constitution and By-Laws—D. F. Crawford, chairman, G. S. M. P., Pennsylvania Lines, Pittsburg, Pa.

Subjects—H. D. Taylor, chairman, S. M. P., P. & R. R. R., Reading, Pa.

Arrangements—R. F. McKenna, G. F. C. D., D., L. & W. R. R., Scranton, Pa.

*Treatment of High Speed Steel in the Smith Shop**

IN handling high-speed steel, when forging into shape for planer and lathe tools, care should be observed in the manner of heating. The steel should be allowed to heat slowly and it is necessary that the bar or the end of the piece that is being shaped should be heated to a good high heat, and then forged while good and hot. It must not be hammered when red hot because the steel will burst and crack if forged at too low a heat. In case the steel should become too cold, it will be necessary to reheat to a high temperature and then forge to a finish. When completed it is essential that the tool be laid down in some dry place to cool. When the tool has become cold, reheat the cutting part to a snow white heat. The cutting point of the tool should then be made quite cold by blowing a fan blast or dry compressed air upon it, care being exercised that only the cutting part comes in contact with the air. Make it a point always to have a good clean fire; a small coke furnace adopted for this work will give the best results for heating.

To obtain good results from the annealed steel, first remember that it should not be heated until placed in condition for hardening. To anneal this steel it is a good practice to use an iron box sufficiently large to fully accommodate the steel, placed in condition for hardening. To anneal this iron turnings, or still better, cover with hammer scale. Next place in a furnace and heat slowly to a good high red heat. Let it remain in the furnace all of twelve hours to cool. This process will assure a good soft steel for cutters, reamers and drills. It will be found that steel annealed for tools of this kind can be worked, drilled and milled into shape equally as well as any carbon steel.

These tools when finished must be heated in a clean fire or a coke furnace to the very highest point of heat necessary to give the results. Care should be taken not to destroy the point of the tool while handling it in the fire. After the tool has attained the proper heat immerse it in fish oil. When it has cooled, the tool, if it has received proper attention throughout, will be a good one. In case it should get too hard, clean the oil off nicely and draw the temper to a straw color and cool off in oil again. Large tools can be cooled under a strong compressed air blast, but in this case see that the air is dry and that there is no water in the air pipe line.

The performance of high-speed steel tools may be gaged as follows:

Planing steel locomotive frames	18	ft. per min.
Planing cast iron driving boxes, shoes, wedges, etc.	27	ft. per min.
Turning driving wheel tires	13½	ft. per min.
Turning steel engine and car axle	34	ft. per min.
Turning brass	80	ft. per min.
Turning cast iron car wheels	34	ft. per min.
Turning holes in steel flue sheet for tubes	30	ft. per min.

*Extracts from a paper by F. F. Noeffle, read before the convention of the International Railroad Master Blacksmiths' Association.

Handling Locomotive Supplies

DURING the past several months numerous articles have appeared in this paper relative to the economical handling of locomotive tools and equipment. Below are given extracts from a paper by Raffe Emerson presented before the New York Railroad Club.

Not only should all articles of the equipment be properly selected for the best service and standardized, but the tool boxes, racks, and other receptacles should be designed for accommodating each article in its proper place, according to the convenience of the enginemen, and also with the purpose of locking articles up securely yet simply, and of permitting ready and rapid inspection.

How is this standardization to take place? Of necessity it must be a gradual process—although I was once ordered to effect it if possible within two weeks on a road owning a thousand locomotives; perhaps I could do it in that time if I were given six months to prepare for the change! It must be a gradual replacing article by article, engine by engine, wherever changes are necessary to secure the better service incident to standard practice. In many cases the new standard articles need not replace the older designs that are in actual service until the latter are practically worn out or are lost. In other cases the articles in present use may be made standard without change in design. Yet, if it were necessary, there is scarcely a railroad in the United States on which the cost of these supplies in a considerable item of expense, where I would not guarantee to replace the existing equipments by a brand new and fully standardized one, and pay for the entire cost of the replacement inside of three years owing to the greater ease of supervision, and the economy. On most roads such a change could pay for itself in two years; in actual practice, where the process of standardization was a gradual one, the cost of the change would never be felt—the economies resulting from the first that supervision of the supplies was exercised being above and beyond all costs both of supervision and of new equipments, many times over.

From standardization we have drifted into supervision, which must be complete. In the first place there should be an equipment inspector, or engine supplyman, or tool checker, at every large engine house and back shop. This man should have the entire handling of all supplies that are put on engines or taken off of them, both turning at roundhouses, and passing through shops. He should check over the equipments each time the engine comes in, and again before it goes out. He should fill shortages. He should see that such damaged articles (e. g., oil cans or wrenches) as can be, are repaired. He should be a man of some experience about engine houses and engines—such as an old engineer whose eyesight may bar him from the service—and he should be paid in some proportion to the value of his services, either by raises in wages for careful and economical handling of the supplies, on a piece plan, or on an efficiency basis. I have found the latter plan preferable in practice.

His rate may amount to as much as 40 cents an hour at a large roundhouse, or in the far west. It may be as little as 15 cents an hour—but a rather higher rate will usually get a man who will save the difference many times over. If additional men are needed, as at a busy terminal, and also for night duty, they should report to the head supplyman who alone should be responsible. Helpers of this kind may even be boys, and will cost from 10 cents to 25 cents an hour.

These supplymen should have quarters fitted up for the storage of extra supplies and tools, in some cases for the repair of same, and they should be given charge of the issuing of lubricating oils as well where this can conveniently be arranged.

The supplymen or inspectors furnish the direct supervision of the engine equipments and of the issue of articles for same. They furnish to the division office, or to a central office, copies of their checking lists each day. In addition to this direct supervision, which will have very substantial results if the men are properly rewarded for their interest, there should be indirect supervision by means of records or accounts showing from day to day what new tools and supplies are issued at each place to each engineer and fireman, necessity for issue, whether old article was returned, et cetera.

One month's record of this kind will not mean much—but a six months' record will tell a very complete story as to who are the careful and efficient enginemen, especially when these records are compared with the trip checking lists before referred to. With such a record it is very easy to bring before each engineer or fireman his responsibility for carelessness, or waste, and to induce improvement of his performance either through an appeal to pride or if necessary by discipline. In those sections of the country where it is difficult to make men amenable to discipline in such relatively unimportant matters, it has even been found that the offering of financial or other inducements will more than pay in the economy and care secured.

We have now touched upon the principal considerations involved in a closer supervision of locomotive tool and supply equipments. It is almost needless to point out to railroad men that what is everybody's business—generally—becomes no one's business—specifically—, and that, to secure certain and complete results, the carrying out of the plan should be entrusted to a competent man preferably under the direction of the superintendent of motive power.

Improvements on Flat Cars

Nowhere is equipment subjected to harder usage than on the Isthmus, and as a result many improvements have been made in steam shovels, cars, and other equipment to meet the unusual conditions. Cars used with the unloading plows are an instance. The 40-ton wooden flat car is used for heavy rock transportation, and carries about 18 yards of material. Eight hundred of these cars were furnished the Commission by the American Car & Foundry Company. They were built up of two 5-in. by 9-in. center sills, four 5-in. by 9-in. intermediate sills, each about 40 ft. long and of yellow pine. These sills, were floored over with 2¾-in. planks running transversely. The car is mounted on two simplex trucks with 5-in. by 9-in. journals, with steel bolsters, and braced with six long truss rods.

The first order of cars was equipped with one 3-ft. gondola side, and one 1-ft. removable side; but before the cars were put in service the chief engineer approved a suggestion that the 1-ft. removable side be displaced by a side extension. This extension was carried on cast iron brackets bolted to the side sill, and it extended the car floor 15 ins. The utility of this change was immediately noticed in the increased capacity of the car, and in the dumping of material farther away from the tracks.

One of the largest items of upkeep on cars was the cost of renewing and repairing "aprons." Each of the flat cars carries at one end an apron 117½ ins. long and

44 ins. wide, made of ⅜-in. sheet steel, and so hinged to the car that one edge of it rests on the next car, thus covering the space between the cars in the train and making it possible to run the unloading plow the full length of the train. These aprons were continually being torn off by the plows during the unloading operations at the dumps. This trouble has been obviated by a design of apron hinge and support which brings the apron slightly below the level of the car floor and little beyond the end of the car. One end of the apron is supported by the forward car and the other rests on cast iron bracket supports bolted to the end sill of the car to which the apron is attached. The hinges were so designed that they offer no obstruction to the moving plow.

As the plow gives considerable side thrust on the gondola side of the car, a special design of high stake-pocket has been made to take up this strain and keep the sides vertical. This stake-pocket runs up on the side stakes about one foot above the sill and the thrust on the pocket is taken up by a 1-in. "U" bolt running diagonally down from the top of the pocket to the first intermediate sill. Further bracing has been added to bring the thrust on the lower part of the side sill, due to the push on the high side, across the car to the other sill.

A recent improvement is the addition of a "bull nose" to the end of a high side of the car. This "bull nose" is made of ¼-in. steel plate and is so shaped that it surrounds the entire end of the side, and guides the plow from car to car in the train. Before this devise was put on the sides of the car it was not unusual for the unloading plow to batter and break the end of a side so badly that the car would be taken out of service for repairs.—The Canal Record.

Narrow Gauge Locomotives for Heavy Service

DURING the past few years the attention of locomotive builders has been confined principally to the development of heavy standard gauge power. At the same time, the capacity of many recent narrow gauge locomotives shows a marked advance over that of similar engines built a few years ago, and the tendency to construct as powerful locomotives as physical conditions and limitations will permit, is evidenced in many narrow-gauge designs.

The accompanying illustrations represent two locomotives recently built by the Baldwin Locomotive Works, and possessing features of interest. The track gauge in each case is three feet. A description of these locomotives follows:

FOUR COUPLED LOCOMOTIVE, ILLINOIS STEEL COMPANY.

This engine is intended for heavy switching service, and was designed for height and width limits of 11 ft. and 7 ft. 1 in. respectively. The total weight in working order is 92,390 lbs., hence the average weight per wheel is about 23,000 lbs. The tractive force is 21,050 lbs., thus giving a ratio of adhesion of approximately 4.4.

The springs of this locomotive are not connected by side equalizing beams, but the engine is cross equalized in front, so that all the wheels readily find a bearing when running over uneven track. The frames are of cast steel, and are made in the form of slabs back of the rear driving-pedestals. Further cast steel details include crossheads, driving-wheel centers, driving boxes, foot plate and front bumper. A radial draw bar is provided at each end. The draw heads are cast steel of the three pocket type, with link and pin couplers.

The Laird form of guide is used on this engine. The connecting and coupling rods are rectangular in section, the connecting rods having forked end stubs at the back, while the coupling rods have solid end stubs. The slide valves are balanced and the valve motion is of the Stephenson type.

The boiler is of the straight top, radial stay type, with two rings in the barrel. The firebox overhangs the rear frames on either side, and the mud ring is carried on sliding supports at the front and back. The boiler carries a saddle tank, which is extended to the smoke box front in order to gain capacity.

The fittings include a steam brake which operates on

FOUR COUPLED LOCOMOTIVE, ILLINOIS STEEL CO.

CONSOLIDATION LOCOMOTIVE. WHITE PASS & YUKON ROUTE.

all driving-wheels. Front and back sand boxes are provided, and the bell is placed on the front bumper.

This is a powerful locomotive for its type, equaling, in weight and tractive force, many standard gauge engines. It is simple in construction, with ample strength in all parts, and is well fitted to withstand the severe service to which such locomotives are usually subjected.

CONSOLIDATION TYPE LOCOMOTIVE, WHITE PASS AND YUKON ROUTE.

Apart from its constructive details, this engine is notable as one of the heaviest 3-ft. gauge locomotives thus far completed by the builders. It is intended for service on a line having grades of 3.9 per cent and 20-degree curves, and develops a tractive force of 31,400 lbs. The design includes a smoke box superheater and an interesting application of the Walschaerts valve motion.

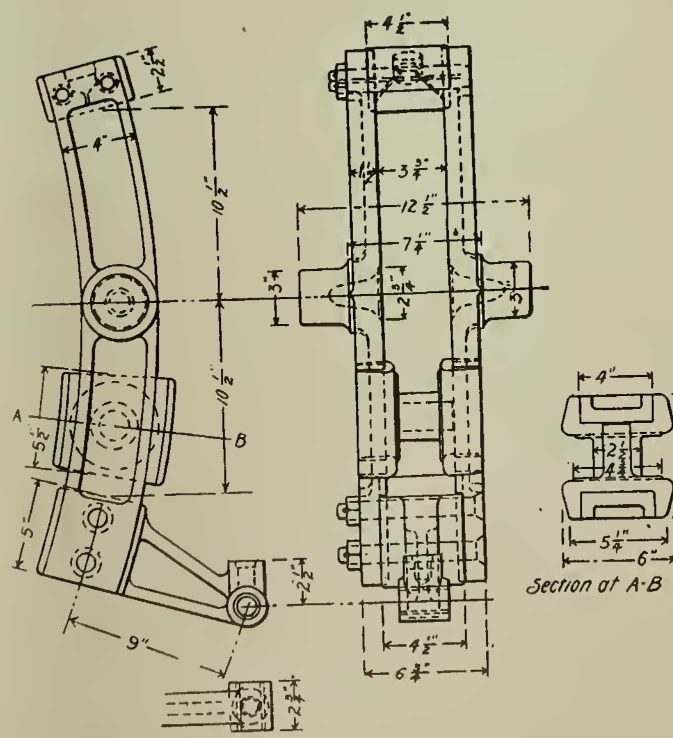
In order to provide increased stability, the frames of this locomotive are placed outside the wheels. The rear sections, which are in the form of slabs, are bolted to the main frames back of the rear driving pedestals. The firebox is placed behind the driving-wheels and between the frames, thus giving room for a deep and wide furnace, and providing sufficient grate area without an excessive overhang at the rear end.

The leading truck is provided with outside journals, and is equalized with the first and second pairs of driving-wheels. The spring rigging is simple in arrangement, as all the driving springs are placed over the boxes. The driving wheel centers are of cast steel, and the boxes are of steeled cast iron. The location of the frames necessitates the use of outside cranks, which are of steel, cast in one piece with balance weights. On the first and fourth pairs of driving-wheels these weights are cast solid, while on the second and third pairs they are cored out and filled with lead.

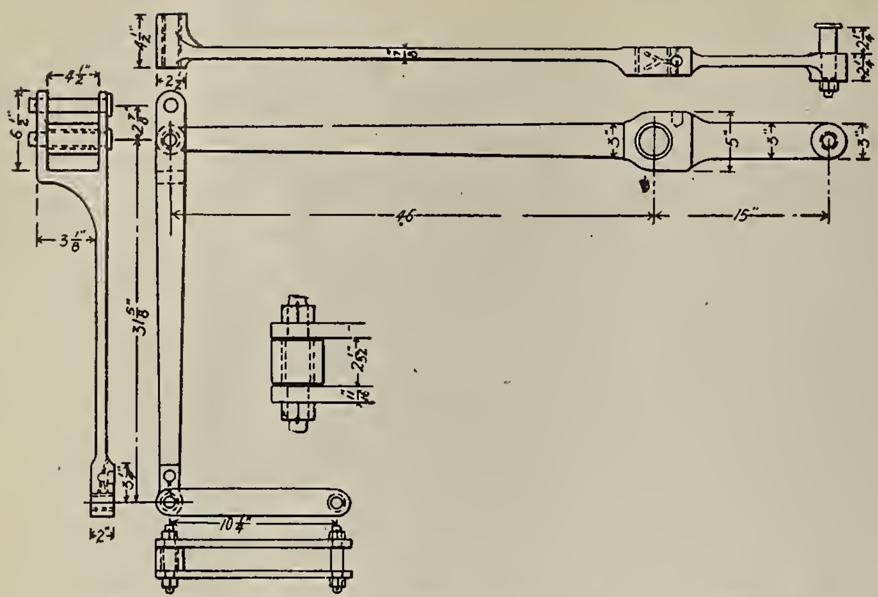
The most interesting detail of the valve motion is the link. This is a new design, and application has been made for a patent covering the same. It is built up of four steel castings, viz: two side plates and two filling pieces. Each side plate is cast in one piece with its trunion, while the lower filling piece is provided with an arm to which the eccentric rod is attached. The link block is of hard bronze and is made in two pieces. It is guided in the link by projecting lips which bear against the edges of the side plates. The two sections of the block are held together by means of lugs which are circular in section and fit one within the other, the larger being drilled out to receive the smaller. The larger lug constitutes a pin which is embraced by the radius rod. The latter passes between the side plates and is suspended at its rear end.

The link bearing is of cast steel, and is bolted to the back of the guide yoke. The link, link block and radius rod are all assembled in the bearing. The link is driven by a cast steel return crank which is clamped to the main pin and further held in place by a through bolt. The upper end of the combining lever is connected directly to the valve stem, thus placing all parts of the gear in practically one plane. The reverse shaft is placed between the second and third pairs of driving-wheels. The valves are set with a lead of ¼ in. and a maximum travel of 5¼ ins.

The boiler is of the straight top, radial stay type, with two rings in the barrel. The crown and roof sheets slope toward the rear, and the front end of the crown is supported by one inverted T-bar hung on sling stays. The fire box is carried on each side, by two expansion bearers which rest on the frames. The grate rocks in one section, and has a drop plate in front. A brick arch is provided and it is supported on studs which are screwed into the side sheets.



NEW DESIGN OF LINK, CONSOLIDATION LOCOMOTIVE.



REVERSE LINK ROD, CONSOLIDATION LOCOMOTIVE.

The superheater calls for no special comment. It is of the smoke box type as developed by the Baldwin Locomotive Works, and is similar in general design to the several examples which have been previously described and illustrated.

The tender frame is built of oak and yellow pine, and carries a U-shaped tank. The trucks are equipped with arch bar frames, double elliptic springs, cast steel bolsters and chilled cast iron wheels.

The tractive force exerted by this locomotive is equal to that of many standard gauge engines in road service, and the design probably represents the limit of capacity attainable in an eight-coupled locomotive on a line laid with 56-lb. rails.

The principal dimensions and specifications of the White Pass and Yukon Consolidation locomotive are as follows:

Type of engine	Consolidation
Service	Freight
Fuel	Soft Coal
Tractive force	31,400 lbs.
Gauge	3 ft.
Cylinders	21x22 ins.
Valve gear, type	Link
Valves, kind	Balanced
Valve travel, maximum	5¼ ins.
BOILER.	
Type	Straight
Working pressure	160 lbs.
Diameter	66 ins.
Material	Steel
Staying	Radial
FIRE BOX.	
Length	59 15/16 ins.
Width	51 ins.
Depth, Front	66½ ins.
Depth, back	60 ins.
Thickness of sheets, sides	5/16 in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, back	5/16 in.
Thickness of sheets, tube	½ in
Water space, front 3½ ins.; sides, 3 ins.; back	3 ins.
TUBES.	
Material	Iron
Wire gauge	No. 12.
Number	182
Diameter, 2¼ ins.; length	16 ft. 6 ins.
HEATING SURFACE.	
Fire box	100 sq. ft.
Tubes	1,760 sq. ft.
Total	1,860 sq. ft.
Grate area	21.2 sq. ft.
DRIVING WHEELS.	
Diameter, outside	42 ins.
Diameter, center	36 ins.
Journals	8x8 ins.
ENGINE TRUCK WHEELS.	
Diameter	26 ins.
Journals	4¼x8 ins.
WHEEL BASE.	
Driving	12 ft.
Rigid	12 ft.
Total engine	19 ft. 10 ins.
Total engine and tender	48 ft. 11 ins.
WEIGHT.	
On driving wheels	119,810 lbs.
On engine truck	14,550 lbs.
Total engine	134,360 lbs.
Total engine and tender	about 215,000 lbs.
TENDER.	
Wheels, diameter	26 ins.
Journals	4½x8 ins.
Water, capacity	4,000 gals.
Coal, capacity	4½ tons.

Increasing Net Earnings by Road Foremen of Engines

RAILROADS are dependent upon their entire organization for their revenue. The net revenue is dependent upon the combined ability of all the employes from the president to the one occupying the position relative to the least significance.

A railroad company may very justly be compared with any large manufacturer. In the mammoth organization known as the United States Steel Corporation its business is composed of two sides or units: the producing side that furnishes the manufactured product; and the sales side, the business of which is to market the finished article. The success of all manufacturing plants is dependent upon two conditions:

First, the manufacturing side must produce articles that are the equal in every respect of like articles produced by other manufacturers engaged in the same lines of business and be able to produce them at a first cost that is competitive in the open market with articles of like nature produced by the other manufacturers.

Second, the sales department must possess the capacity and ability to market the finished product at such prices above the cost of production as will leave a legitimate margin for the manufacturer. The result of the combination of the two elements as above outlined will determine whether the manufacturer continues in business or whether his business is turned over to the courts and passes into the hands of other people.

This is exactly where we stand in the railroad service, and the road foreman of engines occupies in reality an important position in the railroad organization, for there is probably no one element which enters more largely into the railroad's cost of producing what it has to sell,

*Extracts from committee report to sixteenth annual convention of the Traveling Engineers, Association.

viz., the transportation of freight and passengers, than the movement of the trains; and the cost of moving passengers per mile or the thousand tons of freight per mile is affected largely by the manner in which the power is handled, and it is largely the duty of the road foreman of engines to get out of the power the possible one hundred per cent of its revenue capacity. It is generally conceded that a freight locomotive should make an average of not less than 30,000 miles per year. We will assume that the average freight carload is twenty tons per car. Let us consider the net result to the railroad if through the careful guidance of the road foreman of engines one additional car can be added to the train. This would increase the tonnage revenue of the locomotive 600,000 tons one mile per year, and assuming the average returns to the railroad to be one-half of one cent per mile, we have increased the revenue of each locomotive $300.00 per year.

"Can't" is the unfortunate attitude of thought held by a large number of men, and all of us have met in our experience this ready "can't" each time we have presented to others some such possibility as above stated. In writing the preceding sentence I have not overlooked the fact that on some lines the tonnage question has been carried to an extreme, and that the power has been so completely overloaded that in the effort to move tonnage the reserve condition has resulted, and unfortunately on those lines two extremists have met with disastrous results to the net earnings of the railroads. One side has insisted upon the enforcement of the exaggerated idea of tonnage per train, with the result that trains actually spend more time on sidings than is required to cover the distance between terminals, and at the same time those trains consumed more time waiting for orders than the actual running time required between the terminals. In other words, more time is lost on sidings and waiting for orders twice over than is required to cover the distance between terminals, and I question the economy of such operations. But I do not justify the attitude of the other extremist who always insists upon "can't" and therefore does everything in his power to defeat the other plan by increasing the delays above stated.

In all of my railroad service, I have insisted that there is only one department on a railroad, and that is the Department of Profit and Loss, and it is therefore the sole duty of each and every officer of the railroad to let the idea of increased net profits be the mainspring of each and every act as relates to the railroad operation. Therefore there should be no opposing influence between those connected with the motive power and those who are giving their undivided time and attention to the matter of transportation. There should be no conflict between those at the head of the motive power and those at the head of transportation. There should be a close co-operation between the road foremen of engines, train masters and train dispatchers, and each should be perfectly willing at any and all times to set aside his personal opinions in deference to those of the other in an earnest effort to bring out the highest possible good for the railroad as a whole. This statement applies to each and every person in the employ of the railroad from the highest to the lowest, and working along these lines I do not hesitate to say that there are thousands of locomotives in service today that will easily handle one more car per train than they are hauling now on an average year in and year out, and if properly kept moving will handle one more train each month instead of consuming this time on side tracks. Despatch is just as valuable to the shipper as a lower freight rate, and he will always patronize the road that delivers the goods to him with the least delay.

The road foreman of engines and those whom he represents can do a great deal toward drawing the line of consistency between prudence on one hand and overloading the locomotive on the other, and in this way will be able to get the locomotives over the road with less delay and get them into terminals where they can receive proper attention in the way of necessary work and with very little delay have them ready for another successful trip, all of which proves economical in the cost of maintenance and fuel and will enable you to greatly increase the miles per locomotive in your charge.

This means more tons of freight over the road in a given time with the same number of locomotives, and less cost per ton mile. Nothing requires more careful thought and closer co-operation between the road foreman of engines and the transportation department than this one question. By taking hold of this problem with a determination to improve conditions, you can do a great deal toward solving the transportation problem and increasing the net earnings of the railroad. The road foreman of engines can do a great deal to reduce the cost of production or increase the net earnings by properly educating the men under them.

The factor of safety is of the first and greatest importance and requires constant vigilance on the part of all concerned to avoid accident to passengers and employes and damage of property; next in order of importance is economy in the use of fuel, oil and all supplies. This requires close co-operation between the road foreman of engines and the engineers and firemen and close attention to the making of steam and then avoiding its waste. The engine must be properly drafted, so it will steam well. Brick arches must be cleaned off and flues kept clean. Keep all leaks out of the firebox and plug up every other leak around the engine. I might add here that many road foremen of engines would be surprised if they knew the actual loss by leakage on the locomotive; in other words, the surplus steam the locomotive has to make in order to have the amount necessary to do the work. The outside machinery will ordinarily be inspected. The valves, cylinder packing, front end, flues and firebox do not always get tested or examined until trouble of a serious nature exists. An engine with badly worn machinery that has a good boiler and uses the steam without leaks will handle a train fairly well, although it may take a little more coal. Yet the coal is doing the business because it is getting the train over the road, while the same engine with the ordinary leaks would burn more coal and not come near doing the work. In other words, any engine with the boiler kept in good steaming condition and without steam leaks will after the first three months' service out of the shop begin to increase its superiority over its sister engine that is cared for as many locomotives are cared for today, and it will increase its superiority day by day as the time out of the shop grows longer until finally when they go to the shop the first one will still be able to do pretty fair work while the other will be, in common language, "ready for the scrap pile."

The fireman also has a very important duty to perform in connection with economy in the use of fuel. The qualifications for a good fireman are: First, intelligence; second, physical strength and endurance. In the majority of cases no large amount of strength is necessary for proper firing, in itself, and we usually find the best firemen are not those who can raise the heaviest weight, but rather the men with moderate strength and great endurance. They are the men who fire properly and keep constantly at it. The strong man who depends on strength alone will handle more coal and work harder, will be exhausted and require longer periods of rest, all because he has performed much useless labor and incidentally thrown away a large amount of valuable coal. Comparisons between the fair-sized, wiry fireman who uses his head and the strong fellow who heaves coal can be seen at almost every division point in this country, and almost invariably results in favor of the former, provided he has been given proper instruction. As far as placing the coal on the fire is concerned, it consists chiefly in convincing the men, both by sound reasoning and actual example, that it will pay, and pay well, to scatter well-broken coal in small amounts on various parts of the fire at frequent intervals of time to avoid reducing the temperature of the firebox below the igniting temperature of the gases, which would result in a waste of fuel on account of the gases passing away unburned in the form of smoke. This, of course, with the modern locomotive, means almost constant firing, but in most cases it is leisure work, and it is the way the locomotive must be fired to get the best results.

It devolves upon the road foreman of engines to get hold of the fellow with a surplus of muscle and a lack of head capacity, and lead him to a realization of the simple fact that it is what a man can do with his capacity to think that produces results rather than his muscular prowess, and through this capacity of discernment and the ability to lead others into the right way of thinking, which will of necessity bring about the right way of acting, the road foreman of engines can, in my opinion, do more to increase the net earnings of the railroad than in any other way.

Another very important item to my mind is the intelligent reporting of necessary work to be done on the locomotive, and I believe this item is the cause of one of the greatest losses to the mechanical department of a railroad. Every road foreman of engines has noticed in looking over the work book a whole page of work which either was not needed or reported in such an unintelligent manner that it would be necessary for the roundhouse force to tear the engine all to pieces in order to find out what work was necessary to be done, reporting as follows: "Examine cylinder packing," "examine air pump," "examine injectors," "engine does not steam." Such items are frequently found on the work book, not specifying any particular thing nor giving the roundhouse force any information as to where to find the trouble, thus causing a large expense for high-priced labor in finding the trouble, which could have been remedied at a small per cent of the cost if the report had been made out intelligently, so that the man doing the work could have gone directly to the job and done it. By properly educating the engineer to report his work intelligently so that no time will be lost in looking up the defects, the road foreman of engines will be able to get as good results from the engineer's report as from personal inspection.

Another item which I believe should not be lost sight of is carelessness on the part of the engineers in handling the engines in their charge. Some of them do not seem to consider it necessary to pay particular attention to keeping the sand in operation to prevent unnecessary slipping of the engine in starting a train or on a hill, nor do they always consider the amount of fuel that is unnecessarily burned by slipping of the engine. It is a frequent occurrence to find loose nuts or leaky pipes that could have been tightened by the engineer on the road if he would improve the opportunity to do a little work on the engine instead of ignoring any little jobs that could have been done by him. In fact, too many of the younger engineers are entirely helpless when it comes to doing what is considered a locomotive engineer's duties, such as keying up rods, setting up wedges and reporting work intelligently on the engine. In many instances engine failures are caused on account of the engineer or fireman not doing the right thing at the right time, and the expense of these engine failures is enormous to the railroads when it comes to figuring up for the engine and train crew and the delay to traffic.

The opportunity for the road foreman of engines to increase the net earnings is much better if he has direct charge of the men under him, and they should know that if they do not follow out his instructions they would be subject to discipline or dismissal. If the road foreman of engines must report irregularities he finds on the road to the master mechanic, it does not give him an opportunity to handle matters to the best interests of the railroad, for many times when he finds enginemen neglecting their duty, if he is not in a position to correct it right then and there, the value of his services is very much impaired by having to make a report of the conditions to the master mechanic and then have an investigation held over a matter that should have been corrected at the time of the occurrence.

The road foreman of engines should study human nature in order to know his men. He should get the men to feel that he is interested in them and get them interested in him, and he will get them interested in their work. We are all human. I have never yet met the person who did not appreciate a word of commendation. I have never yet seen a fly that did not prefer a small quantity of molasses rather than a large quantity of vinegar. By this, I do not mean that wanton disregard of regulations should be winked at or condoned, but when it is necessary to reprimand, if you will control your passions and not speak in an angry tone to the one you are called upon to discipline, but keep your self-control, recognizing that the one you are called upon to punish is like yourself a human being, and will treat him in the way you want your superior or executive officer to treat you when you make a mistake, you will get better results out of the discipline and will find that you are working directly in the line of increasing the net earnings of the railroad. Harmony has never been attained through fighting or by war in any of its modifications. Harmony is had only through gentleness and dealing justly with one another, and along the lines of doing unto others as we would be done by, and in doing this we will avoid the unjust criticism of the other person, regardless of whether that person is employed in the same branch of the railroad service as we or not, and without regard to what his vocation may be.

Non-Explosive Gasoline Tanks

RAILROAD and shop men will be interested in demonstrations recently made by the Universal Safety Tank and Can Co., of Chicago, in which were shown gasoline tanks on fire with no explosion attendant therewith. The device is intended to be applied to automobiles, launches, gasoline and oil stoves, gasoline lighting and power plants, tank cars, and in fact wherever liquid explosive is used. The business of the company is manufacturing safety cans and tanks to which is attached the company's patent non-explosive valve, making evaporation of any liquid contained in the can an impossibility. The company also manufactures safety gasoline cans for all purposes, a can which cannot possibly explode and which, if lighted, will merely burn out as a torch.

The importance of this invention cannot be overestimated when it is considered that a large proportion of the mysterious fires that destroy millions of dollars' worth of property and hundreds of human lives annually in the United States is due to evaporation of gasoline and other liquid tanks, the formation of a high explosive by admixture of the vapor with the atmosphere in inclosed spaces, and then ignition from a gas jet or a carelessly lighted match.

This is the history of so many hundreds of explosions and destructive fires annually that the insurance companies and business interests of the country generally are eager to adopt any safety contrivance that is shown to be effective. The National Board of Underwriters has recommended the invention and sanctioned its use.

The effectiveness of the non-explosive tank was very strikingly demonstrated, for it burned up and fell apart, after the heat surrounding it had forced open the patent valve and burned all the gasoline.

The Non-Explosive Can Company has charge of the sales of these cans and devices, attachments for storage tanks, tank cars, etc. Any information will be furnished by Mr. Allan F. McIntyre, manager railroad department, 522 Monadnock block, Chicago.

FILLING TANKS THROUGH A FLAME.

Briquets for Fuel

The report of Consul I. A. Manning on the use of briquets for fuel in South and Central America is given in the consular reports as follows:

The Cartagena (Colombia) Railway, which has generally used American coal for fuel in its engines and in the shops, has recently placed an order in England for a thousand tons of briquets, and they are expected to arrive soon. In discussing the matter of fuel with the manager of the railway, he says their turning to the use of briquets is because of the greater economy of the latter over loose coal. He says briquets are more easily fired, and that it is possible to maintain a more steady flame, and therefore a more even temperature, in the firebox, and that briquets have many advantages over ordinary coal.

Briquets are being imported into several places in South and Central America from England, and at Port

Limon, Costa Rica, in June a British ship lay at the pier unloading briquets.

I understand the manufacture of briquets in the United States is limited, but if there is going to be a foreign demand for them the coal interests of the United States should try and meet the demand.

Locomotive Development in the Far East

There has lately been introduced into service on the Peking-Hankow Railway, a system with more than 800 miles of 4 ft. 8½-in. gauge, controlled by the Imperial Chinese Railway Administration—a special type of articulated 0-6-2 :2-6-0 tank locomotive. This locomotive follows closely the design of the articulated engines introduced some years ago by Mons. du Bousquet, the chief mechanical engineer of the Nord of France Railway, for working the heavy coal traffic from the Lens coal basin, in which service they have proved to be eminently successful. The engine is of the four-cylinder compound pattern, and in addition to having six coupled wheels each bogie is fitted with a pair of carrying wheels in front of the cylinders. The coupled wheels have each a diameter of 4 ft. 9¼ ins. and the carrying wheels a diameter of 2 ft. 9½ ins. The high-pressure cylinders, which are 15¾ ins. by 26¾ ins., drive the rear bogie, whilst the low-pressure cylinders, which are 24¾ ins. by 26¾ ins., actuate the front bogie, but when a large tractive effort is necessary, each pair of cylinders can receive live steam, thereby very materially increasing the tractive force of the machine. The boiler and side tanks, etc., are carried on a main underframe, which, in turn, rests upon the bogie frames. Steam passes from the boiler to a rotatable joint at the back of the firebox, and from this joint a separate steam pipe supplies steam to each high-pressure cylinder. In order that the front bogie may be sufficiently loaded, a portion of the water tanks is arranged on this bogie—sufficient space being allowed between the boiler and the tanks to admit of the angular movement of the front bogie. The front tanks have a capacity of 1,980 gallons of water, whilst the remainder of the water tanks, which are arranged on either side of the firebox and are supported by the central girder, have a carrying capacity of 836 gallons. The boiler of the locomotives for the Peking-Hankow Railway follows somewhat the standard pattern used on the famous de Glehn compound express passenger engines of the Nord of France line, although it has an increased grate area, and is provided with somewhat longer tubes than is ordinarily the case. The boiler barrel has a length of 15 ft. 10¼ ins. and a diameter of 4 ft. 9¼ ins. whilst its center line is "pitched" no less than 9 ft. 2¼ ins. above rail level. The total heating surface is 2,632.06 sq. ft. to which the tubes (130 in number and of the "Serve" pattern) contribute 2,503.3 sq. ft. and the firebox the remaining 129.06 sq. ft. The grate area is 32.29 sq. ft. and the working pressure of the boiler 214.7 lbs. per sq. in. In working order the engine weighs 102 tons, although the maximum load on any pair of wheels is only 15 tons. The engine was built by the Societe Anooyme des Forges, Usines et Fonderies, de et a Haine-St.-Pierre, of Belgium.—Indian Engraving.

A New Type of Bolt Cutter Die Head

THIS machine, and especially the die head, has been designed to meet the demands for a bolt cutter for high speed work and one that will give accurate results as well as admit of flexible rake in the die, accommodating the die to the various kinds of material that come up in daily practice.

The head is made entirely of steel, the heavier parts being made from cast steel, spindles from high grade machinery steel, and the smaller parts from tool steel. All the main bearing parts are hardened and ground and all interchange readily. The die head is symmetrical, very compact, and all parts are easily accessible. The die locks within the head and the yoke is not relied upon to hold the die closed while cutting or for carrying any of the cutting strain. In fact, the yoke plays freely and is not locked at all. This makes it very simple for attaching to other makes of machines as well as requiring much less attention along the line of adjusting than is required by the average die head.

The line cut, showing a cross section of the head, shows a section on AOB passing through one of the spindles, I, to which the chaser holder is securely clamped and which carries the greater part of the cutting strain. These spindles are ground and have very long bearings. The same section shows one of the large cone pins, J, which moves longitudinally with ring F, and works in hardened bushings in ring C to rotate same, which opens and closes the die.

Spring K engages the chaser holders and gives quick and positive opening to the die and at all times takes up the back-lash that might possibly occur from slight wear. This spring is made with one coil so as to give it a uniform tension in its different positions.

As shown in drawing of locking device, to open the head, ring G moves back, raising the locking latches from behind their hardened seats, when the springs quickly open the die, and when the die is closed it is positively locked and there is no possible strain on the yoke.

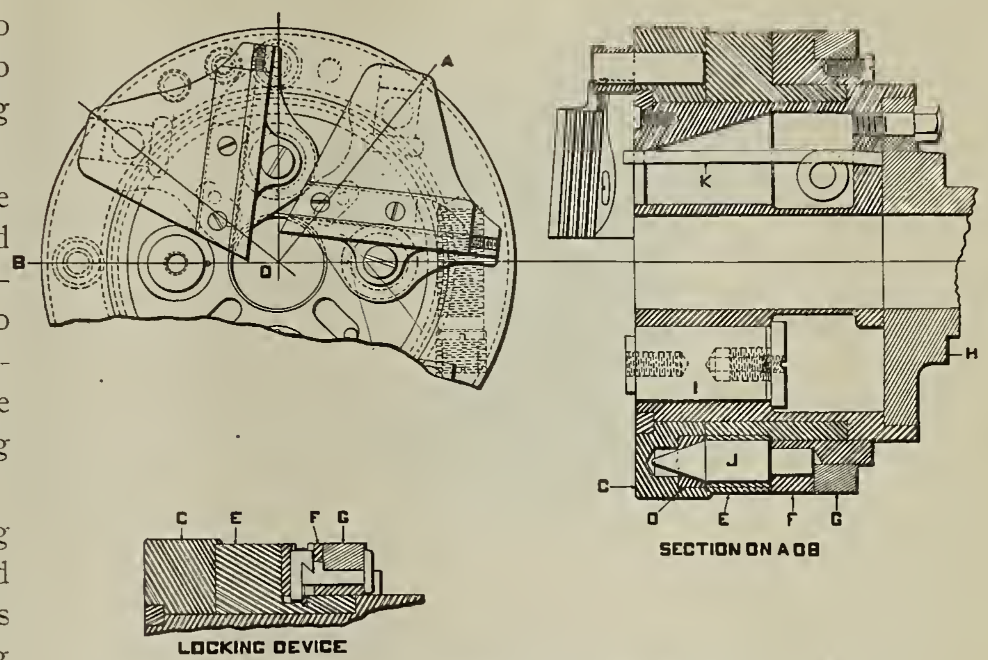
The tangent adjusting screw engages the head body proper and is located in ring E. Graduations on rear of head determine setting positions for different diameters.

DIE HEAD.

Spindle H of the machine proper is fitted into the head in such a manner as to make a rigid job and avoid any possibility of the head working loose from the spindle.

The vertical pin in the locking device with the angle head drops in behind a hardened plate and is held there by a flat spring in ring G. In opening, the ring carrying the horizontal pin starts to move back, raising the vertical pin until it unhooks behind the hardened plate and the die quickly opens. There are two of these locking pins located on opposite sides of the head.

Spindle I acts only as a support to carrying the cutting strain of the die. The die is opened and closed through the actuating of ring C. This ring is in turn operated by cone pins J, one being located on each side of the head. When this ring rotates the sliding shoe in the chaser holder moves the chaser holder back or forth as its periphery, causing the die to open and close from a central point.



SECTIONAL VIEW OF LANDIS ALL STEEL DIE HEAD, SHOWING LOCKING MECHANISM, ETC.

The holders carrying the dies are also made of steel. The cut shows one of these holders with chaser in position and the small hook gauge used for determining the correct cutting position of the chasers after grinding same. The chaser is supported close up to the cutting point and is backed in such manner as to prevent any canting or becoming bell mouthed.

A clamping bar engages dove-tailed slot in the back of the chaser in such a manner as to draw it down and back at the same time by means of the two screws shown on the face of the chaser holder. Chaser is also supported on the rear by a screw which helps hold it in correct cutting position. By means of this screw the chaser can be set forward as fast as worn or ground off.

Any rake can be given the dies in grinding that may be desired to suit the kind of material you may wish to cut. This rake can readily be ground to get a rolling chip at all times the same as would be procured from a lathe tool. This flexible rake makes it easy to acquire the highest possible cutting speeds that can be had from any die, as the cutting clearance in the die is correct and there is no possible drag in the die.

The bevel on the chaser, as shown in the cut, forms the throat of the die, and no grinding is ever done on this bevel at all. The depth of the throat can be made to suit special requirements, where it is necessary to cut close to shoulders or heads of bolts. You can cut just as close to shoulder when the die is almost worn out as when it is new.

Chasers are hard their entire length and to resharpen means a simple grinding operation, which grinding is at all times done on the ends of the chasers. Very many grindings can be had on one set of dies before they are too short to hold.

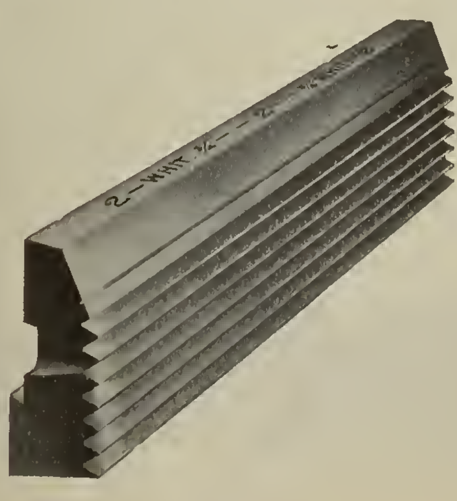
These dies can be made especially to advantage from high speed steel, as they never require to be annealed, hobbed or retempered, thus eliminating much of the annoyance common in the hobbed die.

Another feature of especial value in this die to which attention has been previously called is the fact that the back teeth can not shave the thread, but the back teeth of the four chasers act as a lead nut to draw the work in correct to the pitch of the die, and if required special dies will be furnished with a fine degree of accuracy.

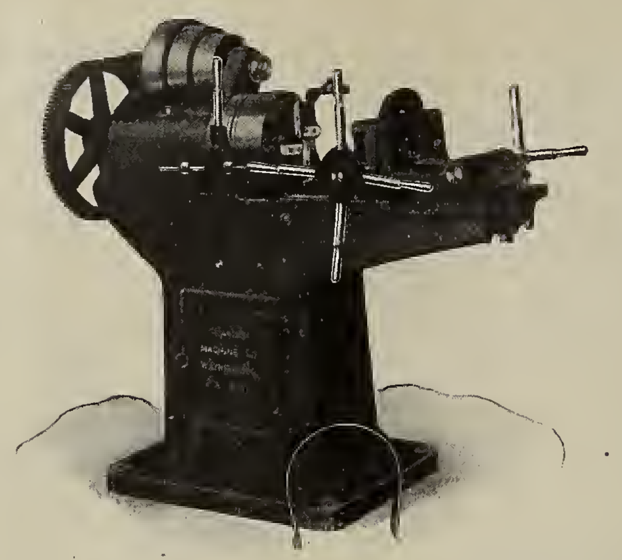
With this die cutting speeds have been procured more than 100 per cent in advance of the ordinary hobbed die due to the fact that the die has correct cutting clearance, flexible rake, and does not have any drag, giving the most ideal cutting conditions that can be had on any tool.

The die is opened and closed in much the same manner as in all ordinary bolt cutters, either by hand or the movement of the carriage. The carriage has special ad-

DIE HOLDER WITH CHASER IN POSITION AND HOOK GAUGE FOR SETTING CHASER.



CHASER.



BOLT CUTTER WITH ALL STEEL DIE HEAD.

vantages of adjustment, either up or down or sidewise. It is gibbed to the bed in such a manner that it can be readily adjusted to compensate for any wear that may occur. The vise has guides centralized over the bolt being cut, with clamping screws immediately below, thus eliminating side thrust. The rack is central of the machine and immediately below the line of the bolt being threaded, and the grips provided with the machine can be turned four ways for holding different sizes or shapes of stock.

The main spindle of the machine is so arranged that any oil running in through the head can not run out on the floor in the rear, but will pass back into the oil tank again.

All machines are provided with rotary oil pumps with spring release valve. When desired, tap chucks can be put on the heads in place of dies to form chucks for holding taps, and one set of chucks will cover the entire range of the machine and can be adjusted in the same manner that you adjust the head and set the dies to different sizes. It is not necessary to stop the machine to take a nut tap out or put one in again.

These machines are built by the Landis Machine Co., Waynesboro, Pa., in single, double or triple heads, with either belt or motor attachments. The same type of die is also used by these people in their pipe threading machines.

The Hackett High Speed Drill

SIMPLICITY, economy and durability is represented in the Hackett drill, which is now being manufactured by the Hackett High Speed Drill Company, of 90 West street, New York. Like most of the best inventions, it not only possesses a great deal of original merit but also retains the advantages of drills now in use. It is made of one piece with a skeletonized cylindrical design and is claimed to save 50 per cent of the steel and reduce the machining to simply cleaning a few ounces of material off the edge of the blank from which the drill is twisted, thereby leaving the skin of the forging intact.

An elimination of temperature strains, which are responsible for the breakage of so many high speed drills, is accomplished by the use of a uniform section from point to tang, a fact which very largely accounts for the great strength this type of drill possesses.

On account of the fact that all drill presses, air motors, ratchets and nearly all turning and boring machines are equipped with Morse taper shanks, it was recognized by the inventor that a skeletonized cylindrical design was necessary to satisfy this very important condition. It is moreover so generally conceded that a taper shank is the only way that perfect alignment can be secured, without which it becomes necessary to stop the machine in order to get the point of the drill into the centre punch hole. This stopping and starting results in an intolerable waste of time.

It is further more true that the Morse taper shank permits of the greatest ease of insertion and removal that is possible to be secured. This becomes especially important when we stop to consider that it only requires about 15 seconds to drill an inch with this tool. The time required to change a drill under these conditions becomes of the utmost importance and instead of requiring a small per cent of the time consumed in drilling, it frequently requires several hundred per cent more time to make the change than it does to make the hole.

This skeletonized cylindrical design diffuses the tough, especially hammered, surface into its general skeleton structure which increases in stiffness and strength as it enters the shank, thereby securing a uniform distribution of the vibration and not permitting it to localize in the shank where the maximum bending moment occurs, but permits the drill to bond in a manner not unlike a leaf spring. This prevents the possibility of crystallization, which is a result of local vibration.

It is apparent that two forces act upon a drill in service, one torsional and the other longitudinal, due to the feed. This drill is designed in such a way as to have the spiral fall on the resultant of these two forces and in this way the steel is placed in compression, thus affording maximum strength. It is further evident that the corkscrew action of the spiral shank tends very strongly to force itself tightly into the socket, thereby securing a firm fit, a feature that is much talked about but very seldom exists in the ordinary solid shank where a slight rupture of either shank or socket will destroy the fit, throwing all the strain on the tang, and thereby twisting it off.

HACKETT HIGH SPEED DRILL.

It will further be observed in this connection that as the torsional stress is applied to this drill, the shank being softer, has a tendency to untwist, thereby creating an expansive effect which also contributes to the securing of a tight fit and takes the strain off the tang. The tang of the Hackett drill stands in a braced position similar to that of the shank, and the undisturbed hammered surface of the steel is retained, adding greatly to its toughness and strength, a characteristic which is carefully preserved throughout the drill. The combination of a tightly fitting shank and braced tang of high speed steel with its enormous strength practically eliminates twisting off this portion of the drill and chewing up of the socket.

Face Grinding Machine

THE grinder, illustrated herewith, is designed for grinding lathe and planer tools, for edge grinding and squaring up ends of work, and for the general miscellaneous small jobs of grinding in the tool room and in the shop.

One of the novel features of this machine is the provision for use of a diamond for truing up both the face and the periphery of the wheel.

A straight edge or surface on tools and a straight face on the edges of work is much easier and more accurately obtained by using the face of the wheel, provided that face be straight and the wheel be of suitable character. Such a face can not be obtained with an emery wheel dresser nor can the diameter of the wheel be kept true with a dresser.

FACE GRINDING MACHINE.

Recognizing these facts the manufacturers of this tool have provided a work table located in front of and extending by the edge of the wheel, so that both the face and edge of the wheel can be used for grinding. This table is located in a guide carried by a transversely swinging arm, and in the end of the arm a longitudinally adjustable diamond holder is located; normally the table can be either clamped to prevent any transverse rocking movement or adjusted to allow a certain amount of such movement, as is often an advantage in grinding wide work; when the surface of a wheel becomes dull or untrue an adjustable stop below the table is moved out of its path and the table swung backward away from the wheel, at the same time swinging the diamond across the face of the wheel so as to give the latter a good cutting and a straight surface.

The table is also slidable longitudinally of the machine in the guide and is provided with a threaded hole to receive the diamond holder, which may be transferred to this hole and the edge of the wheel trued off by sliding the table in its guide. The table guide is pivoted in the diamond carrying arm and can be set by means of graduations and clamped at any angle with the face of the wheel up to 45 degs. Upon the table is also provided an adjustable squaring device or protractor which may be set from 90 degs. to 45 degs. with the surface of the wheel.

The diamond holder may be quickly transferred from one end of the machine to the other and with a little care the diamond will last indefinitely. The wheel spindle of this machine is hardened and runs in adjustable bronze boxes. The wheels used are 12 ins. in diameter by 1½ ins. thickness and are recessed. A water tank of ample capacity is provided for cooling work, located convenient to the operator. This machine is manufactured by the Emmert Mfg. Co., Waynesboro, Pa.

*Methods of Welding Flues, Meadville Boiler Shop**

AT the Meadville boiler shops the process of welding and handling flues is as follows: The flues are sent from the machine shop to the flue rattlers, which are just outside of the shop. Four men handle them on a three-wheeled cart of our own design. About one hundred and fifty flues are put in each rattler and allowed to remain for nearly ten hours. Our next operation is to cut off the ragged end, this is done cold, by a cutter revolving on the flue. We then heat the end to be welded in the furnace, and, when hot, it is brought out and jammed on a mandrel which flares it out. The new end is placed on the mandrel and the flue is jammed onto it, we then take a welding heat and finish the work with a rotary welding machine having a speed of 230 revolutions per minute. While still hot the flue is swedged.

The furnaces we use are of our own design and construction, each furnace having three parts for heating

*Extracts from a paper by Joseph Northend, read before the convention of the International Railroad Master Blacksmiths' Association.

purposes and each part just large enough to heat one flue. We use oil for fuel and direct blast on the furnaces.

Our swedging machine is also of our own design and construction. It is operated by an air cylinder, the piston of which is connected to the upper die, the lower die being stationary. There is a hole in each die of the size to which the flue is to be swedged and by stepping on a foot lever the upper die closes down tight on the lower one, thus squeezing the flue.

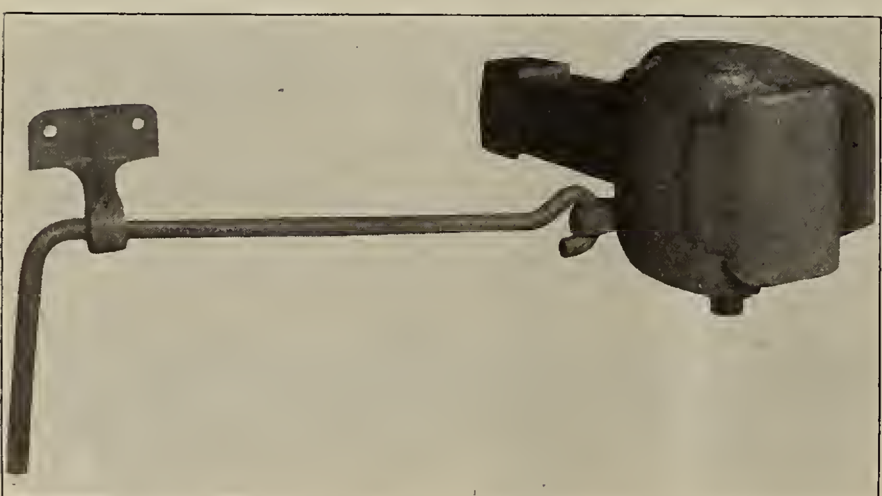
The new ends which we use are beveled and we are now constructing a machine which will grind these ends immediately before being used. Although we have not used it, we think it will help us materially in the welding.

We pay $2.10 per hundred for swedging and welding 2¼-in. flues, while the 3-in. size costs us $2.45 per hundred.

Gould Coupler

A great many persons are at present considering the advisability of having a coupler that can be operated from the side in preference to the present overhead uncoupling shaft and chain.

In view of the above, the Gould Coupler Company has recently brought out a coupler to meet the requirements of a side operated coupler. The accompanying cut shows their arrangement of a coupler which is operated by a side uncoupling lever, attached directly to the lock operating shaft. This coupler as shown only has the shaft on one side of the head. They are developing a coupler of this type having the lock shaft arranged so that an uncoupling lever can be used on both sides of the head. This arrangement is undoubtedly a very simple one, doing away with the uncoupling chain, clevises and pins, which are a continual source of annoyance when not properly taken care of. A coupler arranged in this manner has a closed head at the top which excludes coal cinders and sand from entering the head freely from the top. They make this coupler with various sizes and shapes of shanks to meet the present requirements. This coupler has been in service for some time and given entire satisfaction as to its operation. tI cannot unlock in service by the creeping of the lock, nor will the swing of the uncoupling lever move the lock so that the coupler will uncouple. This is the main feature and advantage of the arrangement of this coupler over others operated in a similar manner.



GOULD COUPLER FOR SIDE UNCOUPLING LEVER.

They also manufacture a coupler with a side lever pull, but do not advocate its use where the couplers have free side movement or the movement that has been found at the present time to be necessary.

Electric Traction vs. Steam Railroad Operation

SOME idea of the development of electric railways in this country can be gained from some figures recently published with reference to the business in the United States. From this publication I learn as follows:

There are in the United States 1,238 electric railway companies with a total mileage in 1907 of 38,812 miles, operating 68,636 electrically equipped cars, sweepers and locomotives, with a total of all other cars of 17,568, making a grand total car equipment on these railways of 86,204, with a total capital stock of $2,251,525,882.00. You will therefore gain from these figures some idea of the extent to which the electric traction business has been pursued in the United States alone, and in all probability it will continue in the next few years to increase very much more rapidly than in the past.

Within recent years there has been quite a tendency among steam railroads to electrify a part of their systems and substitute electricity for steam as a motive power. It may be interesting to note that many of these heavy traction lines are using steam and electricity over the same tracks, and still in the progress of installing electric rolling stock, have the following equipment:

Baltimore & Ohio R. R., 8 electric locomotives.

Erie R. R., Rochester, N. Y., 6 motor cars.

Long Island R. R., Long Island City, N. Y., 219 motor cars.

N. Y.. C. & H. R. R., 35 electric locomotives, 125 motor cars, 55 trail cars.

New York, New Haven & Hartford R. R., 35 electric locomotives.

West Jersey & Sea Shore R. R., 87 motor cars.

You will see from this that there is a very decided indication that electricity will be used in the operation of at least a portion of our steam railroad lines for which it is best suited, and the experience so far, particularly in operating trains in and out of the Grand Central depot in New York, has demonstrated that this service can be made very satisfactory, indeed, although it is quite likely that the development of a few years may very materially improve upon the class of electric locomotives now used in that service.

I am not one of those, however, who is disposed to view with alarm the rapid growth of the use of electricity on our steam railroads as affecting the position of the loco-

*Extracts from a paper by W. H. Evans presented before the Central Railway Club.

motive engineer, as I am quite certain that his services will be required for many years to come in the handling of through trunk line business, both passenger and freight, on most of our larger systems of railroads. However, the electric locomotives require a man of almost exactly the same training and certainly the rigid schooling of the locomotive engineer would be most valuable in the operation and running of electric locomotives. My experience with that class of men is that they most readily adapt themselves and acquire knowledge of any new system of machinery and shortly become thoroughly familiar with its operation. It must be acknowledged that after all the most important schooling of a locomotive engineer, whether electric or steam, is in the use of mature good judgment in starting, operating, running and stopping the machine, according to the fixed schedules and in compliance with the standard code of rules for signals and railroad operation with the greatest safety and protection of life and property. This applies almost equally as well to the motormen on interurban lines where they frequently run on public highways as well as upon private rights of way, and I am frank to say that among the best motormen whom I have ever known were men who previously had locomotive experience on steam railroads.

The operation of electrical equipment while radically different in its detail, necessarily consists in many of its essential features of very similar operation to those of steam railroads. While the electric locomotive engineer may not be bothered about his coal pile or his tank of water, he will have other equally interesting and equally important features of the electric locomotive to fully occupy his mind and which call for his best efforts. For illustration: The matter of lubrication is one which is almost identical in both machines, and the steam engineer's experience will stand him well in hand when he comes to operate electrically. Likewise his knowledge of railroad affairs in many other respects will be of valuable assistance. While it is of course essential that the motorman have a reasonably good understanding of the machine, I am not one of those who consider it essential that in order to properly operate an electric car or an electric locomotive it is absolutely necessary to be thoroughly familiar with all the detail construction of the machine. I am not sure but this applies in some instances quite as well to engineers of steam locomotives, and, no doubt, each of you can recall notable cases in your recollection of successful runners who made little or no pretension to being familiar with the mechanical detail of the steam locomotive.

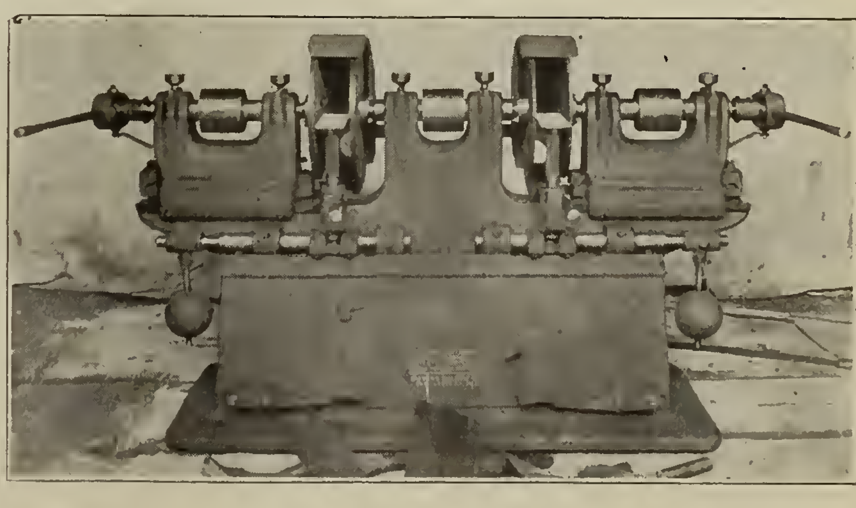
There is one feature of electric railway operation which I regret to say has not been developed to that extent to which I would like to see it, and that is in the character of men who are depended upon to make repairs to the electric car or locomotive, who for want of a better name might be called "electric car smiths." The character of the work is such that it does not require regular machinists or regular electricians, but rather a general handy man who has some knowledge of the character of the electrical equipment, and how it should be properly connected and put together, as well as to have good mechanical ideas for the general operation and maintenance of the machines. While parts of the work can be specialized and given over to certain particular men especially schooled, in the very nature of the case, a man who works around an electric car must have a general knowledge of all the operating parts, both mechanically and electrically. So far this character of work has not appealed particularly to bright young American men on account of the disagreeable features connected with it, and it has therefore been necessary to depend largely upon the better class of the laboring element who are schooled as best they can to perform routine duties of caring for electric car equipment without having any thorough understanding of the "whys" and "wherefores" which cause the troyuble and make repairs necessary.

This appears to be a most inviting field for ambitious young men to take up and thoroughly familiarize themselves with. The detail of the electric traction car in all its varied features, in order that they can be in a position to locate and detect trouble and intelligently recommend a remedy for the trouble. Do not conclude at once that this is a very simple and easy proposition as you must recall that the electric car contains and has the faculty of acquiring all of the troubles and possibly many more which steam railroad men have been contending with for years, in the way of body and truck construction, all of which is entirely outside of and separate from the electrical equipment of the car.

New Disc Grinder

THE disc grinder, which is illustrated, is a new machine built by the Diamond Machine Company, Providence, R. I. While the new machine was originally designed and is shown as a regular disc grinder, a chuck with emery ring may be used so that grinding may be done. If it is found necessary, one set of chucks can be used on one end of the machine for roughing work and finishing can be done between a pair of discs at the other end of the machine.

The machine is especially adapted for grinding, in two stages, work having parallel sides or sides at a slight angle. One pair of discs does the roughing, and the



NEW DISC GRINDER.

other pair the finishing. In this case, two operators are necessary.

Both sliding tables swivel, and can be clamped at any angle up to 10 degrees. This allows slight angles to be ground at one setting. Either head can be slid back to accommodate work of any length up to 12 ins., or be removed entirely to convert one side of the machine into a single-end grinder. The discs can be brought up by hand or foot power, or by both at once. The foot power can be left off, if necessary, but it does not interfere with the regular hand operating device. The tables are counterweighted, which makes the operator's work very easy.

The regular equipment of this machine consists of eight 18-in. steel discs, twenty-four assorted emery circles, one disc cutter, one cementing press, three steel wrenches, two dust exhaust hoods, eight work tables, and one double drum countershaft to run 540 r. p. m.

*Welding Locomotive Frames**

On the Pittsburg & Lake Erie R. R. we repair some of the engine frames as many others do at this time, without removing them from the engine and, as far as appearance of the completed job superficially would indicate, we have very good results in the heating. I do not say that we weld these frames for, like Mr. Uren, I do not consider that such an operation, made without a lap of some kind, deserves the name weld. In fact this butting of frames is simply a burlesque on proper welding. I have satisfied myself as to the virtue of this so-called weld by making several of the same in the shop, granting them many advantages that cannot be offered on an engine, and found that they would invariably separate, showing very little resistance to a light crosswise blow under a small steam hammer. The breaks would show that a union of the metal had been effected, but would also show a very feeble tenacity; yet, knowing these facts, we are very much in favor of repairing frames this way wherever it is possible to spread the frame and take the heat, as it frequently keeps the engine in service until its time comes for general repairs, and this means quite a saving to our companies.

We have what we think are splendid burners, and build a very satisfactory furnace with standard size fire brick. Mr. Shoenberger, foreman blacksmith, in the Ft. Wayne shop at Pittsburg, kindly furnished me the original design for both of them. I build the furnace with the bottom incline as shown in blue print, making it about 1 in. lower at its center than at the fuel holes at the ends. Have also added a small slag hole at the center near the bottom, so the slag will not gather and be blown up against the frame. We use two burners to this furnace, and crude and carbon oil as fuel, and take a very slow heat. The bottom, inclined as mentioned, helps to prevent the wasting of bottom side of the frame and gives the heat a start to return over the top of the frame and out the peep hole. When the heat is complete the furnace is pushed away into the pit and the work completed with light sledges.

I do not approve of making the side V weld under a heavy steam hammer without using a channel tool. The work will be satisfactorily performed, however, if done under a small steam hammer with light blows, or with heavy sledges. In this case the laid in piece should not be made with the overhang cut too close to the frame. Side heats should be drawn well up to the point of the V piece, and this stock driven back into the weld, at the same time a lap being formed where it is much needed, that is, at the ends of weld on the top and bottom of the frame.

If the side V weld is made in a frame under a heavy steam hammer there should be a heavy channel tool placed on top. This tool should be 8 ins. wide, 2½ ins. deep and ½ in. longer in the crown, and ¾ ins. longer at the mouth than the cross section of the frame, that it may release readily. It will shear off the extra stock, prevent the laid in piece from lengthening endwise, will drive it back into the weld, thus forcing it against the walls of the V, and lengthen the lap lengthwise the frame. A second heat should be taken on the laps, in order that there may be no hole or opening at the points of the weld. This is not only the most convenient weld to make in repairing frames but it is the best.

We sometimes make in front sections of frames and in large hammer piston rods, what we call a lap and V weld; we flatten the end of each piece nearly one third, make the lap and weld as shown in blue print, then drive back the end of the laps and lay in a V; this insures a solid center and a solid side opposite each V. It also throws the laid in pieces about 6 ins. apart. This weld will elongate evenly when being reduced and will not slip or shear as the ordinary lap or V-weld will.

*Extracts from a paper by A. W. McCaslin, read before the convention of the International Railroad Master Blacksmiths' Association.

A New Foundry

The Standard Metal & Manufacturing Company, Chicago, have recently moved into their new foundry at 8-10 South Canal street. The Company is only a few years old, but has grown very rapidly since its organization and now enjoys a large and continually increasing business. Their specialties are car journals, car brasses, locomotive brasses, brass castings, bronze castings, Babbitt metals and stick brass, which are used by many of the leading railroads and car lines of the country.

The new foundry of the Company is a most modern and up-to-date plant for the economical production of its specialties. About 10,000 square feet is devoted to the moulding, casting and finishing department. The melting equipment consists of four modern Fisher fuel oil burning furnaces, two of which are class "D" and two class "C" furnaces. The daily capacity is five tons of copper and about 1,000 journal bearings per day can be run out. In the white metal department the capacity is ten tons per day.

DONALD C. BARBEE, PRESIDENT OF THE STANDARD METAL & MFG. CO.

The foundry is located in the heart of the shipping district so that handling and shipping facilities are the best. Altogether the foundry and its equipment is one of the most modern in the country.

Mr. Donald C. Barbee, the president and founder of the Company, is a hustling young Chicago business man, a product of the west, and has made rapid strides in the race for success in the railway supply business. He has made hosts of friends among railway officials of the many roads which are his customers on account of his pleasing personality and his ability to get out and hustle. Aside from this, however, he has succeeded in putting on the market a line of car journals and metals that have stood the severe tests of railroad requirements and have given general satisfaction. There is probably no line of business in the railway supply line that has shown a greater or more rapid growth in the last two years than that of the Standard Metal & Manufacturing Co.

Personal Mention

Mr. C. J. Heaslely has been appointed master mechanic of the Missouri Pacific system at Ferriday, La., vice Mr. J. Schumacher, resigned.

Mr. W. L. Tracy, division master mechanic of the Louisville & Nashville R. R., at Louisville, Ky., has resigned to become assistant superintendent of machinery of the Missouri Pacific Ry., with headquarters at Kansas City, Mo.

Mr. A. H. Gairns has been appointed master mechanic of the Oregon Short Line at Pocatello, Idaho, succeeding Henry Carrick, assigned to other duties.

Mr. Frank Howard has resigned as general foreman in the car department on the Eastern division of the Wabash. Mr. Howard began railroad work in 1869 as car builder for the Missouri, Kansas & Texas; he later became general foreman of the same road and from 1879 to 1881 was master car builder of the Denver & Rio Grande. From 1881 to 1884 he was master car builder of the Northern Pacific, and from 1884 to 1885 was master car builder of the Texas & Pacific. Since 1885 he has been at the head of the car department of the Wabash.

Mr. David Patterson has been appointed master mechanic of the Kansas & Oklahoma division of the Kansas City, Mexico & Orient, and J. S. Hardie has been appointed general foreman of the car department, both with headquarters at Fairview, Okla.

Mr. J. J. Sullivan, master mechanic of the Louisville & Nashville at Louisville, Ky., has been transferred as master mechanic to New Decatur, Ala., succeeding H. C. May, who was transferred as master mechanic to Louisville.

Mr. H. C. May has been appointed master mechanic of the Louisville & Nashville at South Louisville, Ky., succeeding W. L. Tracy, resigned.

Mr. James Martin, master mechanic of the Liberty-White Railroad, has resigned.

Mr. A. J. Barragar has been appointed storekeeper of the Texas Midland R. R., at Terrill, Tex., succeeding Mr. Dan Quill, resigned.

Mr. C. H. Osborn, master mechanic of the Chicago & Northwestern at Baraboo, Wis., has been appointed assistant superintendent of the car department, with office at Chicago.

Mr. John Schrader, night car foreman of the New York Central & Hudson River, has been appointed general car foreman of the car department, Mott Haven yards, New York.

Mr. W. J. Hoskin, master mechanic of the Chicago Great Western at Des Moines, Iowa, has been appointed master mechanic of the Chicago & Alton, with headquarters at Bloomington, Ill.

Trade Notes

Adreon Manufacturing Company, of St. Louis, announce the formation of their company by E. L. Adreon, Jr., D. R. Niederlander and Wm. Miller for the purpose of manufacturing and selling railway supplies. The home office of the company will be in the Security building, St. Louis, and Mr. Miller, vice-president, will have charge of the Chicago office at 300 Western Union building. The company will represent in the Southwest the American Brake Shoe & Fdy. Co., Steel Car Forge Co., Pittsburg Lamp, Brass & Glass Co. and Acme Pipe Clamp Co., and will manufacture on their own account the Campbell Graphite Lubricator, Security Bell Ringer, Security Back-up Valve, Security Rail Brace and Tie Plate and American Gravity Coupling for locomotive tenders.

Gustav Wiedeke & Co., Dayton, Ohio, manufacturers of boilermakers' railway and shipbuilders' tools, issued a calendar "She's a Daisy" which is helpful to boilermakers and will be sent upon request.

The Watkins Machine & Foundry Company of Hattiesburg, Miss., has secured a contract for the repair work on 900 cars of the New Orleans & Northeastern Railway.

Announcement is made by the National Battery Co., of Buffalo, that the receivership under which this company has been operating since last February was terminated August 19. All claims against the National Battery Company have been settled and the entire property has been restored to the stockholders. It is also stated that full control of the reorganized company has been secured by The Cutler-Hammer

Manufacturing Company, of Milwaukee, well known as makers of battery charging rheostats and other electric controlling devices. The plant of the National Battery Company will remain at Buffalo, but the business will be conducted under new management and with ample capital.

John F. Allen, 370-372 Gerard avenue, New York, builder of portable pneumatic riveting machines, reports a recent sale through their Paris agents, Fenwick, Freres & Company, of one Allen jaw riveter, 25-in. reach, 15½-in. gap, 10-in. cyl., to Stussi & Zweifel, Milan, Italy. Other recent sales were made to the American Steel Company of Cuba, the Ansonia Copper Company of Matanzas, and the Krajewski-Pesant Company of Havana.

The board of directors of the Locomotive Appliance Company, Chicago, held the first regular meeting on September 8, and the following officers were elected for the ensuing year: C. A. Thompson, president; Ira B. Kegler, first vice-president; H. S. Gray, second vice-president; Willis C. Squire, third vice-president and treasurer; W. H. England, secretary and assistant treasurer, and E. H. Allfree, mechanical engineer.

Mr. Frank T. Hyndman, formerly mechanical superintendent of the New York, New Haven & Hartford Railroad, has been appointed eastern railroad representative of S. F. Bowser & Company, Inc., of Fort Wayne, Ind., manufacturers of oil storage systems. Mr. Hyndman takes the place of William A. Pitcher, who met his death May 3 last, in the Aveline Hotel fire at Fort Wayne. His experience and extensive acquaintance among railroad men will no doubt serve Mr. Hyndman well in his new capacity.

The Alliance Machine Co., Alliance, Ohio, has a large order for electric traveling cranes for the Gary, Ind., plant of the United States Steel Corporation. There will be 17 cranes, as follows: Two 75-ton patented ladle cranes of 75 tons capacity each; three 50-ton cranes; one 40-ton crane; three 20-ton cranes; three 15-ton cranes; three 10-ton cranes, and two 5-ton cranes. The company has also received orders recently for about 25 cranes for miscellaneous uses.

The Cleveland Crane & Car Company, Wickliffe, O., has opened a Chicago office at 1203 Marquette building, with W. A. Rider in charge.

D. W. Anderson, recently of Pittsburg, has been appointed local manager of the Oswego, N. Y., plant of the Railway Steel-Spring Company. W. J. Golden, former manager, will be transferred to one of the company's other plants.

Robert M. Burns & Company, Railway Exchange, Chicago, have for sale 50 flat bottom gondola cars, 80,000 lbs. capacity, and 50 drop botton gondola cars, 80,000 lbs. capacity. They also are offering a number of rebuilt box and flat cars, 34 ft. long, 50,000 lbs. capacity, and 35 ft. long, 60,000 lbs. capacity.

The Pacific Malleable Castings Company, Riverside, Cal., will make malleable iron and malleable steel castings, but at the beginning will confine itself to the smaller classes of work. The company is erecting two buildings 60x200 ft. and a pattern shop 30x60 ft. The pattern shop will be in operation by January 1. William F. Kerr, who was employed for twelve years by the Chistle Moore Company, Cleveland, Ohio, is manager.

The National Appliance Company, Chicago, has been incorporated with a capital stock of $5,000 to deal in railroad specialties. The incorporators are: C. C. Murphy, B. D. Jones and E. C. F. Meier.

S. E. Gutterridge has been elected president of the Republic Railway Appliance Company, St. Louis, Mo.

The address of the southern representative of the Buckeye Steel Castings Co., Columbus, Ohio, has been changed from 305 Peters building to 835 Equitable building, Atlanta, Ga.

The seats to be used in the 650 cars for the Chicago Railways Company will be made by the Hale & Kilburn Manufacturing Company, Philadelphia, Pa.

The William J. Smith Company, New Haven, Conn., has appointed Fred Ward & Son, Inc., First and Howard streets, San Francisco, Cal., as its Pacific Coast agent for the sale of Smith one-lock adjustable reamers.

The Draper Manufacturing Company, Port Huron, Mich., has recently sold pneumatic flue welders to the Grand Trunk Pacific, at Rhea, Man.; the Idaho & Washington Northern, at Spirit Lake, Idaho; the Lima Locomotive & Machine Co., Lima, Ohio; the American Locomotive Company, at Dunkirk, N. Y., and three machines to the New York Central & Hudson River.

The American Blower Company, Detroit, Mich., reports the following list of the most important contracts and orders received from September 1 to date: Forced draft equipment, Ault & Wiborg, Cincinnati, Ohio; forced draft equipment, Hocking Valley Railroad, South Shops, Columbus, Ohio; forced draft equipment, W. W. Rice Leather Company, Petoskey, Mich.; salt dryer, Worcester Salt Company, Ecorse Mich.; round house heating, Northern Pacific Railroad, Paradise, Mont.; brick dryer, Berlin Heights (Ohio) Brick and Tile Company; forced draft equipment, Empress Hotel, Victoria, B. C.; round house heating equipment, N. Y. C. & H. R. R. R., Avis, Pa.; heating and ventilating apparatus, Western State Normal School, Kalamazoo, Mich.; electric light plant, G. Roene, Douglas, Alaska; soap dryer, Summit City Soap Company, Ft. Wayne, Ind.; special gas exhauster, Lincoln (Neb.) Gas & Electric Light Company; ventilating apparatus, First Baptist Church, Dallas, Texas; moist air dry kiln, Flint (Mich.) Body Company; forced draft apparatus, Garfield (Utah) Smelting Company; forced draft equipment, White Haven (Pa.) Sanitarium; heating and ventilating paper mill, four sets of apparatus, Anglo Newfoundland Development Company, Grand Falls, Newfoundland; heating and ventilating apparatus, M. E. Church, Philadelphia; heating and ventilating apparatus, Philips (Wis.) School; forced draft equipment, Medfield (Mass.) Insane Asylum; heating and ventilating equipment; Eastern Michigan Asylum, Pontiac, Mich.; heating and ventilating apparatus, Abington (Pa.) School; heating and ventilating apparatus, Crystal Springs Bleachery Company, Chickamauga, Ga.; heating and ventilating apparatus, High School, Sistersville, W. Va.; forced draft apparatus, Gluck Realty Company, Niagara Falls, N. Y.; ventilating apparatus, Carnegie Science Hall, Wittenberg College, Springfield, Ohio; forced draft apparatus, Central Union Gas Company; heating and ventilating apparatus, Ford City (Pa.) High School; heating and ventilating equipment, Celluloid Company, Newark, N. J., (Evans-Admirall Company, contractors); heating and ventilating apparatus, Dollar Savings Bank, Youngstown, O.; ventilating apparatus, La Porte (Ind.) County Jail; ventilating apparatus, Tuscon High School; ship ventilation and induced draft, Collingwood (Ont.) Shipbuilding Company; heating and ventilating apparatus, State Homeopathic Hospital for the Insane, Allentown, Pa.; heating and ventilating apparatus, Mahoning County Court House, Youngstown, O.

The Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, recently made a large shipment of Falls Hollow staybolt iron to the Great Southern of Spain Railroad Company, also to the Australian Government Railways, Brisbane, Australia, the Payta-Piura Railway, Payta, Peru, and the Western Railway of Havana, Havana, Cuba. They now have an order on hand for a large tonnage of Falls Hollow iron for shipment to the Ferro Carril de Entre Rios Railway, of Argentine, also for the North Brabant German Railway Company, Gennep, Holland. The ten locomotives recently ordered by the International & Great Northern Railroad from the American Locomotive Company, are to be equipped throughout with Falls Hollow bolts, likewise the six locomotives ordered from the Baldwin Locomotive Works by the Iowa Central Railway, and one locomotive ordered by the Mexican Central Railway.

RAILWAY MASTER MECHANIC

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NOVEMBER, 1908

School of Railway Engineering

SEVERAL appointments to the engineering staff of the University of Illinois, which were made this year, concerned the School of Railway Engineering and Administration. The strength and efficiency of the school has been increased materially since its establishment two years ago by the University.

The Dean of the College of Engineering is director of the school. There is an associate professor of railway engineering in general charge who is especially concerned with railway equipment problems. An assistant professor of civil engineering gives his attention to track construction and maintenance and to signaling. Problems in locomotive performance and train resistance are handled by an instructor in railway mechanical engineering. Specialified problems of electric traction are in charge of an associate in railway engineering. The organization of the school within the Department of Economics consists of a professor of railway administration and an instructor in railway accounting.

The engineers, who were appointed, are men with wide experience in railroad work to qualify them as instructors in their respective departments. It is this fact that should be noted in considering the progress and growth of the railway school.

Illinois Central Terminal Electrification

THE electrification of the Chicago terminal of the Illinois Central Railroad was considered at the recent meetings of the directors and stockholders and authority was given for a thorough investigation of the problem. This may be looked upon as a step toward ultimate electrification of the terminal because it is known that such a change would result in a reduction in operating expenses, particularly with the suburban lines.

The experience with the Westinghouse single-phase electric railway system on the New York, New Haven & Hartford Railroad has shown electrification to be successful in this instance. While no exact figures are given as yet on the cost of operation as compared with steam, it is said that the fuel cost for electric traction is about one-half as much as for steam. Regarding the future value of electrification, the following statement, credited to Mr. William S. Murray, is cited:

"The greatest value to be experienced by electrification will be in the tremendously increased traffic capacity of the present track mileages, due to the facility electricity offers in making rapid main line and yard movement, or, stated in another way, it is thus immediately seen that electrification will permit a tremendous increase of traffic without an increase of track mileage, and thus roads which are up against the requirement of handling their congested traffic by laying new tracks, which, of course, is a most expensive procedure on account of right-of-way difficulties, will be led into providing an equal capacity by electrification of the old trackage."

While the operation of through passenger and freight trains by electric locomotives on the Illinois Central is not by any means an easy problem, it is not beyond solution. It may be possible to electrify the suburban lines previous to the through passenger and freight traffic, because they are separate from the through lines. The investigation will no doubt be favorable to the electrification of the Chicago terminal, but there are many considerations which may call for necessary delays.

Drilling Machines

IN the construction of drilling machines there is to be found considerable variation as to details. The chief points to be considered are the frame, head and table construction, the spindle drive mechanism and the spindle feed mechanism.

The frame construction depends mainly upon the class of drill and the head and table construction. The classes, referred to, include sensitive drills, heavy upright drilling machines, multiple spindle and gang drills, and turret drills. The frames are built with or without base tables and with either stationary or sliding heads. The general form is designed so as to secure strength and rigidity.

The table of the drilling machine is usually supported by an arm which is movable on column by screw and crank. It is also supported by an arm which is clamped to column at any desired height. The universal table is designed to facilitate drilling at angles..

The spindle feed may be obtained by a rack on the for light drilling where excessive strain on the small drill is to be avoided, is usually by the ordinary cone pulleys, by a friction pulley and cones or by friction disc and plate. The spindle of heavier drills is commonly driven by bevel gears from the pulley shaft. . Back gears are used to cut down the spindle speed for heavy work and give a wider range of spindle speeds. The back gears are thrown into operation by a clutch operated by a lever seen at the top of the machine. The speed reduction is about 4 or 5 to 1.

The spindle feed may be obtained by a rock on the sleeve and a pinion, which is common practice in sensitive drill construction. Power feed on the heavier drills is obtained either from the spindle or main horizontal driving shaft through pulleys and belt or gears and then through intermediate shafts, gears, worm and worm wheel to the rack on quill or sleeve. Hand feed is obtained with the latter construction by cutting out the bevel gear to intermediate shaft and automatic feed, and quick return is obtained by cutting out the worm feed. The gearing may be either of open or enclosed construction.

Concerning Timber Supply

THE question of our timber supply has been discussed seriously for the past few years because of the decreasing supply and the increasing demand in our many industries. Both means for maintenance of supply, such as forest preservation, and the more economical use of the present supply, have been brought into consideration.

Relative to the advance which forestry has made in the past ten years, the following quotation from the Year Book of the Department of Agriculture for 1907 is given:

"Forest lands under management have grown from one to two tracts to many, aggregating 7,503,000 acres, scattered through 39 states. The national forests have increased from 39,000,000 acres, practically unused and unprotected, to 165,000,000 acres, used, guarded and improved both in productiveness and accessibility. The number of states which have state forests has increased from 1 to 10; and of those which employ trained foresters from one to 11."

While there has been an awakening to the necessity of preserving our forests and certain progress, as noted above, has been made in the growth of timber, the growth of new timber is much less than the demand. A beginning has been made in forest preservation and it is to be expected that this country with its natural resources will in future years be foremost in the growth of timber. Even at this time it is said that the United States furnishes about 20 per cent of the lumber imported by other countries.

In order to secure the most economical use of our present supply, certain woods are now treated with preservatives which prolong their life many times. The use of preservatives was resorted to in European countries before a thought was given to the matter in the United States, yet it is said that now the treating plants in this country excel both in size and mechanical perfection.

It is evident that both timber preservation and the treatment of wood are now vital commercial problems which shall require the closest attention in view of the foreseen exhaustible supply.

A New Organization

RECENTLY a new organization, made up of representatives of manufacturers of railroad supplies and equipment, was formed to combat adverse criticism of railroads. On account of excessive falling off in railroad business it became apparent that an effort on their part is necessary to enlighten the public and thereby prevent unfair legislation.

Colonel George A. Post, of the Standard Coupler Company, who was elected president of the new organization, stated the reason for the formation of the organization, as follows:

"This assemblage represents a vast amount of invested capital, to which a great army of American artisans look for remunerative employment. Whether the capital so invested shall yield profitable returns to the investors who venture their money therein and whether the labor of workingmen shall be in demand in our plants so that full wages may be earned by them depend entirely upon the measure of prosperity enjoyed by our railroads.

"We all know too well what the conditions have been for long months past. Locomotives and cars have been idle by the thousands, and railroad earnings have shrunken to an appalling degree. There has ensued a shutting down of shops, throwing out of employment an army of mechanics; laying off of train crews and other employes, and almost an absolute cessation of the purchase of materials. This has had its disastrous reflex, of course, in our operations, and the ramifications of distress have been widespread.

"When railroads are prosperous, times are good everywhere; when railroads are not prosperous, jobless hordes are in despair, and the cupboards of workingmen are bare. Largely responsible for this paralysis afflicting our railroads is the attitude of harsh hostility toward them, as manifested in federal and state administrative and legislative circles. Because of this hostility, confidence of investors in their prospective profitable operations and in the stability of values of their securities has been seriously undermined.

"Those who depend upon railroads for subsistence, directly or indirectly, must be loyal to their means of support and quick to resent interference therewith by crafty or turbulent trouble makers.

"Railroads must be operated with a fair margin of profit, else they cannot maintain efficiency in equipment, adequately meet increasing demands for terminal facilities and other betterments, nor can they pay good wages to their operatives. In other business enterprises, it is a maxim that prices include a profit. If there are no profits, there is bankruptcy. There is no reason why transportation rates should not be adjusted upon the same basis. In the latter case, it being a matter affecting the whole people, the adjustment must be made with the concurrence of public officials. Of what vital importance it is, therefore, that such officials should be men of fair minds, clear minds, and act in the light of knowledge."

Pacific Type Locomotives

Erie Railroad

THE Baldwin Locomotive Works have recently completed fifteen Pacific type locomotives for the Erie Railroad. These engines were built throughout, to drawings and specifications furnished by the railroad company, and they will be used in heavy passenger service. The maximum tractive force exerted is 30,250 lbs., and as the weight on the driving wheels is 148,900 lbs., the factor of adhesion is 4.92: hence these engines should be able to start heavy trains promptly under all ordinary conditions.

The cylinders of the locomotives under notice are 22½ ins. in diameter by 26 ins. stroke, and are placed 86 ins. between centers. The steam distribution is controlled by piston valves 12 ins. in diameter, placed 50 ins. between centers. The valve gear is of the Stephenson type, and the valves are driven through rock shafts having both arms pointing upward, the gear thus being direct acting. The links are of cast steel, equipped with double suspension hangers, and the link blocks are connected to the rock shafts by transmission bars which pass over the leading driving axle.

The main frames are of cast steel, 5 ins. wide, and spaced 43 ins. between centers. They are continuous from the front bumper to a point back of the rear driving axle, and are braced by substantial steel castings placed over the first driving pedestals and between the main and rear pairs of driving wheels. The back frames are of hammered iron, in the form of slabs, and arranged to accommodate the rear truck, which is of the radial type with outside journals. A steel casting, which braces these frames back of the frame splice, supports the front end of the fire box and also carries the rear truck radius bar pin.

The boiler is straight topped, with three rings in the barrel. The dome is placed on the third ring, and the opening is reinforced by an inside liner. All the longitudinal seams are welded at the ends and are sextuple riveted.

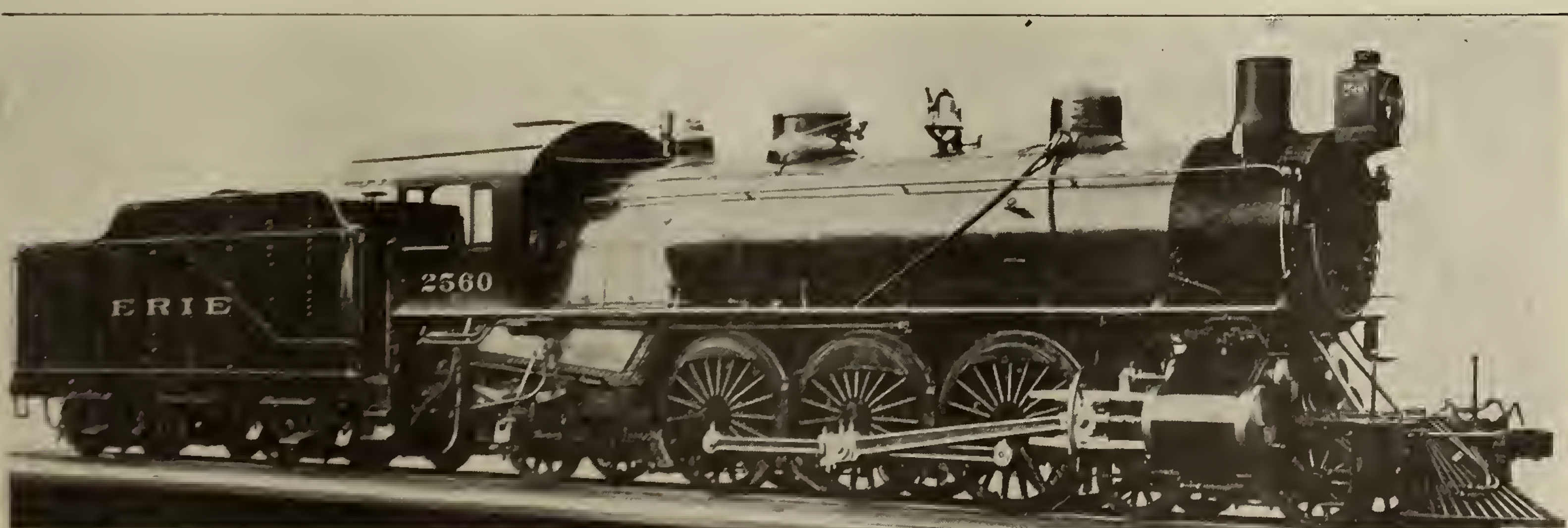
The fire box is radially stayed, and the throat, back head and roof are all sloping. The mud ring is of forged iron, double riveted, and supported by sliding shoes in front and a buckle plate at the rear. The crown and sides of the inside fire box are in separate pieces, while a single sheet is used for the sides and roof of the outside shell.

The front end is of the self-cleaning type. The smoke box has a short extension, and is fitted with a cast iron front and door.

The tender frame is built of 12-in. steel channels with oak bumpers. Arch bar trucks are employed, and they are equipped with cast steel bolsters and "Standard" steel tired wheels. The tank is of the water-bottom type with a capacity of 8,500 gals. of water and 12 tons of coal.

The photograph illustrates the principal features of this design, while the table of dimensions shows that these locomotives are of high capacity, and well adapted to meet the severe requirements of modern passenger service.

Type of engine	Pacific
Service	Passenger
Fuel	Soft Coal
Tractive force	30,250 lbs.
Gauge	4 ft. 8½ ins.
Cylinder	22½ x 26 ins.
Valve Gear, type	Stephenson
Valve, kind	Balanced Piston
BOILER.	
Type	Straight
Working pressure	200 lbs.



PACIFIC TYPE LOCOMOTIVE FOR THE ERIE RAILROAD.

Diameter	74⅝ ins.
Material	Steel
Staying	Radial

FIRE BOX.

Material	Steel
Length	108⅛ ins.
Width	75¼ ins.
Depth, front	82 ins.
Depth, Back	67¼ ins.
Thickness of sheets, sides	⅜ in.
Thickness of sheets, back	⅜ in.
Thickness of sheets, crown	⅜ in.
Thickness of sheets, tube	½ in.
Water space, front	4½ ins.
Water space, sides	4½ ins.
Water space, back	4½ ins.

TUBES.

Material	Iron
Thickness	0.125 ins.
Number	334
Diameter	2¼ ins.
Length	20 ft.

HEATING SURFACE.

Fire box	195 sq. ft.
Tubes	3,958 sq. ft.
Total	4,153 sq. ft.
Grate area	56.5 sq. ft.

DRIVING WHEELS.

Diameter, outside	74 ins.
Diameter, center	68 ins.
Journals	9¼ x 12 ins.

ENGINE TRUCK WHEELS.

Diameter, front	36½ ins.
Journals	6½ x 12 ins.
Diameter, back	50 ins.
Journals	8 x 14 ins.

WHEEL BASE.

Driving	13 ft.
Rigid	13 ft.
Total engine	33 ft. 8 ins.
Total engine and tender	64 ft. 10 ins.

WEIGHT.

On driving wheels	148,900 lbs.
On truck, front	42,000 lbs.
On truck, back	44,250 lbs.
Total engine	235,150 lbs.
Total engine and tender	About 400,000 lbs.

TENDER.

Wheels, number	8
Wheels, diameter	33 ins.
Journals, diameter and length	5½ x 10 ins.
Water, capacity	8,500 gals.
Coal, capacity	12 tons

*Tool and Farmers for Bulldozers and Steam Hammers**

THE bulldozer and the forging machine have within the last few years invaded fields previously untouched by the steam hammer and drop hammer. As we advance from anvil work to die forging and pressing we are not detracting from the trade of the blacksmith, rather do we believe that when improved facilities are brought to bear as applied to the making of forgings we are assisting in the advancement of the trade. The skill possessed by the competent smith may not be necessary for the operation of die forging, but is nevertheless a desirable qualification, as in this line of work, particularly in that of drop forging, all the processes and operations used by the smith are embodied. Material is swaged, fullered, drawn, upset, punched, drifted, welded and cut off as it is on the anvil. The most essential point in this connection, in addition to quickening of processes and increased output is the uniformity of the product, the uncertainties of hand work being practically eliminated by the use of dies.

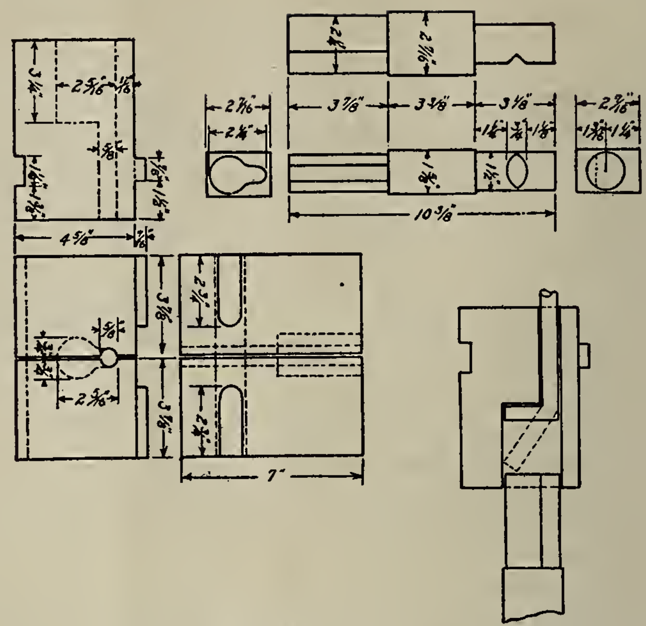


FIG. 1—DIE FOR MAKING HAND-HOLDS.

We are of the opinion that it would be to the interest of any large shop to have a master workman whose duty it would be to assist in the making and repairing of dies and formers. The man may be machinist, draughtsman or blacksmith, and should not be expected to be the embodiment of all knowledge pertaining to this line work, but should be the possessor of a reasonable amount of originality and ingenuity.

Through Mr. A. Bennett, of the Chicago, Milwaukee & St. Paul Railway, we have received a communication from Mr. C. G. Junean, foreman of this company's smith shop at West Milwaukee, Wis., describing some special tools used on the Williams and White bull-

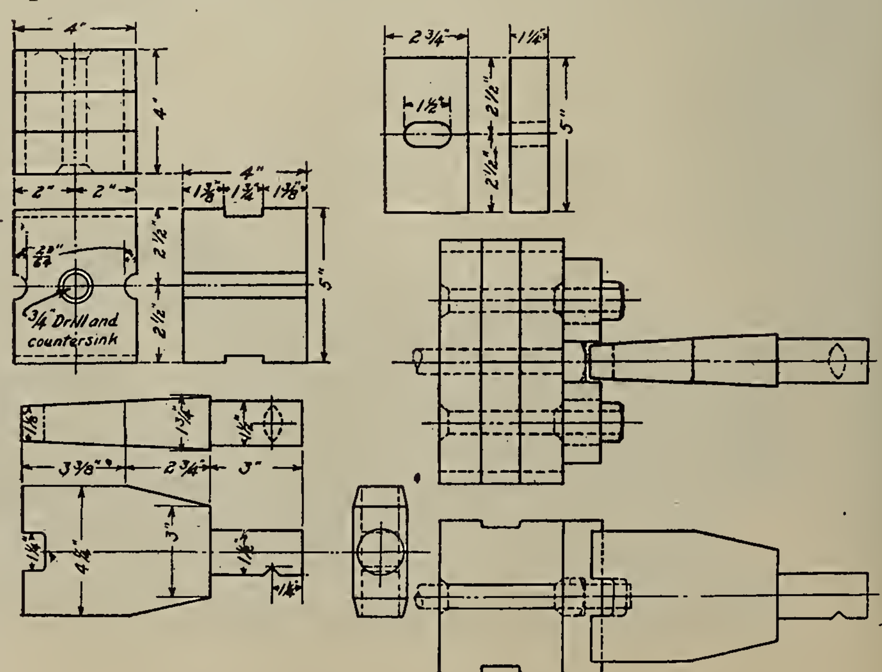


FIG. 2—BOLT-THREADING DIE.

*Extracts from a paper by G. M. Stewart and read before the International Railroad Master Blacksmiths' Association, Cincinnati, O.

dozer, also on punching and shearing machines. Mr. Junean is now using on his bulldozer a tool on which swing hangers are bent and welded, the increase on output being about 4 to 1 on this job. These hangers are made from material ¾x1½ ins., bending on edge. The tool for the first bend is made to run in a groove to guide rollers using two arms working on hinges. The iron is heated for about 6 in. in center, the arms taking the iron on end, working from outside edge of the former, moving forward toward center at an angle of about 45 degrees until bend is complete, then moving straight center to meet the former, squaring the job and finishing the first bend. The second bend is made on tools of quite a different type, but one arm can be used on the live head as it is necessary to clear the end of hanger in making the lap for welding, and instead of using a groove in the plate a wall and spring are used, forcing the arm against the wall, guiding same around a very short curve 2⅝ ins. inside measurement and looping the ends 5 ins. long on each side of the hanger. The hanger is now ready for a welding, after making the second bend, and it is sent over a chute into a furnace to be heated for welding, thereby saving heat and making a welding heat easier to obtain. The output of these hangers is about 40 per hour.

Mr. Junean also has in service a tool for bending eye bolts from ⅜ in. upwards; ⅜-in. eye bolts are bent at the rate of 500 per hour; these are doubled, forming a hinge, such as are being used on stock car hay racks. This tool can be used for different shapes of bends, having a side and end motion which is handier than any tool now in use in Mr. Junean's shop. Another tool which is being used to good advantage is the adapting of a large punching machine for the bending of angles and corner bands, this work being formerly turned out on a bulldozer, the increase in output of ¼x7-in. corner bands by this method, bent cold, being from 100 per hour to 500 per hour, a gain of 400 bands per hour.

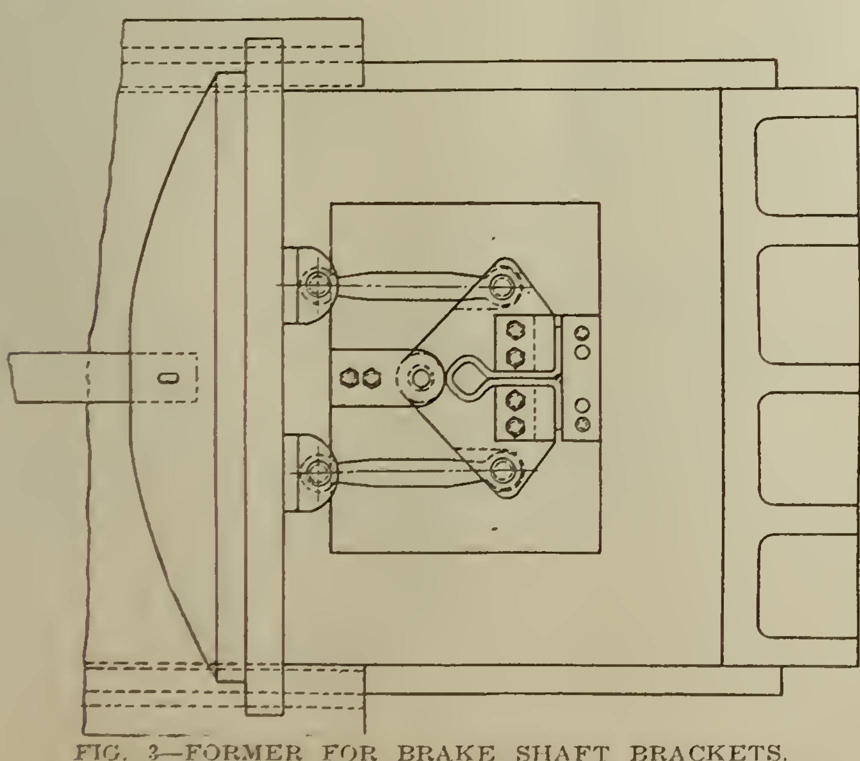


FIG. 3—FORMER FOR BRAKE SHAFT BRACKETS.

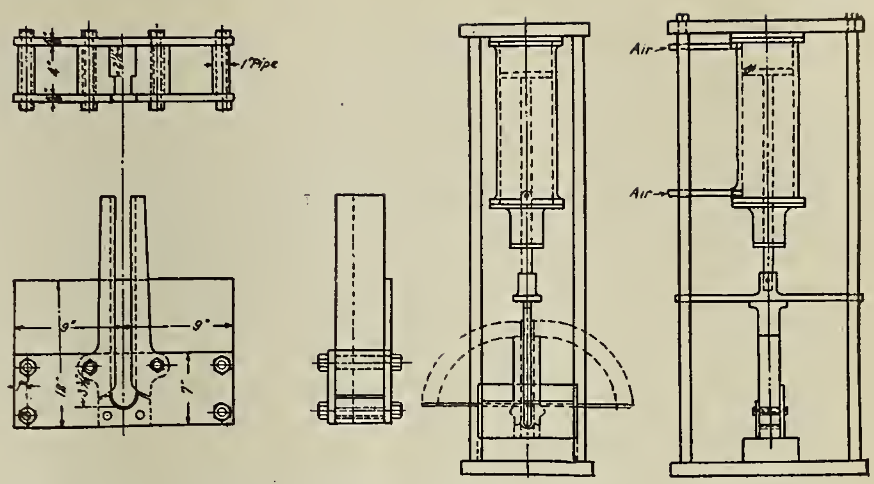


FIG. 4—AIR BENDING MACHINE WITH FORMER.

Mr. Bennett states that there are in service in his department at Milwaukee three Ajax forging machines, 4, 2 and 1½ ins., respectively. On the 4-in. machine he is making from round bar iron a hexagon lock nut, one of these being completed in a single operation. On the same machine he is making 1⅜-in. standard nuts, three of these being turned out per hour. Also, on his 4-in. machine, he is making a foot for front end braces, this requiring two operations. The first operation is made in the header, the second in the dies. These facts are made from 2½-in. round iron and the output is fifteen in ten hours.

Figure 1, a drawing furnished by Mr. Mayer, of the Michigan Central R. R., Detroit, shows in detail a die for the making of ⅝-in. round hand holds or grab irons on the 1½-in. Ajax upsetting and forging machine. These dies are made of cast iron and are put in service just as they come from the foundry, without machining, and are good for from 10 to 12,000 grab irons. Figure 2, also furnished by Mr. Mayer, is a bolt heading die which can be applied to any style of bolt or forging machine from 5 to ½ ins. When this die was first installed by Mr. Mayer, steel was used in its construction and 5 to 6,000 bolts could be made on one pair. After changing the style of this die, making the side blocks adjustable and using cast iron, 87,000 ⅞-in. bolts were made with one pair and 100,000 ¾-in. bolts with another, all of these dies being good for more, none of them having been in the machine shop after being machined when new.

The following described devices are in service at the Pennsylvania R. R.: Figure 3 is a detailed drawing of a former for bending brake shaft brackets for "GL" cars; these are made from ⅜x2-in. material, cut 19⅞ ins. long, and the operation is performed in one motion of the machine. These formers can be applied to either bulldozer, air press, forging or bolt machine as well as to a steam hammer. It is the practice at Altoona car shops to use these formers on a temporarily constructed air machine, a general plan of which is shown in Fig. 4 in connection with a former used for bending truck lever guides. This makes a very cheap bending machine which almost anyone can use, providing a supply of compressed air is at hand.

A 50-Ton Steel Underframe Box Car

C., L. S. & E. Ry.

THE 50-ton steel underframe box cars built for the Chicago, Lake Shore and Eastern Railway by the Western Car & Foundry Company, have proved very satisfactory in service. The specifications for the cars were furnished by J. Horrigan, superintendent of motive power, and, of the 400 cars that were built, 300 were equipped with Andrews steel truck frames and 100 with Bettendorf.

The length of car inside of body is 40 ft., the width of car inside of body is 8 ft. 6 ins. and the height of car inside of body is 8 ft. The width of car over eaves is 10 ft. 1 in. The height from top of rail to top of brake mast is 13 ft. 3 ins., from top to rail to center of coupler is 2 ft. 10½ ins., and from top of rail to top of truck frame is 2 ft. 4⅞ ins.

UNDERFRAME.

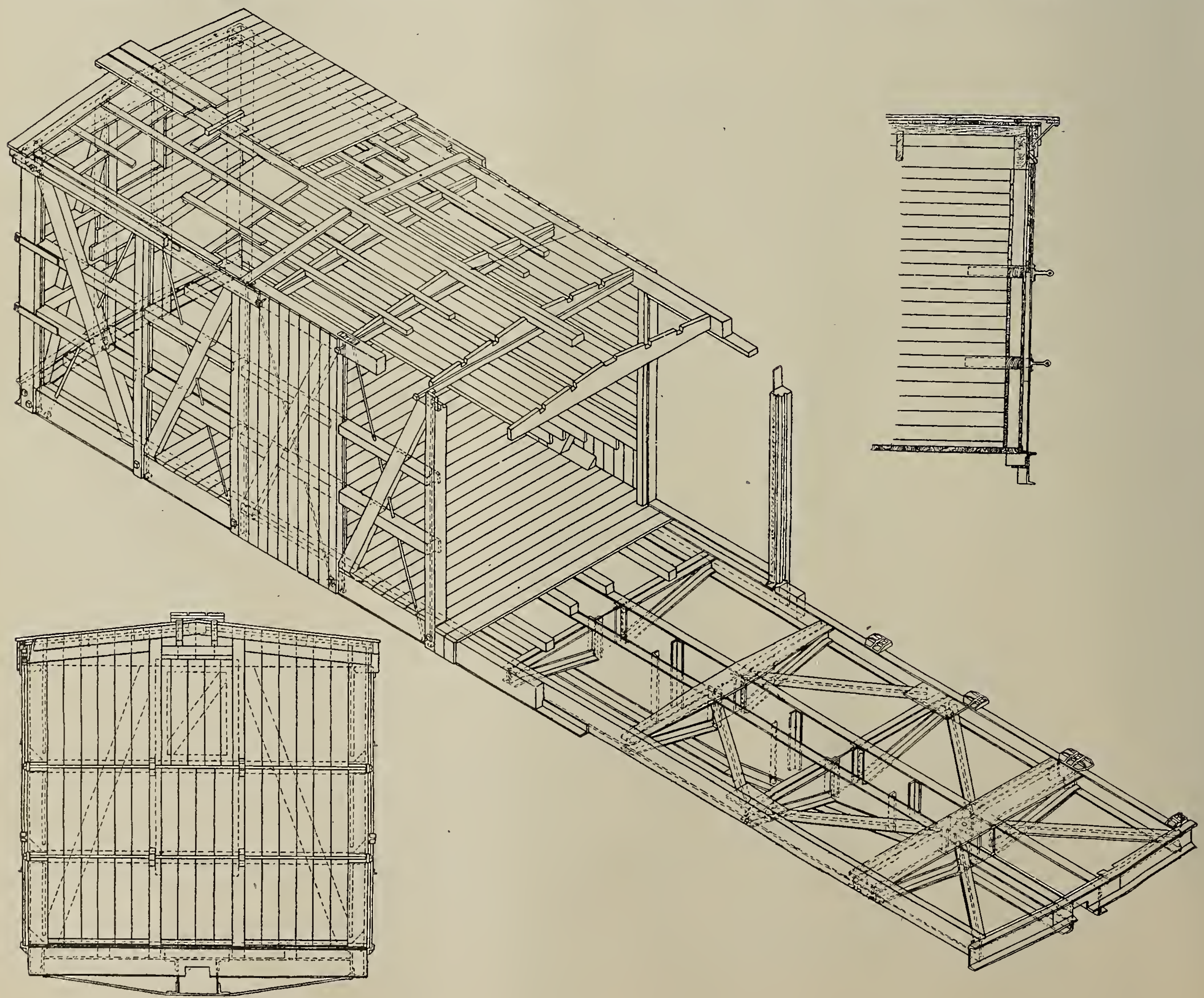
The center sill is built up of ⅜-in. webs, which are 12 ins. deep at the ends and 30 ins. at the center and are spaced 13 ins. apart, 4x3x½-in. top angles and 4x4x½-in. bottom angles. The side and end sills are of 10-in., 30-lb. channels and diagonal braces are of 5x3-in. tees.

The body bolsters are built up of a ½x16-in. top tie plate, a ½x16-in. bottom tie plate, ¼-in. webs which are 4⅝ ins. deep at one end and 11⅝ ins. deep at the other and 3x3x⅜-in. angles. A malleable iron body bolster center brace is used and ½x6-in. U-braces are used at the ends.

The needle beams are built up of a ½-in. top tie plate which is 12 ins. wide at the center, ¼-in. webs which are 4 15-16 ins. deep at one end and 14 9-16 ins. deep at the other end, and 3x3x⅜-in. angles.

The floor nailing strips are of 4x4-in. yellow pine and the flooring is of Norway pine. The posts are of white oak and the sills, side and end braces are of Georgia pine. Angle and post rods are ⅞ ins. The sheathing is of white pine or Washington fir and the lining of Norway or yellow pine.

There are eleven 2x10-in. carlines of white oak, the ends being set in malleable iron pockets. The roof cross tie rods are ⅝-in. rods. The ridge pole is of 3¼x6-in. long leaf yellow pine, bolted through carlines with ½-in. bolts. The ⅞x4½ in. subcarlines of white



C. L. S. & E. 50-TON STEEL UNDERFRAME BOX CAR.

pine are bolted to the purlins with ⅜-in. bolts. The Chicago-Cleveland metal roof is of 20¾-in. by 4-ft. 8-in. plates.

The roof nailing strips are of 1x4-in. white pine and the roof boards are of 13-16x5¼-in. white pine. An 8-in. galvanized iron ridge covering is used.

Automatic Stoker as Compared with Hand Firing for Locomotives

THE stoker we have in operation on our division is known as the Hayden stoker. The method of operation is as follows: The coal is taken from the tender, through a grating with 3-inch openings, by an elevator which is operated by a quadruplex engine, it is raised to a conveyor located over the fireman's head, is dropped into a hopper over the firebox door and falls through a slide gate opening onto a table located inside the firebox door. It is then blown by five separate nozzles or jets of steam which have a tendency to cool the table and prevent its burning out. The center jet blows the coal toward the flue sheet. The next two jets on either side are located to place the coal in front corners of the firebox. The two outside jets are located so that the coal will be distributed along the sides and the back corners of the firebox. They are governed by separate valves, to regulate the blast of steam through each jet and can be adjusted at will at any time. In operating this machine we found it desirable to run the front jet closed all the time, as it is not needed on the engine on which we operate it, the next jets a turn open and the back ones full open.

The steam that furnishes the blast to place the coal, is controlled by a quadruplex engine located on the back end of the boiler butt, which has a crank movement actuated by a screw-wheel, operating a control valve. This admits steam through a 1-inch pipe passing to the nozzles, which are regulated by means of a globe valve. The control valve, as a general proposition, is only run one turn open, and varies with the weight and amount of coal to be handled. The length of blast is governed largely by the raising or lowering of the latch on the trip valve and the rapidity at which the engine is run. The faster the engine is run the less coal is thrown at one blast. If desired, the valve can be tripped by hand and all of the coal in the hopper can be blown into the firebox. In fact, the fire can be covered black inside of half a minute.

The steam connection to the engine operating the stoker conveyor is by 1-inch pipes. The steam connection operating the stoker engine is by ⅜-inch pipe.

The efficiency of the stoker in distribution of coal as compared with hand firing can be better illustrated by referring you to the coal test recently made on our division. In this test the stoker had to compete with some of the best firemen we had on the division. Ordinarily coal used in service is 50 per cent Blossburg, which contains from 15 to 35 per cent ash, and 50 per cent Dagus coal; but to be sure of getting a uniform grade of coal it was decided that nothing but the best Dagus coal should be used, as we have made a test both with and without a stoker. The engine was drafted for the mixed coal, and stronger than it would have been if Dagus coal was to be used. If the mixed coal had been used, I am inclined to think that the steam pressure would have been more favorable to the stoker than it was in this performance, but taking it all in all the performance was very satisfactory for an engine that had been out of the shop for ten months since having received general repairs. Occasionally coal will pile up in some places in the firebox, making it necessary that it be leveled down. This may be caused by a clinker forming or a little deviation in front of engine or holes in the grates. All that is necessary is to close the hopper, blow the coal off the table and the door can be easily opened, and the fire leveled with a rake if desired. There is nothing to be removed, and it is a very easy operation, nearly as much so as though the engine was being fired by hand, but if the stoker is properly adjusted it is not necessary very often. If the nozzles are not properly adjusted the coal will be banked in one place or another, and the labor is immensely increased over hand firing.

The knowledge of the mechanism of the Monarch stoker, I am advised, can be acquired by a competent fireman so as to handle it successfully after one trip. The same would apply to the Hayden stoker. Of course, the greater the knowledge of the mechanism of the stoker, the better we are prepared to operate to the best advantage. The natural width of the firebox at which the Hayden machine can be operated successfully, as given by the builders, is any firebox that can be successfully fired by hand. The same applies to the Monarch. It is claimed that the stoker can be operated in a Wootten firebox the same as a single-door firebox, by using two stokers.

As far as plugging the flues is concerned, we have practically no trouble. So far as leaky flues are concerned, we have had no failure of flues that could be traced to the stoker in length of time it has been in operation with us, which has been ten or eleven months. In fact, the boiler men advise me that they have noticed on various occasions that the flues were practically clean when the engine came into the terminal and required no flue work, which speaks well for the stoker. The reason I give for this, is that the coal is fed in such small quantities that if any coal is carried into the flues it is sufficiently fine as not to stop in the flues and clog up.

The ability to maintain the maximum steam pressure is better than with the average fireman, and I find that the tendency of engineers who have been running an engine with a stoker is to work the engine harder than for hand firing, and this would get the train over the road in less time.

The efficiency of the stoker depends upon the elevator being properly set and adjusted in the tank, and with the experience and knowledge of the machine I

*From a paper by G. C. Grantier before the Traveling Engineers' Convention.

have had, I believe it would pay every railroad company to see that their engines are equipped with self-cleaning hopper tanks, if the stoker is to be used, so that the last of the coal in the tank will be run to the elevator if possible. This will give ample time for the firemen to watch the operation of the machine and signals, and the labor will not be burdensome to him. Heat will also be eliminated almost entirely so far as the firebox is concerned by the use of the stoker. I have noticed that where the stoker is used it is not necessary to clean the fire as often as with hand firing. I believe, as a general proposition, that the stoker produces less clinkers, and if the grate has sufficient opening for air, the gases and carbon will be burned and a more uniform pressure of steam can be maintained, with a material saving in coal.

The Monarch people claim that a lump of coal as large as a man's head can be used, which means run of mine coal. From my observation of the stoker any size of coal that will go through a 3-inch opening will give the best results, and I believe that all will agree that when firing engines of any class if we have as uniform size of coal as possible, better combustion will take place.

We have tried the wash-fine coal, such as used by blacksmiths, but with very poor success. The stoker did as well as could be done by hand firing, but I do not think it possible to use that grade of coal to advantage, as it lays very close and is liable to pile up, causing the fire to burn full of holes. To get best results the coal should be prepared, either by crushing or screening, before it is put on the engine. I do not think it possible to get the best results with any stoker unless the coal is carried to the firebox by means of a conveyor, as it requires practically the same labor as would be necessary if the man were to fire by hand, with the exception of eliminating the heat; I believe that the additional care of watching the stoker will more than compensate for any elimination of heat that may be made by increased labor when the conveyor is not used.

If elevators or conveyors are used and properly set with a self-cleaning hopper tank so that the coal will run down and is properly controlled so that it will be prevented from plugging the elevator, the decrease in labor will be very noticeable and will materially aid the fireman and insure his giving closer attention to the operation of the stoker and signals, with a material saving in fuel.

For the length of time this stoker has been in service on our division the repairs have been very light. The greatest expense has been caused by the table burning out. I cannot give the exact number, but I should say eight new tables have been applied. The cross-heads on the engines have had to be reduced from time to time, and some light repairs have been made, mostly pipe work. The stoker has been out of service at different times on account of not having the proper material on hand to repair it at once. Of course, this would be expected, having but the one in service.

In the winter one of the hostlers allowed the conveyor engine to freeze up, bursting one of the cylinders. The pipes should be properly insulated to protect them from the severe weather, as the condensation taking place is considerable. The stoker is furnished with five-eighths of a quart of valve oil for each 140 miles, and requires one-fourth of a quart of engine oil.

I believe I am perfectly safe in saying that with a stoker properly installed and set in a tank, and coal prepared to a uniform size that can be handled by the stoker, the fireman can operate the engine with a saving of at least 33 to 50 per cent labor, at the same time maintaining a uniform pressure of steam with a large reduction of leakage of flues and furnishing steam under all conditions better than can be done by hand firing and with a saving of fuel. A lower grade of coal can be used with the stoker than without. By this I do not mean that the grade of coal with 30 or 40 per cent ash can be used successfully with a stoker against the fireman having the average run of mine coal.

There has been a good deal of fault found by the fireman, not with the stoker, as many have expressed themselves as highly pleased with it, but with the additional labor of crushing the coal as finely as need be to go through the grating. I am of the opinion that the stoker has come to stay, as I know this one can do all that is claimed for it if given care that it is entitled to. By this I do not mean that it will not fail if not taken care of.

Air Brake Hose Bolt Shear and Clamps

THE accompanying views illustrate several devices made and used in the Decatur car shops of the Wabash Railroad. Fig. 1 shows the shears for cutting bolts off and also a clamp, back on the table, for compressing the clip and holding until the bolt is applied. In Fig. 2 are shown a clamp for holding the hose and the cylinders for pressing on the fittings. Both steam

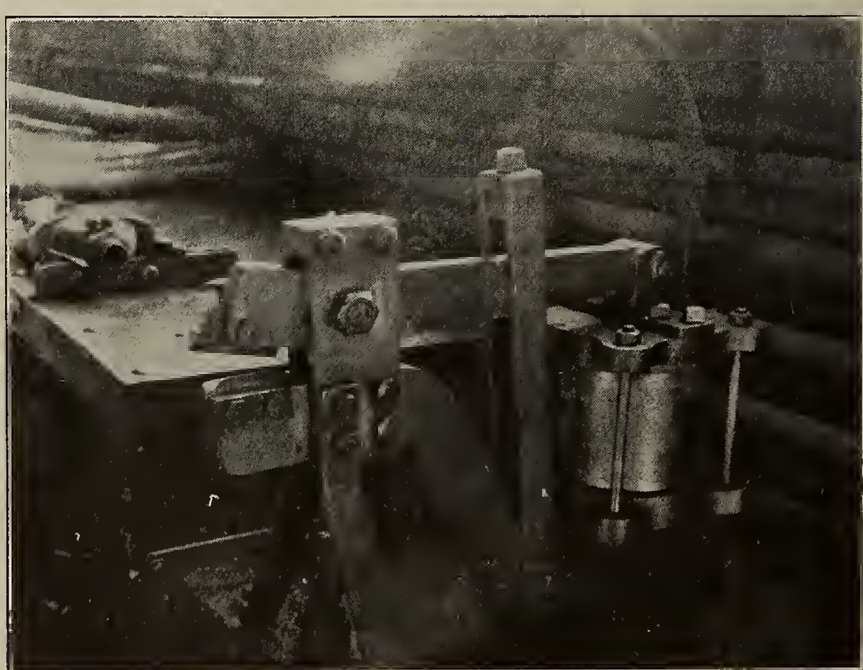


FIG. 1—SHEARS AND CLAMP.

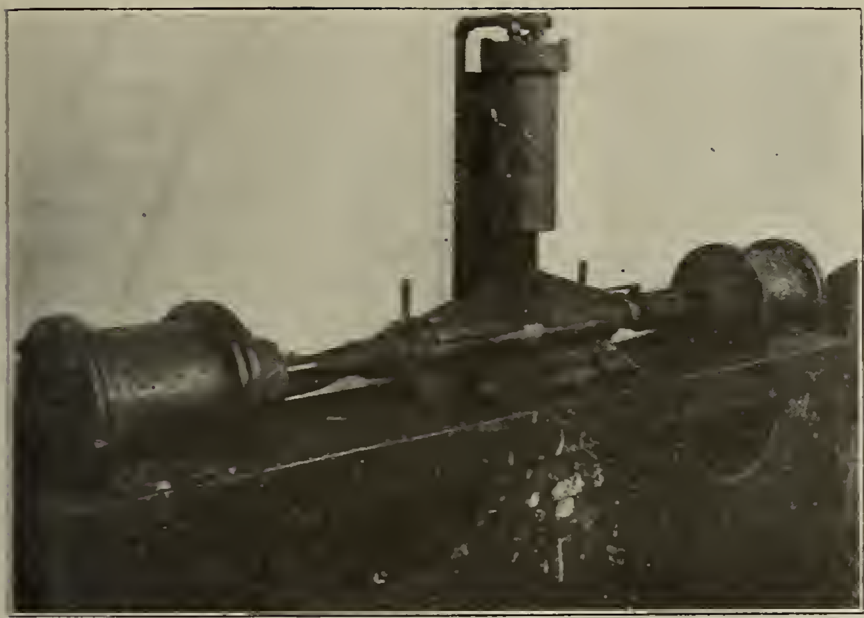


FIG. 2—CLAMP AND CYLINDERS.

heat and air brake hose work is done in the Decatur shops.

A considerable saving of the metal fittings from the hose is effected. These devices are readily made in any shop as the construction is simple and the materials are to be found around the shop. We are indebted to J. C. Meehan, general foreman car department, for the illustrations of these devices.

Locomotive Tool Equipment

THE discussion of the paper on handling locomotive supplies presented before the New York Railroad Club by Raffe Emerson proved very interesting. Extracts from Mr. Emerson's paper were printed in October issue. The discussions of D. R. Mac Bain, assistant superintendent of motor power, of the New York Central System, and of Mr. Emerson are given in parts as follows:

BY D. R. MAC BAIN.

Two or three years ago there was a very efficient committee appointed for the purpose of going into the tool matter in all its phases, with a view of ultimately organizing a scheme in almost exact accordance with the one recommended tonight—to reduce the cost and at the same time increase the efficiency of the service. That committee, after laboring one year, brought in their report and the result was, taking into consideration the number of men that would have to be employed at the roundhouses on this system of railroads, to supervise, inspect and carry on the work necessary to put the scheme into effect, that the cost was so very high, approximating about $16,000 per year, for eight roundhouses, that it was practically prohibitive.

Another campaign was started, the idea being that if everybody in the organization would give a little of his attention to the matter of supplying locomotives with proper tools, and seeing that no more than were necessary were supplied, some results would be attained. The thing was started about a year ago and everybody worked conscientiously towards seeing that locomotives were properly equipped with no more tools than were necessary and that care should be exercised in giving out tools, and in repairs, etc., to make them inexpensive as possible, and as a result of that we found that the cost per locomotive for the system for the past year was $33.36; not quite down to the minimum table in the proposed scheme of Mr. Emerson, but very much under the maximum. In connection with that, I wish to say that the tendency is to get better results every year and I believe that with the same careful supervision on the part of all interested, at the end of another year we will be down to $30.00 per locomotive. I do not believe that any expenditure is necessary for checking, etc., but with a little supervision I think that from a practical point of view, good results can be obtained.

If you should inaugurate a system of checking, I think you will find the expense is hardly justifiable, inasmuch as that very item would be likely to run the cost of this particular subject—small tools for locomotives—higher than it ought to be.

Now, getting down to the matter of shop tools, which was also touched upon by Mr. Emerson, we believe that we have accomplished something along this line, as has been done in other portions of the country. In looking up the records of the New York Central Lines, I find that during the year the largest expenditure for the maintenance of shop tools and equipments in the history of the road was made, that the cost per engine, per year, was $141 as against $156, the best figure shown by Mr. Emerson as a result of five years of the system.

Coming along a little further to the larger things touched upon tonight, I find that the average cost of maintenance of locomotives per mile was 3½ cents in 1898, and in 1908 the same item cost 5.28 cents, an increase approximately, of 60 per cent. To offset that increase in the cost of repairs per mile, we should bear in mind that the locomotives have increased 100 per cent in weight, 107 per cent in tractive power, and this, together with an increase of 31 per cent in the wage bill and 25 per cent in the cost of materials, still enables the New York Central Lines to maintain a horse-power at the draw-bar for less money than it was ever maintained before.

Referring to Mr. Emerson's paper, "Under this condition have not only labor costs been high, but materials have been less carefully and more wastefully used, as well as increasing in price and operating costs, per unit"—In this connection I wish to admit that notwithstanding the great increase of business for the past five years, referred to by Mr. Brown in his conversation with Mr. Lissman and notwithstanding that every person in the organization was taxed to his utmost to take care of the work assigned to him, I can conscientiously say that there never was a time in the history of the railroads of the United States, and especially the lines I am connected with, when materials were more carefully and less wastefully used than at the present time. A little further on the writer touches on individual and collective efficiencies.

We must not lose sight of the fact that many of the railroad systems of the country have, in recent years, the very years during whch the great increase in business was forced upon us, done a great deal for the education of the rank and file of their employees and have adopted measures which, I believe, have been of great benefit to the service. Take for example the schools of instruction organized by the railroads for enginemen; the first, second and third year examinations are graded in a very systematic manner. Examinations are held twice a year, at which time candidates for the position of engineer are given examinations, which are of much service to the roads in grading men for promotion. In addition to that the road foremen have their meeting with the men, at which time instruction on all live subjects is given. These men meet once or twice a week and at these meetings they take up and have explained to them the new devices coming into use and everything is taken up in an intelligent and systematic manner. Not only is this done by the road foremen and other competent instructors, but the general officers of the companies have taken a great interest in the matter and frequently go before their men and give addresses which are beneficial and instructive to all concerned.

Concluding my remarks regarding the efficiency of the men, there is one thing that I wish to refer to, and that is the splendid system of apprenticeship schools that has been inaugurated throughout the country and I wish to say that I believe, considering the length of time that it has taken to establish them, that more has been done during this period of great activity—the past five years, than ever before in the history of railroads. I am, at least, sure that more has been accomplished in the five years referred to by Mr. Brown, than has been done in any twenty years previous to that period.

I was much interested in the display of slides that Mr. Emerson gave us and with particular reference to one of these pictures entitled "Sinful Waste," I would say that I have recently been out on an inspection trip over the road with which I am connected and saw many piles typical of the one that was shown on the screen. A close examination of those piles disclosed the fact that the oil cans in them were very much like the boy's gun—they were in need of a "new lock, stock and barrel," and consequently not worth repairing at any cost. I do not mean to say that there is no waste in this line. We all know that there are many articles which get into scrap piles that are still useable, but it is not serious with us. It is frequently the case, no doubt, that an engine crew will throw off firing tools at the end of a run because they are bent out of shape, but in 95, or yes 98, per cent of the cases where they are thrown off they are afterwards picked up and straightened and restored to use on the locomotives, so the actual loss along that line must, of necessity, be very small. Assuming that many of the rakes are lost along the line, we all know that on a well organized system the engineering department will come along the road and pick up those things and, at least once a month they are sent to the shop and fixed up so that they can be used again and that they are not actually wasted, so, while we lose them for a while, the actual loss from that particular source is very small. As an example on that point I went to an important storehouse at a point where 75 engines are handled daily, to see how many rakes had been issued during a month, and the result of that investigation was that we found that six rakes were issued in 90 days, which goes to show that the actual loss of that particular item is very small.

Referring to the small tools used: I think that for instance, a chisel should be of a cheap grade of steel and that instead of using a machined hammer, a malleable iron hammer would answer fully as well, and cost about 75 per cent less. Those, of course, are small items, but the principle applies to many other tools, as showing how the bill of expense can be reduced without losing any of the efficiency.

Where locomotives are pooled, I maintain that it would be impossible to maintain a tool box such as illustrated tonight, unless that at every roundhouse we had a stock of keys, or a man to fit keys, so that when every engine came in the tool box could be opened and inspected to check up the tools, and that it would keep one mechanic busy supplying keys to keep the tool boxes locked up as recommended.

Going on the torch question—Having been an engineer myself for a good many years and having been associated with engineers all my life, I feel somewhat qualified to speak on the subject of the things that the engineers like.

I have used just such a torch as proposed by Mr. Emerson and every other torch has been used more or less on the lines where I have been employed, and I guarantee to you that, notwithstanding the fact that the old malleable iron torch is heavy and cumbersome, when you consider its utility in knocking the wet sand out of the pipes and all the other things that it can be used for, it is not only the most popular with the engineers today, but it is the cheapest that can be made and any expense for anything different from that torch is not justifiable.

I just wish to take a moment of your time to digress from the report. I have in mind a division roundhouse on the New York Central Lines where we handle from 200 to 225 locomotives every 24 hours; some of the locomotives are herded in many places in the yard, as the house is not large enough to hold all, and some of them are taken into the house, and I was just thinking what the keeping of a record of all tools, etc., on those engines, inspection of those engines for tools lost whenever they came in, and seeing that each engine was supplied with tools before it went out, would mean. All this would entail an expense neither necessary from a practical standpoint or justifiable from a financial standpoint, even though the expense for the tools could be cut in two—that is the actual expense for the tools.

BY RAFFE EMERSON.

My first experience in this matter of handling locomotive supplies was gained from a study of the methods adopted by the New York Central Lines. The recommendations of their committees, with reference to standard tools on their engines, and the workings of the inspection system which they had attempted at various points, were very beneficial to me, so that in a sense I may be said to have begun there. The recommendations in the paper presented tonight are the logical working out of those early beginnings. This was something over five years ago. I will take up in order a few of the points brought out.

Mr. Sanderson said he feared that the economies in engine tools suggested in my paper and the figures shown in connection therewith might be used by the general public as an argument against the necessity for increases in freight rates which are being advocated by many railroad companies. I did not come here to discuss the rate question, because I am not a traffic man and do not pretend to know anything about it. However, to one statement, that the labor and material were the only controllable elements in railroad cost, I think a modification could be made, with reference to the investment in equipment—it does not matter whether it is equipment carried on engines or the motive power and rolling stock equipment as a whole. The expenditure, a large item on account of, and interest charges, for equipment can be controlled also, if you use the equipment you have to the fullest possible capacity, and there is not a railroad in the United States that does that literally. A great many have considerably improved the extent to which they can and do use their existing equipment, and if it is used to its greater capacity, the investment in new equipment can be postponed and minimized, and the consequent increase in interest charged may be eliminated. As Mr. Sanderson says, and as I have stated in my paper several times, and also reiterated tonight, this item of locomotive tool equipments is a very insignificant one—it means perhaps only one per cent of the operating expenditure; less than one per cent on an average. There are however, railroads on which it has run as high as one per cent; but its very smallness and insignificance is the reason why it was selected as an example of the subject presented tonight.

Referring to Mr. Thomas's (Pennsylvania) remarks, the point that I wanted to bring out is that the proper organization of men in any department is very valuable, and a scheme for such organization with respect to efficient handling of engine equipments, is included in the broad term that I have designated "supervision." Mr. Thomas has said furthermore that in effecting other economies on our railroads each man should do his particular part, and that in outlining your organization, you should distribute your duties in a functional capacity—let one man attend to duties of one character and not expect each foreman to be not only a foreman but a disciplinarian, a clerk, an accountant, and several other things besides—have your organization so that each man is selected for the particular functions of his degree. That proposition has been brought out most ably by Mr. W. Taylor in a paper on Shop Management which he read before the American Society of Mechanical Engineers, several years ago.

Now Mr. MacBain brought up the point of the necessary cost of supervision, keeping the records and so on. I am inclined to think that the experience of the New York Central and the enormous cost they had for the keeping of these records was somewhat unfortunate. It has not been my experience that the cost would be so large as indicated, if they were properly adjusted. I found that where the supervision was specialized—where you have at each roundhouse or shop one or more men whose sole business it is to look after this equipment, and you have over these inspectors a man who has general jurisdiction over such matters and the arrangement of the accounts, office records, etc., you get the lowest total cost of supervision and material, where the cost of such supervision, stationery and clerical work about equals the cost of the supplies used on the engines, that is where your supervisory cost is just as much as the actual cost of supplies on the engines at that point. I have found as a general proposition that where there is sufficient supervisory work you get the most economical total cost for these supplies, and that is indicated in the table.

I may say that the methods recommended on the New York Central Lines, and which I have extended, have worked out satisfactorily both on that road, as indicated by the figures quoted by Mr. MacBain, and in my own experience. Emphasis was also laid upon the instruction and education of men; but just previous to that Mr. MacBain said that the efficiency of our labor had not fallen off, and that we were not more wasteful than we used to be, but more careful. Now if the body of men as a whole tend to be more careful, why is it necessary to furnish them instruction? If the mechanics are more careful than they used to be, why is it necessary to have an apprenticeship instruction system? This subject has been discussed quite largely in the technical papers and I think under the labor union system the tendency has been toward inefficiency and carelessness on some of our great Systems, and some of them, notably the New York Central, in order to counteract this tendency are training up their own men and especially the rising young men by an adequate method of instruction.

It is true that the examples of waste were rather flagrant, although they were not what you might call spectacular. I happened to pick them out in my various journeys over the country in one railroad shop or another. If the exhibits do not represent in some degree the wasteful use of material, why is it that on so many railroads the cost of these things has increased so largely during recent years?

As to the tool box used on pooled engines, it is quite true that a good deal of trouble was occasioned and effort was required in inspection. But with the standard box, and with the tools arranged in standard order, it is not found to run the cost of inspection, plus the cost of material used, to an unreasonably high figure. In one of the slides I showed where the pay of the tool checkers would be about $1,000 a month and the cost of supplies from $1,000 to $1,600, making a total of some $2,400 a month, to be the cost where pooled engines were used and where the most rigid inspection was practiced, and the result was a saving of about $1,000 a month over the method where they did not have the standard tool boxes and did not have the inspection.

Reclaiming Brass Fittings

Editor Railway Master Mechanic:

Practical experience has convinced me of the great saving in the practice of reclaiming many brass fittings, besides many difficult repair jobs can be made without the loss of time or cost of pattern.

Fig. 1 shows a body of a monitor injector. If you look close you will note a crack in the lower part where the steam ram screws in. Fig. 3 shows the shape and size of this portion of the body before same was prepared for the foundry. To reclaim this about ½ inch was faced off and the diameter was reduced about ⅜ of an inch, then a wooden cap turned to fit same. The injector is then filled with the

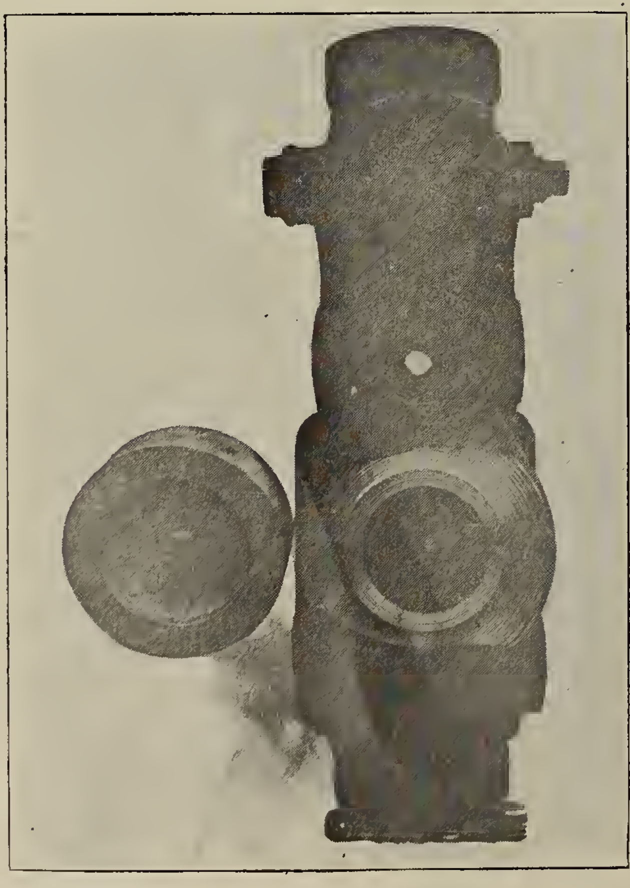


FIG. 1—MONITOR INJECTOR BODY WITH WOODEN CAP.

FIG. 2—INJECTOR BODY AS IT COMES FROM FLASK.

usual foundry sand and same is rammed firmly into place. The wooden cap is then placed on the injector, then the injector put in flask and sand rammed in in the usual way.

The lower rough projection in Fig. 2 is the gate where the brass was poured in. The upper rough projection is the riser where the melted brass flows out after passing over and around the part from which the wooden cap has been removed. It is necessary to use about 35 lbs. of melted brass on a piece of work of this size. After the brass passes up the riser, it flows into a pocket made in the hand beside the flask.

The injector body now comes from the flask as shown in Fig. 2. Fig. 3 shows the same after it has

FIG. 3—FINISHED INJECTOR.

FIG. 4—CRACKED WHISTLE BELL REPAIRED.

been machined and is ready for service again, for the new brass has knit firmly to the old.

We reclaim pop valves, lubricators and many other parts the same way. Very truly yours,

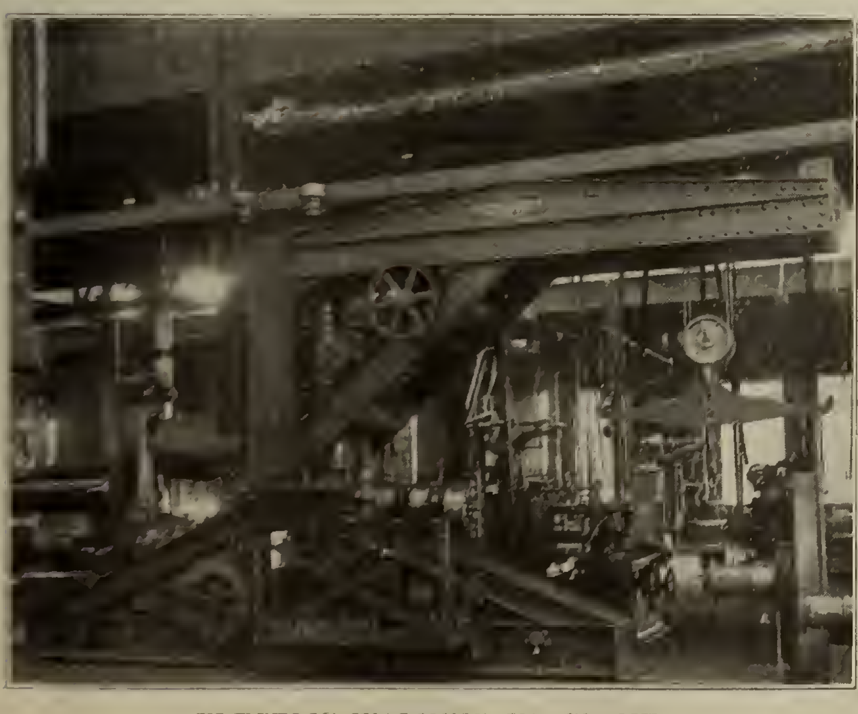
Wm. Hall.

802 West Mulberry St., Bloomington, Ill.

Electric Walking Gib Crane

An electric walking jib crane, installed in the Burnside shops of the Illinois Central Railroad Co., is shown in the accompanying half-tone. The function of this jib crane is to pick up the wheels and axles, distribute them through the shop to wheel lathes or elsewhere if desired and also to place wheels in storage. It is manufactured, designed and installed by the Whiting Foundry Equipment Co., Harvey, Ill.

The crane is of seven tons capacity, four motor, 12 ft. effective radius. It is supported on one track rail, top of mast being supported by I-beam track; requiring minimum floor space. All wearing parts are easily accessible for oiling and repairs. It was specially designed for this railroad and for the work it will perform. A feature to be noted is that of the low head-room.



ELECTRIC WALKING JIB CRANE.

The four motors are distributed as follows in the working of this crane: One for traveling crane, one for trolley, one for rotating jib, one for hoisting.

An important feature not to be neglected is the fact that load is always in absolute control, being automatically sustained at all times. The hoisting gearing is provided with improved double automatic safety brake, so arranged that the load may be raised and lowered by power and be automatically sustained. This brake attachment consists of two independent brakes, one electrical and one mechanical. The electrical brake is operated by an electric solenoid in circuit with the hoisting motor, and so arranged as to come automatically into action when the electrical current is off the hoisting motor circuit.

A maximum of efficiency is claimed for the service the crane is designed to perform, together with a minimum of cost as to installation and repairs. It is instanced as one of the many crane installations of this company facilitating production in modern plants.

The crane travels on a permanent mono-rail track, running the entire length of the shop at right angles to the erecting pits. The track is laid as close to the columns separating the erecting floor from the machine shop floor as clearance permits, so that the crane serves the erecting pits on one side of the track and the wheel lathes on the other.

The hoist motor is 15-h. p. and hoists 16 ft. per minute. The trolley rack motor is 2-h. p. and racks trolley on jib at rate of 90 ft. per minute. The jib rotating motor is 2-h. p. and swings jib at rate of two revolutions per minute. The crane travel motor is 10-h. p. and travels crane 160 ft. per minute.

The jib is fixed in horizontal position—not raised or lowered. The maximum lift of hook from rail is 10 ft.

Railway Mileage of Brazil

The total railway mileage of Brazil is divided as follows, the figures being given in miles: Government owned: Central of Brazil, 1,050; Great Western, 887; Bahia to San Francisco, 357; Baturite, 187; Sobral, 134; Central of Bahia, 197; San Francisco Railroad Company, 281; Minas and Rio, 106; Western Minas, 723; Parana, 259; Porte Alegre and Uruguayana, 362; Santa Maria to Passo Fundo, 220; Rio Grande to Bage, 176. Total, 4,939.

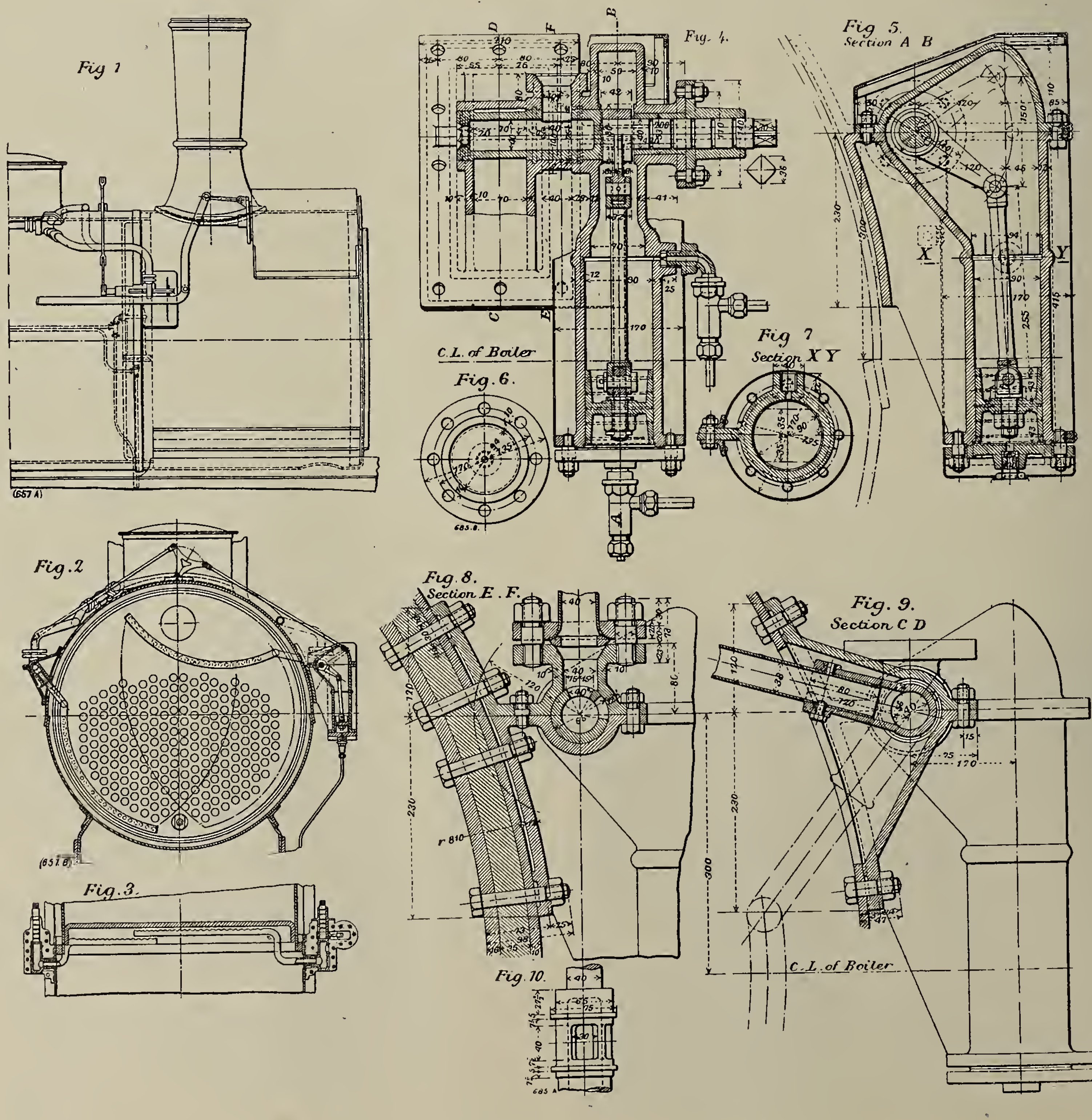
Private concessions: Leopoldino Railroad Company, 1,539; Santos to Jundichy, 86; Paulista Railroad Company, 636; Brazil Railroad Company, 1,372; Mogyana Railroad Company, 873; Sapucahy, 333; Northwest Railroad Company, 183; miscellaneous, 1,243. Total, 6,265.—Consular Report.

Tube Cleaner for Locomotive Boilers

THE locomotive boiler tube cleaner, illustrated herewith, is said to have met with considerable success on the Prussian State Railways. It is made by Messrs. Henschel & Son, Cassel, and was described in Engineering, of London, as follows:

The essential parts of this appliance consist of two movable arms, through which steam is blown, and which move up and down in front of the smoke-box tube-plate, steam being thus directed through the tubes. These arms may be operated either by hand or by steam. In the illustrations given the steam-operated device is shown. In Figs. 1, 2 and 3 the general arrangement of the device at the smoke-box is shown, Figs. 4 to 10 being details of the operating mechanism, etc. The operating valve is not shown; it is placed in the cab. It has three positions. In its mid-position it is altogether closed. If turned to either of the other positions, steam is admitted to the horizontal pipe near the top of the boiler (Fig. 1), which branches out, passing to connections on either side of the smoke-box, and also at the same time to one or the other of two small pipes (shown dotted in Fig. 1), which communicates with the upper or under-side of the piston of the operating mechanism (Figs. 2, 4, 5, etc.). At the same time any steam on the opposite side of the piston is allowed to escape.

Only one piston is required, the swinging arms being coupled by means of linking over the top of the boiler (Fig. 2), so that both move at the same time. The piston is provided with grooves only, and has no rings or other packing. It works by means of a trunk connecting-rod on to a crank on a spindle (Figs. 4 and 5). This spindle is fitted with grooves on the outer end. The other end of the spindle is hollow, and to this end is fitted one of the swinging arms inside the smoke-box (Figs. 3 and 9). Steam from the main steam-pipe passes down the connection shown in Figs. 4 and 8, the latter being a section on the line E F in Fig. 4. Fig. 10 shows a portion of the hollow end of the spindle, show-



TUBE CLEANER FOR LOCOMOTIVE BOILER.

ing the ports by which steam is allowed to pass from the steam-pipe to the arm from which it is blown out through the holes into the tubes. The arm on the opposite side of the smoke-box is fitted with a similar hollow spindle, through which it is supplied with steam: but, as stated above, it has no operating piston, movement being transmitted to it by the link gear from that on the other side of the smoke-box.

It will be noticed that the connection is such that when one arm moves up the other moves down. It will also be seen that all the tubes are covered in the course of the movement, while the central tubes are blown through twice in each operation. The piston may be left either at the top or bottom of its stroke after operating the gear; but this is immaterial, as the operating cock in the cab may be moved to start it from either position.

New Fireproof Smoke Jack

A NEW fire-proof jack has recently been brought out by the H. W. Johns-Manville Co., of New York. It differs from the ordinary "built up" jack because it is not made of many pieces held together with flanges and bolts, but consists of only three separate and distinct parts, each of which is in one piece without a seam or joint of any kind.

The Phoenix jack is made of a fireproof plastic material which is moulded into the desired shape and sets hard in a few hours. When thoroughly dry, it is almost as hard as iron and is extremely strong and durable. The materials used in its construction are absolutely fire and acid proof and the jack is not affected in any way by heat, moisture, acids or the gases of combustion. The entire jack is reinforced with extra heavy galvanized iron wire cloth, which is imbedded in the material and gives it exceptional strength and rigidity. The entire structure of the jack, when first assembled, consists of three parts, the hood, the circular stack and the cowl, all of which are finally fastened together with Phoenix compound in plastic state, producing a one-piece jack.

NEW FIREPROOF SMOKE JACK.

The jack is supported entirely by hanging rods attached to eye openings in the hood. These openings are made of the same material as the jack and are reinforced with heavy wire cable, the ends of which are unraveled and interwoven with the wire cloth. This makes the eyes strong enough to sustain the weight of the entire jack and by spreading the rods attached thereto the weight becomes distributed over a large area of the roof.

After the jack is in place these rods are covered with Phoenix compound to prevent deterioration. The interior of the jack is perfectly smooth, without any protruding bolt heads or flanges and it offers therefore an unobstructed and smooth surface with no tendency to prevent the escape of the smoke.

The jack is made in standard sizes or any special size that may be required. It is constructed from materials and moulds which are shipped to the round house, where the jack is made and set up. The average thickness of the jack is ⅝-inch, and the weight from 4 to 4½ pounds to the square foot.

Passenger Train Illumination

STATISTICS from Julius Pintsch Aktiengesellschaft compiled to April 1, 1908, show the progress in the adoption of the Pintsch system throughout the world. In four and a half years there was an increase of 35,301 car equipments and 2,773 locomotive equipments. The average increase per annum was 7,845 car and 616 locomotive equipments, making a total of 8,461 equipments per annum.

The following table gives a list of cars and locomotives equipped with Pintsch lighting systems throughout the world:

	—October 1, 1903—		—April 1, 1908—	
Country	Cars.	Locomotives.	cars.	Locomotives.
Germany	42,471	5,583	52,846	7,958
Denmark	45		45	
England	19,256		20,459	
France	6,837		11,914	
Holland	3,633	5	3,978	5
Italy	1,537		1,552	
Switzerland	392	2	398	2
Portugal	67		67	
Spain	38		38	
India	10,312		13,686	60
Austria	5,003		6,465	
Russia	3,467	132	4,428	329
Sweden	731	53	944	67
Servia	216		219	
Bulgaria	98		154	
Turkey	114		119	
Egypt	148		382	
United States	21,380		32,455	
Canada	393			
Brazil	978	31	1,324	31
Argentine	1,133		1,548	127
Chile	46		46	
Australia	2,396		2,945	
Japan	150		180	
Total	120,871	5,806	156,172	8,579

A Modern Steel Car Plant

THE shops of the Bettendorf Axle Company, one of the progressive industrial concerns engaged in the manufacture of car equipment and the building of all-steel cars, have been gradually extended in the past few years to enable the company to handle its growing business. The new site at Bettendorf, a suburb of Davenport, Ia., covers an area of 70 acres which are rapidly being utilized for manufacturing purposes. The layout, shown herewith, gives the arrangement of buildings and tracks which facilitate the operation of the plant.

The main shop of the plant, a building 700 x 240 feet in size, contains perhaps the most complete hydraulic plant in the country. All, or nearly all, of the shaping of the car parts is accomplished by the aid of hydraulic presses, of which there are upwards of sixty varying in capacity from fifty to eighteen hundred tons. Some idea of the power developed can be gained when it is stated that in the largest of these presses 24-inch I-beams are shaped cold, i. e., the ends are reduced and the beam is otherwise shaped and punched in various places without being heated, and all the smaller car parts, except the castings, are shaped and prepared for use in the same way. All special hydraulic machinery used in this plant was designed and built by the company.

Aside from the complete hydraulic plant, and in connection therewith, the works contain a full complement of other machinery operated by electric power and compressed air. There are eleven traveling cranes of varying capacity, which are electrically operated and enable the rapid assembling of the car parts. They were furnished mainly by the Pawling and Harnischfeger Company and the Cleveland Crane Company.

Much of the riveting (of sheets particularly) is done by compressed air, and this power is also made use of in finishing most of the cast parts. A sandblasting apparatus for cleaning the sheet-iron and other parts, preparatory to painting, has been installed and is also operated by compressed air. A complete electric light plant furnishes light for the shops as well as for the office building some little distance away.

The operation of the main shop is from east to west. The hydraulic presses are located in the east end where the bolster and car parts are shaped and punched. The car and bolster riveting departments are in the west end of the shop. The castings are brought from the storehouse, south of the main shop, into the center of the shop where they are riveted to the steel bolster and car parts. The body and truck bolsters, steel underframes and all-steel cars are assembled, painted and shipped from the west end.

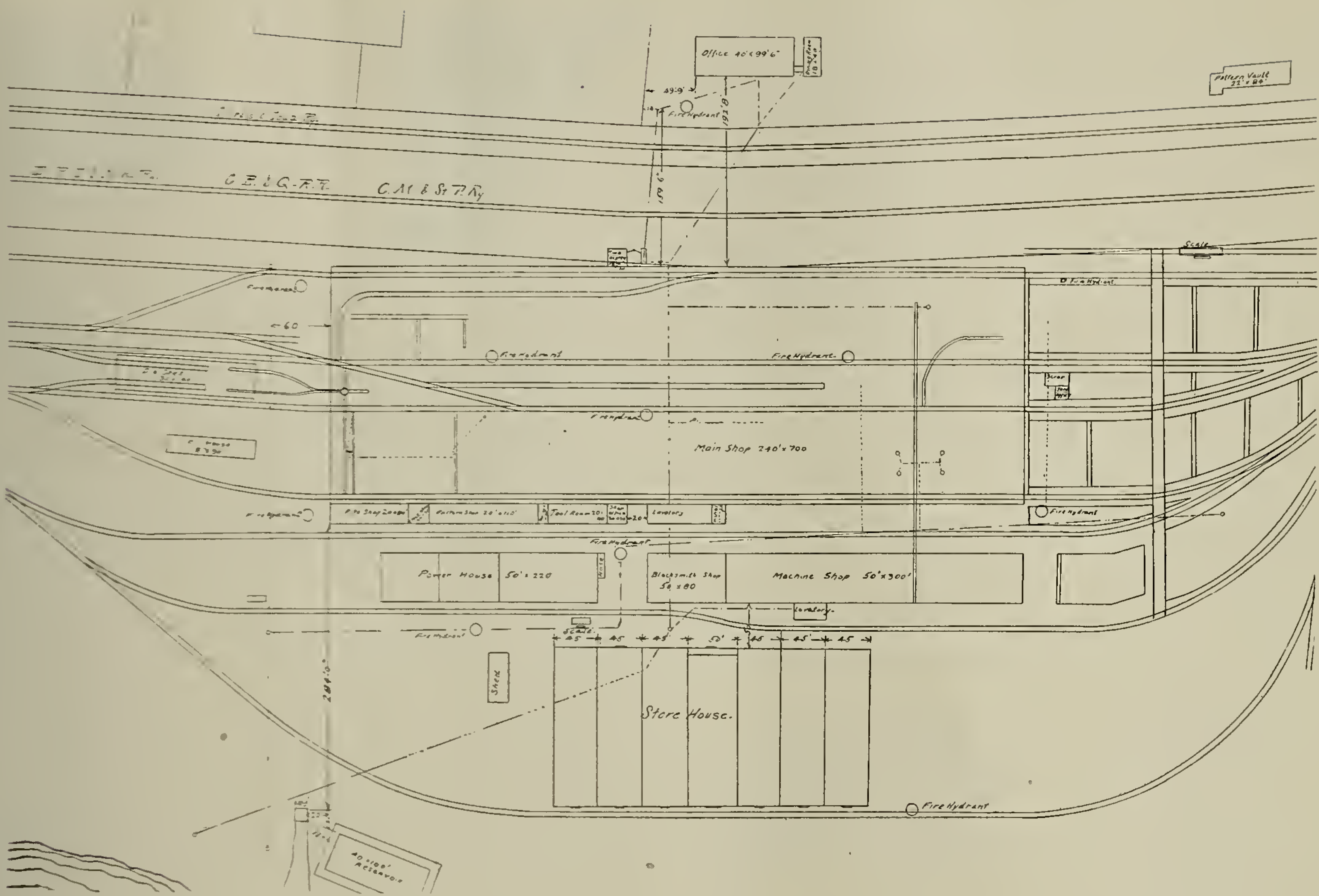
Immediately south of the main shop is the power house 80x220 feet in size, part of which until recently was utilized as a machine shop. The six horizontal boilers, with an aggregate capacity of about 1,000-h.p., are in the west end of the building, and the engine room adjoining contains the pumps and machinery.

Still further to the south and east are the extensive store houses for the material, covering an area of several acres, and to the west is the paint shop and other minor buildings in a group by themselves. The C., B. & Q., C., M. & St. P. and D., R. I. & N. W. railways run through the manufacturing tract, and excellent switching and yard facilities, including tracks, running through the main buildings, have been obtained. Locomotive cranes facilitate the loading and unloading of materials in the yards and shops.

The machine shop, as has been stated, was until recently located in the power building, but the available space proving entirely inadequate for the purpose, it was last fall decided to erect a new machine shop directly east of the power house and south of the main shops. The new machine shop is a building 50x380 feet in size, of which the west 80 feet will be utilized for the blacksmith shop, leaving the size of the machine shop proper 50x300 feet.

The office building of the company has also recently been enlarged by the addition of a second story, which will give more ample room for the rapidly increasing clerical force; and judging from the devel-

BETTENDORF STEEL CAR WORKS.



LAYOUT OF THE SHOPS OF THE BETTENDORF AXLE COMPANY.

opments of the past it will not be long before we will be in position to call attention to further improvements and additions to the already big plant of this striving and flourishing corporation.

To give an idea of the progress made by the Bettendorf Company in the manufacture of railway equipment, it may be stated that starting in about ten years ago with the production of the I-beam bolsters in the old Davenport plant, there has since been added the manufacture of the Bettendorf steel car underframes, the cast steel truck with integral journal boxes, and finally complete tank and freight cars.

Of the bolsters there are now over half a million in the service, and the Bettendorf ideal car truck with the one-piece frame is rapidly being adopted by the leading railway systems of the country. The tank cars of the Bettendorf type have been furnished to upwards of forty private car lines, and with the present year the manufacture of complete freight cars on an extensive scale was commenced. Just recently the shops turned out an order for 1,000 gondola cars for the C., B. & Q., which car was described in a recent issue of this journal.. To give a further idea of the capacity of the plant at the present time, it may be stated that it can turn out 25 complete cars or forty steel underframes in a day, and further contemplated improvements will largely add to this capacity.

Electrification of the Melbourne Suburban System

The Victorian Railways Commissioners, who are responsible for the management of the State Railways, have for some time past been considering the advisability of applying electric traction to the Melbourne suburban lines, which form the most important part of the whole railway system. So important, indeed, is it that it is doubtful if on any other large railway system the metropolitan traffic forms so large a proportion of the whole passenger business dealt with, both as regards train-mileage and receipts. In numbers, of course, the suburban trains exceed the other trains in most cities; but while in London, for instance, the long-distance trains entering the metropolis on an ordinary day number about 500 out of a total of 8,000, or some 6 per cent, in Melbourne they form only 4.5 per cent of the total, while the suburban train-mileage forms no less than 40 per cent of the total train-mileage of the system.

In conclusion, the engineer considers, especially in view of the large sums which in any case will have to be expended before long on enlarging termini and adding to the tracks, and on new rolling stock, the application of electric traction, to a portion of the system at least, should be taken in hand. It is apparently not intended to carry out the whole scheme at first, but in stages, so as to profit by the experience gained.—Engineering, London.

Sight Feed Air Cylinder Lubricator

THE design of the Detroit sight-feed air cylinder lubricator was effected to overcome the difficulty in properly lubricating the air cylinder of locomotive air brake pumps and thereby to do away with the serious results which attend improper lubrication. This new device is an attachment that provides for the lubrication of the air cylinder of the pump in connection with the locomotive cylinder lubricator.

With this lubricator in use the engineer or fireman does not get out on the running board to operate a common oil cup if the air cylinder goes hot during a run. The use of the proper cylinder oil is insured and the possibility of carbonization and clogging is obviated. The engineer is given complete and convenient control of the lubrication of the air cylinder.

The device consists of three parts, an emergency valve a sight feed fitting and a check valve connection. It is made in two styles, the single feed pattern as shown in Fig. 1 and the double feed pattern as shown in Fig. 2. The single feed style is made for use with a 9 or 11-in. Westinghouse pump equipment and the double feed style for an equipment consisting of two Westinghouse pumps, a New York duplex pump or a Westinghouse compound air pump.

Oil is supplied from the oil chamber of a Detroit lubricator of the bullseye type by removing the plug and screwing in place the emergency valve. This emergency valve, shown in Fig. 3, is not used to regulate the oil supply but merely as an emergency shutoff valve in case of accident to or leakage in the supply pipe between the emergency valve and the sight feed fitting.

The location of the sight feed fitting, which is equipped as shown with the regular bullseye glasses, is either to the right or left of the locomotive lubricator or at any point on the boiler head convenient to the engineer. A bracket, made from 3-16 or ¼x-1½-in. flat iron, may be used to support the fitting. The bracket may be given a quarter twist and drilled

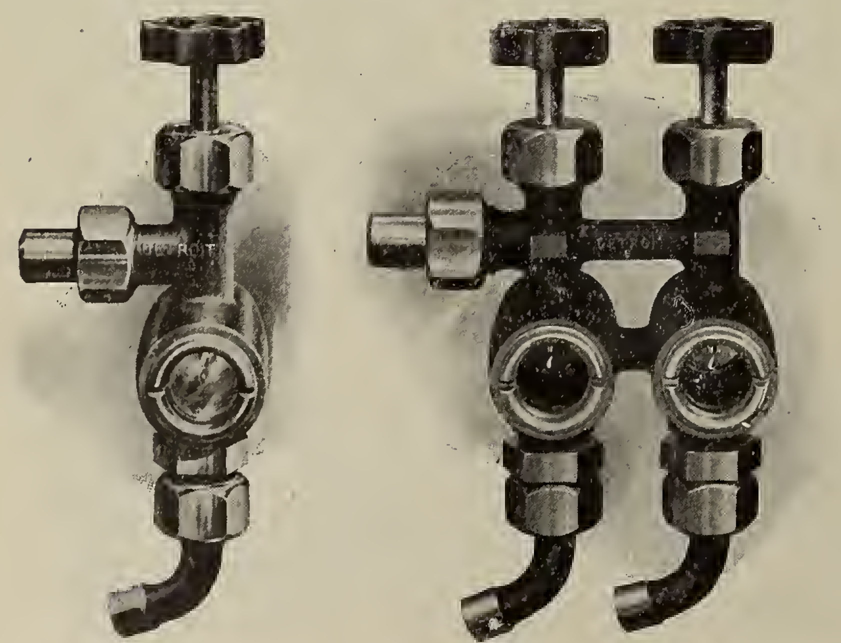


FIG. 1—SINGLE FEED AT LEFT, AND FIG. 2—DOUBLE FEED AT RIGHT.

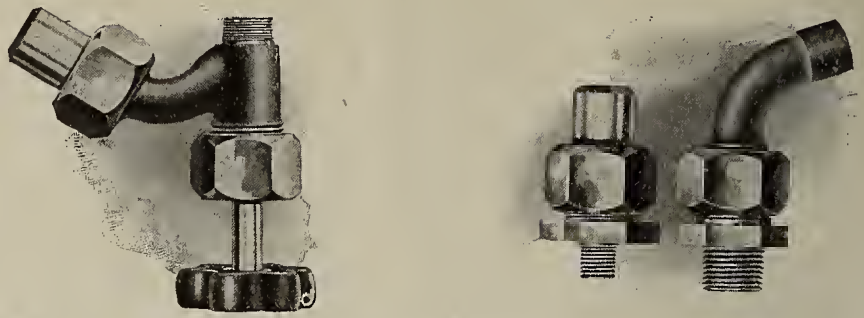


FIG. 3—EMERGENCY VALVE AT LEFT, AND FIG. 4—CHECK VALVE CONNECTION.

at both ends, the hole at one end fitting over the support post of the locomotive lubricator and the hole at the other end serving to support the fitting.

Compressed air is prevented from entering the oil delivery pipe between the sight feed fitting and the air cylinder by a check valve connection containing a ball check, seating upward. This check valve connection, shown in Fig. 4, is screwed into the place occupied by the oil cup. A gradual decline should be maintained in the oil delivery pipe between sight feed fitting and the oil inlet to the air cylinder, no trap being allowed as the oil flows through this space from gravity and the suction created by the pump. On the other hand there must be a trap formed between the regular lubricator and the sight feed fitting of the air cylinder lubricator, to prevent water from entering the oil supply pipe after all the oil has been fed from the oil reservoir of the regular lubricator. Therefore, if it is desirable to locate the sight feed fittings at a lower point on the boiler head than the regular locomotive lubricator, the oil supply pipe should first extend upward to about the same height as the upper part of the oil reservoir of the regular lubricator, and then downward to the desired point. With this arrangement water cannot enter the oil supply pipe.

A constant feed to the air cylinder is not advised, but it is recommended that no more than ten drops of

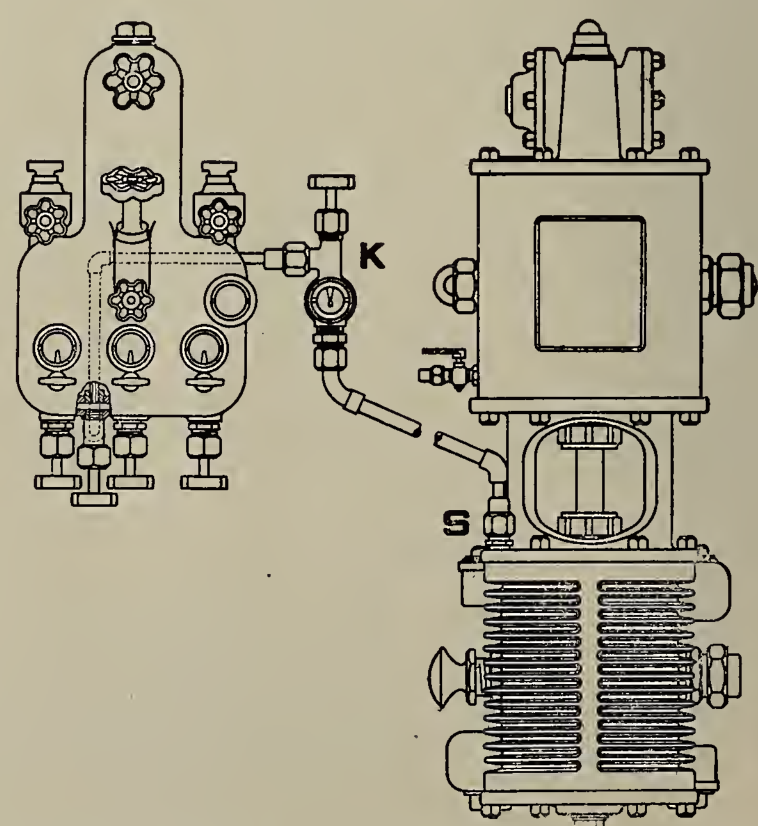


FIG. 5—SIGHT FEED AIR CYLINDER LUBRICATOR CONNECTED TO WESTINGHOUSE AIR PUMP-K, SINGLE SIGHT FEED FILLING-S, CHECK VALVE CONNECTION.

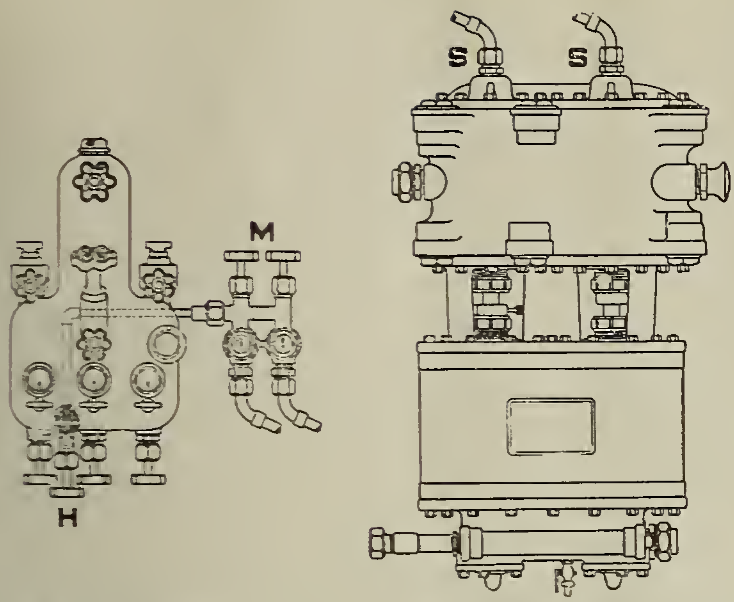


FIG. 6—SIGHT FEED AIR CYLINDER LUBRICATOR CONNECTED TO NEW YORK AIR PUMP-H, EMERGENCY VALVE-M, DOUBLE SIGHT FEED FITTING-S, CHECK VALVE CONNECTIONS.

oil be fed at any one time. Experience has indicated that the best results are thereby secured.

Car Foremen's Association of Chicago

The annual meeting of the Car Foremen's Association of Chicago was held on Oct. 12 and the following officers were elected for the ensuing year: President, P. H. Peck, master mechanic, Belt Ry.; first vice-president, W. O. Davies, Jr., foreman, C., M. & St. P. Ry.; second vice-president, W. F. Hall, Mather Stock Car Co.; secretary, Aaron Klein; treasurer, W. E. Sharp, Armour Car Lines. About 400 members were present. The organization has now about 800 members, and is in a flourishing condition and very influential.

Concerning Car Wheels

A letter has been addressed by the chairman of the Master Car Builders' committee on car wheels to the car wheel manufacturers asking them to agree on a specification. Expressions for railroad representatives who have previously met the car wheel manufacturers in conferences indicate a disposition to specify a charcoal iron mixture. On behalf of the manufacturers it is continually urged that the first requisite to the improvement of the chilled car wheel is the payment by the railroads of a price which will permit the use of charcoal iron exclusively or charcoal iron and old wheels made from such iron. The committee on standard rail and wheel sections of the American Railway Association will soon meet to consider the wheel situation and determine what report it will make to the forthcoming semi-annual meeting of the association.

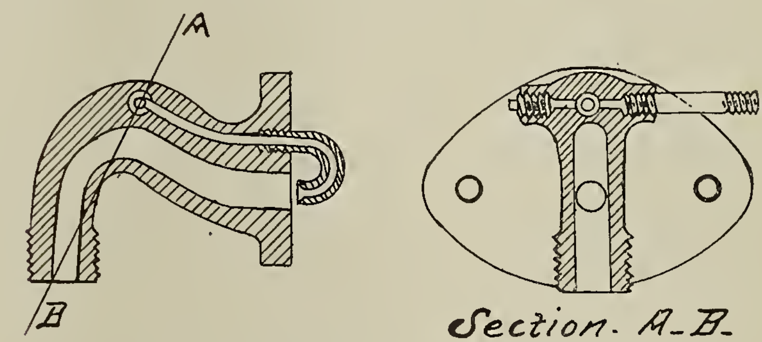
The office of the secretary of the New York Railroad Club and the Central Railway Club, as well as the International Master Boiler Makers' Association, has been removed from 62 to 95 Liberty street, New York city. This information was received from Mr. Harry D. Vought, secretary.

New Track Sander

THE principal feature of the White track sander, shown herewith, is its ability to handle efficiently all kinds of sand, such as wet sand, dry sand, baked sand, screened sand, etc. This claim is made by the designers after lengthy trials under various conditions.

In the illustration of the flanged type it can be seen that so far as the device itself is concerned that it is very simple in construction, consisting of the body and the air nozzle only. The sander is intended to take the place of the common hand sander, the sanding device to be attached to the sand box with a flanged joint same as the hand sander pipe is attached, and the sand pipe to be attached to the threaded end of the casting as shown.

A year's trial under all possible conditions, proved that the White sander is so reliable that the hand sander can be safely dispensed with.



SECTION THROUGH WHITE SANDER.

This sander will operate with either compressed air, steam, or water from the boiler. It is self-cleaning, and, having all connections outside of the sand box, is readily applied without cutting extra holes.

The manufacturers furnish the same device with a threaded end at the sand box connection and also with either a single or double discharge. It is manufactured and sold by The White Locomotive Track Sander Company, of Greensboro, N. C.

Personal Mention

Mr. Charles Anderson, general inspector, car department, of the Wabash, has been appointed general foreman, car department, at Toledo, Ohio, succeeding Mr. Frank Howard. Mr. A. S. Sternberg, car foreman at Landers, Ill., succeeds Mr. Anderson. Mr. C. E. Stough succeeds Mr. Sternberg.

Mr. C. C. Reynolds has been appointed road foreman of engines of the Atchison, Topeka & Santa Fe (Coast Lines) at Winslow, Ariz., with jurisdiction over the Albuquerque division, succeeding Mr. William Daze, promoted.

Mr. R. R. Royal has been appointed foreman in the locomotive and car department of the Mobile, Jackson & Kansas City at Louisville, Ky., succeeding Mr. G. W. Brewer, assigned to other duties.

Mr. William Hall has resigned as machine foreman and assistant general foreman, Bloomington, Ill., Chicago & Alton Railroad.

Mr. E. M. Sweetman has been appointed master mechanic of the Southern Railway at Sheffield, Ala., succeeding Mr. W. F. Moran, resigned.

Mr. J. F. Casey has been appointed general foreman, car department, of the St. Louis, Brownsville & Mexico, with headquarters at Kingsville, Tex.

Mr. G. W. Cuyler, roundhouse foreman of the Cleveland, Cincinnati, Chicago & St. Louis at Mt. Carmel, Ill., has been appointed roundhouse foreman of the Chicago, Rock Island & Pacific at Booneville, Ark., succeeding Mr. A. Schnable, resigned.

Mr. J. T. Carroll, assistant master mechanic of the Lake Shore & Michigan Southern at Elkhart, Ind., has been appointed master mechanic of the Lake Erie & Western at Tipton, Ky. Mr. A. R. Ayres, assistant superintendent of shops at Collinwood, Ohio, succeeds Mr. Carroll.

Mr. T. M. Baughan, formerly connected with the Illinois Central at Paducah, Ky., has been appointed general car foreman of the Arkansas division of the Chicago, Rock Island & Pacific, succeeding Mr. T. E. Carter, resigned to become general car foreman of the Denver & Rio Grande at Denver, Colo.

Mr. James H. Farrell, foreman of the erecting shops of the Pennsylvania Railroad at Harrisburg, Pa., and 30 years in the company's service, died Sept. 29.

Mr. T. L. Smith, master mechanic of the Chicago, Burlington & Quincy at Beardstown, Ill., died Sept. 29.

Mr. A. L. Moler, master mechanic of the Beaumont, Sour Lake & Western, the Colorado Southern, New Orleans & Pacific and the Orange & Northwestern at Beaumont, Tex., has resigned and will be succeeded by Mr. M. S. Curley.

Mr. A. H. Powell, of Alamosa, Colo., has been appointed master mechanic of the Denver & Rio Grande Railroad at Salt Lake City, succeeding Mr. A. H. Gaines, who is now master mechanic for the Oregon Short Line at Pocatello, Idaho.

Mr. J. H. O'Brien, master mechanic of the Mexican Central, has resigned. Mr. C. W. Tessiers will succeed Mr. O'Brien as master mechanic.

Mr. John Mooney has been appointed assistant superintendent of motive power on the Grand Trunk Pacific, with headquarters at Rivers, Man.

Mr. R. F. Kilpatrick, formerly superintendent of motive power on the Delaware, Lackawanna & Western, has been appointed assistant superintendent of motive power on the Denver & Rio Grande.

Mr. T. F. Barton, master mechanic of the Chicago division of the Illinois Central, has resigned, to become master mechanic of the Morris and Essex division of the Delaware, Lackawanna & Western. Mr. Barton will be succeeded by Mr. A. J. McKillop, master mechanic at Freeport, Ill.

Mr. A. T. Shortt has been appointed master mechanic of the Canadian Pacific at Cranbrook, B. C., to succeed Mr. A. N. Hobkirk, promoted to trainmaster.

Trade Notes

The Rubberset Brush Co., Newark, N. J., have just established a railroad sales department under the management of Mr. A. L. Holtzman. Mr. Holtzman has been connected with the sales department of this company for several years and has built up a large railroad trade on Rubberset brushes already. The steady increase in the firm's railroad business has led to the establishment of this separate department to take care of this business. Mr. Holtzman is well acquainted with the railroad trade, as he has attended the various railway conventions with exhibits during the past few years, besides calling on railroad officials personally. Besides manufacturing probably every kind of a brush used by a railroad company, the Rubberset people have just brought out a new design of brush, called "A Flat Iron Shape Car Scrub." This brush is a great improvement over the old style of car scrub brush in that the shape of the handle makes it much easier for the operator and very much more effective in its work. As the name implies, it resembles the handle of a flat iron. The company is now manufacturing these brushes and are offering to furnish one free for trial to any master painter requesting one. Mr. Holtzman is about to issue a catalogue of standard railroad brushes for his company. It is said this will be the only catalogue devoted wholly to this line of brushes, published. It will contain all the various kinds of brushes used by a railroad.

A pamphlet on Westinghouse Nernst Multiple-Glower Lamps has been issued by the Nernst Lamp Company, Pittsburg, Pa. It gives a brief description of the lamp and data on the many types and sizes.

The McConway & Torley Co., Pittsburg, Pa., recently sent out a very interesting pamphlet descriptive of the Janney M. C. B. coupler with radial movement for interurban cars.

The Cleveland Crane & Car Co., Wickliffe, Ohio, is now known as the Cleveland Crane & Engineering Co. This company discontinued the manufacture of cars many years ago and confines its business to the manufacture of cranes of every description.

The Cleveland Twist Drill Co., Cleveland, Ohio, is sending out a pamphlet on the "Peerless" high speed reamers which are made in a large number of styles.

Mr. Alonzo G. Delany has been engaged as representative of the Chicago Car Heating Co. Mr. Delany for the past two years has been connected with the Safety Car Heating & Lighting Company, and previous to that, spent ten years in the mechanical department of the Chicago, Burlington and Quincy Railroad.

John F. Allen, 370 Gerard avenue, New York city, has recently sold an Allen riveter to the Paris Bridge Co., Paris, Ill., also two riveters to the St. Louis plant of the American Car & Foundry Co., and two riveters to the Johnstown, Pa., plant of the Cambria Steel Co. One of the latter is a special riveter to exert 80 tons pressure on the rivet, with a reach of 60 ins. and 22-in. gap. The enormous pressure required, necessitated special parts and bearings to avoid crushing same, all of which have been carefully arranged for.

The Whiting Foundry Equipment Co., Harvey, Ill., has just furnished the Standard Cast Iron Pipe & Foundry Co., Bristol, Pa., with two Standard No. 12 Cupolas, which are notable for their size; having a capacity of 30 to 35 tons per hour. The shell is 108 ins. in diameter, and wind box 150 ins., with a 10½i-n. lining. It is fitted with two rows of tuyeres, eight in each row.

The American Brake Shoe & Foundry Co., 405 Western Union building, Chicago, recently sent out a pamphlet on Manganese Steel Castings.

A manual for engineers, leather covered, vest pocket size, compiled by Prof. Charles E. Ferris of the University of Tennessee, is being supplied free by the American Blower Co., Detroit, Mich.

Mr. Warren L. Boyer, formerly with the Peckham Truck Co., and later on with the New York Car & Truck Company at Kingston, N. Y., has become associated with the American Brake Shoe & Foundry Co. as assistant in the engineering department. His duties will be to look after the standardization of brake heads and brake shoes on the lines of the standards of the American Street & Interurban Railway Association.

The American Car & Equipment Co., Chicago, has received several orders from trunk line railroads for repairing and rebuilding freight cars. The shops of the company at Chicago Heights will be kept very busy for some time in fulfilling these contracts.

Mr. F. A. Barbey, New England agent of Thomas Prosser & Son, New York, the Rostand Manufacturing Co., Milford, Conn., and the Frost Railway Supply Co., Detroit, Mich., and a number of other railroad supply houses, has moved his office from 185 Summer street to Room No. 230 South Terminal Station, Boston.

The International Car Co., New Orleans, La., which was incorporated last July with a capital stock of $350,000, is preparing plans for its new plant. The company will purchase a full line of woodworking machinery, and the necessary iron-working machinery, together with boiler, engines, dynamo and motors.

The New York Air Brake Co. has received orders for the equipment of 15,000 new cars. It is now working 1,200 men, full time.

The Chicago Steel Car Co., Chicago, Ill., has been incorporated with a capital stock of $50,000 to make and sell cars and iron and steel products. The incorporators are Frank T. Winslow, S. B. McEldowney and I. L. Miller.

The Carlgen Brake & Coupling Co., Salt Lake City, Utah, has been incorporated, with $75,000 capital stock, to make automatic brakes and air-brake coupling devices, the patents on which are controlled by Knut W. Carlgen. The officers of the company are: President, Knut W. Carlgen; vice-president, K. E. Carlgen; secretary, Brigham Clegg; treasurer, William P. Pratt; general manager, Charles Carlgen.

The Bettendorf Axle Co., Davenport, Iowa, secured a new factory site several years ago, which enabled the company to extend its operations to the manufacture of all classes of railroad equipment, including the building of complete cars. The new shops at Bettendorf, a suburb of Davenport, are being constantly extended and further equipped with improved machinery to take care of the rapidly increasing business. This company has now over 500,000 bolsters in service, and the Bettendorf ideal car truck with the one-piece frame is being adopted by railroad systems of the country. Recent orders have been received by the company from the Chicago, Milwaukee & St. Paul Railway for 7,500 steel underframes, trucks and bolsters.

The American Blower Company, Detroit, Mich., booked a large number of orders since October 1st. Among the more important are the following: Engines— Fried & Reineman, Pittsburg, Pa., stoker equipment; Stephens Adamson Mfg. Co., Aurora, Ill., electric light; Michigan Employment Institute for Blind, Saginaw, Mich., electric light; Westinghouse Electric & Manufacturing Co. (for export), driving generator; Hiram Walker Sons, Walkerville, Can., power purposes, Fairbanks Morse Co., Chicago, Ill., three engines for driving generators; City of Rocky Mount, North Carolina, municipal electric light plant; Ault & Wiborg Co., Cincinnati, O., driving blower; Allis-Chalmers Co., Milwaukee, Wis., two engines for driving generators; Barr Holiday Box Co., Isola, Miss., electric light plant; Isthmian Canal Commission, driving generator; Flint Body Co., Flint, Mich., electric light plant; Western Electric Co., Boston, Mass., driving generator; W. T. Osborn & Co., Kansas City, Mo., electric light plant. Heating and ventilating apparatus— National Museum Library of Congress, 13 fans; U. S. Hamping Co., Moundsville, W. Va.; new Palmer Falls school, New York, N. Y.; new Corinth school, New York, N. Y.; American Lead Pencil Co., Murfreesboro, Tenn., factory; Tucker, Speyes & Co., New York, N. Y., loft building; Washington school, Indiana Harbor, Ind.; Ilion school, New York City; estate of Benjamin Lichtenstein, New York City, loft building; Clark Wilcox, Brooklyn, N. Y., loft building; Packard Motor Car Co., Detroit, Mich., factory; South Brownsville (Pa.) school; Ashland Ky.; Bullock Electric Mfg. Co., Cincinnati, O., factory; Zechine Coal Co., Newcomb, Tenn., mine ventilation; International Paper Co., Brownsville, N. Y.; International Paper Co., Livermore Falls, Me.; Union School, Wheeling, W. Va.; State Female Normal School, Farmville, Va.; Sanitary Can Co., Indianapolis, Ind., factory; Seventh Ward School, Allegheny, Pa.; President St. Bath Bldg., New York; First Ward School, Ambridge, Pa.; Monessen (Pa.) School; Trussed Concrete Steel Co., Youngstown, Ohio, factory; Armstrong Cork Co., Lancaster, Pa.; School Building, Rocky Mount, N. C.; Auburn (N. Y.) School; Carrollton (Ill.) School; Hobart College, Geneva, N. Y.; Clay County High School, Clay Center, Kansas; Maryville (Mo.) High School; Hotel Gotham, New York; Presbyterian Church, Batavia, N. Y. Forced Draft Apparatus—Richard Best, Newark, N. J.; Eisenbrath & Schwab Co., Chicago, Ill.; Toledo Furnace Co., Toledo, Ohio; Auburn (N. Y.) Light, Heat & Power Co.; Assam Distillery Co., Jorhat, Assam, India; House of Providence, Detroit, Mich.; American Shipbuilding Co., Lorain, Ohio, steamship; H. T. Weston, Beatrice, Neb.; Beatrice Poultry & Cold Storage Co., Beatrice, Neb.; Dutchess Tool Co., Fishkill-on-Hudson, N. Y.; Water Works, Beatrice, Neb

Technical Publications

STEAM POWER PLANT ENGINEERING, by G. F. Gebhardt. Published by John Wiley & Sons, New York. Cloth binding, 798 pages, 5½x9 ins., illustrated. Price, $6.00.

The book covers fuels and combustion, boilers, and auxiliaries, superheated steam, coal and ash handling apparatus, chimneys, mechanical draft, steam engines, steam trubines, condensers, feed-water purifiers and heaters, pumps, separators, traps and drains, piping, lubricants, finance and economics, testing and measuring instruments, etc., besides descriptions of several typical installations, rules and tables.

The book was written by Prof. Gebhardt after a series of lectures at Armour Institute of Technology. It treats the subject of power plant engineering in a thorough and systematic manner. While it is one of the best books published for class room purposes, it may be considered an excellent reference book for engineers.

BOILER ACCESSORIES, by Walter S. Leland. Published by the American School of Correspondence, Chicago. Cloth binding, 117 pages, 6x9 ins., illustrated. Price $1.00.

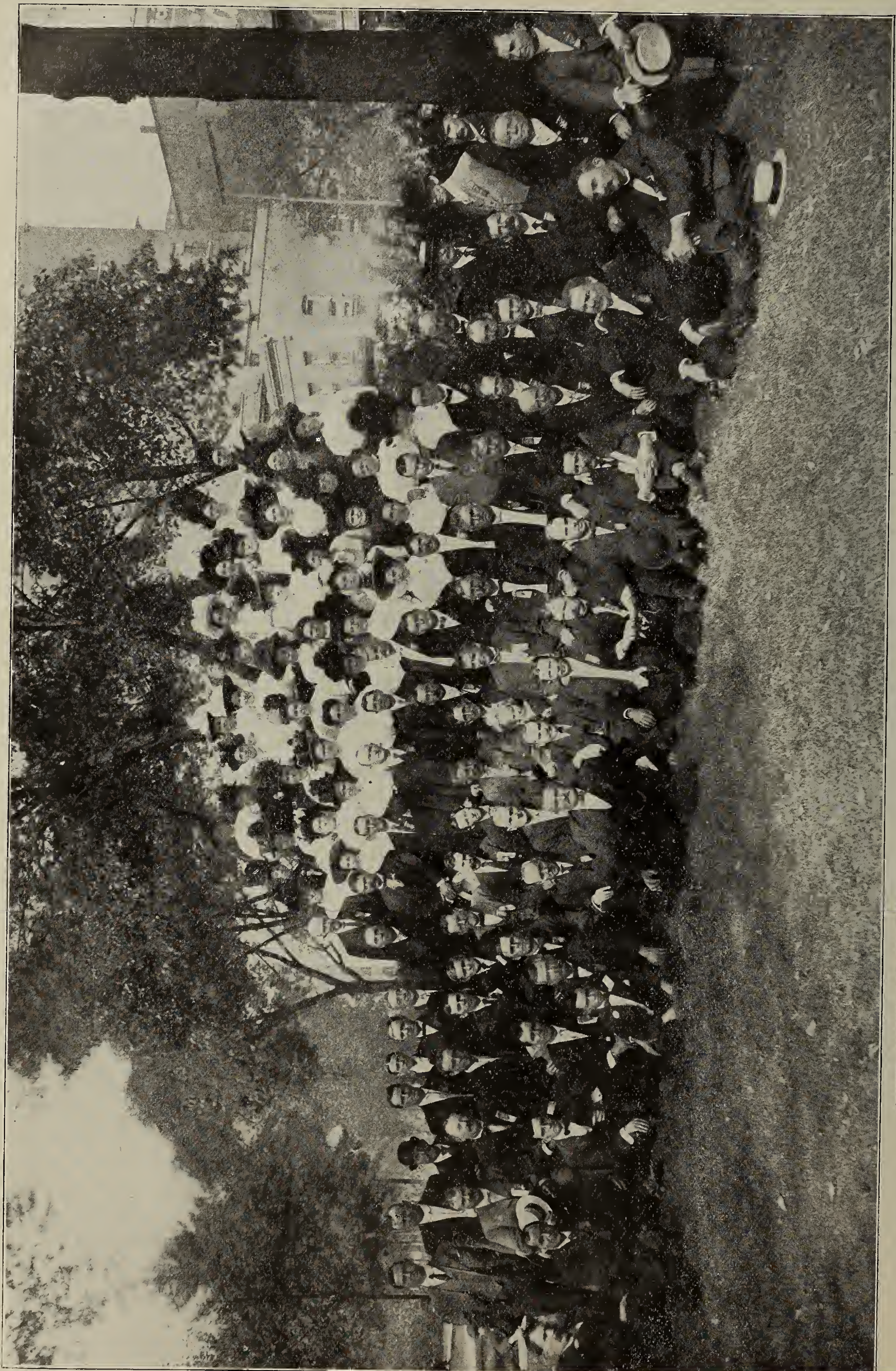
The book is divided into three sections as follows: Special constructions and mechanical aids; control and supply devices; and boiler troubles and tests. In the first section boiler setting, furnaces, natural and forced drafts, tube cleaners and tube stoppers, manholes and handholes, etc., are treated.

It is a book which is readily understood, not being complicated in discussions. It is only intended to cover the accessories of the boiler and engine rooms.

FOUNDRY WORK, by William C. Stimpson. Published by the American School of Correspondence, Chicago. Cloth binding, 143 pages, 6x9 ins., illustrated. Price, $1.00.

The book is a practical guide to foundry work, covering the methods of moulding and casting in iron, steel, bronze and other metals and giving data on shop equipment and management.

The book is divided into three sections, as follows: Materials and methods of moulding; making and finishing castings; and shop management, useful tables, etc.



CHIEF JOINT CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION, DETROIT, MICH., SEPT. 9, 1908.

Convention of the Chief Joint Car Inspectors' and Car Foremen's Association

The ninth annual convention of the Chief Joint Car Inspectors' and Car Foremen's Association was held at the Cadillac Hotel, Detroit, Mich., Sept. 8 and 9, 1908.

President H. Boutet, of Cincinnati, called the meeting to order at 10:30 a. m.

It was moved that the reading of the minutes of the previous meeting be dispensed with and that they stand approved as printed in the Railway Master Mechanic. Seconded and carried.

ADDRESS OF PRESIDENT H. BOUTET.

Members of the C. J. C. I. & C. F. Assn.

Gentlemen: It is with a great deal of pride and pleasure that I again address you as your president at this, our ninth annual meeting, being the third time I have had that honor, for which I wish to express my thanks.

I cannot but feel that this meeting should be one of the best of the association, but it can only be made so by your united action in entering freely in the discussion of each subject that is presented, not taking a selfish view of same, but advocating what is going to be, in your opinion, the best practice for the country at large, and making such recommendations to our superior officers as will be a credit to you and our association, bearing in mind that one good recommendation accepted and approved by our superiors is far better than one hundred that are not considered.

One of the recommendations of our last meeting, referring to rules 125, 126, 127 and 128, has been referred to the executive committee of the M. C. B. Association, and the American Railway Association, and it is hoped that it will be favorably acted upon, as it is believed that it will be a great help in getting worn out cars home by the shortest possible route and prevent hauling cars thousands of miles unnecessarily when in a weak and unserviceable condition.

In this connection I wish to call your attention to the action of some car foremen reporting to their master mechanic or superintendent of motive power, that a car is in a decayed and worn out condition, when in fact it has a combination of defects brought about by rough usage, for which his line is solely responsible.

You should never recommend sending a foreign car home in any other manner than which you would be willing to receive one of your own cars home.

I am pleased to hear from the interstate inspectors that there is still a decided improvement in safety appliances and I trust that each of you will give this matter your earnest attention and enlist the help of your inspectors and car men so that it will be soon a curiosity to hear that a railroad company has had a penalty defect reported against it.

Our meetings will be from 9 a. m. to 12:30 and from 2 to 5 p. m., each day and it is hoped that you will be as prompt in attendance and remain throughout the sessions, as in previous years, as I believe you will be greatly benefited by the discussions and deeply interested in the several papers that will be read from different parts of the country. They are especially interesting and should be given your special attention.

You will be suitably rewarded by the entertainment committee in the evening. You need not be anxious about the ladies, as this same committee, who are all handsome and gallant gentlemen, have given me their personal word that they will leave nothing undone to see that the ladies have a nice and pleasant time and that they will be shown everything in Detroit worth seeing.

I wish to express to the entertainment committee and to the firms that have contributed to our entertainment fund, our sincere thanks and appreciation for the part they have taken to make our stay here pleasant.

I am sure that each and all of you will feel in leaving Detroit that we have had a splendid meeting and a very pleasant time. I wish to especially thank our secretary for his untiring efforts to help make this meeting a success and feel that few of you can realize the amount of work necessary to properly bring this meeting before the people interested throughout the country.

I also wish to thank the different members of the executive committee for their able assistance.

I also wish to thank those persons that have spent their time and thoughts in preparing papers for the meeting.

President Boutet: At the last meeting in Chicago the constitution was changed in order to elect a secretary and treasurer and you elected Mr. Sharp treasurer. He wrote me saying that it would be impossible for him to serve and positively declining the office. The different members of the executive committee agreed with me that it would be proper for the secretary to act as treasurer also, consequently the two offices have been combined, as in the past.

Mr. Lynch, as chairman of the committee appointed to audit the books, consisting of Messrs. Lynch, Trapnell and Berg, reported that the committee had examined the books of the secretary and treasurer and found them correct.

It was moved that the report of the secretary-treasurer be received and placed on file. Seconded and carried.

DISCUSSION OF M. C. B. RULES.

PREFACE.

Mr. Lynch: My understanding of the third section is that it is the intention that all cars interchanged at all interchange points should be interchanged in accordance with the rules as expressed by that article.

President Boutet: Is it not your understanding that two or more railroad companies can make any agreement they see fit under which to interchange cars?

Mr. Lynch: If in acordance with the rules; if such an agreement does not conflict with the rules, I think it would be allowed.

President Boutet: To go a little further, A and B, two different railroads, one running north and south, the other east and west; they are both members of the M. C. B. rules; at the point where they intersect they agree between themselves to accept cars under some plan other than in accordance with these rules —if they accept all cars from one another without any inspection, would that be permissible under these rules?

Mr. Lynch: No, sir. I do not think, according to that section, that any agreement that would conflict in any way with the rules would be allowed.

Mr. Gainey: I think that any railroad has a right to make any private agreement that they see fit; that is a matter between themselves, but I do not think that they can take any of their cases before the arbitration committee; they have to settle all differences between themselves.

Mr. Hogsett: I do not understand that it was the intent of the M. C. B. Association when placing in the preface the third paragraph, that it prohibited interchange centers from forming or entering into local interchange agreements, as long as the agreement only applies to a given point. It is my opinion that any joint car association has the right to make local rules, when such rules are for the sole purpose of improving interchange matters in general. We found it absolutely necessary to put into effect at Fort Worth, local interchange rules to meet local conditions, and they have proven of great advantage in the movement of cars through Fort Worth terminals, and its influence is felt at other less important interchange points in the southwest.

Mr. Waughop: The Central Association of St. Louis does not recognize that the master car builders have anything to say on interchange so far as the local situation is concerned. The way I look at it, it is simply a slap at the different associations throughout the country.

Mr. Campbell: I will say that in St. Paul and Minneapolis we have local agreements and our interchange is made on the basis of the M. C. B. rules regarding the condition of the cars, but we can enter into any agreement we want to and if any dispute arises we have an arbitrator who decides it and the disputes cannot go to the arbitration committee of the M. C. B.

Mr. Lynch: In reading that article it is my opinion that it is the intention of the M. C. B. to have something uniform in interchanging cars at the different points throughout the country. Local agreements may be made that will not conflict with these rules, but as I understand it the M. C. B. does not wish to encourage such agreements, especially if they conflict with the rules. The reading is plain. It is my opinion that the M. C. B. wishes to discourage any local agreements that would conflict with the rules. We have a right to form agreements to facilitate the movement of cars, but that agreement must be in accordance with these rules.

Mr. Trapnell: The second paragraph reads: "Railroad companies handling cars are responsible for damage done to any car by unfair usage." Kansas City took the initiative in a plan whereby they intend to make the car owner responsible for all owner's defects that might happen to their cars in fair usage, such as the breaking of a coil and the drip pans and pipes that they have on cars. It caused quite a furore of excitement with all the private lines connected with Kansas City, and they in turn had the arbitration committee get this latter clause inserted to specifically affect Kansas City, because we figured that a car being delivered to a packing company would not be considered in the true interpretation of interchange, a car offered in interchange, because they could not give anything in return. We put it up to the Central Association of Railroad Officers and they advised us that they did not consider that a car offered in interchange and that brought this rule in. If they want to make their rules complete they ought to take out the first clause of that second part of the preface of the rules; leave out the words "unfair usage" and make them responsible for any damage done to any car.

Mr. O'Donnell: It is my opinion that the officers controlling the railroads of this country are superior to these little rules that we call the master car builders' rules, and if in their best judgment they see fit to enter into any local arrangement to expedite the movement of freight with as little delay as possible they reserve the right to do so, and it is my explicit understanding that all roads are complying with the M. C. B. rules in interchange, strictly up to the letter, because the rules of interchange are the salvation of the railroads throughout the country in the handling of freight without delay. Outside of this I do not wish to enter into the discussion.

Mr. Trapnell: I believe Mr. O'Donnell is wrong wherein he says that the M. C. B. rules are the salvation of the railroads to expedite the movement of freight. We find that in order to expedite the movement of freight it is necessary to have local rules, because if you lived strictly in accordance with M. C. B. rules you would set the car back and make him do the repairs. We receive the car and move the freight, either transfer it or repair it. We do not set the car back.

Mr. Waughop: There is one little comment I want to make there. If the interchange rules, as promulgated by the master car builders is lived up to we will block the traffic of the country. Local rules have to prevail so far as each individual point is concerned. There is no question about it. We might add a "codicil" to that and say simply "for arbitration purposes only." If a case comes up before the arbitration committee wherein the rules have been ignored, then the arbitration committee will decide the case under the rules in force at the time regardless of the local interchange.

President Boutet: At Cincinnati it is the impression of the Central R. R. Association officers that the M. C. B. rules is a code of rules gotten up for the interchange of cars throughout the country and they are as good as the mechanical departments have been able to concoct for the general management and the good of all. They advocate putting on cards when the cars are interchanged, and if the M. C. B. rules are not up to all the requirements, it is our duty to make such recommendations to the master car builders as we think will be a benefit to the cars throughout the country. If we find something that is an, advantage in a local way, it would, in a great many cases, be an advantage in a general way. We understand at Cincinnati that we have a perfect right to depart from the laws as laid down in these rules, but we cannot appeal to the arbitration committee of the M. C. B. on any case that may come up under special agreement.

Mr. Hogsett: In our local agreement we have a rule that affects only cars owned and controlled by a line in the Fort Worth association, i. e. they will accept all cars owned or controlled by them without requiring defect card to be issued or repairs to be made by the line delivering. Also another rule which applies to foreign cars, and which is as follows:

"Car inspectors shall be instructed to receive all home and foreign cars having old unfair usage defects that do not render them unsafe to run or unsafe to trainmen on record of condition of such cars without cards, and that each company be responsible and card for all new unfair usage defects to foreign and home cars, that may be brought about while cars are on their lines; provided, that in case such cars are carded at some other point of interchange for old defects passed on record at Fort Worth, the line so carding will be protected by defect card on joint record at Fort Worth."

The members of the Fort Worth association were somewhat divided on this question, and I told them that I would bring it up at this meeting. The more I look into it the more I am satisfied that any number of lines have a perfect right to enter into local agreements that will better interchange conditions.

President Boutet: To get the matter plainly before everybody it is the opinion at Fort Worth that A and B can enter into any agreement to interchange D's cars with defects for which the delivering line is responsible, they have no appeal outside of their local organization to get any redress?

Mr. Hogsett: None at all.

President Boutet: But if B delivers the car home to D he must card if they are cardable defects.

Mr. Hogsett: No line should be held for defects for which it is not responsible. Our idea is to pass cars on record for old defects. If as you state, A delivers B a car and B delivers to D, and B is compelled to card for some old unfair usage defects, I will issue a card for B's protection against A, on record of the car passing from A to B through Fort Worth interchange. It is not our intention to hold up cars for such defects.

Mr. Hacking: Suppose A has a car belonging to D and A broke something and gave a card to B, and they broke something else which formed a combination; who would be responsible for the repairs?

Mr. Waughop: Any car delivered in interchange with defects for which the owner is responsible will be stood by the owner.

President Boutet: That discussion would probably come up under "combination defects," but it is not my intention to hold strictly to parliamentary usages.

Mr. Lynch: I would like ot ask the question: Does it conflict with the present rules for the receiving company to make the repairs? Is there anything in the rules that would permit such an agreement?

President Boutet: That is out of order. We are discussing the third paragraph of the preface of the M. C. B. rules.

Mr. Lynch: Would such an agreement be in conflict with M. C. B. rules for B to repair A's cars? I do not see anything in the rules that would permit it.

Mr. Chas. Hitch: I believe the intent of the third section is to have a uniform inspection of cars at interchange points. I also believe that any two roads have a perfect right to enter into any agreement, but cases arising to be carried to the arbitration committee for defects of cars which were interchanged under local agreements, not in compliance with the M. C. B. rules—I do not believe that the arbitration committee would act on. I do not think you would have the protection of the M. C. B. association unless the cars are interchanged in compliance with the rules which they give us.

Mr. Waughop: I do not think you are right. The idea is that the M. C. B. arbitration committee will decide the case under M. C. B. rules regardless of the local interchange rule.

Mr. Fox: I move that it is the sense of this meeting that the formation of local rules are permissible under the rules. Seconded.

Mr. Lynch: Would it not be better to say: If they do not conflict with the M. C. B. rules?

President Boutet: It would not be necessary to have any local agreement then.

Mr. Lynch: If A delivers to B a car in bad order, does it conflict with the rules for B to make the repairs to A's car? I would like to have the question answered.

Mr. Fox: I do not think the arbitration committee would recognize any case brought to them of any cars interchange under the local agreement; for that reason I think the last section of the preface was put in there.

President Boutet: My understanding of your motion is that two or more railroads have a right to make any local agreement they may see fit to but they cannot appeal any dispute that may arise to the arbitration committee.

Mr. Fox: I will accept that.

Mr. Devanney: When you make local rules they should be settled by the local points.

President Boutet: It appears to me that is the proper course.

Mr. Devanney: I would like to have you explain under what conditions a case can be brought before the arbitration committee.

President Boutet: There have been several cases that have been brought before the committee and they declined to act. I have been told that the reason the rule was inserted, so that no one could bring in anything unless it was in accordance with the M. C. B. rules. I talked to one of the arbitrating committee.

Mr. Hogsett: Local agreements are varied in their general makeup to meet conditions at a certain point. I have no doubt that the local agreement at Fort Worth would not do at all at Cincinnati. This agreement was made for the purpose of relieving congestion, that would occur perhaps under M. C. B. rules at a given point.

It is not our intention to go beyond our own organization to settle disputes, because we make our own local rules and are in sole charge of them. We do not intend that the arbitration committee shall have anything to do with the settlements of our troubles arising from our local agreement, and it is not our intention that our local rules shall conflict with M. C. B. rules, but we made our local agreement to improve and relieve local conditions at Fort Worth.

Mr. Hacking: They are all right to a certain extent. It is all right to make rules for the interchange of freight which will not conflict with the M. C. B. rules.

President Boutet: Did you ever stop to think that no local agreement can be made between two or more railroads unless those people themselves are directly interested? I may be representing one road, you another, and so on. We get together and we find conditions at some point in such a way that it would be foolish to make the same kind of an agreement. We realize that if we get a car from one of the other roads and take it to a certain point on our road, we are going to be compelled to card for that car. That is between the parties making the agreement.

Mr. Trapnell moved that the motion as it now stands be tabled. Seconded and lost.

President Boutet: If we have come here to discuss rules, let us discuss them. We came here for the purpose of getting information in regard to what other roads are doing for the benefit of the railroads. Let us get the sense of everybody here. As long as I am president of this association everybody is going to be heard and given a fair show. I came here for the purpose of getting information and I believe the rest of you have. I believed the amendment was out of order and so decided. I believed the motion to table was lost and I so decided.

Thereupon Mr. Waughop asked for a division of the vote, which was granted, and the motion to table duly declared lost.

The question was put upon the original question and carried.

RULE 1.

Mr. Skidmore: We should come to some understanding on that rule so we would all understand it alike. My understanding of that rule was that the adjusting of air brakes was added to it for the purpose of compelling all roads to keep air brakes adjusted and that there would be no charge against the car owner for so doing. It has been a question with quite a few as to whether it was a chargeable defect for adjusting brakes, and for that reason I think it was added to rule 1.

Mr. Waughop: The only difference with him is that there isn't anyone doing it.

RULE 4.

Mr. Waughop: At St. Louis our general rules require certain missing material on cars to be provided for by the receiving line, or are charged the owner. What is the custom at the other joint points for such as brake shoes to private lines?

President Boutet: At Cincinnati the inspection is made in this manner, a car comes in on A's line, it is inspected to see if the safety appliances are all right, and car is safe to go to repair or transfer track. Any defects found on the delivering line, repairs are made to that car and charged to the owner of the car, if they could have been charged for by the delivering line. That rule is in vogue in Cincinnati, except with the Norfolk & Western.

Mr. Waughop: Has any other man seen any agreement whereby they can receive certain cars with certain defects as specified and charge to the owner?

Mr. Campbell: We have that same agreement in St. Paul and Minneapolis.

Mr. Waughop: How far does it go?

Mr. Campbell: I can give you a copy of the agreement if you wish.

ARTICLE 5. WORKING FORCE.

Sec. 1. The superintendent of the Minnesota Transfer Ry. Co., to appoint, subject ot the approval of the members of the association, a general car foreman, and a clerk, and the general car foreman to employ a sufficient force of inspectors, car repairers and oilers, and an air brake inspector and repairer, and such other assistants as the business will warrant. The wages to be the wages as paid by the member lines in the Twin Cities

Sec. 2. M. C. B. rules to govern the condition and inspection and repairs to cars for the interchange of cars.

Sec. 3. The general car foreman's decision to be accepted. Any disputes arising from his decision shall be placed before the arbitration committee for their adjustment.

Sec. 4. The Minnesota Transfer Ry. Co., to (as heretofore) either release or repair all cars damaged while in its possession.

Mr. Waughopp: I would advise all joint points to read the St. Louis rules in regard to passing cars with missing defects and live up to them—it would then become universal and a good thing.

Mr. Lynch: I do not think that is a good arrangement. I think when a car door is missing on a foreign empty car repairs should be made and charged the owner: otherwise it would encourage running bad order cars home to the owner. The repairs should be made to keep the car in good serviceable condition. Just such arrangements conflict with the M. C. B. rules.

Mr Hogsitt: It is impossible to have a local agreement apply to all points alike. I am satisfied that the St. Louis local rules would not suit at all at Fort Worth. I think the intent of this association is to bring about uniform rules, but at the same time we should have the right to form our own agreements.

President Boutet: There is not any doubt about each individual point, but the interchange of cars is not so much different at Fort Worth from what it is at Cincinnati. It appears to me that if a rule is good at one point it ought to be good at another. There may be some different arrangements, but outside of that it appears to me that interchange ought to be pretty nearly the same all over the country. It is possible that the one at St. Louis may be the best one, but the best rules ought to be selected and if they are good for one locality they ought to be good for all.

RULE 5.

Mr. Burg: It does not make it mandatory, but at the option of the receiving road.

RULE 11.

Mr. Hogsitt: What gauge would apply to those wheels?

President Boutet: That is merely a shop practice, and does not apply to the inspector at all. It only applies to the fitting of wheels. I would not stop it if the flange did not comply to that.

RULE 21.

President Boutet: You will notice that there is quite a change of wheel gauge.

Mr. Hogsitt: The question I asked a while ago will apply now, if a wheel has been previously cast.

President Boutet: That would only be a shop practice, and it would be a gauge that you would have to have in the shop, but for the interchange of cars it would not interfere. There is a difference in the manner of making it, there is 17-64 cut off of the bottom of each slot to allow you to gauge the thickness of the flanges. In the next four or five months some of the railroad companies will discover that.

Mr. Hogsitt: On the wheels cast prior to 1907, before that 17-64, there is not much difference between the old gauge and the new gauge. The flange never wears absolutely vertical.

Mr. Wohrle: I want to speak about a gauge that we can gauge the thickness of the flange more properly than under the old gauge, due to the corner being cut out. You will notice that they recommend to hold the gauge on the outside of the wheel, and in that way gauge the thickness of the flange. It is quite an improvement over the old gauge.

President Boutet: I do not know that you can gauge any more accurately than with the old one. It ought to set down straight on the tread.

Mr. Wohrle: You found that the flange was within the limit and still the gauge would not go down. Most all wheels had a fillet, and the gauge would rest on the fillet.

President Boutet: Was the wheel condemnable?

Mr. Wohrle: It did not comply with the instructions at first—it does now.

Mr. Lynch: I think Mr. Wohrle is right; No. 4 is the gauge you have reference to. You will notice that the throat has a piece of the gauge cut off there, and while that is condemnable under the new gauge, would not remain there at the bottom of the wheel. You cannot set the gauge down straight on account of the fillet, so that you could not condemn the wheel.

President Boutet: You say you cannot condemn a wheel, although it is condemnable? Why was it condemnable if the gauge would not condemn it?

Mr. Gainey: We are going to have a great many more wheels condemned now with the gauge in the shape it is. You will have one-third more wheels condemned than you had under the old rules.

RULE 22.

Mr. Burke: What would you consider a pitted journal?

President Boutet: I would consider a pitted journal a journal with small holes caused by an inferior axle.

RULE 26.

Mr. O'Donnell: I would like to ask if it is the custom of interchange points when you allow defect cards, to put in the full quota of brasses on your cars, or do you single out just those that are actually destroyed?

President Boutet: The practice at Cincinnati is to give a card when you remove a pair of wheels for slid flats; rough journals on chipped flange some roads require the foreman to use two brasses, on each axle splice, as it was a rule of the road that they would not use any old brass and a card was given for what brass was used. It was done at the request of several of the roads and was made a universal practice to execute a card.

There were one or two cases where a charge was made for brass on the car and a charge made on account of applying the wheels and we stopped giving any cards for brasses whenever we changed a wheel, although it is well known that they can charge for any brass that is required to make that change. That same rule applies to box bolts.

A Voice: They always bill for them whether they are mentioned on the defect card or not.

Mr. O'Donnell: If you consider one good enough, you actually bill for the two. I have found in traveling around in different yards that it is not absolutely necessary at all times to apply these brasses. We might apply brasses fifteen miles from an interchange point at Buffalo, and then a car that goes over the Lehigh Valley, or some eastern line, they actually throw away the brass, and I am simply trying to save that amount of money.

President Boutet: I have always considered the M. C. B. rules plain. No bill can be made unless repairs are actually made, and any person that would remove a pair of wheels for a defect for which the delivering line was responsible, to make a bill for two brasses, if he doesn't use two brasses, is merely stealing in my opinion.

Mr. O'Donnell: That is the point that should be brought out. There is a large amount of money involved in many instances. We must consider the honest part and not charge unless the work is covered.

Mr. Skidmore: I would not like to have the minutes of this association go out and give people not attending the meeting the impression that the members of this organization were removing wheels, using the same journal bearings that were removed and making a bill for new journal bearings. Quite a number of roads have instructions issued that in case of removing wheels, new journal bearings must be used in all cases. There are some that permit the use of journal bearings if they consider them in condition fit for use, but in that case no bill is rendered against the car owner for old journal bearings re-applied. The only bill would be for new material used. I would like to hear from the members present how many are re-applying journal bearings and billing for it?

Mr. O'Donnell: After Mr. Skidmore has made these remarks it is due to me that I should say a few words. We possibly will do the same after the 3rd of November at Buffalo as they do in Cincinnati. I do not charge that our boys in Buffalo do that. I called attention to the fact that the opening is there and if the temptation is placed before us you can draw your own conclusions as to whether or not you will do that or not. I am heartily in accord with Mr. Skidmore that the matter should be brought out so that we will all thoroughly understand where we are.

President Boutet: From the way I understand Mr. Hacking's remarks, I think he ought to say something. It appears to me from his talk that whether it was necessary to remove two brasses or not, he removed one of the old brasses and made a charge for two.

Mr. Hacking: I have seen the bill and if it included the brasses and was fair, we have never objected to it.

Mr. Skidmore: That is perfectly legitimate if you use the material, but we do not make a bill for any material not used. I believe that the car foremen and the men making repairs in this country are honest, and I do not think that any of our employers would tolerate us for one minute if they thought we were acting dishonestly in making bills, though, as it has been said, the opening is quite large for dishonesty in matters of that kind. If you wanted to be dishonest it is not necessary to wait until you remove a wheel. You could go out in the yard and take the car numbers and then go back in the office and make bills for journal bearings for all the car numbers you have. I think this association should understand that no bill should be allowed to be presented for journal bearings or journal box bolts that have not been actually used. To do so would certainly be dishonest, and if you act dishonestly for the company you would certainly act dishonestly against the company and I do not think the officials want that kind of car foremen.

Mr. Hacking: Often this is done in the office and in making the defect card no mention is made of the brasses worn out, so that there is no way of knowing whether they renewed them or not, but they usually renew them.

Mr. Pfeiffer: I believe that if all parties making repairs to defective cars would live up to rule 76 there would be no chance for any dishonesty to creep in.

President Boutet: I believe it is the duty of every car foreman to have the man making repairs to a car make out a slip showing just what material he used on the car. He should do that to check up the storekeeper and then the clerk would have the information. They should make out a slip showing that they applied two pair of wheels or used one box bolt, if necessary, and when that information goes into the office the bill clerk can make out the bill in accordance with the repairs. I think every man should be instructed that they must make out a slip to turn into the office to give the bill clerk a chance to know just what repairs were made.

Mr. Bacherer: The instructions of the Pennsylvania is in all cases to apply repair cards for all repairs made. If we are unable to attach the cards, we send the card to the superintendent of motive power.

Mr. Gainey: That is just the way we carry on our work down home. For every car that is repaired, the man making the repairs places on a slip all the work that he does to that car; all old or new material applied, and in that way the clerk gets a correct account of all the work that goes out. As to journal bearings, if they are good—if we get a car from the Big Four for a pair of slid flat wheels and we renew them we try them on the journals; the pair of wheels that we put back in the car, if they have good crown bearings, we put the two old brasses in. If the pair of wheels that we put in, the brasses haven't a crown bearing, then we use new brasses and charge.

Mr. Chas. Hitch: We are handling the matter just as Mr. Gainey has outlined it. We have to answer for every brass we draw from the store room and the number of new or second hand brasses used. We place the second hand brasses as Mr. Gainey says: Whenever they fit the journal we make no charge for the brasses placed in the car.

President Boutet: For the benefit of the man who spoke a while ago about complying with rule 76, will say that it would be to the advantage of all to use the slips.

Mr. Lynch: In speaking of the honesty of employes of the railroads, I believe they are all honest, but in changing car wheels sometimes they take a maul and break the box bolts off instead of unscrewing the nuts. Should the delivering company be held responsible for the box bolts broken in that way? I think they ought to take time to unscrew the nuts off of good bolts.

President Boutet: Sometimes it is hard to get the nuts off.

Mr. Lynch: I mean where they can be gotten off.

Mr. Berg: All you have to do is to see that it fits properly, and I believe that the material is safe in their hands.

RULE 30.

Mr. Rau: In St. Louis we are having quite a number of triple valves robbed and in some instances the parties robbing put the cap back on so that the inspector is unable to ascertain that they have been robbed. If we get one of these cars and the air brake men would find that the inside parts are missing, would we be justified in charging the owner?

Mr. Trapnell: I would say "No." We also have another feature in this, cars offered in interchange are usually delivered by the switch engine and the air brakes are not connected so that the inspector is unable to locate seamy pipes; those cars to all intents and purposes are in good order. When placed in the train and the engine is attached to the train, leaky train pipes are discovered and the cars have to be taken out and delayed for 24 hours. In accordance with my understanding of rule 30, you have no recourse only to bill yourself. You cannot bill them because you have received this car in interchange, which I believe is an injustice. The triple valve—if you have the missing parts of that triple and have received the car in interchange, you cannot go back to the delivery line. That is strictly in accordance with the rules.

Mr. Berg: It is no unfair usage on the part of the road and if the inside parts were robbed it is not owner's risk and therefore should be not charged to the owner. You do not test them on interchange.

President Boutet: We have never run across that kind of thieves; if they robbed the tripple valve they left the cap off.

Voice: A representative of a western road was telling how cute the thieves were. They substituted wood for the brass ring and had it painted so that it wasn't detected until the proper test was made.

Mr. Gainey: Under rule 30, if you delivered me a car and I placed it on the repair track and found the interior of that triple taken out, I would ask you for an M. C. B. defect card on the road.

President Boutet: The rules of interchange provide that you may inspect a car any time before the car leaves the terminal and any old defect is charged against the delivering line.

Mr. Skidmore: I think we are a little ahead of the rules in discussing missing parts of triple valve. That part isn't mentioned in rule 30, but rule 35 makes the missing parts of a triple valve, delivering line defect. Consequently there is no question about who is responsible for the missing parts of triple valves.

Mr. O'Donnell: What was the object of inserting that in there if it wasn't to cover this part?

President Boutet: This says "damaged."

Mr. O'Donnell: Rule 35 covers "missing."

President Boutet: To bring out the discussion on rule 30, you deliver a C. O. & T. P. car from the New York Central to the Michigan Central with a leaky pipe, caused by seams; that car gets over to the Michigan Central and you discover it, would you give a card against the New York Central covering it?

Answer: Yes, that is our inspection and I consider it is only just, unless we can prove by taking it up that these missing parts were taken in the train yards. The inspection of the delivering company line is simply for safety appliance defects. That is, if it is caused by unfair service, seams due to rust and the breakage of pipes and such as that are charged to the owner.

Voice: It is chargeable to the car owner until it becomes interchange according to these rules.

Mr. O'Donnell: We are simply doing business in an honest manner. I am there to interpret the agreement. The book of rules is there to govern us. I am not going to dally on technicalities. Anything that is honest is charged to the car owner.

Mr. Gainey: I should not think it ought to make any difference with the roads or a car in interchange; if I could charge if I make the repairs, before I deliver them, why hasn't a man the same right to bill the car owner?

President Boutet: Except to impose the penalty. I am surprised to find Buffalo and Cincinnati so near alike. That car would be inspected in A's yard and if the safety appliances were all right, it would go. If a leak would be discovered in B's yard, B would repair it and charge the owner.

Mr. Lynch was advocating that roads had no right to enter into private agreements. Suppose that the Lake Shore would deliver a car with defective air pipe caused by seams; that car was in the Big Four yard and they call your attention to it, what would you do with it?

Mr. Lynch: If the defect is not detected on inspection, we do nothing with it. If the defect is detected on inspection we, of course, would issue a defect card, if the car was delivered in that condition. Cars are interchanged in Cleveland in accordance with the M. C. B. rules as far as we can and cards are issued accordingly.

Mr. Wohrle: We would consider it owner's defect and we cannot issue a defect card for owner's defect. If they are offered in interchange, we would have to put a card on.

Mr. O'Donnell: If the repairs are made in the receiving company's yard?

Answer: Yes.

President Boutet: It has always been the contention at Cincinnati that when cars were held up at Columbus or Cleveland they would say that Buffalo would not receive them. We come here and find out that Cincinnati and Buffalo are so near alike, don't you think it would be a good plan to get Cleveland in line?

Mr. Wohrle: Do you inspect cars before delivery?

President Boutet: We make no inspection except for safety appliances and see that the car is safe before delivery.

Mr. Lynch: At Cleveland, all cars are interchanged in accordance with the M. C. B. rules in force, no running of delivering company's defects on record. One man may inspect cars for two or more roads if conditions permit and defect cards applied covering delivering company's defects. So, I can not see, under our system and conditions, that we could adopt your system and be a success.

President Boutet: The New York Central is the principal mode of traffic between Cincinnati and Buffalo. If we deliver a car to the New York Central of the Big Four Lines at Cincinnati, that car, according to our rules down there, would go through Cincinnati all right and would go through Buffalo all right. The repairs we have made would be charged to the owners. At Columbus it wouldn't be stopped because it is all Big Four through Columbus. It comes to Cleveland and they would demand a card and they would get a card against the Big Four for it. We possibly couldn't work that same interchange with all lines, but if a car is going to Buffalo, we would treat it exactly like Buffalo. Cleveland would not allow the car to go through so that it could reach Buffalo. Don't you think we ought to get together on that?

Mr. Lynch: There is no inspection between the Lake Shore and the Big Four except for safety appliance defects.

President Boutet: If an L. & N. car was delivered from the Lake Shore to the Big Four at Cleveland and it was discovered on interchange that the car had a seamy pipe?

Mr. Lynch: No, sir; not between New York Central lines. There is an arrangement there whereby they are only inspected for safety appliances. It would pass through Cleveland regardless of what inspection you made.

Question: There wouldn't be any card given?

Answer: No, sir.

Question: If that was a foreign car?

Answer: Any car.

Mr. Wohrle: I would think that rule applied simply to missing side doors and brake shoes, and any foreman who makes that repair can charge the owner, but if they neglect that a defect card will have to be issued at Columbus. I couldn't get around it.

President Boutet: You have an L. & N. car going through to the Big Four; the Big Four has the car in its possession with a missing side door; the Big Four could put that car on the repair track and bill the owner for it; what difference does it make if that car went through to the Hocking Valley and they would put a door on?

J. V. Berg: I believe that all the large interchange points are passing missing side doors, and that the rule should be changed so that they should be at owner's defect. The way it is, it is only at the small points that are acting strictly according to the rules. The intent of the rule isn't carried out, and therefore it would be a good thing to have the rule changed.

President Boutet: In my opening address I called attention to the changes in the rules, and I hope some of you will try to offer some recommendations. I would like to ask Mr. Campbell how they treat these things.

Mr. Campbell: In regard to rule 30, the Minn. Transfer Co. has a yard into which all the roads enter. That yard handles the interchange for all the roads and we have only one repair track. I repair the cars for all the roads and of course any car that comes in with any owner's defects would be repaired on account of the owner. I make both the in and out inspection in that yard and if I find any defect on the second inspection that wasn't caught on the first and the car ought to be set on the repair track, we would still repair it on account of the owners. We represent all the roads and do the repairs for all the roads. Of course in the Twin Cities it is different than in the Minnesota Transfer yards. Our agreement in the Twin Cities is that the cars must be in a safe condition to run to destination. The chief joint inspector is nothing more than an arbitrator; he doesn't get around in the yard unless he is called upon to decide some question in reference to some dispute. In case a car was offered in interchange with defects on it that made it unsafe to go to destination, the receiving line has a right to refuse that car under our agreement at present, but we are talking of having a new rule that will modify that agreement.

President Boutet: How would you treat a car in interchange that had passed interchange?

Mr. Hogsitt: Literally speaking, it would be a cardable defect, but at Fort Worth I wouldn't card it. If it came over to the receiving line they would repair it and charge the owner. That is a matter of adjustment with the chief joint inspector; he is supposed to be fair and act honestly, and when he knows that that is a defect of which the owner is responsible, the fact that it had passed interchange should not relieve him from the responsibility of paying for it. If it came about by derailment or any unfair usage, I should card for it.

President Boutet: You treat it as an owner's defect whether the car was caught before delivery and charge the owners upon the principle that it doesn't make any difference who repairs it?

Mr. Hogsitt: Yes, sir.

Mr. Trapnell: We bill the car owner.

Mr. Waughup: We charge the owner.

Mr. Devanney: It seems to me that this association ought to go on record as being against that section of the rule.

President Boutet: We are discussing now the proper interpretation of the rules. Suggestions for changes will come later.

RULE 31.

Question: How do you handle that at Cincinnati?

President Boutet: There isn't any possible chance to reject them for old dates except they go on the receiving line. No cars are returned at Cincinnati for anything that we do not consider a penalty defect. Is there any one in the room that considers an old date on an air brake or triple valve a penalty defect?

Mr. Lynch: Cleveland doesn't; we allow the car to run.

Mr. Wohrle: Neither does Columbus. We do not consider it a penalty defect.

Voice: The interstate inspector considers it a penalty defect when he finds them on our line.

President Boutet: Did you ever know of an interstate inspector that marked it down against you?

Voice: There is nothing except a defect that endangers life. Isn't that the proper meaning of a penalty defect in the true sense of the word? Where a missing grab-iron or something of that nature would endanger life.

President Boutet: That is it in an off-hand way.

We have a gentleman here who wishes to know if he is entitled to join in the discussion. We would be glad to have him do so, and I will ask him what he considers penalty defects.

Mr. Carr: We consider five penalty defects: Height of couplers, cut levers inoperative, hand holds, 75 per cent air brakes and cars that are not coupled by impact.

Mr. Waughop: What do you consider a sill step on a car under the rule?

Mr. Carr: Well, we consider it very necessary under the corner of a car.

Mr. Waughop: What do you consider a safety sill step on a car under the rules?

Answer: I do not consider anything else a sill step but what is on the sill of the car.

Question: How many?

Answer: Two.

Question: On what corner?

Answer: The right hand corner.

Mr. Waughop: You are wrong; it is the left hand corner.

President Boutet: You are both right; one is looking at the car from the side and the other from the end.

I have made the statement that the interstate inspector will claim that a sill step that is in such a condition that it is hazardous is a penalty defect. It appears to me that if a person got hurt getting on a car with the sill step bent or broken that it would lay the company liable under the safety appliance act. I would like to get a full expression on that matter.

Mr. Burke: From what information I can get from the interstate inspector, it is in regard to the coupling and uncoupling and it doesn't cover a man climbing on a car at all. If we have one grab-iron on the side and two on the ends and the coupler all right, we are clear.

Mr. Wohrle: I do not see that there is any difference, and they do not consider a sill step a penalty defect. There is but five penaty defects which have been named.

Mr. Lynch: Doesn't the laws of the State of Ohio claim that a sill step is a penalty defect. The state inspector has so informed us and we consider it a penalty defect.

Mr. Wohrle: They require four steps to every car, but they are not enforced.

President Boutet: The law provides that a car must be equipped with four grab-irons; it doesn't say anything about sill steps.

Mr. Wohrle: The state inspector tells me that that is true of state traffic; they don't go out of the state of Ohio, but when a car is billed outside of the state it is interstate traffic and he has nothing to do with it.

Mr. Dyer: I might say that at one time Mr. Johnston held up 30 cars that wasn't equipped with sill steps on the four corners of the car and finally the cars moved forward, but he held them and put a card on each of them. He was a state inspector.

Mr. Devanney: This is a national convention and we ought to look more to national laws. We want something for all over and let you fellows fight it out in Ohio by yourselves. The question is whether or not under rule 31 it is a penalty defect. It is not unless you have less than 75 per cent of air on the train.

Mr. Hogsitt: Is it the intention of the rule that a pressure retaining valve and pipe, if the car did not denote rough usage, is chargeable to the owner?

Mr. Lynch: As I understand that rule there are two classes of usage, unfair and rough usage, and what I understand by rough usage is the possibility of the end of a car being broken out by the load shifting. In that case the valve was damaged and that would be considered rough usage to the pipe or valve. That would be my definition of it and it would be a delivery company defect under rough usage.

President Boutet: The pressure retaining pipe broken by the end of the car bursting out would be owner's defect if no combination existed.

Question: Why?

Answer: Because of no rough usage.

Mr. Lynch: There are two kinds of usage—rough and unfair, and the delivery company being responsible for all unfair usage. What I wanted was to know what rough usage meant?

Mr. Carr: I should like to ask a question. A car that has been damaged by a load going out of the end of the car and it is not equipped with a pressure retaining valve: the repairs are made and the car is put back into service; when it comes up to the next interchange point, what would be the result?

Queston: The car hasn't been equipped?

President Boutet: If the bottom of the car did not disclose that it had any, I would take it as owner's defect.

Question: What would the inspector do if he saw the pipe missing?

Answer: He wouldn't put on the card unless he found the bottom of the car equipped with a retaining pipe and there was no evidence that it had been removed.

President Boutet: I would treat that as if it had never been on.

Mr. Gainey: Rule 38 covers that so far as the retaining valve is concerned. This man says that the car originally showed that it was not equipped.

Answer: It comes with proof of it, but what are you going to do with a car that had the end bursted out with the retaining pipe and valve gone?

Mr. O'Donnell: When you have a combination of defects on the end of your car, no matter how the damage occurred, the pipe and the retaining valves are chargeable to the delivering company; when you have no combination, they are simply owner's defect. That is the way I look at it.

Mr. Gainey: I agree with Mr. O'Donnell on that.

Mr. Wohrle: The way I understand that rule the air pressure retaining valve and pipe would not be included in a combination of defects but would have to be covered by a card—the delivering company responsible. If a pipe or valve is damaged, card for it regardless of whether there is a combination on the end of the car.

Mr. Pfeiffer: The way I understand that rule, if a car is damaged by having the end bursted out, or any other unfair usage, the retaining valve and pipe are chargeable to the owners.

President Boutet: If they are missing?

Answer: If it was due to the end bursting out.

Mr. O'Donnell: I think that should go on record in the form of a motion, and when they are missing they are also charged up. If there is no combination it is chargeable to the owner.

Mr. Lynch: It includes all the parts that are delivering company defects and it says: "Also pressure retaining valves and pipe when damage to car denotes rough usage." What does that mean? I do not think that rough usage means unfair usage. I do not think it is intended that there is a combination of defects at the end of the car through this rough usage that has damaged the pressure retaining pipe or valve, because, as I said before, it is my opinion there are two classes of usage.

Mr. O'Donnell: I move you that it is the sense of this body that the interpretation of that rule is that when a combination of defects exist on the end of a car it is understood that the retainer and pipe will be carded and consdered unfair service, and when no combination exists, it is owner's defects.

Mr. Lynch: Any damage from unfair usage is delivering company defect. It wouldn't make any difference what the damage may be; the rules cover that, because all defects are delivering company where a combination exists.

Mr. Wohrle: That last sentence was added in this year's rules and it includes the retaining valve and pipe.

Question: Why?

Answer: So as to include all air brake parts.

Mr. Dwyre: I believe as Mr. O'Donnell says that if there is any repairs to the end of a car denoting that the valve and pipe may have been removed that it is the delivering company defect and should be so treated.

Mr. Waughop: All I have to say is "read the rules."

Mr. Skidmore: Do I understand that it is the sense of the meeting that the retaining valve was also the owner's responsibility.

Mr. O'Donnell: I would not care to put that in there particularly. I would rather simply follow the course of the reading of the rule, that any damage to the pipe or retainer when there is no combination on the end of the car, is owner's defect.

Mr. Hogsitt: Rule 35 refers to missing material; it is not damaged, and where the valve and pipe is missing it is delivery company; otherwise, it is not.

Mr. Skidmore: I want to call his attention to the fact that rule 35 does include missing or damaged air brake pipe.

Mr. Lynch: I would like to ask Mr. O'Donnell how he intends to reach any car where it is damaged alone?

Mr. O'Donnell: The fore part of the rule covers that.

Thereupon the question was put upon the motion and duly carried.

RULE 37.

Mr. Campbell: Even the Master Car Builders have a different interpretation of this. It has been understood to mean that all cars offered in interchange must be equipped with air brakes with 1½-inch pipes on and after September, 1909, but there is a period there. It stopped at that point.

President Boutet: My interpretation of that rule is that no cars be offered in interchange after September 1, 1909, all cars must be equipped with 1¼-inch pipe.

Mr. Hogsitt: The Southern Pacific have lots of cars.

Mr. Campbell: This rule does not change the status of the cars offered in interchange now.

Question: I want to know what is a car equipped with air brake?

President Boutet: A car equipped with a cylinder and triple valve and 1¼-inch air pipe.

Question: I want to ask if a car that has been originally equipped with air brake has been in a wreck and you want to send it home; you probably card that car and put on a straight air pipe; will that be accepted in interchange?

Answer: No, sir; not in Cincinnati.

Question: Would you accept one with air hose missing?

Answer: We would repair the air hose.

Question: What is the difference; all the brakes being gone? Is it not a fact that all roads are running cars not equipped with air?

Answer: No, sir; we do not run any. I am only speaking personally; if there is any of you doing any different, I hope you will speak up. One line wouldn't accept it from the other; the road wouldn't deliver it; it wouldn't make any difference whether it had been originally equipped or wasn't equipped at that time. It was not an air brake car.

Question: Suppose part of the cylinder was broken?

Answer: We would put on a cylinder and card against the delivering line, but we would not equip the whole car with cylinder and triple valve and reservoir and everything.

Voice: The roads are running a good many refrigerator cars and you can't repair them to the satisfaction of the owners and it is better to get the car to the owners and have them make the repairs; but I wanted to get the sense of the foremen here as to whether they would run a car with straight air pipe. We are running straight air cars today, why can't we run wrecked cars?

Mr. Dwyre: We are running cars not equipped with air and they are not in running order and there isn't any reason in my mind why they should not be passed on to the owner. The train would have to have 75 per cent of air otherwise.

President Boutet: We have always treated a car with cylinder, triple valve and reservoir gone as not equipped with air.

Question: Is the New York Central one of the lines that say they will not run them. I understand them to say they put cards on them. In my opinion that is wrong; with good straight air on, it is just as good.

Mr. Wohrle: A car that never had originally been equipped with air brake, we would not pass; but a car that has been wrecked, we would not consider to come under the rule and we would pass it.

Mr. Campbell: It would depend on the road; some will take them and some wont. I would first ask the permission of the road to allow it to go forward.

Mr. Hogsitt: The rule reads: "All freight cars offered in interchange must be equipped with air brakes."

Mr. Lynch: A car not originally equipped with air brakes we would send back. A car having been in a wreck, with the air brake appliances damaged, if it has a home route card on it and is safe to go, we notify the receiving road and ask their permission to run the car. We have no authority to accept it and we ask the receiving road if they will accept it; if they do, the car goes forward.

Mr. O'Donnell: All the operating officials have circulars in our agreement that no car will be accepted unless fully equipped with air brakes. I consider it an imposition to run such a car and offer it to your neighbor to run six or seven hundred miles. There are one or two roads that will take them and repair them, but the majority of them will not.

Thereupon an adjournment was had until afternoon.

RULE 38.

Mr. Campbell: My understanding of that is that whenever you get a car at an interchange point that is not properly equipped with retaining valve and the receiving line would not receive it without the retaining valve, you have a right to put it on and charge the owners. Some of the roads are not so particular, but the roads running west require retaining valves.

RULE 39.

President Boutet: A late decision of the United States court shows the height of the coupler to be 34½ inches. We should offer something in regard to the question if we have a car within the height of 31½ and 34½ should it be considered a penalty defect. This association should recommend to the M. C. B. that they take that up with the Interstate Commerce Commission and have the law changed so that a car between 31½ and 34½ would not be a penalty defect.

RULE 40.

The only change is the word "rivet" is added to cover steel cars.

RULE 41.

We have come to the place now where there is a difference in the interpretation of this rule in different parts of the country. At my place it is that a car bearing a card of any kind whether private line or railroad company that bears the advertisement of any firm. For example, "Standard Oil Co. This car contains coal oil," or other language, "to John Jones, vis. such a line." That car cannot pass interchange at Cincinnati without a card being given. If it has shipping directions on the receiving line would cut off the advertisement and card against the receiving line for it.

Mr. O'Donnell: I have a card here that I brought along with me. There were 30 of these sent back from this city by the Michigan Central, desiring to know why we allowed them to pass Buffalo. The card reads:

"Empty; return to Union Tank Line Co., Whiting, Ind.; via. W. D. P. R. R. M. C., I. H. Belt; U. T. L. Car No. 6300."

President Boutet: I would not consider that an advertisement.

Mr. Campbell: I would consider it a plain shipping card to return the car home.

Mr. Whorle: I would not consider that an advertisement.

Mr. Lynch: Cleveland would not consider it an advertisement.

President Boutet: Mr. McAdams, chairman of the entertainment committee, has something to say to you.

Mr. McAdams: Mr. Hart was called away unexpectedly and they called on me to help out. I said I would be only too glad to do anything I could, but this information did not come to me until late yesterday afternoon; so I have had to act rather hurriedly. Part of the ladies have been taken on an automobile ride this afternoon and tomorrow more of them will be taken. Tonight we will have tickets for the theater; tomorrow we will have tickets for the State Fair Grounds for Paine's fireworks and Thursday afternoon we have arranged a trip by boat through the ship canal into the St. Clair river. Lunch will be served on the boat. (Applause.)

Mr. Trapnell: I move that the report of the entertainment committee be accepted and that a rising vote of thanks be tendered to them for their prompt action in the matter.

Seconded and carried unanimously.

Mr. Marea: If this card came to Toledo we would be compelled to give a card. They have notified us to remove a card 6x8 and bill for every one that uses a tack.

President Boutet: We had a rule at Cincinnati that an advertisement, under the rules last year, had to exceed 7x9. Anything under that would not be considered.

Voice: The advertisment would be cut off and a card would be given against the delivering line for it, if it bore any instructions toward shipping, regardless of size.

Voice: That bears the name of the owner of the car. I think the words "Union Tank Line Co." would make it an advertisement.

Mr. Trapnell: That car is their own. I would consider that as a return card.

President Boutet: I cannot find any one in the house that says it would be an advertisement. It must be that we would have to use our own judgment.

Question: Is this a shipper?

Mr. Pfeiffer: It is a private car company just the same as any refrigerator company. That is nothing but a return card, to return the car to Whiting, Ind.

Mr. Maria: I understood that the name of the firm was attached to the card and the card attached to the car in this case.

President Boutet: The Union Tank Line is a tank line.

Answer: Yes; it is the Standard Oil Co., or the same thing.

Voice: So is the Toledo Grain & Milling Co. Their name is attached to a card and the card attached to the car.

President Boutet: That I would consider an advertisement.

Question: Why not that?

President Boutet: That is simply a return card, returning the car home, just the same as a car with the initials printed on and the information to send the car home by such and such a route.

Mr. Burge: Do I understand the man to say he is with the Clover Leaf?

Answer: Yes, sir.

Question: If a card was put on "Via Clover Leaf" would that be considered an advertisement? Suppose the Clover Leaf put on a card on their own car?

Answer: We are talking about interchange cars.

Mr. Gainey: The Union Tank Line Co. belongs to the Master Car Builders' Association the same as the railroad companies and is scheduled in the book of rules on page 88.

Mr. Campbell: I move that a card of that nature would be considered simply as a home, an out card and not as an advertisement.

Mr. Lynch: The Union Tank Line is not a shipper or manufacturer?

Mr. Skidmore: Is it a card bearing the name of a shipper or manufacturer?

Answer: No, sir.

Question: What is the Union Tank Line Co.?

Answer: It is a private car line to haul commodities, used mostly for hauling oil.

Question: Then a card bearing the name of Armour or Swift Car Line would not be considered an advertisement?

Answer: They have a private line.

Question: The Union Tank Line is not a shipper or manufacturer; Armour and Swift are. It is simply a private car line.

Mr. Trapnell: The same thing is true of the Swift Refrigerator Line and the Armour Car Line. The Armour Refrigerator Line is not the Armour Packing Co. The same would be applicable.

Mr. Waughop: The card is under the rules of advertising; there is no question about it. At St. Louis we will pass any car with the name of a firm on it 8x10 until otherwise ordered, regardless of M. C. B. rules.

Mr. Devanney: I cannot agree with our worthy friend from St. Louis. There is nothing on there that can be considered as an advertisement.

Mr. Hobart: I cannot see that the Union Tank Line can be considered as a manufacturer, although they may in a different name manufacture the stuff. The same thing applies to the Swift Car Line: they do not manufacture the stuff. I consider it the same as a railroad company.

The question was put upon the motion and carried with but one dissenting vote, that of Mr. Waughop.

Mr. Lynch: I would like to get the sense of the meeting on two other cards, as follows:

"LAKE SHORE & MICHIGAN SOUTHERN RAILWAY
From ASHTABULA HARBOR
To WYLIE.

Contents .... Ore.
Consignees, Carnegie Steel Co., Clairton Works.
Car No. .... Loaded .... 190..
Initial ....

President Boutet: I would consider that as an advertisement.

Mr. Waughop: It is not! it is a railroad company; it is not a private line.

Mr. Lynch: The Carnegie Co. is a manufacturer.

Voice: It makes no difference what card is placed upon a car; it has to go to some consignee.

Mr. Pierce: I do not think it was the spirit of the Master Car Builders to go into such hair splitting questions. I think the general sentiment was to stop the placarding the side of a car with bills varnished on which was a detriment and a disfigurement to the car. I do not think it was the intention of the Master Car Builders to take off a little card that you would need a magnifying glass to find out what was on it. We should be a little broader in that respect.

Mr. Lynch: We have here an advance copy of the report of the committee which was passed around at the last convention of the Master Car Builders, and I will read some suggestions on that:

Mr. Hogsett: I cannot see how any man can consider that an advertisement. It is a route card; that has nothing to do with the Carnegie Steel Co. All lines use route cards. It is a railroad company proposition. It belongs to the L. S. & M. S. showing the movement of that car.

President Boutet: When they offer that car in interchange I believe it is an advertisement pure and simple.

Voice: I know of some large cities that are tearing the entire card off. Others are merely cutting off the advertisement and allowing the destination part to remain on the car. I think we should have some idea about how we should do that. I would like to know how other large points are handling the matter.

President Boutet: When we card for removing an advertisement whether pasted or tacked, we should remove it clean. If tacked, remove all the buttons; if pasted, remove all the paste. According to the rules, we cannot bill until we have done the work.

Mr. Jones: This is the same as a destination card. I understand the entire card is being taken off at some points; while at some places they are merely tearing off the advertisement and allowing the routing to remain.

President Boutet: We will give a card for an advertisement if it bears the name and simply take off the advertisement, leaving the routing to remain.

Mr. Pierce: Suppose some of the routing is the name of a firm. Suppose that Mr. Pierce runs a steel works right here in Detroit and a car is routed from New York to the Pierce Steel Works. What are you going to do, route it into Detroit and cut off the "Pierce Steel Works" so that a man would not know where the car was to go.

President Boutet: That is my instructions.

Mr. Pierce: I imagine that the spirit of the Master Car Builders' Rules is forgotten. I presume the Union Tank Line Company thought best to use this card instead of stenciling it on, because they might have a station somewhere in Pennsylvania that they would like to have the car sent to. It is not with the object of advertising the firm's business. It was primarily the object of the Master Car Builders to do away with damaging and defacing rolling stock.

President Boutet: I said my instructions were so and so. Cincinnati does not set itself up as a model. I did not mean to say that that was official. We are liable to be wrong.

Mr. Chas. Hitch: I do not believe it is the sense of the rule to undertake to make a railroad company liable for any of their printed matter. This card is printed by a railroad company itself and they have printed the consignee's name on it for their own convenience and I do not consider it would be an advertisement under any conditions.

Mr. Lynch: I do not think the rule is right. I think it is wrong, but the fact that there is a printed name on there of a manufacturer or shipper, under Rule 41, makes it an advertisement whether it is a railroad card or any other card.

Mr. Trapnell: I will state that I was talking with Mr. Hammers, I believe at this time chairman of the arbitration committee and he informed me that they worked on a card 5x8 inches to present to the executive committee of the Master Car Builders, to have incorporated in the rules a provision whereby the shipping instructions of a car might go out with the name of the consignee on the same, so that all parties would be advised. I have been informed since the executive committee met that they would have nothing whatever to do with it. That the rule would have to be enforced just as it reads. I do not see that we can do anything else with it.

Mr. Waughop: We will have to. So far as we are concerned we will pass any car with the name of an advertisement on it 8x10.

Mr. Trapnell: We have to figure that there are other points that work strictly in accordance with the M. C. B. rules.

Mr. Pierce: I cannot help but see that there is a good deal in this ruling of the Master Car Builders, but there used to be a good deal of old-fogyism in the Master Car Builders' Association which is gradually dying out. (Interruption.)

Mr. Trapnell: I do not think we are in a position to criticize the Master Car Builders.

Mr. Pierce: If you will allow me to come back to the rules I will show you that I am on the right side. We were at one time fighting for a spliced center sill; we eventually got it. We then fought for two splices and we got that. We wanted the abutting splice and this year that is permissible.

For my part I would like to see this body come out in a broader spirit, and recommend to the Master Car Builders that they use a little broader gauge in regard to this advertising matter. I think it would come with pretty good grace from this association and let us have a little more common sense in handling it. I know it has been a bug-bear ever since the law has been in existence and there should be something more definite on that point. That is my view of it exactly.

It was moved that the card of the Lake Shore & Michigan Southern Railway Company, bearing the name of the Carnegie Steel Company, be not considered as an advertisement in any sense of the word and that a copy of the same be printed in the minutes.

Seconded and carried.

Mr. Sternberg: I would like to get the sense of the meeting in regard to buttons not being removed from advertising, whether there will be cards issued for removing the buttons and strips after the advertisements have been removed.

President Boutet: As far as Cincinnati is concerned there will be no attention paid to the buttons.

Mr. Waughop: St. Louis will pay for them.

Mr. Haight: This question of carding against the railroads in interchange for buttons and strips has been considerably exercised at the Niagara frontier. Mr. O'Donnell has approved a large number of these cards, and I am very glad that the subject has been brought up for discussion, and that there are others interested in the matter. It has come to my lot to take the matter personally before the secretary of the M. C. B. Association. I attended a meeting of all the railroads in Chicago in his office, and he informed me that a certain railroad running into the Niagara frontier had carried that question to the arbitration committee. The arbitration committee would not even consider it and threw it out, and yet the Wabash is being continually carded against. We do not feel that we can pay these bills, and we are not paying them, and it does seem that where we have joint inspectors such as the Wabash has, and these cars pass through the different interchanges, and no cards given, and when they get east they are carded against, and we are obliged to dishonor these bills, we do not feel that it is justice to the company to pay them.

Mr. O'Donnell: A man is supposed to obey the "Big Stick" when it comes through the right source. The executive committee held about fifteen sessions on the question of advertising matter between the dates of Sept. 1 last year and up to the close of the year, and at all of these meetings I was opposed to the question of carding for any advertisements, but certain roads in our agreement insisted that they would, however, have cards, and under these conditions our executive committee passed the resolution that four or more buttons or four or more strips, which would constitute a frame, would be cardable in the Niagara frontier agreement. At the present time we are carding one or two a day. They are practically all removed. There is practically no advertising matter traveling.

President Boutet: I think it would be all right for this association to say whether it is right or not.

Mr. Bourke: I move that it be the sense of the meeting that no cards be issued for buttons or strips on a car, no matter if the whole frame is there.

Motion seconded.

Mr. Lynch: I do not see the reason for that motion. The committee on revision of rules run across the same thing. They say that it should not be considered as advertising matter. They have already passed upon it.

President Boutet: Is there anything in the rules?

Mr. Lynch: Rule 41 says that it must be printed matter.

Mr. Hogsitt: The rule says: "If an advertisement can be read it is an advertisement." If it does not bear a name there is no sign there.

Mr. Sternberg: Under the old rules the railroads had more or less trouble on its part, subject to being called upon to card for buttons and strips where the advertisement had been removed, and my idea was to bring this before this association and take a vote on it, and it will cause a national understanding that there will be no use to demand a card for any such thing in the future. It will cut out all that controversy we have had in the years gone by.

President Boutet: I have been asked for cards for removing buttons and, of course, I could not give them.

Mr. Hogsitt: You remember my writing a letter to you, asking how you did this thing in Cincinnati, and you came back to me saying that you had quit carding for strips and buttons from the fact that you have been issuing 150 cards a day.

President Boutet: We did not abolish it until we got instructions to.

The question was put upon the motion and carried.

RULE 46.

President Boutet: You have discussions on that every day. Is it a penalty defect if a receiving line makes repairs before moving the car? I will state according to my interpretation of it, it is not a penalty defect if they repair it before moving.

Mr. Waughop: How about the delivering line? If you deliver the car and the receiving line repairs it?

President Boutet: The prosecution could be made against the delivering line for the handling of the car with a broken uncoupling attachment, but if that car is delivered and is on the interchange track, Mr. Mosely does not say that they compel the delivering company to make these repairs. He says you must not move it with a penalty defect. If a car is set by A to B with a broken uncoupling device, B repairs the car, he cannot be prosecuted for it. If he repaired it before he handled it.

Mr. Trapnell: That was the idea of the Interstate Commerce instructors at one time. They promulgated that with the idea of creating dissatisfaction, and he came back with the words "used" or "moved" underscored.

Mr. Gainey: I will have to agree with Mr. Waughop that the delivering line is responsible.

President Boutet: That part has not been disputed. There is no question but what anybody handling a car with defective safety appliances can be prosecuted.

Mr. Waughop: A car delivered by the delivery line is responsible the same as if he had removed that car from track No. 1. How many of you live up to that rule in that respect?

Mr. Gainey: So far as the Queen & Crescent is concerned it is done in all cases.

Mr. Campbell: On all wrong repairs we make them attach a defect card. It is often we do not know when we make wrong repairs.

President Boutet: Do you always put on a repair card?

A Voice: We do not always—we do not have time. It is impossible for a man to make repairs and write out a report card at the same time.

President Boutet: It is putting on wrong brake beams and such—it is not light repairs that causes the trouble.

Mr. Pierce: I think I am in a position to say something on this subject. I have spent half of my life with trunk lines, but I am free to tell you that I do not know, in all my twenty-one years' experience in trunk line service, that it was possible for so much dishonesty in regard to handling your neighbor's cars. The principle that is involved in car interchange and car repairs is one of the broadest and noblest for an honest man, but I am sorry to say that we are far from having them all honest. I go out today—the paint has been on possibly six months. I will ask one of my men to put a piece of siding. Everything external is in first class shape. I go to another one, I find the same thing for an end. We get joint evidence on it, on the draft timbers. I remember a while ago I traced a car from New York to St. Louis, and I asked for a card on it, and the man's excuse was that he didn't have a piece of wood large enough to make a dead wood of the ground. I asked him if it wasn't possible that he had a piece of an old sill. I am going up against cases of that kind daily with the sills, ends and siding and the joint evidence card as a general proposition is not worth the paper it is written on. Why cannot we follow out the old rule of interchange and be honest? I am sorry to see that there is so much dishonesty in the country.

President Boutet: This is one of the most important rules in the book. A man working for a company may think it to his interest to make repairs and make some kind of a report not indicated on the repair card. It goes home to the owner and the consequence is that in a short time it is found that the repairs are inferior to the original construction, and your own company is going to catch you up. That man doesn't live who can work for a railroad company and practice dishonesty and not be caught. Your company may wink at you for a certain time, but they will catch you and you will be out of a position. There is only one thing for us to do, and that is to make the repairs in accordance with the rule, and if you cannot do so put on a defect card and the officials will think more of you.

Mr. Waughop: I would like to ask if there is any chief inspector present who has found a Master Car Builder's defect card on a car in the last five years.

President Boutet: I have and have found repair cards covering the same defects.

Mr. Lynch: Cleveland has received them.

Mr. O'Donnell: I will send you the stubs of 20 or 25 of them.

Mr. Bradley: I will say that they are in Buffalo, not only on the Nickle Plate, but on other roads.

Mr. O'Donnell: The New York Central holds periodical meetings with the men and always emphasizes the fact that the New York Central does not want a penny that does not belong to them. Our car representative at Buffalo, Mr. Thompson, is very stringent on that.

Mr. Waughop: How do you account for Sr. Louis?

A Voice: We have never seen them.

President Boutet: Perhaps you do not look.

Mr. Waight: We look for them, why don't we see them? As far as honesty is concerned, I am not throwing any tips at myself, but I will quit when I have to be dishonest. We do not have to be dishonest, but we do not see these things, and I question very much whether the foremen at St. Louis follow out the rule. We are as badly in it as anybody as far as putting a card on is concerned, but why is it that we do not see them coming in from the east and the west?

Mr. Bunting: I will say that a foreman working for the Pennsylvania company will have to quit if found dishonest.

RULE 56.

Mr. Sternberg: What is considered a Combined Front and Back Coupler Stop, according to Rule 49?

Mr. Gainey: According to the argument at last year's convention, if I do not mistake, it was decided then that a Combined Front and Back Coupler Stop would have to be an attachment similar to the minor. If it was corrected for last year, there has been no change in the rule. I do not see much room for argument this year.

I move that a Combined Front and Back Coupler Stop must be in one piece.

Question was put upon the motion and carried.

RULE 60.

Mr. Skidmore: In case it would be necessary to remove from a foreign car a 30-inch wheel on account of a cut journal, and it was replaced with a 33-inch wheel, would there be any responsibility attached to the line making the repairs?

Mr. Bourke: Yes, sir, I think it would—it would not be standard to the car.

Mr. Trapnell: The rule says "For which the owner is responsible."

Mr. Sternberg: A car having a cut journal, it would be due to unfair usage, and, in my opinion, a railroad company damaging this journal would have to make a change of wheel at their own expense, but substituting a 33-inch for a 30-inch wheel under this rule.

Mr. Skidmore: There is considerable room for discussion and it looks as if we do not all agree.

Mr. Bourke: Then we would be responsible, because we would be changing the construction of the car, and the rule plainly states that it is allowable to change the construction of a car when it is the owner's defect, so if the Master Car Builders decide that a 30-inch wheel is an O. D. wheel, and it is allowable to be replaced with a 33-inch wheel, making the owners responsible I do not see why it would not be perfectly proper to bill a 33-inch wheel in place of a 30-inch wheel, when removing a wheel on account of a cut journal.

Mr. Pierce: The way I should do that—I would think a 33-inch wheel is an acceptable Master Car Builders wheel, but I might bill them for the repair on it. The owners can remove that wheel and bring the car back to the standard, giving us credit for the M. C. B. wheel, and just charge for the labor.

Mr. Bourke: Would it be practical to substitute a 33-inch wheel for a 30-inch—wouldn't it throw the truck out of line?

Answer: I would say that to take a steel tire wheel on a gauge that is turned down two or three times—there is two or three inches difference in the wheel. They remove one wheel that is 2 or 3 inches smaller than the wheel in the truck, and it would be all right. In regard to this rule, it seems to me that it is plain enough that where it is owner's responsibility you can put in a 33-inch wheel, but it would seem to me that it was the delivery line's responsibility.

Mr. Bourke: I will say that a passenger car and a freight car are entirely different. As a rule, we find no equalizers on a freight car.

A Voice: Some years ago there used to be more 36-inch wheels than there are now. We used to put on 33-inch right along with a 36-inch and it ran all right, and I have put in a 36-inch in place of a 30-inch and they ran all right. There is not enough difference in the height to make any difference in the running of the truck.

Mr. Gainey: I move that a 33-inch wheel can be substituted in place of a 30-inch wheel under all conditions where practical.

Seconded by Mr. Skidmore and carried.

RULE 61.

Mr. Lynch: What kind of a coupler are those of a vertical plane type?

Mr. Trapnell: It means a coupler that does conform to the M. C. B. specifications.

Mr. Lynch: Are there any such couplers—if so, on freight cars?

President Boutet: There might be.

Mr. Lynch: What is the necessitv for that in the rule?

President Boutet: We find couplers pretty badly worn.

Mr. Sternberg: In case these are not inserted in the rule, it would give a field to make another than those of an M. C. B. type.

RULE 62.

Mr. Trapnell: I want to commend the Master Car Builders on that rule in cutting out the malleable back bearing.

RULE 64.

Mr. Hogsett: We find cases where they make couplers higher than the shearer.

Mr. Skidmore: A coupler should be made between 31½ and 34½ to make it within the standard height, measured from the top of rail to the carrier iron to the center line of the coupler. I don't know whether there has ever been any objection or a car rejected on account of having a shim between the carrier iron and the coupler. I do not see how a car could be rejected for anything of that kind as long as it was in a serviceable condition.

Mr. Trapnell. If you get the center line on the shank of the coupler between 31½ and 34½, you are all right.

Mr. Skidmore: It has been decided that an empty car is not within the required height unless it is 34½ inches. Anything under 34½ inches puts an empty car below the required height, but I do not think that any points are paying any attention to that part of it so long as they come within the limits. Neither do I think that it would be advisable to put all empty cars to 34½ inches because there are a number of cars that have become old and when you load them the ends go up instead of down, which would make the coupler above 34½ inches loaded. However, I believe that it is absolutely necessary that empty cars be handled between 34½ inches and 31½ inches. I just brought that point out to see if anybody was undertaking, at any points, to keep cars up to 34½ empty.

Mr. Trapnell: I do not know of anyone in the Kansas City territory that is doing it.

Mr. O'Donnell: In the Niagara frontier we handle a large amount of coal and grain, loading on lines on this side of the river. The Canadian lines will deliver to the Delaware or the Erie 200 empty cars to East Buffalo and haul back to the Grand Trunk under load. These cars, when they go through empty, must be raised up to 33 inches, and before the cars are delivered that feature of the work is always carefully considered. It is thoroughly understood in our agreement, which I think you gentlemen will consider only fair and just.

Mr. Trapnell: I understand you to say that you raise them to 33 inches?

Answer: Yes, sir.

Mr. Trapnell: I was in a case at Omaha not long since: suit was brought against them in the U. S. court for a car 35½ inches high. They followed the car and when it was returned it was 34½ inches high. The difference was caused by the car sagging in the center and the ends coming out. The decision of the judge was that the safety appliance law does not specify on a 34½ inch whether you had a 3-inch variation up or down. He gave the road the benefit of the doubt.

Mr. O'Donnell: Before we pass upon that rule we should coincide with the president's views that the drawbars within the required limit of 31½ inches or 43½ inches has fully complied with the law.

President Boutet: I would suggest that you refrain from taking any action except as to the interpretation until tomorrow when you can make any changes or suggestions to the committee as you see fit.

Mr. Skidmore: It was just the sense of the meeting, it was not any change now.

President Boutet: We want to get them to change the law so that it will not be a violation.

RULE 65.

Mr. Farran: I would like to ask whether it is permissible to splice all longitudinal sills, except center sills between crosstie timbers?

President Boutet: They can be spliced between cross timbers. I believe the sills are as strong spliced as they would be before. There are some of you under the imprssion that you cannot splice an intermediate sill next to the draw sill if only one draw sill is spliced. It would be fair to get the sense of the meeting on that.

A Voice: It says "Not more than two adjacent sills." It does not mention the sills.

RULE 76.

President Boutet: This refers to cars of double load where two cars are chained together as an additional safeguard.

RULE 83.

President Boutet: Is it the impression that they can take that card off and make a bill on it without making the repairs? The M. C. B. rules are positive in stating that no bill can be rendered unless the repairs are actually made. After you receive the car at home, you may get joint evidence and a card for wrong repairs. That does not entitle you to make a bill on the car unless you have made the changes and brought the car to the original standard.

A Voice: I think you are correct.

President Boutet: There are some people that are not doing that, and I believe the association should go on record in regard to it.

Mr. Pfeiffer: Is it proper to make a bill for missing springs and followers when they are missing? Certain companies were making bills on account of the coupler being pulled out but not missing and the springs and followers missing.

Mr. Skidmore: So far as we are concerned, we will bill a car owner for missing springs and followers when the coupler is not missing.

Mr. Gainey: For the benefit of the young man over there, I will state that that case will be decided very shortly by the arbitration committee. We charged for the followers and springs and the correspondence went on for about six weeks. We finally submitted it to the arbitration committee.

Mr. Pfeiffer: We had a similar case and it came to the point of going to the arbitration committee. When the papers were submitted, they informed us that there was already a case before them and that we should hold our case off.

President Boutet: Individually I believe we can bill for them, yet we will have to wait until the arbitration committee decides it Is there anybody present who does not think a bill can be rendered under these circumstances?

Mr Stark: I do not believe that a bill can be rendered under these circumstances. The railroad company or whoever has that car on the line may have the springs and followers in their possession somewhere on the line.

Mr. Jones: Under Rule 56 it says that it can be assumed that the missing couplers and attachments are damaged unless shown to the contrary. It is assumed that they are broken if missing and owner's defect.

A Voice: Do they bill a draft spring or follower plate or both and charge the owners when the coupler is not missing?

President Boutet: I understood them to say when it was missing.

A Voice: They should be charged to the owner.

Mr. Gainey: The coupler was pulled out and the springs and followers missing. We charged for the springs and followers.

Mr. Pfeiffer: I move that it was the sense of the meeting that the missing springs and followers in connection with the coupler pulled out should be charged to the owner.

It means that the same coupler was re-applied and the draft springs and followers missing.

Mr. Skidmore: I think this motion is mis-stated. While we all understand it here, reading the minutes that the coupler being pulled out it was also missing. I would like to amend the motion so that it will read that it is the sense of the meeting that it is proper to charge the car owners for springs and followers when missing.

Mr. Jones: That has no connection with the question at issue. When a coupler was pulled out and the followers and springs missing. It is correct that when a coupler was applied on account of being pulled out, the followers and springs being missing.

A Voice: That would conflict with the rule. The rule covers this case.

Second to the amendment.

Mr. Dwyer: I do not understand that the amendment has any? thing to do with the question as raised. The question is, can you bill for coupler, springs and followers when missing—when missing with the coupler?

Mr. Charles Hitch: Can you bill for springs and followers on a car when you have the coupler? You infer that the springs and followers are broken.

Mr. Skidmore: So far as the coupler is concerned and the question is brought up of charging for springs and followers when coupler is pulled out, it is not necessary to show on your report card that the coupler was pulled out in applying the springs and followers to your car. It is necessary to put up your coupler. Your repair card would be just the same for applying the springs and followers. We discussed that question last year, I believe, and the same objection was made. Quite a number of people might take it to mean that a coupler was also missing, so if you can charge for springs and followers missing, you can certainly charge for springs and followers missing even though the coupler is pulled out of the car and lying on the ground and you apply the same coupler. Is it the sense of this meeting that it is proper to charge for springs and followers missing, and that there can be no objection made to the bill? That is all he has done, charge for the material of the springs and followers, the labor for applying the coupler.

Mr. Dwyer: It is understood that you can bill for springs and followers when they are missing. The question raised is can you bill for the springs and followers missing when the coupler is found? I think that the motion put in the first place is correct, and the amendment should not prevail.

Mr. Burg: Everyone is governed by existing conditions. If a car was equipped with the spindle attachment and you have found that the spindle was broken and the springs and followers missing, wouldn't you consider then, that the springs and followers were intact, and, on the other hand, if you found the coupler pocket broken and the springs and followers missing, wouldn't you then consider that the springs and followers were intact and be governed by the conditions existing?

Mr. Pierce: I thing Mr. Burg is an honest man.

Mr. Stark: What is presumed to have become of these springs and followers that are missing?

President Boutet: That brings us back to the matter of the honesty of the different car foremen.

Mr. Stark: I do not think we could bill for them.

Mr. Hankin: Couplers, springs, followers and yokes may be included in the above, if lost with the coupler. If they are lost and the coupler is still there, they are chargeable to the owner. If you read the two rules—they are plain enough. Where the coupler is there you can bill.

Mr. Sternberg: I offer as an amendment to the amendment in case the coupler is pulled out and re-applied, it is proper to charge for springs and followers if missing.

A Voice: I believe it will be misleading to say "springs and followers missing."

The amendment was seconded and carried, and the president announced that that carried with it the motion.

RULE 89.

Mr. Burg: I wish to ask what you would consider proper to charge for applying a pair of wheels in a Bettendorf truck? You have to take the entire sides off to get the wheels off.

Mr. Gainey: There is no arbitration on that at all.

President Boutet: That is easy; you don't have to take off any oil box bolts.

Mr. Skidmore: It is done very quickly after you get used to removing them.

Mr. Berg: I haven't said yet that it would be a very difficult job, but I want to know where you would class them, whether it is pedestal or other item.

It was moved that pictures be taken of the convention group at 12:30 tomorrow. Carried.

Thereupon the convention adjourned until Wednesday.

WEDNESDAY MORNING SESSION.

It was moved by Mr. O'Donnell that an invitation be extended to Mr. Bonner of the M. C. B. to come over this afternoon and give a talk. Seconded and carried.

Messrs. O'Donnell and Fox were appointed as a committee to extend the invitation to Mr. Bonner.

RULE 97.

Mr. Devanney: In order to bring this before you right, in regard to 106, I would like to know how the foremen consider that. For instance, I put in a C. N. O. & T. P. car and it has a channel side truck frame broken. I buy that in the open market; do the work on it, cut out the oil box holes and all that. Does this rule cover that or is it covered by 106?

President Boutet: 106 is not specified. The side plate on a Buckeye truck is what they refer to. In 106 there is no provision for a side plate on a Buckeye truck.

Mr. Devanney: We should pass this up until we come to 106, or go to 106 now. I want to know if one of these truck sides is a damaged part. Should I charge it under 106 or 97?

President Boutet: If I were to do the repairs I would charge under 97. I believe 106 refers to the construction of the body of the car.

Mr. Devanney: The same will hold good of the end sill.

President Boutet: That is structural material.

Mr. Devanney: Parts that you take off and put on can be charged under 106.

Mr. Burg: I understand that they are governed by the weight for straightening and so much per hundred pounds for plates, etc.

President Boutet: That would come under 106 according to my idea; anything that you would take off and straighten, but a Buckeye frame would come under structural material. If they were broken you would have to charge the market price.

Mr. Gainey: I do not think there is anybody running the Buckeye trucks but us, and the Hocking Valley has a few. We have always O. K.ed the bill for cutting out. Where they buy a 15-inch channel from the open market and they cut out for the pedestal, and they charge under 106 for putting the rivets in them.

Mr. Devanney: I am not referring to that alone, but any part.

President Boutet: Rule 97 means the application and 106 means repairs.

Mr. Devanney: That is the way I have been charging, and I move you that it is the sense of the meeting that 97 is understood to cover only application of new structural steel.

Seconded and carried.

RULE 102.

J. V. Berg: When a car is equipped with a brake beam and goes on a foreign line and is damaged, can you supply a second hand or new brake beam and charge it to the car owner and consider the repairs made, or should it be considered wrong repairs when the car is returned to the owner with no brake beam other than the one it was formerly equipped with?

President Boutet: It is always considered that metal brake beams come up to the standard.

Mr. Barnaby: How is it in case they apply a simplex brake beam, or Pennsylvania brake beams; and car stenciled for Monarch beam; there are a good many different kinds. Some cars are just stenciled metal brake beams.

President Boutet: There has been a disposition among the Master Car Builders to recognize all the standard brake beams. I have never seen a joint evidence for a wrong brake beam when any standard make was applied.

Mr. Barnaby: We have had a case where they had a Monarch and they put on something similar to a Simplex and they came back at us.

Mr. Jones: If a car is equipped with and stenciled solid brake beams, they would consider it wrong repairs if the hollow is applied.

President Boutet: Have any of you had joint evidence for a bill made for a wrong brake beam?

Mr. Burg: I have.

Question: With private line people?

Answer: Yes, sir.

Question: Did you ever have with a railroad company?

Answer: Yes, some western road. We had at one time three or four cases and I at that time was of the opinion that you could apply any make of a brake beam to a car and it would be considered proper repairs.

President Boutet: There seems to be an understanding with the different Master Car Builders that brake beams would be interchangeable the same as couplers. There isn't anything that would justify me in refusing to sign joint evidence for a car equipped with a wrong coupler.

Mr. Hitch: Also with the metal brake beams, under rule 63, the same provision is made.

Mr. Burg: There is another rule which makes for the coupler.

Mr. O'Donnell: I have been on a committee for the Central Railway Club, in Buffalo, for the past two or three years to offer suggested amendments to the Master Car Builders' rules on interchange. We offered suggestions last March for the June convention and among these changes we offered a recommendation that any metal brake beam with the hangers and all parts fitting properly, would be considered proper repairs under the M. C. B. rules. They turned it down. I do not see anything in the rules that would permit applying a different make of brake beam to any standard equipped under the rules. However, it is being done, and I do not think there is any exception. There are cases where the hangers and other parts are wrong.

President Boutet: There seems to be a hitch some way that they do not want to make a standard brake beam. They have the requirements but there isn't a brake beam on the market today that will come up to the requirements. They have considred one as good as another. There is a feeling among the Master Car Builders that there should not be any charge, but there isn't anything in the rules that would justify us in not giving joint evidence, as I see the rules.

J. V. Berg: If joint evidence is presented to you?

President Boutet: I would decline to give an M. C. B. defect card. There is no rule that they could hold you up on, except that they do not want to compel anybody to put on a certain make.

Mr. Berg: I move you that it is the sense of this meeting that when a car is repaired they can apply any make of metal brake beam, regardless of whether the car is stenciled a certain make of brake beam, and that any road making repairs is justified in declining to furnish defect card when the joint evidence card is presented to the owners.

Mr. O'Donnell: While I am ready to vote in the affirmative on that motion, I would call attention to the fact that if the Master Car Builders in their wisdom have not seen fit to bring out that point, I do not think it would be the proper course for this body to put it in their proceedings. I am in favor of the suggestion that something be in the rules that would permit such things being done, all things being equal, but at this time I do not think we should take it up with the M. C. B. association on that score.

Mr. Gainey: I am like Mr. O'Donnell. I think some member of this association ought to take it up and recommend to the M. C. B. that they make the change just as has been done in former years. If they do not see fit to do it, I do not think we should.

President Boutet: The M. C. B. has recommended a brake beam, and there isn't one on the market today that will stand the stress that they require. Some one has been lame; when they adopt a certain one as a standard they should know that there is one that will stand it. We are doing something contrary to the rules and if we are wrong we will have to take the blame for it. I think it is a good idea to express our opinions on that.

Mr Dwyer: We ought to get some universal way of handling brake beams. Down in Buffalo they are doing it a certain way and others are doing something opposite and we are going to be mixed up. I think it is well to go on record; it is only as to our understanding as to how this matter should be handled.

Mr. Milburn: We are losing sight of one or two things in the brake beam question. If you apply a brake beam that is shorter than the original and the facilities on the road are not sufficient to take up the slag, what will you do?

Mr. A. Berg: That would be similar to applying a Cristy brake head where it necessitated changing the hanger. It has been understood that a Cristy brake head was an M. C. B. standard. if there is such a thing, and if it is permissible to use any brake beam, then if the connection has to be changed, that may be termed wrong.

Mr. Shultz: I believe we ought to go a little further and refuse to sign a joint evidence card in a case like this. I do not believe in signing for anything that we do not propose to issue a defect card for.

President Boutet: It would be my understanding if this motion prevails, that it would be wrong for me to give joint evidence, and I presume it would be considered wrong to furnish a defect card.

Mr. Shultz: In order to avoid this unnecessary signing of joint evidence cards when there are no use to the parties, I would like to sec it go on record that we would refuse.

Prsident Boutet: I positively will not allow one of my men to sign joint evidence unless he sees the car.

Mr. Shultz: That might be the condition in other points, but Chicago is different. Joint evidence cards are being signed by being forwarded by mail. The same stand is taken in Chicago on signing joint evidence as it is on the presentation of a defect card. The assumption is that it is correct. If it is right on the one hand to accept a statement required by a receiving road for a defect card, it is equally so to accept a statement that repairs on their car were wrong.

President Boutet: You certainly do not mean to say that you are connected with one road in Chicago; some other road would send joint evidence stating that they had certatin wrong repairs and you would sign it?

Mr. Schultz: We do not for the private line cars, but for the railroads we do.

Question: You sign joint evidence without seeing it?

Answer: Yes, sir.

President Boutet: I am sorry to put Mr. Shultz in the embarrassing position. Joint evidence in my opinion is rather a serious matter. It carries with it the information that we know the repairs are wrong. How are we to know they are wrong? It is no wonder Chicago gets so many joint evidence cards.

Mr. Sternberg: The inspectors have seen these wrong repairs and they are the ones that sign them. Chicago isn't any worse in furnishing joint evidence cards than Cincinnati in that respect. Our inspectors have seen the defects and have the evidence on file.

Mr. Dwyer: Some of them are 15 miles away from where they start the car out and it would be a pretty hard job to be right on the spot. When a car arrives they make an inspection and ask for joint evidence; what are you going to do about it?

President Boutet: I did not have any intention of casting any reflections on anybody in Chicago. I happened to be at a meeting of the Chicago car foremen and a certain chief clerk got up in the meeting and said: "We get joint evidence whenever we find repairs have been made to our cars wherever we can."

Mr. Shultz: We do not for the private line cars, but for the actually wrong.

President Boutet: That is the impression I am trying to create. He went on to say that a number of car people were billing them for repairs that they did not make and that was the only way they had to get even. I said that while there might be some people doing things that were not right. I did not think they should bill a railroad company for something that they had not done.

Mr. O'Donnell: While I am always pleased to agree with the chairman. I will have to take exceptions to this argument. Our present rules allow us to charge the owner of the car for all ordinary running repairs as owner's defects; there are bills charged against different roads every month for $2,000 or $3,000. I do not believe you would want the representative of the car owner to see each report that is made. Coming to the question of joint evidence, we have had just about as many pleasant tilts in Buffalo with the boys from Chicago as any one. They want everything reported up in Chicago and they will get it if possible. We have in our interchange 80 or 90 joint evidence cards some days for the bolts in place of rivets on the double spring rigging. The executive committees have instructed me to sign these without question unless it is my privilege to see the cars. The only cars that I see are where the repairs are excessive. It would not be possible to hold loaded cars to sign the joint evidence, and I think our chairman will agree with the boys from Chicago that according to their arrangement it is absolutely necessary to accept the joint evidence on a receiving line as honest and in good faith, unless there is a suspicion that it is wrong.

President Boutet: We positively will not under any circumstances give joint evidence unless we personally see the cars.

Mr. Waughop: St. Louis is with you.

President Boutet: If the car inspector happens to be in the same yard he signs the joint evidence. All joint evidence is not seen by the joint inspectors or their assistants, but is signed by inspectors from each road when they see the car.

Mr. O'Donnell: According to that the inspectors for the receiving yard have free access to our defect cards and it is up to me as the arbitrator for all the roads to approve them and check them up. If I have the least suspicion that any of our inspectors are abusing the use of these cards, it would be my duty to stop it. I take the same view on joint evidence. The defect cards are used for defects that necessarily require carding. It is impossible for me to see every card that is used. The fundamental principle of our agreement in Buffalo is honesty; if any person is found to the contrary he is not allowed to remain in the family.

President Boutet: We look at giving a joint evidence card in a different manner. The cards we can only give against our local lines, but when we sign joint evidence the chances are 10 to 1 that it is going to be used against some foreign line. With a foreign line it is a different thing and we must see it. When it comes to a combination of defects or rough usage we must see it. We see a slid flat wheel or anything of that kind. Joint evidence isn't worth anything unless the company makes the repairs. If they are going to make the repairs the car is certainly not going to be held much longer for us to see it.

The question was put upon the motion and lost.

RULE 112.

Mr. Gainey: I would like to see a full discussion on this rule. This same thing was up last year—5 cents for testing air. I would like to get the sense of this meeting as to what that means. After the repairs are made I think we are entitled to 5 cents for testing the air.

Mr. Waughop: Doesn't the rule so state?

Mr. Burke: Did not the arbitration committee make some decision on that about a year ago? I do not think our company is charging 5 cents.

Mr. Bunting: I would like to ask brother Gainey how he would know that the proper repairs were made to a train line without testing the air. We always test the air to find out whether we have made the proper repairs, but we do not charge the car owner.

Mr. Gainey: What is that in there for? I will agree with the brother over here that we are not charging it and we reject all bills that come to us, but what is that in the rule for?

Mr. Pfeiffer: I believe this charge of 5 cents is proper only when the repairs are made to the train line, but the charge for testing the air brake is not proper when no other repairs are made.

President Boutet: You can charge if they are owner's defects, but if they are delivering line's defects you cannot charge.

Mr. Pfeiffer: If you have a defect card on you can charge for testing the air. You cannot charge when no repairs have been made.

Mr. Gainey: If I give a card for a defective pipe or broken pipe, they could charge for repairing the pipe and 5 cents for testing the air after the repairs have been made.

Mr. Burke: When the air brake repairs are made.

President Boutet: I am giving a card for the broken train line.

Mr. Burke: There is a price on that.

President Boutet: How do you know that you have made a job unless you test it?

Mr. Burke: If you take a train of 50 cars there would be no trouble in running up a bill if you charged 5 cents against every item.

Mr. Waughop: What do you do when you make repairs of that nature; do you test the air?

Mr. Burke: When you get the train pressure and you start to cut air and the hose is leaky—say you have a train of 50 cars and you do a dozen little jobs to get the train line tight, if you charge 5 cents you have 60 cents just for testing.

Mr. O'Donnell: I move that it is the sense of this body that a charge of 5 cents for testing air after repairs covers one branch of work and not running repairs.

Motion carried.

RULE 118.

Mr. Schultz: I had up a case of that kind and they maintained that they were not a switching road doing all their business on a switching basis, but they said they paid a per diem on railroad company cars while in their possession, and they are entitled to the same privilege that the railroad company is.

Mr. Hacking: I move that it is the sense of this meeting that a road doing all of its business or the major portion of it switching, charging everyone, though they do pay per diem, should not be allowed to make bills the same as a railroad company.

RULE 119.

Mr. Brown: If a P. & L. E. car came into Cleveland with worn out brass and possibly getting pretty warm, we renew the brass and it goes to Youngstown and they have to apply another brass, we do not understand by that that the Erie should charge but the one brass that we applied in Cleveland.

President Boutet: That would be my understanding of it.

Mr. Brown: We might not be aware of the fact.

Mr. Dwyer: There might be a charge for the second brass, but for Mr. Brown's information I might state that when the car reaches Youngstown the joint passenger car inspector would change that and make it a P. L. & E. charge, so that the Erie would not be connected so far as any bill is concerned, but I should like to ask if it would not be considered a double trip, there are two lines concerned. the car runs from Pittsburg and the New York Central engine is cut off there and an Erie engine is attached. The same conductor takes the train right through from Pittsburg to Youngstown and from Youngstown to Cleveland over the Erie line.

President Boutet: If you were going from Pittsburg to Cleveland over that route, how would you designate it?

Answer: I would say that it was one trip.

Mr. Pierce: I am surprised that an Englishman could not divide a little better than that and make it "'alf and 'alf."

Mr. Brown: I should make that plainer by saying that on arriving at Youngstown they found a bad journal bearing and removed it and applied a new one. The same train went right on to Cleveland, and we found the same one giving trouble on arrival at Cleveland; we applied a new one, and that will make two operations on one trip. There should be some way of knowing that there were two brasses applied on one trip.

Mr. Dwyer: If it is the same trip, the P. & L. E. are responsible for the brass that is applied at Cleveland, because they would have to bear the expense, if it is considered as a through run all the way through.

Mr. Schultz: Each one of the roads over which they operate should charge for one brass on one journal. That, I believe, is the intention of that rule.

President Boutet: I do not believe it was the intention of the rule to say that a car should travel from New York to San Francisco and get one charge for one journal. I believe that if there were four brasses applied on one journal by different roads, they could all be charged, for one road would have no means of knowing what any other road had done, and I am satisfied that if the case went to the arbitration committee they would decide that each charge was correct, but I believe that one road should only charge for one brass on any one journal on one trip.

Mr. Brown: The Pullman Company, not being members of the M. C. B. Association, would look at that rule in that way. I merely wanted to get the idea.

Mr. Fox: The handling of coaches, as was stated here before, was generally done under special agreement between different roads. Every road makes their own rules.

Mr. McMann: Referring to Rule No. 3 of the Passenger Rules, I would like to ask how the membership of this association interpret the third clause. Are we to understand that that includes window glass, or is that only in connection with the lamps?

President Boutet: It is my understanding that it would be the window and door glass.

Mr. Brown: We have had some experience on line charges, and up until July 1, 1908, he charged for all glass broken. We included window glass, vestibule glass, glass globes, in fact any glass that was used in a car or fixture that was broken, whether it was right or not, they accepted our bill.

President Boutet: To get the matter properly before the association, I believe it would be well to make a motion that it should include all glass, and we will discuss the matter and bring it before the association.

Mr. Brown: I move that all broken glass in coaches, which includes window glass and door glass, broken gas globes, not excepting drinking glasses or stationary mirrors, be charged on line expense bills.

Motion seconded.

Mr. Gainey: What would you do in case A delivered to B one of their coaches on a special run?

President Boutet: That would not be line expense.

Mr. Brown: Line expense and charges on a mileage basis. We charge that company 50 per cent. of the line expenses.

Mr. Gainey: We charge all that is enumerated on line expenses, but if we get a car from the Big Four to go to New Orleans and that car came back with broken glass, we could demand a card for the broken glass.

Mr. McMann: I believe that the only question necessary is to have that bracket put before the word "and;" that would include all broken glass then, excepting mirrors and drinking glasses, as stated.

Mr. Pfeiffer: I understand that refers to lighting, because between the two brackets it says "lighting."

Mr. Hitch: I do not interpret the rules that way. It names all the glass and fixtures pertaining to the lamps and goes on and says and uses the word "and" broken glass. They do not use any points to separate it, but at the end it says "all broken glass."

Mr. O'Donnell: Inasmuch as Mr. Downing, of the Lake Shore, and Mr. Miller recommended this change, would it not be wise to drop them a line and have their reply incorporated in our proceedings?

A Voice: I am in favor of what Mr. Hitch advocates, and of the opinion that it means all broken glass, window glass, mirrors and all glass.

Mr. Dwyer: I second the motion for the purpose of getting it before the house. It is my opinion that it only concerns glass in connection with lamps.

Mr. Brown: I don't think we should take the mirrors into consideration. It is merely the stationary fixtures and part of the car. I think it is due to the fact that many times stones are thrown through the windows of the cars and the gas globes are broken, and that it affects the glass that is more liable to be broken than the mirrors. It is seldom that a mirror is broken.

Mr. Chas. Hitch: Where the line repairs are made to cars and the expenses are pro rated, I do not interpret that that any one road would assume the responsibility of the mirror broken that would cost $5 or $6 to replace, and charge the other items pro rata—I believe it means all glass.

Mr. Pfeiffer: I would like to have it explained why the word "light" appears in there.

Mr. Schultz: All these items pertain to lighting only.

Mr. Hackey: To make it clear, make it include all glass, and the suggestion that that bracket be changed and put before the word "and."

Mr. Chas. Hitch: I infer that this rule only applies to cars operated only on individual lines. It does not refer to cars offered in interchange, but it is line expense where the expense is divided between two or more roads.

Mr. McMann: It seems to me that it would be well to write and ask what they really mean. I believe that it is intended to cover all glass in any car, but the way the rule reads it does not mean that. It refers to only that used in connection with lamps.

President Boutet: I don't want to stop the discussion, but it is my intention to take Mr. O'Donnell's suggestion that we write these people and have their reply incorporated in our proceedings.

The question was put upon the motion and lost.

Mr. Campbell: I would like to refer back to Rule 40 and ask what the practice is in safety appliances, using the uncoupling lever for a grab iron. Some roads accept them, and other roads will not.

The following letter was read from Mr. George Post:

New York, Aug. 27, 1908.

Mr. Henry Boutet, President Chief Joint Inspectors & Car Foremen's Association, Cincinnati, O.

My Dear Mr. Boutet: I am compelled regretfully and reluctantly to inform you that I find it will be impossible for me to be present and deliver an address at your convention in Detroit in September. I had hoped that I might accept the flattering invitation from your association, conveyed through you, for whom I entertain great respect, but matters requiring my constant and unremitting attention have intervened so that I cannot enjoy the pleasure of being with you and your association.

Sincerely yours,

GEO. A. POST.

It was moved by Mr. Gainey that the letter be received and incorporated in the minutes.

The motion was seconded and carried.

Mr. O'Donnell: With your permission I would like to ask the sentiment of the gentlemen present on a question that is now up before our agreement in Buffalo. The operating departments of the roads centering there are very zealous on the per diem charge, and within the past six or eight months quite a number of complaints have been made about the expense of defective cars in defective condition. We will say there are 500 cars going to one of the roads in a switching movement; among that number there are ten that will be cut out for broken couplers or anything occurring in ordinary service. In accordance with our agreement, we have always ruled that it is the duty of the receiving company to make these repairs and pass the empty car along and overcome the backward switching movement. It is now before the executive committee of our agreement, who are about to pass upon it, that is, to be placed before all the officials for their approval. I have contended that it will be much more reasonable for the receiving line to make these ordinary running repairs and get the car back to the delivering line, as the expense of switching more than offsets the per diem charge, which is 25 cents per day. I would like an expression that I could take back to Mr. Thompson, the president of our executive committee. It is a serious question. We have a large number; there are, in the busy season, two or three hundred cars daily going into the Lackawanna steel plant; the D., L. & W. and Erie handle these cars only on switching movements, and is it just that they should make a request that in the switching movement for empty cars for loading, the receiving line will make the repairs where the repairs constitute only running repairs. If they extend to a combination of defects, the receiving line serves notice on the road to return the cars to the delivering line.

President Boutet: I would state that at Cincinnati it is handled something in this manner: Cars are inspected coming in on the line and going to a foreign line, for safety appliances and to see if the car is safe to go to the repair track on the receiving line, and it is up to the receiving line to receive the car and make the repairs, in case the car is going to some line other than required to put the car in condition. The receiving line will only inspect for safety. The switching line will only inspect the car to see if it is safe for them to handle. They will get a switch movement out of it. If the car was sent in over one line going to the other line, they may reject the car going to some industry on their line for the purpose of retarding that movement; that the other line cannot get the freight, so it is up to the delivering line to know that that car is in a fit condition to go before delivering to connections.

Mr. O'Donnell: Am I to interpret that that the receiving line is not to make the repairs?

President Boutet: If it is to be loaded by an industry within their switching limits, they are not supposed to make the repairs for the benefit of that line.

Mr. Schultz: In Chicago we have a local agreement by which all loaded cars offered in interchange are inspected for defects to safety appliances. In regard to empty cars and no delivery, it being meant to force them onto us, we make the running repairs. We maintain that it is equally important to make prompt delivery to the shipper of an empty car as it is to bring in a loaded car. The understanding seems to be generally satisfactory.

Mr. Lynch: Cleveland is the same as Cincinnati in regard to empty cars, and it is expected that if a car has such defects that it cannot be repaired readily on the road, we allow the car to come in and be repaired by the delivering company, or if it is a delivery company defect, and can be repaired easily, we would apply a defect card.

Mr. Hogsett: We handle it just about the same. Where a car is delivered to the delivering line to be loaded, the receiving line would make the repairs necssary to the car in order to permit the switch. The per diem part of it, of course, the receiving line is subject to $3 per diem, but in case the inspector is not notified of the commodity that car is to be loaded with, and it goes over to another line, and they want it for bulk grain, and it is not good enough for anything but sacked grain, the receiving line is not responsible so far as getting it on the main line service, the receiving line makes the repairs for line service.

Mr. Wohrle: The receiving line would charge the delivering line for bad order repairs. The first twenty-four hours the delivering line pays, but if held longer than that, they charge for the time necessary and that comes under the per diem rule.

President Boutet: Suppose the Pennsylvania wanted to deliver to the Big Four a car in bad order, what would you do?

Answer: We would use a reclaim card to ship the car to the receiving line. If the repairs can be made within twenty hours, one man's work, we ship to the Big Four tracks, and it is optional with them to make the repairs or allow it to go.

President Boutet: It is my understanding that we compel the receiving line to receive that car and make the repairs if it is to be loaded within the receiving limits.

A Voice: If the repairs can be made within a reasonable time. We do not know in all cases where the cars are going to, and we attach it to the car and that puts us on the safe side.

Mr. Merris: We accept according to M. C. B. rules. The delivering line must deliver their cars in good order.

Mr. Schultz: We have at Chicago a local agreement per diem, what we call a bad order reclaim.

President Boutet: We have that, but that doesn't refer to this.

Mr. Schultz: Since July 1 we have abolished this bad order reclaim. Previous to that we used to make reclaim.

Mr. Campbell: The cars must be in safe condition to run to destination. If the car is in bad order they do not have to receive it. That is optional with the road. If they have a mind to accept it, they do so.

Mr. Devanney: Speaking of St. Louis, our local rules force us to accept all cars under load or empty, except safety appliances. If it is empty cars going homeward, we must inspect for safety appliances, if an empty car going home for loading, the receiving line is to be the judge. If they take that car and repair it, it is all right. If we get a bad order car at St. Louis, offered for loading, and it has two draft timbers broken, we take it and load it. Our rules are so arranged that we card the fellow that broke the end sill with a defect card and charge him for the transfer, but we do not charge him for the draft timbers.

A Voice: The receiving line is to be the judge; if they don't want to take the car, they don't have to.

Mr. Devanney: They have no rules whereby the receiving line is to be the judge.

Mr. Trapnell: We have no rules covering the movement of empty cars.

Mr. O'Donnell: I have a copy of our agreement, which I will read for the information of the gentlemen:

Art. 3. All cars will be received by either of the companies interested in this agreement and inspected in their respective yards, except any cars having defects contrary to the Federal Safety Appliance Act; such defects must be repaired by the delivering line before offered in interchange. The receiving company reserves the right to transfer any car that cannot be repaired under load. They also reserve the right to reject high and wide cars and cars the lading of which will not clear the measurements of the receiving line, or its connections, in order to pass same to destination, as per clearances published by the Official Clearance Guide.

The point I wish brought out is that before the per diem became effective we never had any trouble. The operating officials took the stand that empty cars in switching movement was not covered by that agreement. We have maintained that for the preservation of our agreement, it must cover that, because if you cut back cars and allow the yard department to switch them back and forth, you take away the stability of the agreement. I maintain that if you take 50 cars and switch them a mile and a half you are very apt to break a draw bar, and I maintain that a draw bar should be repaired by the receiving company and overcome the backward movement. I want to take to our committee the sense of this meeting in order to preserve the fundamental principles of the agreement.

Mr. Schultz: I believe the stand that Mr. O'Donnell takes is the correct one. I am opposed to the backward movement of cars. It is dangerous to handle the cars and when they are in bad order they do not get any better.

Mr. Pierce: I think that local conditions should govern that entirely; for instance, we are so situated that we have terminal points that have considerable local industries connected with them. It very often requires a large amount of empties for loading. If that principle was put in vogue in St. Louis it would create a hardship on the terminal. In other places the conditions are milder and they can handle it better. That should be left entirely to local conditions, and the best arrangements can always be made right at home.

Mr. Dwyer: I move you that it is the sense of this meeting that it is bad practice for the receiving line to send back a car in bad order with defects that can be repaired in twelve hours by one man. Empty cars offered for loading.

Mr. Devanney: I think we should specify in twenty-four hours.

Mr. Devanney: I will accept that amendment.

Mr. Hoggett: I think the limit should be twelve hours. If you get an order for 50 cars, you are liable to get 25 bad order cars, and as a general rule you have all the loads to take care of.

President Boutet: Would it not be well to take into consideration that you have freight officials out soliciting freight all the time, and they find out what the trouble is, and it resolves itself back to us to know why they are sending bad order cars over there to get their freight.

Mr. Devanney: It is not one-sided. It will save time.

Mr. O'Donnell: If it is in line to amend the constitution, I would offer an amendment at this time that the President, Secretary and Executive Committee be reimbursed for any extraordinary expense in connection with convention work.

Seconded and carried unanimously.

The following paper was read by Mr. Lynch:

CAR INTERCHANGE.

The subject of "Car Interchange" has been assigned me by our worthy president, and to my mind this subject is very much alive at the present day, one that is, I understand, occupying the minds of some of the best interchange railroad men in the country, so that I can not hope to do more than to set forth briefly my personal opinion and experience.

All railroad men who have given this subject the attention it deserves know that the proper inspection of interchange cars is one of the most important branches of the whole complex system of railroading in which the car inspector plays no minor part, for has he not to know that the car is safe to run; safe for trainmen; and safe to lading, before he allows it to go forward, and usually the time allowed the inspector to perform these important duties is all but sufficient, for upon his decision may depend whether the car shall safely bear its portion of the country's commerce, or shall carry destruction in its onward rush to destination.

The M. C. B. rules, as now revised and generally understood, if honestly enforced and lived up to, would very largely facilitate the work of interchange cars, give prompt movement to freight and at the same time protect the receiving and delivering company. Notwithstanding the advantages of interchanging cars in accordance with the M. C. B. rules we find today at many large interchange points, railroad officials have entered into local agreements, which in some instances conflict with the M. C. B. rules. This is especially so where no joint system of inspection has been established, claiming that owing to local conditions they are obliged to make such agreements. Possibly these agreements are necessary to make their system satisfactory. Would it not be advisable to try a different system that would be more in harmony with the M. C. B. rules? To my mind their action is a reflection on the framers of the M. C. B. rules for have they not given a great deal of time and thought in compiling these well-nigh perfect code of rules, which are not intended for certain locations only, but for all interchange points throughout the land, so that we must in all fairness admit that those men did not neglect to see the effect of the application of these rules under all conditions and in all sections of the country.

It is not the enforcement of the M. C. B. rules, but the non-enforcement of them that causes the greatest trouble. This applies not only to the interchange, but to the car shop and repair tracks also. Take for example, interchange points that have no joint system, inspection is usually made by the receiving company's inspectors who have little or no regard for the rights or protection of the delivering company. Records are taken of owners and delivering company's defects and occasionally defects that do not exist, and the car allowed to go forward on what is called "Record." Most of us are familiar with the trouble arising from this system of interchange inspection, which results in endless tracing and correspondence. Were the M. C. B. rules complied with and defect card applied, covering delivering company's defects and wrong repairs, much of the tracing and correspondence would be avoided.

I am at a loss to know what excuse there is for such a system of inspection unless it is that the delivering company is unwilling to accept the receiving company's record until it is backed up at the next interchange or delivery point, all of which would go to prove the advantages of and the necessity for the honest observance of the M. C. B. rules, which gives equal protection to all, saves much valuable time that is spent in tracing, and often useless correspondence. Then again, some foremen refuse to give their inspectors authority to issue defect cards, claiming ignorance on the part of the inspector. Does such claim not reflect on the foreman? Is it not the duty of the foreman or the person in charge to go out on the train with the inspector and instruct him? All inspectors are not to the manor born, yet all inspectors are not ignorant. It has been my experience that car inspectors as a rule who have been properly instructed and remain in the service, become expert in their line of work so that defect cards are very seldom issued in error.

No class of railroad employes receive much less consideration than the interchange car inspector. He is on duty long hours, day and night, through sunshine and storm, and is often looked upon, especially by the transportation people, not as one whose duties are of much importance, but as a hindrance to the movement of freight. Yet to my knowledge none of the serious railroad accidents which have occurred in recent years can be traced back to the carelessness of the car inspector, a fact that speaks volumes for his ability, intelligence and good judgment.

This feeling of indifference or misunderstanding between the several railroad departments should not be allowed to exist, for is it not a fact that a railroad company, in order to attain its greatest success and efficiency, all departments must work in harmony and hearty co-operation, one with the other?

Now, Mr. President, the object of this organization, as I understand it, is to have uniform practice of interchange and repairs to cars in accordance with M. C. B. rules, and a common understanding of the rules, which, if accomplished, will greatly simplify and facilitate the business of the railroads generally and efficiently.

We are assembled here today from widely separated parts of the country and I venture to say, though the fault be not ours, that at present we are almost as widely separated in our method of handling interchange cars. This condition would cease to exist were cars interchanged at all stations in accordance with the M. C. B. rules, and in my opinion the only feasible way to accomplish this would be to place the work of interchange solely in the hands of one man, who would be held entirely responsible for all matters in connection with the inspection of interchange cars. All interchange inspectors under his supervision would receive the same impartial instructions so that all cars received or delivered would be carefully and impartially inspected, at the same time having in view the interests of both companies. This would entirely relieve the local foreman from all responsibility in the matter of interchange, so that he might devote all his time to the supervision of repairs. No conflicting instructions would be sent out to inspectors, because the interests of both delivering and receiving company must be equally and impartially considered, and now that a movement is on foot throughout the country for a uniform method of interchanging cars under the supervision of a chief, agent, or the more dignified title of superintendent if you will, who should be chief in fact as well as in name, we as joint inspectors and car foremen can do much in assisting to make this movement a success and an accomplished fact.

GEORGE LYNCH,
Chief Joint Inspector.

Cleveland, O., September, 1908.

Mr. Campbell: I move that the paper be accepted, placed in our minutes, and a vote of thanks be tendered Mr. Lynch for the able manner in expressing ideas on these points. I think he has covered the subject very thoroughly.

Seconded by Mr. Berg and carried.

Mr. O'Donnell: There is one clause in the paper that if I were to let go unchallenged it would appear to some of you gentlemen that I was not filling my position in justice to those I represent, and that is the reference to the inability to understand why some chief interchange points are handling the interchange on other than strictly joint inspection. On the Niagara frontier joint inspection was thoroughly in force up to eight years ago, and for reasons of their own the officials of the different lines saw fit to change the arrangement which revolutionized the old method of interchange of cars. It is a matter that I do not think wise to discuss today, but I have heard it remarked since the present arrangement was placed in vogue that if we were to revert to joint inspection it would mean the congestion of the yards at that point. Joint inspection, as carried on under the old method, practically meant one set of men inspecting for the two roads. In other words they would inspect them in the delivering company's yards for what the receiving company were obliged to handle. The officials have talked the matter over and have been through the matter very thoroughly, and I am convinced that from my experience with both agreements for the past twenty-six years, that I will have to cast my vote in favor of the present arrangement.

I will give you the reasons why: We will say three hundred cars will come down from Chicago over the Lake Shore or one of the lines, and they arrive at the frontier for movement to the seaport, over one of the roads at Buffalo. Under the old arrangement it left the right to a disinterested party to say what the other roads were to haul for 420 miles. With all due respect to the ability and good judgment of that joint inspector, the present arrangement leaves it to the inspector of the receiving company, who is paid exclusively by that road, to see what that road is willing to haul. As to ability and other attainments, with an arbitrator to temper that man if he does not do justice, I leave it to you gentlemen here to draw your own conclusions. You gentlemen know what has been accomplished in the last ten years in railroading. It has been revolutionized the world over, and the methods of the old days have been found to be impractical. Our present agreement is based on honesty to each road. The arbitrator visits these yards each day; if he is not on the job somebody is after him. Without any reflection as to the ability of the present encumbent of that position, I must say in deference to our agreement, and in contradiction to the statement made by Mr. Lynch, that I consider our agreement the very best that we can get up to expedite the movement of freight.

In giving out defect cards I do not think our inspectors have any inclination to rob their neighbors; if they have I am right after them. These men are taught to expedite the movement of freight and the arbitrator will take care of the expenses to the delivering line on defect cards. I would be derelict in my duty if I did not stand here today and defend the present arrangement on the Niagara frontier.

Mr. Pierce: I said a while ago that I thought local conditions should govern. It is the same in business and customs in different states. The M. C. B. rules furnish the key to work on, but you cannot work to the letter and do 20th century railroading strictly in accordance with these rules.

President Boutet: There are some exceptions that I cannot help taking to Mr. Lynch's report in regard to the running of cars on records. It does not make any difference whether a man is going to be for the delivering company or for the receiving line. We hire our inspectors with a view to having people who are honest. We have to depend upon the honesty of the inspector; if we don't we have no M. C. B. rules. If we accepted Mr. Lynch's idea of applying an M. C. B. defect card to every car that is interchanged with delivering line defects, we would soon have the cars plastered up with M. C. B. cards, if the cards were not removed as soon as they came back on the line. I was never able to harmonize the matter of carding a car for every defect on that car according to M. C. B. rules, and as quick as the car got back on that line to remove the card.

At Cincinnati here is a Lake Shore car delivered by the Big Four to the Cincinnati Southern with three siding boards; an M. C. B. defect card is put on the car; it goes south and is delivered back to the Big Four; that card is removed, if it is caught by the inspector, for they have instructions to remove all cards applied on cars when the car is returned to their line. What is the difference between that and a record? On some roads they take advantage of a M. C. B. defect card. They have some repairs and if it is necessary to repair, they remove the defect card and make a bill on it for defects that existed long before the car came on the Big Four line—perhaps it existed there for two or three years. I cannot see the difference in running a car on record and putting an M. C. B. defect and on it, except that I would make the road responsible for the number of defects that have been on for a long time. I would not consider that I was treating my company right to make them pay for something for which the delivering company was responsible.

Mr. Lynch: I think I explained that the chief carding is for missing material. The object of that is to stop the tracing up of cards on the cars giving the wrong repairs.

President Boutet: That would be all right if the card remained on the car.

Mr. Lynch: That is the object—to try to get all roads to do that and save all this clerical work tracing. Some have been tracing for cars for years.

Mr. O'Donnell: If allowed to speak the second time, I would like to ask Mr. Lynch if he would approve the placing of defect cards on equipment traveling through the country, some of it 30,000, 40,000 and 50,000 capacity about ready for dismantling? We pass cars on notation; we get from large interchange roads as high as 300 or 400 cars in 24 hours and pass on notation. Our arrangement is that the notation must be in my possession not less than 48 hours after the car leaves that point. These notations are preserved and if, for any reason afterwards, the road accepting the car is made responsible they come back and if that notation is on file in my office, the road receiving the car is protected. I contend that it is a waste of time for the inspectors and a waste of money from the loss of cards to put them on for all the old roof boards and various other parts from cars being dismantled.

The carding under our agreement is economically done. We pass side doors and end doors run in notation. Upon instructions of the executive committee I kept a record of cars that were passed in that manner and if cards were applied it would run up to $4.500 in money. Those were practically all owner's defects. If you put on cards it is $3.50 or $5 at the next point; that goes against the neighboring line, whereas it should be charged to the car owners.

Mr. Lynch: I do not advocate the carding of decayed or rotten cars or old cars, but I would like to ask Mr. O'Donnell if he does not occupy the same amount of time taking his record that would be consumed making out a card. I cannot see why he would take that record, place it in his office and afterwards spend months tracing. I think the time spent in taking a record is lost in comparison to the time of the card.

President Boutet: I would like to ask Mr. Lynch if he ever has the claim department ask him for a record of cars passed in interchange for loss to freight or damage to freight.

Answer: We do.

Question: How do you answer them?

Answer: We usually refer that to the local agents.

President Boutet: Two-thirds of the office work in my office is in answering freight agents and claim agents as to the condition of cars passing in interchange, from one to five years back, settling up claims. It will run from 10 to 40 letters a day. The records are kept six years. All inspectors are required to make a report of the condition of a car, the damage to the freight. It is necessary for us to have these records for the protection of the different lines, and in making that record we have all the record we want. We don't have to stop and write out a lot of defect cards The rules require us to get these cars through. If a train of from 30 to 40 cars comes in from a connecting line they will be inspected and ready for service inside of an hour. If we had to write out defect cards for all the cars that had delivering company defects, I do not think we could get the train out in two hours. We preserve a record and we believe it is just as good as a M. C. B. defect card.

Mr. Gainey: As far as Cincinnati and Buffalo are concerned I do not think you could get two points any more alike. The joint inspector at Cincinnati is just the same as the arbitrator at Buffalo.

Mr. Lynch: That was the intention of the paper, to bring out this discussion and get a uniformity of practice. It says that it is my personal opinion. I do not wish to insist that Cleveland has the best system of inspection, but what we want is something uniform. If the paper has any merit, it is all right, but what we want is uniformity of practice. That is the object of this association, to have some uniformity in regard to the intercharge of cars.

Mr. Gainey: Mr. Lynch's point is well taken. He doesn't want the association to adopt what he has put in there, but he wants to get a uniform practice.

President Boutet: Mr. Lynch well understood that when he prepared his paper. It is the duty of all of us to cull out the good points.

Mr. Lucor: I have listened to the discussion with a great deal of interest and I do not notice many points of difference. The matter of whether a defect card shall be applied to the car, or whether it shall be run on record, is the only point of difference I am able to discover. I think we are all pretty well together after all.

President Boutet: I will state that I think there is little difference of opinion, except possibly the people from Chicago who think it is not necessary to have a joint inspector up there, but there is no question but that some large interchange points are far superior having joint inspectors, as much so as it would be for a road running each division with no general head; it is as important to have somebody in charge of interchange.

Mr. O'Donnell: In closing the discussion I want to say that Mr. Lynch is broad minded and liberal enough to know that the opening of the discussion was simply to create an argument. I have every respect and confidence for Mr. Lynch as an interchange inspector, and I have also heard many compliments paid the gentleman. We are simply talking for the future. A few years ago there were many methods that were perfectly proper to the minds of the operating officials in charge of the railroads at that time, but times have changed. It is up to us as car men throughout the country to keep in touch with the methods to create the best means of moving freight throughout the country. I wish to thank you.

Mr. C. M. Hitch read the following paper from the car foremen.

PAPER PRESENTED BY THE CINCINNATI CAR FOREMEN'S ASSOCIATION—SIDE DOORS ON BOX CARS.

The problem of side doors on box cars is one that should interest every car man and freight claim agent in the country.

In the first place, the cost of keeping up side doors is greater than the cost of maintaining couplers, and, in the second place, a greater number of claims are made for loss of freight on account of faulty doors, I believe, than for any other cause.

What are the causes? Mainly the manner of applying the doors. A new car will be built with side doors, each weighing on an average of 200 lbs., and fastened with three No. 18 1¾ in. screws in each of the two hangers. While this would possibly be all right if a car was a stationary building and not butted around the country continually, the door first bumping against one stop and then the other or swinging between them. It is only a short time until the screws begin to work loose and a little while longer the door falls off.

No attention whatever is paid to it, as long as it will open and shut, no matter under what conditions or what trouble.

They are allowed to run with the corners broken off at the bottom so that they will not catch in the brackets that were put on to hold the door close to the car, and when the door falls off on the road or in some yard it is not picked up, but is allowed to remain there and be run over by cars or teams and destroyed.

In a great many cases it is allowed to be carried away by some employe or some other person to build a coal bin, pig sty, or for some other use and car is sent to repair track, a new door is applied and owner of car is billed on for a new door, or car is sent to an interchange point when a card is given for same. This appears to be the general practice throughout the country.

If you have any doubts of this, examine the bills made out against your road by other roads.

A great portion of this expense could be overcome by giving the doors a little better attention when they are on our repair tracks and at our freight houses to load and unload. While some of you may claim that the expense is borne by a foreign road and is not a matter that concerns your road, especially if the car happens to be a foreign car.

This appears to us to be an injustice to the owners, in so far as giving foreign cars the attention we should give or expect for our own cars, under similar circumstances.

There is also another and very urgent reason why we should give their better attention. We would consider it a suicidal policy if our freight agents were to load a stock car with merchandise, such as cloth, clothing, shoes or groceries, when the contents could be seen from the outside of the cars, but at the same time we will permit them to load box cars with this same class of freight with the side doors in such condition that any person can see the contents of the car.

If they are looking for a chance to steal (and unfortunately there is a great many of this class of people in this country) they know just what car to go to in order to get the most valuable goods.

Still another matter, we allow cars to be loaded with a class of freight that will wedge against the door and in its weakened condition it will bulge out in such a manner that it will catch a passing train and do a great amount of injury, especially if it happens to be a passenger train.

Another reason, a large amount of freight is lost on account of leaking out of side doors. This is especially true of grain.

The grain door may be faulty or weak, one board of it will bulge out allowing the grain to run through, but if the side door was in good condition it would hold the grain between the grain door and the side door, saving in a great many cases claims that amount to more than the road gets for hauling freight.

While it is true that a great many of you will say that your company will not allow you the help to do this work, it is possible that would be the case if one or two roads were to attempt to remedy the evil, but if we would unite in this matter it would not be a hard thing to overcome, and it would save the railroads of this country many thousands of dollars every year.

At this period of cheap rates and hostile legislation against the railroads of this country, they badly need every dollar that it is possible for them to get in a fair way.

I do not believe that there is any other item in the car department that will give as good results for the outlay as will be obtained by equipping box cars with good side doors and maintaining them in good repair.

It was moved by Mr. Trapnell that the paper be received and a vote of thanks be tendered to the writer. Seconded and carried.

Thereupon an adjournment was had until Wednesday afternoon.

WEDNESDAY AFTERNOON SESSION.

Mr. Rau read his paper as follows:

ST. LOUIS & SAN FRANCISCO RAILROAD COMPANY.
OFFICE FOREMAN CAR DEPARTMENT.
3900 CHOUTEAU AVE.

St. Louis, Mo., Aug. 1, 1908.

Chief Joint Car Inspectors' & Car Foremen's Ass'n. of America.

Greeting: Interchange work at St. Louis and East St. Louis is progressing very nicely, but there still remains room for improvement in our Master Car Builders' rules to facilitate prompt movement on all cars moving homeward under M. C. B. home route cards.

These cars are giving a vast amount of trouble in these terminals at present, on account of being improperly routed and home route cards not covering all defects in cars. This subject is of vital importance to all railroads in this great country of ours and should be given more thought by men in all branches of railroading, so that in a very short time railroads would not be compelled to haul old, worn-out cars all over the country before landing them at home.

At the present time, under Master Car Builders' rules, cars are sometimes routed home by owners a thousand miles out of the way in order to save paying freight charges by a more direct route, whereby this same car might reach home by traveling one hundred miles, saving this vast amount of unnecessary handling and possibly a great amount of additional damage—at the same time giving the owners of these cars an opportunity to put cars back into service in less than half the time required under our present rules.

Every car man in the country knows the importance of getting bad order cars repaired with as little delay as possible to avoid additional damage which is sure to occur from continual switching. The old saying is "A stitch in time saves nine;" so it is with a bad order car. This matter should be taken up by all car men all over the country and agitated so strongly that the management of the different railroads throughout the country would take hold of this matter and bring it before the Master Car Builders at their next convention, to have our present rules changed so as to facilitate the prompt movement of cars bearing home route cards, and as a suggestion I would like to offer the following changes to be made in our present rules, Nos. 125, 126, 127 and 128. To start with, all cars bearing home route cards should be billed home on regular billing from point where cards are applied.

Rule 125: A car unsafe to load on account of general worn-out condition, due to age or decay, should be reported to its owners, who must be advised of all existing defects. Owners shall furnish two home route cards by the most direct route, which may be designated by the owners. Owners to pay any freight charges that may accrue after it leaves the line on which it became unserviceable.

Rule 126: 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 owners for appraisement and disposed of as provided for in Rule 125, except that the road damaging the car shall pay any freight charges that may accrue. Car owners shall accept their own cars when properly covered by defect cards. Bills for repairs shall be rendered as specified by Master Car Builders' prices for labor and material.

Rule 127: In case of cars of private ownership sent home on account of general worn-out condition, due to age or decay, such cars shall be billed home by the most direct route and owners notified. Owners to pay any freight charges that may accrue after the car leaves the line on which it became unserviceable. No mileage to be paid to owners by the line on which it became unserviceable.

Rule 128: Private line cars sent home to owners on account of being wrecked or damaged in accident, shall be regularly billed home, free of charges, by the most direct route and the owners notified. Any freight charges that may accrue to be paid by the road damaging the car. Car owners shall accept their own cars when properly covered by defect cards. Bills for repairs shall be rendered as specified in Master Car Builders' prices for labor and material.

It costs railroads money to haul these cars, delays these cars in transit and keeps them from hauling revenue freight, not saying anything about the vast amount of temporary repairs each railroad company has to make in order to get the car home.

I hope this association will urge upon the Master Car Builders the importance of changing these rules in order to bring about better results.

Very respectfully yours,

G. RAU,
Foreman Car Department.

It was moved by Mr. Waughop that the paper be received and spread upon the minutes. Seconded and carried.

The following letter was read from Mr. Pierce of the Big Four at Cleveland bearing on the subject

Linndale, O., Sept. 1, 1908.

S. Skidmore, Secretary, Cincinnati, O.

Dear Sir: Your invitation to attend the meeting of Chief Joint Inspectors' and Car Foremen's Association of America at Detroit, Sept. 8 and 9, duly received. I had fully made up my mind to attend the meeting, but now find that circumstances are such that I will have to forego the pleasure.

Have enclosed a paper showing an interchange movement that should be improved upon. If you consider it of any value, kindly bring it before the association.

Hoping you will have a pleasant and instructive meeting, I remain,

Yours truly,

E. C. PEARSE,
General Foreman.

Linndale, O., Sept. 1, 1908.

Movement of flat car M., D. & S. 238, from Nickle Plate to Big Four, May 17, 1906, loaded at Wayne Junction, Pa., for Webb City, Mo., via East St. Louis, either Frisco Line or Missouri Pacific. On June 12, 1908, the Missouri Pacific got tired of it, said it had rotten sills, bad decking and brake rigging and was not safe for use, and turned it over to the Frisco. The Big Four received it from the bridge June 15 and it was set back, received from bridge again June 21, mem-billed home via Nickle Plate at Cleveland, empty and accepted without question. On its arrival at Cleveland, June 28, it was rejected for one decayed side sill, two end sills and floor not safe and three cut journals, really a combination. Finally after changing three pairs of wheels, reinforcing the sills, repairing the floor and tightening car up, the chief joint inspector agreed to accept it if protected with home route cards. Those were furnished July 24 reading via Big Four; to Nickle Plate, C. H. & D., C. N. O. & T. P., B. & O., Southern, A. C. L. and Central of Georgia to Macon.

Our association aims for uniformity in interchange. At our last meetings at Cleveland and Buffalo, I strongly urged its adoption. To the men on the ground it looks as if there is room for improvement, and it can and should be brought about through a better understanding between the car and transportation departments engaged in the care and prompt movement of the equipment entrusted to its care.

E. C. PEARSE.

President Boutet: That is only one of the thousands of cases that any of us could enumerate. There should be some radical steps taken to change the rules.

Mr. Skidmore: I think Mr. Pearse's letter and the movement of that car is enough to show most any one the necessity of changing these rules. That car was probably hauled 1,000 or 1,500 miles to go about 200, and as has been stated, cars that become in general worn out condition are not fit to travel such distances. By sending the car direct home it would not be handled by so many different lines, and it would really be cheaper for the car owner to pay the freight and get the car home. The car owner is responsible for almost all repairs, and this car in question, no doubt, cost that company several dollars for repairs while it was going in such a roundabout way.

A Voice: What is the custom of sending a home route card, where you have immediate connection? We are entitled to home cards and ask for them, but the question of requiring them has been up.

President Boutet: The practice at Cincinnati is that if there is a car comes in on any line belonging to any local line where they have direct connection, the car is sent home, if the defect is one for which the owner is responsible.

Mr. Lynch: The same applies to Cleveland in reference to the condition of the car.

Mr. Wohrle: We have the same at Columbus.

Mr. Lucre: I do not believe the point the man intended to bring out has been brought out. As I understand it, it was this: Suppose a C., B. & Q. car should be received at Chicago by the Michigan Central, loaded to Detroit, and when the load was taken out of the car at Detroit the inspector looked it over there and saw that it was unfit for loading; would he have a right, under the rules, to ask for a home route card?

Answer: That isn't the point.

President Boutet: It would be necessary to ask for a home route card in that case.

Mr. Sternberg: We have a Missouri Pacific car in Chicago; its home is in St. Louis, and we have direct connection with the Missouri Pacific at St. Louis. What we would like to find out is whether it is practical to get home route cards where we have an immediate connection. Our transportation department in Chicago when the yard became congested with freight cars of that nature, tried to insist on us sending the cars home on home route cards.

Mr. Shultz: The only object would be the fact that we would be permitted to stop the per diem. If the car is in a worn out condition I believe it would be all right to get a home route card.

Mr. Trapnell: The minute you make a request for the home route card the per diem on that car stops.

Mr. Sternberg: By the time I could ask for a home route card, through the general office, the car could be home. We would move the car.

Mr. Skidmore: We have instructions from the Illinois Central that any Illinois Central car that became unserviceable is billed out direct to the Illinois Central at the nearest junction point, and the Illinois Central will accept it. If that was a rule on all roads and they would agree to accept their cars in that manner, it would save much delay and unnecessary handling of cars—to get them billed direct out to the nearest junction point where you have a connection with them.

Mr. Rau: I would like to give an illustration to this convention of the consistency of the home route cards in our territory: We had a B. & O. car that came in, its home route cards reading "via Frisco, C. & D. I. to Chicago." The car got into the B. & O. yards at St. Louis. Just as soon as they saw the home route card on this car they sent it back to Frisco. They had to give a card to the C. & D. I. and it hauled it back to Chicago. They wouldn't take their own car in their own yards.

Mr. Head: We had a case of the Illinois Central of a car that became unserviceable in Chicago. I asked for a home route card and they refused to grant the request, saying that we had a direct connection with them at Albia. Inasmuch as they could not give the card, and the car was not improving any in the Chicago terminal, I instructed to have the car sent home by way of Albia, and in order to protect the Wabash, I suggested to the car service department that no per diem from the time I asked for the car until we delivered it to them at Albia be charged.

Question: What was the outcome?

Answer: The per diem business is handled through another department and I don't know, but I feel free to guess that they didn't get any per diem. We were entitled to the card and could have held that car in Chicago until they had given it to us.

Mr. Skidmore: I would like to offer an illustration from a joint inspection point—it shows the advantage of joint inspection: two cars that were in a defective condition due to age and decay, but a combination of defects existed, and the line taking it up with the car owners had considerable correspondence about the cars and finally sent a representative to look at them, and he decided that there was a combination on the cars and for that reason the delivering line was responsible, although admitting that the cars were worn out. They were steel cars. The controversy continued until the per diem amounted to between two and three hundred dollars, and the cars were finally disposed of, not through the heads of the departments, but by moving them to the joint inspection point where they were turned over to the car owner through instructions of the joint inspection. There is a case of cars being kept out of service for between five and six months, the heads of the department and all connected with them corresponding about them, and the bill to exceed $200 for per diem, which I suppose will make more correspondence and controversy with another department; where, if there had been a joint inspection at that point, there would have been no delay to the cars and the matter would have been settled without any difficulty. I did not finish as to the disposition of the cars. One of them, owing to the length of time that it had been held out of service, the joint inspector decided that the delivering line was responsible for some defects on that car, but for the other, the owner was responsible. That is one advantage of joint inspection; you can dispose of cars of that kind because you have an arbitrator there.

Mr. Pearse: He knew something about "'alf and 'alf."

Mr. Head: We find more trouble in getting cars home by asking for the home route cards.

President Boutet: This was not a case of "'alf and 'alf." Two cars were rusted, the floor had all rusted through, and the rivets had all pulled out, which, no doubt, many of you have seen in the same condition. The front car had the draft timbers gone, possibly it had been done in the same way, but it had been covered up. Wooden draft timbers had been put on and it was almost impossible to determine, without dissecting the car, whether the defects were such as to hold the owners responsible. I would run the car home, but I could hardly say whether the owners were responsible.

Mr. Pierce: I have had a varied experience with cars in St. Louis before we had this so-called joint inspector at St. Louis. A car bearing a home route card, if it went to any line that was foreign to the association, it was almost impossible to pass it through the gate-way of St. Louis. A home route card on a car seemed to be regarded as a case of smallpox, nobody wanted to touch it, but after we entered the general arrangement there, during my whole time on the trunk line until last year, I do not suppose I asked for one home route card. As soon as we got down to a system of handling cars through a joint arrangement, that entire trouble seemed to vanish, and it made no difference whether the home route card was on it or not, if the inspector had the record of the home route card. Before this I had to hold the car a month for a duplicate, but after that, as long as we had a record of it, we passed it along and we have had very little trouble with St. Louis in regard to it. That is one of the grand advantages of an arbitrator or chief joint inspector, where there is a large aggregation of railroads meeting. He seems to act as umpire and settles all disputes keeping the cars going. For my own part I advocate that roads handling a car, if the home route card was missing, that they be empowered to apply their own home route card and the writing in red ink "duplicate of such a home route card applied at such and such a time." I think that is a good idea yet to those who have trouble.

Mr. Lucre: There is one point in the first paper in reference to returning private cars. A car going from Omaha to Detroit becomes unserviceable on the road bringing it into Detroit. They are required to return the car free of charge to the road that had it between South Omaha and Chicago, is it charged mileage?

President Boutet: If that was the direct route home it would be, but suppose that car came over from Omaha and they wanted to send it to Chicago.

Mr. Lucre: Suppose that it came over a direct route and they would be sending it back over the same route?

President Boutet: That would be a matter for the American Ry. Association to settle. Some of them will haul a certain number of cars a certain number of miles, but they would haul the same number loaded.

Mr. Lucre: This was a proposed rule to be presented to the American Railroad Association.

Mr. Skidmore: I believe it was the understanding in the case as stated by Mr. Lucre that the car would be hauled back empty free of charge, but if it were necessary to send it by direct route over which it had not come, there would be a freight charge.

Mr. Burke: We had quite a controversy at St. Louis on the question of whether a delivering line should be carded. I always maintained that they should.

President Boutet: If a foreign car going home bears a home route card and there is a defect which is not covered by the home route card for which the delivering line is responsible, the delivering line is carded against.

Mr. Burke: We have a rule in St. Louis where only joint evidence is given.

Mr. Shultz: I believe the way you speak of, Mr. Burke, is a good idea, where it is a railroad company car, but would it work with a private line car?

President Boutet: Suppose you were in Chicago representing the Armour Co.; here was a car that came from Boston, carded home on account of the decayed condition, when it got to Chicago there were two draw sills broken, wouldn't you insist upon a card covering a combination of defects?

Mr. Shultz: We sign joint evidence upon the channel in which the car came.

President Boutet: In case there was no record of it, you would have to give a card. Your record is the same as a card.

Mr. Burke read the rule in force at St. Louis.

Mr. Gainey: Doesn't it look like all roads in the country handle home route cards the same as they do at Cincinnati and other points? I have a case lying on my desk now of one of our cars, another road asked for a home route card for two broken draw sills, and the car in a general worn-out condition. The car passed over several lines, while it could have come direct home in 65 miles. When the car got home we found that it had two butted draw sills, and a broken end sill, evidently broken at the same time. We had it up with the road receiving it, from the road that we gave the home route card to, and asked for their report. The superintendent answered it, stating that they did not inspect a car when it had home route cards on it. It is one of the biggest trunk lines in the United States, and the other line that had it above there has a record of the defects just how the car came home. It is a matter to be settled by the different ones interested as to who is going to pay for that combination. The other road that has a record of it is in the clear.

Mr. Skidmore: There was something mentioned about private lines, whether they should be carded against the same as railroads. The M. C. B. rules provide for private lines the same as they do for company cars, and there isn't any reason why a private company should not have the same consideration as a railroad company in so far as carding for defects and sending them home on home route cards. If the rule were complied with in asking for home cards there would be no occasion for any joint evidence or defect cards being issued by intermediate roads or on the arrival of the car home. It says you must notify the owners of all existing defects, and if he so elects he will furnish a home card showing all these defects on the car. If some line deceives a car owner asking for home cards, and only gives them a part of the defects existing, puts the home cards on and these intermediate roads pass it back, they should be carded against. It should be handled strictly in accordance with the rule. If it has defects for which the delivering line is responsible and not covered by the home card at that point, there should be a defect card put on for them and if that intermediate road does not so protect itself the next road should be compelled to card against it. This thing of some people asking for home cards and not enumerating all the defects, and then when the car goes home they give him joint evidence which is not worth the paper it is written on, it is an injustice to the car owner, either private line or railroad company, and I say treat the private lines in accordance to the rule.

Mr. Shultz: It is seldom you see the inspection of a refrigerator car that is satisfactory to the owner when they get the car home.

Mr. O'Donnell: I called up Mr. Brown and he said he would be only too glad to accept the invitation to come down and say a few words to you if it were possible for him to do so, but he has a meeting this afternoon with some of their own officials and he could not possibly break the engagement. He referred me to Mr. Ross and he also said it would be impossible for him to be here.

Mr. Trapnell read the following paper:

Kansas City, Mo., Sept. 1, 1908.

Chief Joint Car Inspectors' & Car Foremen's Association of America.

Gentlemen: Another year has passed since we last met in Chicago and during the year a great financial panic has visited our midst, causing widespread disaster, and it has been the paramount issue with the heads of the great railroads which pass through our various gateways to economize in the expenditure of moneys for all departments.

This subject again opens up the thought, have we all looked into our various departments and curtailed the expense in line with the policy of the lines. Interchange inspection costs the various lines a large amount of money each year which, if consolidation of inspectors were made where it could be done, would lessen the cost very materially to each line.

The lines could make joint inspectors and have inspectors act for more than one line and the expense pro-rated on a wheelage basis, which would be a great saving with better movement of cars, as the inspectors would report to the one head and it would be efficiency that would hold men in their position and their ability to use good judgment in the movement of cars. With this end in view prompt movement of equipment will be secured with no friction between inspectors that does now exist. For if an inspector would issue M. C. B. defect cards against a line on a short movement or several cards are issued, the inspector whose card is issued says this inspector is very close, well I will get even with him. This idea of revenge would be done away with and the service benefitted by inspectors capable of knowing when a car was safe to run and not fill up the repair track with cars that he does not desire to assume responsibility to run, but sends it to the repair track that the foreman can assume the responsibility and delays car at least twenty-four hours in its onward movement, because he will not assume that responsibility for which he is paid. While an inspector should know if a car is safe to make the trip under fair usage, he should let it go forward and thousands of dollars per year saved in the operation of terminal yards by the prompt handling of cars that are safe to run, but instead marked to the repair track for the reason above cited.

I note by the Railroad Age Gazette, of Aug. 7, there is a movement on foot in large terminals to consolidate the joint interchange inspection and the joint yard clerks with one bureau for the purpose of reducing the expense and expediting the business of the reporting of the cars handled.

There is one point that has this plan in operation, that is Denver. I do not know what the conditions are there and if the same plan could be put in operation at all points. There are some other points that have the matter up at this time, they are Minneapolis and St. Paul. The joint inspector at that point says twelve inspectors could be saved by making it joint inspection, consequently a saving of that amount to the various railroads. Also Niagara frontier, Cleveland, Indianapolis, Terre Haute, St. Louis, Fort Worth and Kansas City, all of which, in my opinion, a great saving could be made each year to the different railroad companies nterested.

As per my paper of last year, the trouble still exists with the movement of empty cars. At a recent meeting the different foremen car departments at Kansas City got together and have recommended that all empty cars offered in interchange will be accepted.

"Empty cars refused by any road, on account of the condition of cars, must not be returned to the delivering road except for United States safety appliance penalty defects, without authority of the chief interchange inspector, who will attach cards to each side of cars authorizing the return."

This I believe will relieve the matter of refusing so many empty cars as the inspector will be more careful in handling, as they would have to have an inspection by an impartial representative of all lines. Of course cars that would come under M. C. B. rules Nos. 125 to 128 inclusive, would be handled in accordance with such rules.

In my opinion M. C. B. rule No. 125 should include the billing of the damaged car home, that is the line which owns the car should furnish to the line on which the car became unserviceable, in addition to the home route cards, billing covering the entire home movement of the car. Then the car would be moved home without any controversy which now often happens on account of no bill accompanying car, and home route cards lost or torn off.

For instance, the C., B. & Q. brings in a car with home route cards on. In the handling of the car through the terminals the home route cards are torn off, car is set back by the line the C., B. & Q. had delivered to on account of car not in condition to load. Car set back by the yard clerks, they not realizing the use of the home route card. Then some one has to hold car until duplicate home route cards can be procured.

This would be obviated if the car was properly billed when the home route cards were furnished. I believe all divisions of the Central Association of Railroad Officers should adopt a uniform code of rules governing cars interchanged in large terminals under their jurisdiction, with but very few changes to suit the locality.

The matter of transfer of freight, the rules give a list of non-transferable freight which, if the car is in bad order and defects exist to car body which would take more than twenty-four hours of one man's time to repair, a transfer card shall be furnished, charging the cost to the delivering line, but if the same car should happen to contain transferable freight, the line receiving same would be compelled to transfer it at their own expense. Then having adopted the twentieth century rule, run repair or transfer. If transfer is necessary do it at your own expense, as the delivering line has had in all probability the cost of originating the load for your line and then you tax them with the cost of the transfer if it is a non-transferable commodity which is hardly justice to the originating line.

Now this same load delivered at your various freight houses you would take by the wagon load and put it in the car, then why not handle at your own expense when carload lot is delivered to you for shipment over your line and stop the trouble and confusion caused in the present method of handling.

Let us discuss the various papers presented and get the good points of each and then exercise every legitimate means to have them incorporated in rules for the benefit of all concerned in order to expedite the business. The freight agent solicits business, the unschooled car inspector diverts it which would be stopped by making the inspectors joint men, properly instructed in the rules and held strictly accountable for any unnecessary delay to freight which would then make them competent men and the various railroad companies would profit thereby, not only in the prompt movement of freight and at a greatly reduced cost.

Let us each and every one take heed and endeavor to work out our plans and then some progress will have been made, but if we hold conventions and prepare our papers and talk on them and do not seek to put the good parts in operation, our purposes amount to nothing.

Yours truly.

F. W. TRAPNELL,
Chief Interchange Inspector.

It was moved by Mr. Campbell that the paper be received and spread upon the minutes.

Mr. Campbell: I do not see that there is any chance for discussion because he brings out all the good points. I believe in having the work done as he suggests.

Mr. Gainey: There is one place in Mr. Trapnell's paper where he states that if all inspectors were put under a chief joint inspector, expenses would be reduced. There is no doubt about that. In other places he says we would get the same instructions. So far as Cincinnati is concerned, all inspectors get the same instruction, even though they work for different foremen. They go over the rules and discuss them thoroughly, and each foreman instructs the foremen under him in accordance with what they decide upon at their meeting. In that way all of them have the same understanding. We work at Cincinnati under the 20th century agreement. We inspect for safety only. The car is delivered to the connecting line, its inspector inspects it and marks it for the repair track, if it has to go there. When under the old M. C. B. rules we used to block the yards.

Mr. Bunting: I will say for Cleveland that the foreman there has nothing to say to the joint inspector. The only difficulty I find is to furnish the joint inspectors with good men. The joint inspector should hire and discharge his own men. I think that should be handled entirely by the chief inspector. It is pretty hard to get an interchange inspector. Of course if a man doesn't fill the bill they tell them they don't want him.

Mr. Pierce: I am surprised to hear that from Mr. Gainey in regard to Cincinnati. It is generally understood that nothing wrong could come from Cincinnati. For my own part I do not approve of the idea of the foremen of any line issuing instructions to the interchange inspector that is under a general inspection. They pay the chief joint inspector for just that part of the business and it is his duty to inspect all material and with us at St. Louis if a car foreman butts in he will very soon be butted out. The only one to instruct interchange inspectors is the chief joint inspector, and his car foreman will see that he gives the proper instruction.

Mr. Gainey: I want to state that the joint car inspector has no charge of the inspectors at Cincinnati. Each foreman has direct charge over his own inspector. The chief joint inspector is an arbitrator; he settles all cases of dispute and if a man doesn't change his tactics when required, he calls the foreman's attention to it.

Mr. Waughop: This association has been told that they have 20th century inspection at Cincinnati.

Mr. Bunting: The foreman at Cleveland does not know that there is an interchange inspector only when he puts another man in the place and we do not give any instructions at all. They report to him entirely and get their orders from him.

Mr. Lynch: I wish to thank Mr. Bunting. I think that is a compliment.

President Boutet: Answering in regard to Cincinnati, I will say that the inspection is done on the 20th century plan. The cars are delivered. It is up to the receiving line to say what they want to do with them. He is an arbitrator and has no control over the inspector, except his orders are to report all inefficiency or any fault that he may have. He may be a good inspector, but he may get off the track. I take it upon myself to try to put him in line. There is no friction with the lines. Each road does their own inspecting. They wish the inspector to do their local work also which is an advantage over the joint inspector. There is some advantage gained by having the inspector under a joint inspector and some disadvantages by having the inspector under the foreman. We do not set anything back; we keep the cars going forward. There isn't a car set back even for safety appliances.

Mr. Lynch: Can there not be some saving in having a chief joint inspector who would have authority to say whether a car should be set back? You would have full control over that man and should say whether the cars should be set back or not, that is directly or indirectly. In my opinion there would be a great saving in the matter of labor and that cars could be interchanged under the same conditions that they are today.

President Boutet: When an inspector is inspecting in your own yard, if you want him to do some local work, he does it. If he were working at interchange he wouldn't do it. Some yards could cut off one or two men and others you would have to put on a couple to do the local work.

Mr. Lynch: If in the opinion of the chief joint inspector the work would not interfere with the interchange inspection, the man would come under the orders of the local foreman, provided the repair track is located in the yards where the interchange and inspection is made.

President Boutet: Does your interchange inspector repair them?

Mr. Lynch: Yes. We apply bolts and in some instances apply grab handles. We repair all penalty defects that it is possible to repair on an interchange. One man will take care of one or two points. The only difference I can see is that the—

Mr. Gainey: I do not think there is a joint car inspector anywhere in the country any more worked than at Cincinnati. He goes to work at 5:30 and works until past 6. I can see two men inspecting all cars coming from the Big Four and C., C. & L. In addition to that I have these two men inspect all cars coming into our yards. If so many come in that these two men cannot handle it. I get some man to come out and help. If you have a joint inspector and all the inspectors are under him, you are bound to tie the yard up.

Mr. Lynch: If the work would not interfere with the interchange work, the local foreman could tell the man to go on the local work, testing air, etc.—taking the work of local men in addition to interchange work. I do not think that Cincinnati is ahead of Cleveland.

Mr. O'Donnell: I thought the cat would come out of the bag at last. Yesterday and today, both in session and out of session, these men who have the strictly joint inspection arrangement have been advocating some change. If these joint men want an increase in salary we are not the men to come to to get it; let them take it up through the proper channel.

President Boutet: I do not believe that there is a point in the country that inspects as many cars as Cincinnati, that the inspection is done as cheaply as it is there. I do not think it possible to do the work any cheaper than it is done now. If we found that a man could be taken off he was dispensed with. So far as saying that inspectors will do local work, my experience is that they never have time. The joint inspector is never in the yard to tell them, but where the inspectors are directly under the foremen he can tell them to repair a car if necessary. That is one advantage to be gained and I think it will more than offset what will be gained the other way.

Mr. Bunting: I would say for Cleveland that the chief inspector there has the force cut down, that there is no time for them to do anything else there but the chief joint inspection. The men on my pay roll complain that they have too much work, so I couldn't give them any more.

President Boutet: That is one of the disadvantages of having the inspection in the yard over which the foreman has no control. We find that they are busy all the time and they do not get any other work except interchange work out of them.

Mr. Pierce: They are directly under the control of the foremen of the respective roads, but all interchange instruction is given by the chief joint inspector.

Mr. Brown: In Cleveland the local conditions are not all the same. On the Pennsylvania business may be better. On the Erie Mr. Lynch's men are helping out by doing all the safety appliance work and all work that is to be done on running repairs. And I will venture to say that so far as the Erie is concerned they are inspecting cars at Cleveland as cheaply as any point in the country at the present time.

Mr. Boutet: How many cars are interchanges and how many inspectors?

Mr. Brown: I am not in a position to say because I am a foreman.

President Boutet: In comparing the expenses that is the only way to compare them.

Mr. Lucre: At this time when the saving of men was brought about at Buffalo, did Mr. O'Donnell say that they reduced the number of channels through which the cars interchanged, is that true?

Mr. O'Donnell: The forces were reduced at certain points. It was necessary to maintain twelve men at Black Rock, which was discontinued, and inspect the cars in the East Buffalo yard, which is the receiving yard of the same roads. It did away with joint inspection within a radius of 22 miles. We simply inspect where the trains are made up and leave for the main line. I am not at all backward about having my remarks quoted in the minutes. I am here representing the roads in interchange agreement, and anything that I say here I would say to the men I work for in Buffalo.

The following paper was read by Mr. Lucore:

1. Nearly a year ago, upon reading in the Railway Master Mechanic the proceedings of your 1907 meeting—your eighth annual convention—I felt a desire to attend your next convention and listen to your deliberations.

2. In reflecting on the extent to which you men influence car movement in this country and finding where you can still further aid in improving the service, it seemed to me a better acquaintance with you than is possible by being a listener only, would help me personally, very materially, in the contact I may have with you later on. I was glad therefore of the opportunity to appear before you today.

3. One has but to read the proceedings of your meetings to see the benefits of your association. I wonder how many outside of your department keep in touch with it?

4. Recently I began posting up as to what other associations are doing. I found the freight agents at most large centers have associations through which they handle local matters of mutual concern, and that they also have what is called the American Association of Local Freight Agents' Associations' meeting once a year to discuss matters where larger action is desired than the single city can bring about. No one can read the proceedings of their annual meetings without realizing valuable work is being done. I imagine their agitation of the car inspection question has encouraged, if not caused the employment of chief joint interchange inspectors at some of the larger centers.

5. I attended the agents' twenty-first annual convention last June and was impressed with the earnestness displayed. They worked hard; large subjects were handled and treated in a broad way. There was nothing narrow in their discussions. I know they must feel kindly toward your association since whatever you do to improve car movement assists them also. I wonder if the progress they are making is watched closely by other organizations.

6. The Central Association of Railroad Officers is another organization that is producing results. As the name implies, it is confined largely to the central states. It seems to me there is room for its extension. Problems are arising at various points which need attention but do not have the benefit of such a body. Their object is "the development and solution of problems in railroad work and more particularly co-operation and unity of action at junction and terminal points." Car interchange centers certainly present attractive fields for co-operation.

7. The Association of Transportation and Car Accounting Officers, an outgrowth of the International Association of Car Accountants, which has held meetings since 1876, has for its object "to promote improvements in matters of car service, car accounting and transportation." It is recognized by the higher officers as an organization of far reaching influence. I think the value to transportation interests of the work these men have done and are still doing, will be felt even more in the future than it has been heretofore.

8. The Master Car Builders and the Master Mechanics' Associations have for their purposes the bringing out of "uniformity and the adjustment of mutual interests, growing out of interchange and repair of freight cars."

9. Then there is the Freight Claim Agents' Association composed of men who have to do with settling claims presented by our patrons for delayed and damaged goods. It is safe to say they will handle fewer claims of merit, when the full co-operation of the roads and the improved methods these organizations are trying to bring about, are finally secured, and they are coming fast.

10. The advances already made in railroad operation could not have been accomplished except for the organizations like those already mentioned.

11. To realize that the traffic department—transportation department, the mechanical department, the accounting department, are all working for a common purpose is stimulating. Each has an important part in perfecting transportation. No subject demands closer study than that of relations which should and must exist to accomplish the desired end. Every man should engage in that study.

12. If all business terminated on the line that originated it the rolling stock of one road would not need to pass into the possession of another road. If there was no need of an interchange of cars and freight co-operation between the departments of each road would meet all requirements. But over half the tonnage of this country moves beyond the road on which it originated. Thus freight interchange of tremendous proportions is necessitated. An interchange of freight requires an interchange of cars. The ease with which this joint business is handled and the net earnings resulting therefrom, depend not only on the co-operation between the different departments of each road, but upon co-operation between the different roads. To handle the business for the best interests of the patrons and of all the transportation lines necessitates a good understanding of the relations which should exist.

12½. The transportation business is of such proportions that a division of the work is required. Thus departments have been brought into existence.

13. The mastery of the details of one department is a life study, yet contradictory as it seems, the mastery of a single department is not possible without an understanding of other departments. No fixed rules can be laid down defining these relations. It is a matter of constant adjustment, of continual effort.

14. The real purpose of transportation must ever be kept in mind and must outweigh the department. Transportation interests as a whole are more important than the interests of a single road. A single road is greater than any of its departments.

15. It is easy to have department lines so sharply drawn that loss accrues to transportation as a whole, and to the road that created the department. If individuals are discouraged in venturing beyond the borders of their own work for fear of trespassing, the best that is in them is not secured. Fear of treading on another department's toes often prevents action that should be taken. The fear of a department that some other may intrude upon its rights is not conducive to good service. Hardly an important question comes up under the present order of things but affects more than one department. To properly handle it there must be hearty co-operation. Co-operation can only be accomplished by having a good understanding between departments and between railroads, and by having a practical way of making such understandings operative.

16. If a department proceeds on the even tenor of its way without much reference to other departments it may defeat the very purpose for which it was brought into existence and yet make a brilliant record—on paper. To fulfill its mission the department must keep constantly in mind that it is but a link in the chain, not the chain itself—a strand in the cord, and endeavor to find its proper relations with all parts of the whole, contributing its full quota of strength.

17. We have learned that the working parts of a machine must be in proper relation one to another, else the machine will not do its full duty. Men study for years to simplify machines composed of iron and steel and brass, to reduce the number of working parts and to prevent friction. Railroads employ high grade men to watch these machines, keeping each part in order, tightening a bolt here and there, applying oil wherever needed avoiding undue strains, and protecting parts from rust.

18. But the greatest machine in the transportation business today is that composed of human parts. Individuals are welded into departments; the several departments make up the single road; railroads collectively constitute transportation as a whole. American railways employ more than 1,500,000 people. Each employe has natural endowments. Each must be depended on to put into his work his natural ability plus his acquired skill. On the smoothness with which this most gigantic piece of mechanism works, depends the successful or unsatisfactory service which transportation furnishes to the shipping and traveling public. On it depends the satisfactory or disappointing returns from the operation of transportation lines. Fewer parts and stronger material in many cases would lend strength to the machine as a whole. Adjustments are constantly necessary. Making these adjustments requires a high degree of intelligence and care.

20. If 100 per cent. of efficiency could be secured from each of the 1,500,000 employes, what a transportation system ours would be. Failure to receive it may be the individual's fault, and there may be cases where the individual has no control over the matter whatever. It may be due to working under a system that has been outgrown. For example: The lasso is the approved method of catching wild horses, but it would not stop a locomotive. It is the function of associations such as yours to devise new ways of handling business as new conditions arise. Conditions change so gradually that it is not always easy to realize there has been a change or to determine when to discard the old and embrace the new methods. Bringing about the most effective and economical practices and securing uniformity so far as consistent throughout the country is a most laudable undertaking. That is what your association stands for.

21. Railroads have already seen the advantage of placing in one man's charge at each interchange center the work of inspecting cars in interchange movement. Your platform says "Freight agents solicit business—unschooled car inspectors divert it." You could have stated without stretching the truth that railroad managers undertake to give the public good service and to earn dividends in so doing, but that some of the human parts of the transportation machine through mistaken zeal or because of inadequate interchange agreements delay the goods the patrons ship and by expensive ways of handling their work, divert the profits.

22. You realize that a car should be kept moving to its destination, not delayed in transit that there may be a quarrel between inspectors as to who is responsible for some repairs. You concede that the patrons' goods should not be delayed, because of a difference between the delivering and receiving lines. You appreciate the need of equitable clear-cut agreements so that disputes won't arise. Arbitrators serve a most useful purpose, but arrangements that will overcome the necessity of arbitration are even better. In addition to conceding the shippers' rights, you appreciate there is no money made by the railroads in delaying freight. Your understanding of the law and of good practice must teach you that there is nothing in the safety appliance act which requires a different practice in the handling of cars in their movement as between railroads than in their movement between divisions of a single road. Common sense must govern and rules which will bring about the best practices must be urged and when once secured must be kept in force.

23. Broadly speaking, the only movement of an empty car that is justified is to get it to another load, and the only movement of a loaded car that is justified is to get it to destination. You realize that in accomplishing these things at a single point, and in securing a uniform interpretation of Master Car Builders' rules between all roads at a given center, is not enough; that the practice should be extended to cover all interchange centers—hence your organization of chief interchange inspectors to talk over and agree upon a proper interpretation of M. C. B. rules to comply with the full spirit of the safety appliance act, throughout the whole country, and to keep before your employers the most advanced ways of handling business. For example: M. C. B. rules (No. 9 if I remember correctly), at one time required that each road shall return foreign cars in as good general condition as they were in when received, and that if this is not done the car may be refused upon its return until repaired or until the company which has used it agrees to pay the expenses necessary to restore it to such general condition. This rule was put in when car interchange was light and when cars remained away from home a short time only. It was doubtless a good rule when adopted, but conditions changed (gradually to be sure, but no less certainly), until the rule retarded the movement of traffic and accordingly the principle of holding the road on whose tracks the car is located responsible for its physical condition, was completely reversed some twelve years ago by placing the responsibility on the owner. With equipment away from home, to the extent of a million cars constantly, and staying away so long at a time as they do when cars are scarce, can any one doubt the wisdom of the change? You will agree the effect on transportation produced by this change was good. Somebody had to agitate it. I feel sure there were those who did not see the necessity of a change, but the objectors were swept aside. Your positions peculiarly fit you to note the effects of interchange rules and agreements and to recommend changes as conditions change. As individuals, your unit of operation is the single interchange center. As an organization interchange centers collectively constitute your unit. In both cases you are specialists. You have justified your existence both individually and collectively. Surely no one will hold that car interchange is not sufficient in volume to justify specializing. Two hundred and fifty thousand interchanges daily necessarily call for the services of an army of men, each of whom should, indeed must, understand what he is about or he will work injustice, and the fact it is done unknowingly does not lessen the loss. But if each of these men is well drilled each is able to give all concerned a square deal and that is all a railroad wants. You as chief interchange inspectors make a specialty of drilling inspectors in their work. I wish this drilling could be extended beyond the fifty-some centers now members of your association, to all interchange points in this country. Your work is only begun. There are many unfinished problems, even at the points where you now are in charge, that will demand the best that is in you.

24. Interchanging cars in such great numbers daily brought about by the bulk of the tonnage being destined beyond the line originating it, is comparable, a little bit, with pouring water out of a bottle. The neck of the bottle determines the flow. If any obstructions enter, it makes a slow flow, even slower. It sometimes looks as if we all try to see how nearly we can clog interchange points—these bottle necks—not necessarily with cars but with our ways of gathering what data is needed, and by our systems of inspection. Some times we get away from the co-operative all-in-the-family idea.

25. There are many departments concerned in the interchange of a car. The mechanical department looks after its physical condition, the operating department the condition of its load, the auditor of freight accounts for an accounting of the earnings from the freight handled, the car accounting officer for the proper settlement covering the car's use. Each department must secure the necessary data on which to base its records.

26. Railroading is so big that no department pays much attention to what data the other departments of the same road need and the amount of duplication as between departments, while enormous, is scarcely to be wondered at.

27. There are always two roads parties to the interchange of every car—the delivering line and the receiving line. One is concerned just as much as the other. The corresponding departments of the two roads want the same information, e. g., the car accounting officer of the delivering line wants data precisely like that needed by the car accounting officer of the receiving line, yet each road sends a representative into this bottle neck. Why? Because the receiving line gathers the data for its own use exclusively, and the delivering line not wishing to accept the receiving line's record, gathers the data also. This applies to more departments than the car accounting departments.

28. On account of this suspicious feeling, or possibly it is due only to departments in interest not getting together on some mutual plan, there is great duplication of work, not only between the corresponding departments of connecting lines, but between the several departments of the same roads in the interchange of equipment and correspondingly an adverse influence on the movement of the equipment of this country.

29. There is a growing disposition to overcome some of this, by establishing joint arrangements at car interchange centers to collect this interchange data and work it up for all parties in interest, the men engaged in the work thus having the interest of not merely one of the interchanging roads at heart, but both roads. Even after the establishment of such co-operative plans (which should be encouraged in every possible way in order to avoid the duplication between the operating departments of the delivering and receiving lines) the data in a great measure is still largely a duplication of what you mechanical men gather for your own records.

30. If we were spending our own money I am sure we would try with great diligence to still further combine this work. The managers of railways necessarily depend on those directly in charge to devise ways of improving conditions. The man on the ground ought to know best how to improve conditions. Executives are largely at the mercy of their army of employes in working out improvements. They want the men to think as well as work. Are we making out experience count in the advancement of the transportation business? Are we pulling together or are we just drifting? As new plans come up for our consideration, are we going to condemn them off-hand simply because they are new, and merely because we did not think of them first?

31. The interest displayed in associations such as yours indicates you are not only anxious to talk about improving the service but that you want to actually put improvements into effect.

32. At your last convention, one of your members presented a paper pointing out a way of improving the service and also reducing operating expenses. Another paper was presented at the same meeting showing that an actual test of the proposed plan had been made and that the claims advanced had actually been accomplished at one interchange center. I have reason to believe there is going to be a change along the lines indicated in the paper just alluded to. If the plan which was proposed is adopted, the saving at one car interchange center that I have in mind will exceed $25,000 per annum. The service will also be improved, and the saving will be nearer $50,000 than $25,000.

33. There are other car interchange centers where the adoption of similar plans will effect even greater savings and the general service will also be appreciably improved. In addition to this recommendation of your member, I want to indicate a way to help improve the service. It is in the matter of interchange reports. These are reports which are prepared by the operating departments and rendered among others to the car accounting officers on which these officials base their car records and settle per diem amounting to millions of dollars annually. Changes in methods should not be made until the situation has been most thoroughly studied, but in this growing country, changes must be looked upon as necessities—they are inevitable in all progress.

You men have it in your hands to aid or retard in the work. I am sure you are anxious to maintain proper relations with all departments, and in so doing add strength and efficiency to the transportation machine.

Mr. O'Donnell: I wish to ask the members of the association to show their appreciation for the very intellectual and valuable paper that has been placed before us to-day and that we extend to Mr. Lucore a rising vote of thanks, and I move that the paper be received and spread upon our minutes.

Seconded and unanimously carried.

President Boutet: In regard to recommendations that we should like to present to the Master Car Builders, I would suggest that instead of presenting our proposed changes for the rules here, that we present them to the secretary whom you elect before the first of January; such suggestions to be submitted to your executive committee for their rejection or approval. The time is so short that we cannot make the suggestions that we ought to make for the changes of rules.

Mr. Trapnell: I would offer that as a motion.

Seconded and carried.

President Boutet: It appears to me that the paper presented by Mr. Lucore cannot be intelligently discussed in the length of time we would have to devote to it, but will leave it for the association to say. In case we decide not to discuss it at this time I trust that we may all read it carefully when it appears in our minutes and endeavor to take upon ourselves our duties regarding the link in the chain that each of us forms regarding the construction of cars.

Mr. O'Donnell: I think your views are entirely proper, and that it would be an abuse of the paper to attempt to discuss it in the time that we have. There is one clause that I want to note particularly in reference to the fact that no fixed rules can be relied upon permanently; constant adjustment being necessary.

Mr. Shultz: One report is very opportune and that is to utilize the labor that we must have at certain points to such an extent as to have no duplication. On the road I am with they are all employed to such an extent that there is no time to waste, but at some of the smaller junctions where it is necessary to have inspection we use these men for yard clerks and freight agents. We take a first class car inspector and teach them the agent's business and have saved men in that way. I think the policy of our company is to pursue that a little further, and I believe we could go through the country and find a good many places where they are doing practically the same thing.

President Boutet: There are a number of large interchange points where persons working in mechanical departments could be used to a great extent, and it behooves us to get together and get the best results out of the fewest men.

The following paper written by Mr. Skidmore was read by Mr. Hitch:

This paper appeared in September's issue of the Railway Master Mechanic.

It was moved and seconded that the report of Mr. Skidmore be received and spread upon the minutes. Carried.

It was moved and seconded that the next order of business would be the election of officers. Carried.

Mr. Trapnell was called upon to take the chair during the nominations for president.

The name of Henry Boutet was placed in nomination by Mr. Berg and seconded by many.

It was moved by Mr. Gainey that the nominations close and that the Secretary be instructed to cast the vote of the members present for Mr. Boutet as president. Seconded and unanimously carried.

The secretary cast 78 votes for Mr. Boutet.

Thereupon Mr. Trapnell duly declared Mr. Boutet president of the association for the ensuing year.

President Boutet: I can only say as I have said on previous occasions that I thank you very much for the honor conferred upon me and I will endeavor to forward the interests of the association and do all the good I can. My individual work is never tiresome when working for the association and I will continue to do the best I can.

For vice-president, Mr. Waughop placed in nomination the name of F. W. Trapnell.

Mr. Gainey: I wish to place before you the name of a man who has been at our conventions since our organization. I feel kindly towards Mr. Trapnell, but I think he is the right man in the right place and we hope that there is where he stays for another year, because we need a good man on the executive committee. I place before you the name of A. Berg.

It was moved by Mr. Lynch that the nominations close.

Mr. Trapnell: I ask that my name be withdrawn and that Mr. Berg be elected by acclamation. I move you that the nominations be closed and the secretary be instructed to cast the ballot of the members present for Mr. Berg. Seconded and carried unanimously.

Secretary Skidmore cast 78 votes for Mr. Berg as vice-president and the chair declared him duly elected.

Mr. Berg: I thank you very much. This puts me in a peculiar position and reminds me of a story of a fellow down east who was a very profane man. He used to create lots of sensations and the people would gather around him to see what he would do when provoked. One time he was hauling sand up a hill and the end-gate came out of his wagon; when at the top of the hill he discovered the sand was gone. The neighbors expected that something would be going on, but he just looked around and said: "Friends, it is no use, I can't do justice to the occasion."

President Boutet: I have one suggestion to make and that is that you change your constitution, combining the office of secretary and treasurer, and would also ask that you elect your secretary from the same place as your president. The work of this association is very voluminous to carry on by mail.

It was moved by Mr. Trapnell that we refer to new business and that the articles of incorporation and the rules of this association be amended to incorporate the office of secretary and treasurer, making it read "Secretary-treasurer," instead of secretary and treasurer.

Seconded and carried unanimously.

The name of Stephen Skidmore was placed in nomination by Mr. Waughop as secretary and treasurer.

Mr. Trapnell moved that the rules be suspended and that the vice president, Mr. Berg, cast the ballot of the association for Mr. Skidmore.

All of which was accordingly done, and President Boutet declared Mr. Skidmore elected secretary and treasurer.

Mr. Skidmore: I did intend to make quite a long speech and fully expected to be re-elected. I gave my speech to Mr. Lynch to read over to see what he thought of it and it has disappeared, so he probably didn't think much of it and perhaps the rest of you would have thought no better of it if you had heard it. I thank you for the honor and will do the best I can. While it isn't the office I desire—I would rather be among the members and better able to take part in the discussions because I take a great interest in them, but of course I can read them in the printed record.

Mr. Gainey: I would like to place before this body the names of three men for members of our executive committee; two of these men have served in the past year and done good work, and I hope they will be re-elected. The first is F. W. Trapnell of Kansas City; the second, George Lynch of Cleveland, and the third, T. J. O'Donnell of Buffalo.

These nominations were seconded by many, and it was moved by Mr. Pierce that the secretary be instructed to cast the ballot of the association for the gentlemen named. All of which was accordingly done, and President Boutet declared their election unanimous.

Mr. O'Donnell: When I received an invitation from your president to attend this meeting he expressed the wish that I prepare a paper to submit here for the advancement of the association. In acknowledgment of the invitation I stated to Mr. Boutet that inasmuch as I was coming here as a newcomer, I did not feel that it would be proper for me to get up here with a paper. I still feel the same. I feel that you have many good men here to put on your executive committee. What little I have done to make your meeting interesting is only the duty I owe to the railroads that are in the agreement at Buffalo. As your time is short I will accept the position on the condition that each member of the organization will strive in the next year to secure at least two new members. I will go back to Buffalo and tell the gentlemen there that I have come, listened, converted and am going to stay. (Applause.)

Mr. Trapnell: I kind of like the remarks of Mr. O'Donnell. They sound like in a Methodist experience meeting. He also gave us the admonition to work and bring in some new members. He has a new field in which to work for the association to bring our membership up second to none in the country, and each of us can do the same thing. I have brought one or two members every time I have come from Kansas City, and I believe if we would all do that we would have to have a Coliseum in which to hold our meetings, instead of a hall this size. I will endeavor, to the best of my ability, to serve you for the best interests of the association.

Mr. Lynch: I think speeches are out of order at the present time. I merely desire to thank the members of the association for the honor they have conferred upon me. I shall endeavor to fill the office to the best of my ability.

President Boutet: I wish to express to the association my heartfelt thanks for the manner in which the election of officers has been carried on. I believe you have elected the best set of officers that it would be possible to elect. The other officers are excellent and I am satisfied that if you will take with you the sentiments expressed by Mr. O'Donnell and Mr. Trapnell our membership will go up to 500 or 600.

I trust that each one of you when you go home will take it upon yourself to procure at least one new member and send his name in to the secretary immediately with his $1.50 to cover subscription to the Railway Master Mechanic. There is another thing that I would like to ask of the association and that is that we have the Railway Master Mechanic as our official organ. For the last several years it has been the belief of the officers that we could get more advertising by having our minutes printed in that paper than by having them published in book form, and it gives us the additional advantage of having a mechanical paper coming to our address during the year.

Mr. Trapnell: I move you that the Railway Master Mechanic be made the official organ of this association. Seconded and carried.

It was also moved by Mr. Trapnell that Miss Unkenholz, the stenographer, be allowed to give out copies of any paper presented to other trade journals that might request the same. Seconded and carried.

Mr. O'Donnell: I would ask the association to show their appreciation for the able and efficient manner in which your worthy self has presided over the meeting; the kindness of Mr. Cass Hitch and Mr. Charles Hitch and also our worthy secretary for patience shown in the past two days. I think it is also only proper and just that we should extend our grateful thanks to the reception committee for the manner in which they have looked after our wants.

The question was put upon the motion of Mr. Trapnell and unanimously carried.

President Boutet: Before we adjourn I would like to call the attention of the members to the entertainment, which our ladies and ourselves have enjoyed so far and other entertainment proposed for tomorrow, and we owe it to the firms, who have made these entertainments possible to us by their generous help, that we should at least give them a rising vote of thanks. It was moved by Mr. Gainey and seconded by many that we tender the following firms a rising vote of thanks for the generosity and courtesies shown us while in Detroit:

American Car & Foundry Co.
American Steel Foundry.
American Brake Shoe & Foundry Co.
Buckeye Steel Casting Co.
Bettendorf Axle Co.
Butler Drawbar Attachment Co.
Cardwell Mfg. Co.
Commonwealth Steel Co.
Columbia Brake Shoe & Foundry Co.
Chicago Railway Equipment Co.
Duff Mfg. Co.
Farlow Draft Gear Co.
Gold Car Heating & Lighting Co
German-American Car Line Co.
Galena Signal Oil Co.
Hutchins Car Roofing Co.
Latrobe Steel & Coupler Co.
W. H. Miner Co.
Modoc Soap Co.
McIlvain Co.—J. Gibson.
McCord & Co.
McConway & Torley Co.
Michigan Malleable Iron Co.
Monarch Steel Casting Co.
Morgan & Wright.
National Malleable Casting Co.
National Car Wheel Co.
National Fulton Brass Mfg. Co.
Parker Car Heating & Lighting Co.
Pittsburgh Equipment Co.
Russell Wheel & Foundry Co.
Standard Railway Equipment Co.
Standard Coupler Co.
Standard Car Truck Co.
Sherwin-Williams Co.
Swift & Co.
Trojan Car Coupler Co.
U. S. Metal Mfg. Co.
West Disinfecting Co.
Westinghouse Air Brake Co.
Ward Equipment Co.
Wheel Truing Brake Shoe Co.

Moved by Mr. Gainey that the hotel management be extended a rising vote of thanks. Seconded and carried.

Mr. O'Donnell: Our association, as I understand it, is an American association and there is no objection to getting in members from Canada?

President Boutet: Certainly; it reads "America."

Mr. Skidmore: I move that this association extend a vote of thanks to Miss Unkenholz for the able manner in which she has taken the minutes of our meetings. Seconded and carried.

Thereupon an adjournment was had to meet next year at the call of the executive committee.

LIST OF MEMBERS—C. J. C. I. & C. F. ASSOCIATION.

C. G. Anderson, F. C. R., D. L. & W. R. R., 130 Ideal St., East Buffalo, N. Y.
John Allison, M. E., Pittsburgh Eqpt. Co., Glasport, Pa.
H. Boutet, C. I. I., 11 Carew Bldg., Cincinnati, O.
Robt. Barnaby, F. C. I., D., L. & W. Ry., Sloan, Erie Co, N. Y.
O. C. Brady, M. A., L. & N. Ry., 1708 Greenup St., Covington, Ky.
J. C. Burke., Foreman M. P. Ry., 422 West Davis St., St. Louis, Mo.
J. Bradley, C. F., N. Y. C. & St. L. Ry., 22 Oakdale Place, Buffalo, N. Y.
F. M. Brown, C. F., Erie R. R., 2449 W. 15th St., Cleveland, O.
A. Berg, F. C. D., L. S. & M. S. Ry., Erie, Pa.
J. V. Berg, Clerk, L. S. & M. S., Collinwood, O.
R. M. Berg, L. S. & M. S. Ry., 920 E. 25th St., Erie, Pa.
G. M. Bunting, Gen. Foreman, P. R. R., 6113 White Ave., Cleveland, O.
F. H. Becherer, Ass't G. F. C. I., P. R. R., 314 Babcock St., Buffalo, N. Y.
F. P. Black, F. C. R., C. C. & L. Ry., 1599 Fairmount St., Cincinnati, O.
V. Baltz, C. J. I., W. T. Ry., Wheeling, W. Va.
J. I. Bailey, F. C. R., C. & O. Ry., Russell, Ky.
B. Boutet, A. C. I. I., 809 Carlisle Ave., Cincinnati, O.
J. L. Brady, F. C. R., L. & N. Ry., 1708 Greenup St., Covington, Ky.
H. Baldwin, F. C. R., M. C. Ry., Montrose, Can.
S. P. Bush, Buckeye Steel Casting Co., Columbus, O.
I. H. Brown, Westinghouse Air Brake Co., 1102 Traction Bldg., Cincinnati, O.
J. H. Bendizen, Vice-Pres. Bettendorf Axle Co., Davenport, Ia.
L. W. Barber, Standard Car Truck Co., 1070 Old Colony Bldg., Chicago, Ill.
J. O. Brumbaugh, Gold Car Lighting Co., White Hall Bldg., 17 Battery Place, N. Y.
C. H. Carey, C. C. I., C. L. S. & E. Ry., 9132 Greenwood Ave., Chicago, Ill.
M. F. Covert, A. M. C. B., Swift Car Line, Chicago, Ill.
E. R. Campbell, G. C. F. & J. I., Minnesota Transfer Ry. Co., St. Paul, Minn.
J. Coleman, A. C. I. I., 758 W. 9th St., Cincinnati, O.
R. L. Chandler, F. P. W. I., N. Y. C. & H. R. R. R., 15 Shumway St., Buffalo, N. Y.
John Chambers, F. A. B., N. Y. C. & H. R. R. R., E. Buffalo, N. Y.
W. E. Coffin, National Mall. Casting Co., Cleveland, O.
J. R. Cardwell, Cardwell Mfg. Co., 544 Monadnock Bldg., Chicago, Ill.
H. R. Curtis, Latrobe Steel Coupler Co., 1720 Old Colony Bldg., Chicago, Ill.
D. Copland, Asst. Mgr., G. A. C. L., Chicago, Ill.
E. A. Craig, Westinghouse Air Brake Co., Pittsburg, Pa.
J. J. Devanney, F. C. D., T. R. R. A. of St. Louis, 410 Union Station, St. Louis, Mo.
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John Dixey, M. C. B., Dairy Shippers' Dis., 6340 Ingleside Ave., Chicago, Ill.
S. H. Dodd, C. F., A. T. & S. F., Argentine, Kas.
Jos. Dyer, C. I. I., P. & L. E. and Erie Rys., Youngstown, O.
Authur P. Denne, C. J. C. I., L. L. & W. and Erie Rys., Binghamton, N. Y.
J. H. Deibert, F. C. R., 316 Fenton St., E. Buffalo, N. Y.
F. C. Dunham, U. S. Metal Mfg. Co., 25 Broad St, New York.
W. G. Dunham, M. E., McCord & Co., Branford, Ont., P. O. No. 84.
F. Eicher, P. G. F., C. C. C. & St. L. Ry., 923 Chattau Ct., Price Hill, Cincinnati, O.
A. Eicher, Inspector, C. C. C. & St. L. Ry., Cincinnati, O.
B. F. Edmonds, F. C. I., St. L. & S. F. Ry., 1815 No. Booneville St., Springfield, Mo.
G. A. Edgin, Duth Mfg. Co., 50 Church St., New York.
J. W. Ensign, Dist. Mgr., American Car & Foundry Co., Huntington, W. Va.
Max Epstein, Gen. Mgr., G. A. C. L., Chicago, Ill.
J. F. Farran, F. C. R., P. C. C. & St. L. Ry., Pendleton Shops, Cincinnati, O.
F. L. Fox, Gen. C. F., P. M. Ry., Iona, Mich.
H. H. Fryer, Rep., Swift Car Line, 29 Live Stock Express, Buffalo, N. Y.
M. Fehl, F. C. D., P. C. C. & St. L. Ry., 3426 Golden Ave., Cincinnati, O.
A. Faerber, F. C. R., N. Y. C. & H. R. R. R., 51 Garrard Place, Buffalo, N. Y.
P. G. Givans, F. C. R., L. & N. Ry., Cincinnati, O.
J. J. Gainey, G. F. C. R., C. N. O. & T. P. Ry., 16 Davis St., Ludlow, Ky.
C. F. B. Granstaff, J. C. I., B. & O. Ry., Wheeling, W. Va.
John Grundy, G. F., Wabash Ry., Randolph, Mo.
J. M. Getzen, Arbitration Dept., N. Y. C. & H. R. Ry., Car Shops, E. Buffalo, N. Y.
Geo. Groohey, Gen. Sales Agt., Buckeye Steel Casting Co., Columbus, O.
M. A. Garrett, Farlow Draft Gear Co., Chicago, Ill.
E. A. Gilbert, Rep. W. H. Minor Co., 667 Rookery Bldg., Chicago, Ill.
C. M. Hitch, G. F. C. R., C. H. & D. Ry., Cincinnati, O.
C. A. Hitch, P. C. F., C. & O. Ry., Covington, Ky.

John Hackett, Gen. Night Yard Master, Big Four Ry., 6th and Millcreek, Cincinati, O.
J. W. Hogsett, C. I. I., Ft. Worth Rys., Ft. Worth, Tex.
C. A. Halleen. F. C. D., L. S. & M. S. Ry., Ashtabula, O.
E. Hacking, G. C. F., C. & G. W. Ry., Oelwein, Ia.
E. Head, C. C., C. D., Wabash Ry., Springfield, Ill.
Martin Hoffman, F. C. R., D. L. & W. Ry., 133 Milburn St., Buffalo, N. Y.
Charles Hildebrand, F. C R., B. R. & P. Ry., 27 Garvey St., Buffalo, N. Y.
C. C. Higgins, American Brake Shoe & Foundry Co., 504 W. Union Bldg., Chicago, Ill.
C. H. Hatfield, Asst. Supt., G. A. C. L., Chicago, Ill.
E. A. Jones, Traveling C. I., I. C. Ry., Chicago, Ill.
J. H. Jaschka, Mech. Eng., National Mall. Cast. Co., Chicago, Ill.
A. Koerhner, F. C. R., P. C. C. & St. L. Ry., Columbus, O.
A. Kipp, C. J. C. I., D. & H. and N. Y. O. & W. Rys., Sidney, N. Y.
Wm. Kay, F. C. R., C. C. C. & St. L., Elmwood, Hamilton Co., O.
J. J. King, F. C. R. Erie Ry., Suspension Bridge, New York.
M. Longden, F. C. R., B. & O. S. W. Ry., 2452 W. 6th St., Cincinnati, O.
Geo. Lynch, C. J. C. I., Cleveland Roads, Erie Depot, Cleveland, O
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Geo. L. Lovejoy, Office, Supt. M. P., C. & S. Ry., 595 S. Sherman Ave., Denver, Col.
E. Merriss, C. J. C. I., Lexington, Ky.
J. B. Malone, F. C. R., C. H. & D. Ry., Ivorydale, O
F. L. Meyer, F. C. R. Vandalia Ry., E. St. Louis, Ill.
W. G. Milburn, C. J. I., 562 N. Main St., Fostoria, O.
J. F. Mann, G. C. F., P. M. Ry., Saginaw, Mich.
Jas. Marea, Gen. F., T. S. L. & W. Ry., Toledo, O.
W. R. McMunn, S. Insptr. Car Dept., N. Y. C. & H. R. Ry., Union Station, Albany, N. Y.
P. J. McGreevey, Car Foreman, B. & O. Ry., Cleveland, O.
John McCabe, F. C. R., L. S. & M. S. Ry., Sandusky, O.
R. J. McGrain, C. C., S. M. P. & E., T. St. L. & W., Frankfort, Ind.
Horace A. Martin, G. C. F., B. & A. Ry., Milo Junc., Maine.
M. M. Marcuse, V. P. & T., West Disinfectant Co., 9 E. 59th St., and A. & V. Ry., Pittsburg, Pa.
Stephen C. Mason, McConway Torley Co., Pittsburg, Pa.
Thos. Madill, Mgr., Ry. Sales, Sherman Williams Co., 630 Ry. Ex. Bldg., Chicago, Ill.
Chas. C. Mickle, Gen. Mgr., Trojan Car Co., 500 Fifth Ave., New York.
P. H. Murphy, Pres., Standard Ry. Equip. Co., 400 to 423 Nat. Bank Com. Bldg., St. Louis, Mo.
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DECEMBER, 1908

Master Blacksmiths' Proceedings

THE report of the proceedings of the sixteenth annual convention of the International Railroad Master Blacksmiths' Association has been issued in book form. This volume contains many valuable reports and discussions, several reports having been published in this journal.

Flue welding, case hardening, tools and formers and locomotive frame making and repairs are a few subjects which were discussed. The progress in mechanical work covered by this association is presented in the report. It would undoubtedly be advantageous for men interested in this line of work to possess one of these books.

Results of Apprenticeship System

THE apprenticeship systems of training men, which have been developed in recent years, are now giving excellent results by improving the individual efficiency of mechanics. In a paper presented by Mr. C. W. Cross, superintendent of apprentice schools for the New York Central Lines, some of the results are given as noted below.

In the first place the efficiency of the apprentice has been materially increased due to the attention which is given each individual by the shop instructor. Furthermore the apprentice is now capable of handling difficult jobs which were previously deemed beyond his ability on account of lack of experience. In a few months' time he can read simple working drawings and it is not long before he can read the most difficult drawings and produce accurate sketches where such are necessary.

From the results, which have already been shown, the new apprenticeship system has proved a success. In later years the apprenticeship system may become universal and regarded almost as a necessity.

The June Conventions

THE next annual conventions of the American Railway Master Mechanics' & Master Car Builders' Associations will be held at Atlantic City, N. J., June 16 to 23, 1909. The time and location of the holding of the conventions were determined at a meeting of the executive committees of the two associations, which was held in New York City on Nov. 20th.

The executive committee of the Railway Supply Manufacturers' Association at a meeting held the same day decided to again use Young's Million Dollar Pier for meetings of the railway associations and also for the exhibits of the railway supply manufacturers.

At the request of the executive committees of the Master Mechanics' and the Master Car Builders' associations action was taken by the executive committee of the Railway Supply Manufacturers' Association, forbidding the distribution of souvenirs at the convention. This ruling ought to result in the lessening of souvenir fiends who have pestered exhibitions for years past and give the supply men a better chance to show their exhibits to those who are really interested.

Coupling Accidents

IN the August issue mention was made of the decrease in casualties due to reduction in traffic in the first part of the year. In bulletin No. 28 of the Interstate Commerce Commission, which covers the months of April, May and June, 1908, a greater decrease is shown. The number of employees killed in coupling and uncoupling cars is reported as 30 which is smaller than the number recorded for any quarter except the one ending September 30, 1901.

It is also noted that the number of passengers and employees killed in train accidents is about 63 per cent of the number for the previous year, while the number of coupling accidents is 20 per cent less. The smaller decrease in coupling accidents is explained by the fact that many of the dangers have been done away with by law through the requirements of automatic couplers and certain regulations in recent years, and that the fatal casualties are now due mainly to the failure of parts or to carelessness.

The fatal casualties for the year ending June 30, 1908, are attributed to coupling damaged cars and defective uncoupling levers and in cases, where too much risk is taken, to miscalculated speed of cars, to accidental starting of engine, to catching foot in frog or switch, to lost footing, to unexpected movement of car and to going between cars unnecessarily and contrary to rule.

Notes on Machine Tools

THE investigations, which have recently been made of machine tool manufacturing plants in the United Kingdom by Special Agent Capt. Godfrey L. Carden and reported in the Daily Consular and Trade Reports, contain some interesting information. In the following brief mention will be made of a few facts brought out in the reports.

Regarding the use of chains instead of ropes and belts for driving machine tools, it was found that the Renold works at Manchester were making a specialty of manufacturing three types of chains. It is claimed that the output of a machine is increased over 20 per cent by the chain drive and a better quality of work results with a considerable reduction in the wear and tear on the machine. The following statement from the report is given:

"It is the opinion of Messrs. Renold that a chain can economically replace ropes and belts, and in the new Renold plant chain-driving is employed to an astonishing extent. Three types of chain are made, namely, block-chain, roller-chain, and silent-chain. The block-chain may be run at speeds up to 500 feet per minute, and in larger sizes is used more especially for conveyer and elevator works. In the smaller sizes it is applied to feed-drives on machine tools and the like. Roller-chain has the rivet surrounded by a steel bush on which is a roller which actuates the sprocket-teeth. Roller-chains may be run up to 900 feet per minute and are made from one-half inch pitch upward, in many hundreds of sizes. They are used in cycles and motor vehicles, and also for machine driving. The silent-chain is designed for high speed, and drives even when worn out, it is said, with the swiftness of a belt. In a modern form of this chain segmental hardened bushes are fixed in the hole of each row of links and bear on hardened pins, the hole in the alternate links being recessed on one side to clear them. The silent-chains are capable of running up to 1,250 feet per minute and even faster, it is said, when special oiling provision is made. It is claimed that 500 horse-power can be transmitted with silent-chain, and larger sizes, I understand, are now being developed. The manufacturing operations in connection with these chains is carried out with minute exactitude."

In the Renold shops mentioned above electric motors are used exclusively, the motors being similar and interchangeable. In the shops of Thomas Shanks & Co., Johnstone, Scotland, heavy machine tools, such as lathes, shapers, planers, are built. Concerning direct motor driving and belt driving this firm favors belt driving.

"The opinion is held by Messrs. Shanks that motor driving on machine tools neither adds nor detracts from the tool. On the other hand, it is contended that by increasing the width, thickness, and strap velocity of belt, and providing the mechanical means of tightening it to the right tension until it is competent to deal with the heaviest cuts at the highest speeds, that the perfection of driving is arrived at. The countershaft and pulley, it is further asserted, should be self-contained with the machine. It is contended that by belt driving there is more safety against accidents which would smash expensive details where the potential power of a direct driving motor is used. The firm, however, declares that it is not averse to direct driving, especially for heavy lathes, but it is evident that Messrs. Shanks prefer belt driving."

At the Shanks works all gearing is machine cut, but it is their opinion that machine cut gearing does not stand the test of years. Steel is used for drivers and hard cast iron for the driven wheels in most cases, and important bearings are provided with gun-metal bushes and caps for wear adjustment.

In the United Kingdom it was found that a very small proportion of the firms specialized in the manufacture of a single tool. It is stated that the protective tariff gives American manufacturers control in the United States where the demand is often beyond the manufacturers' facilities and makes it possible for American machine tool builders to specialize. Specializing makes possible production at lower cost and a better knowledge of the tool, tending toward perfection. The firm of John Lang & Sons, Scotland, specializes, however, in the manufacture of lathes and is building an excellent lathe which is in good favor in European shops.

Relative to gear cutting and hobbing machines and also grinders the following statements are of interest:

"On the subject of gear-hobbing machines, Mr. Lang declared that the hobbing machines can not do as good work as a straight out-and-out gear cutter, such as Brown & Sharpe and Gould & Eberhardt make. I saw a Wanderer hobbing machine and a Biernatski machine working close to a Gould & Eberhardt, and Mr. Lang summed up the situation by saying that for all ordinary work the two German-made hobbing machines sufficed, but if he wanted to gear a wheel to sell he would do the work on a Brown & Sharpe or Gould & Eberhardt. It all resolved itself, he declared, into a question of pounds and pence. He asserted that the hobbing machines can not cut straight teeth. This statement, he says, may be combated, but it is based on his experience after long service.

"On the subject of grinders, Mr. Lang said that the important feature, aside from the accuracy which the American grinders possessed, is to secure as little vibration as possible, and he believes that the overhead drum is the controlling factor."

Statements regarding the quality of work turned out by American and European makes of lathes in relation to the cost of these machines are as follows:

"In my report on the Swiss electrical house known as Maschinenfabrik Oerlikon it was stated that the opinion was there expressed by one of the directors of that concern that the Lodge & Shipley high-speed engine lathe was superior to any foreign lathe in the shop, and that this particular tool yielded a saving of 30 per cent in cost of production over any European lathe, barring only that of Darling & Sellers. This high estimate of the Darling & Sellers lathe I found borne out by other independent opinions. The value of this English lathe lies in its strength, solid construction, and good assembling features. I am told that one of these tools has been in constant service for some forty years. It is not a cheap tool. A Darling & Sellers lathe of the same size as the Lodge & Shipley is being sold for $145.80 more than the American tool.

"In this connection it is interesting to note that the Ernault (French) lathe is selling here for about the same price as good American lathes. The fact that Ernault tool posts are of steel construction causes them to be regarded favorably. It is also interesting to note that there are a number of English lathes which can be purchased for about one-half the cost of a Reed lathe or other standard American tool, and while it is recognized that these cheaper English lathes are outclassed by the better grade American tools, still they are often regarded here as good enough for use on a job which is designed to be finished later on a grinding machine."

Mallet Articulated Compound Locomotive

Mexican Central Railway

The Baldwin Locomotive Works have recently completed a Mallet locomotive for the Mexican Central Railway Company, Ltd. This engine is intended for freight service on the Tamasopo division, where there are frequent curves of 15 to 22 degrees, and the maximum grades are 3 per cent, compensated. The track is laid with 85-lb. rails. The weight of the engine is distributed over a wheel-base of 44 ft. 2 ins., while the rigid wheel-base is but 9 ft. 10 ins. The 2-6-6-2 wheel arrangement is employed, and the locomotive is designated as "Class H," according to the railway company's classification.

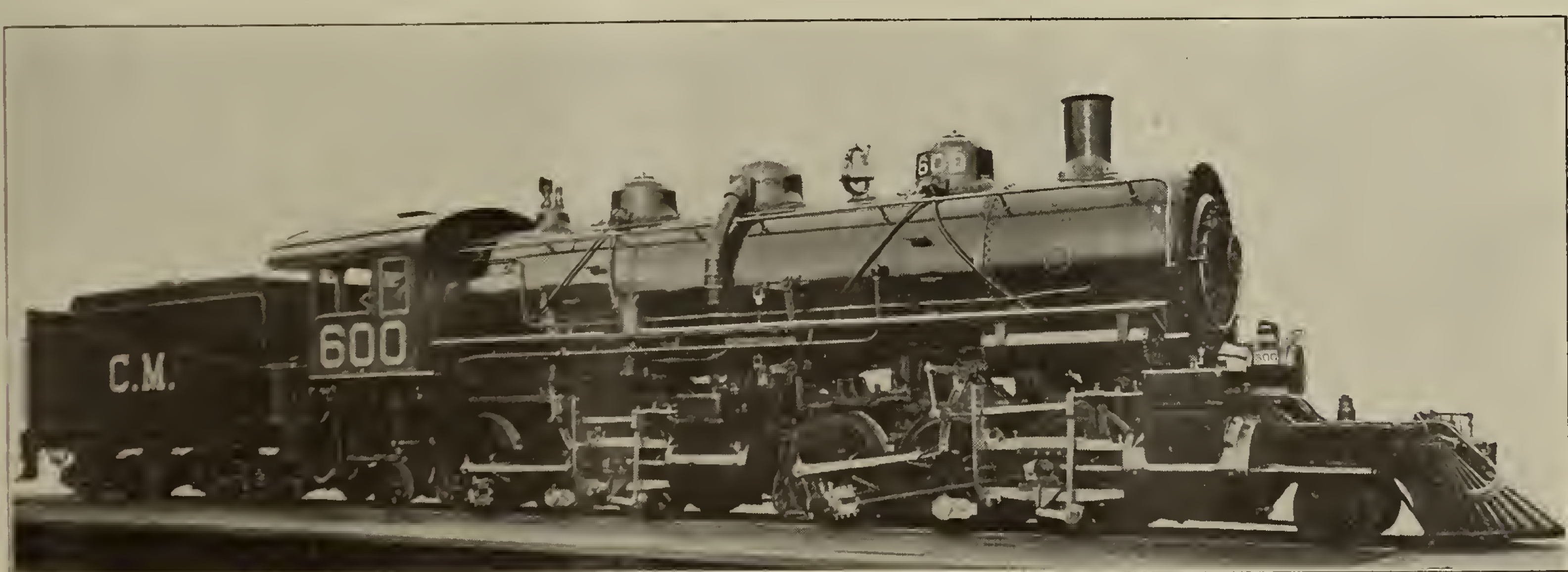
In its general features, this locomotive resembles the standard gauge Mallet engines heretofore built by the Baldwin Locomotive Works, although improvements, based on previous experience, have been made in some of the details, and various changes introduced to suit the practice of the Mexican Central Railway.

The boiler is straight topped, with a radial stayed firebox, and is equipped for oil burning. The shell is 78 ins. in diameter in front, and is built with three rings. The first and third rings have sextuple riveted butt seams on the top center line. On the second ring, which carries the dome, the seam is also placed on top, but is welded throughout its length, with a heavy liner inside. Liners are also placed inside the shell over the high pressure cylinder saddle and waist supports. The dome is of steel, cast in one piece, with short connecting pipes through which steam is delivered to the high pressure steam pipes. The circumferential seam in front of the dome is triple riveted.

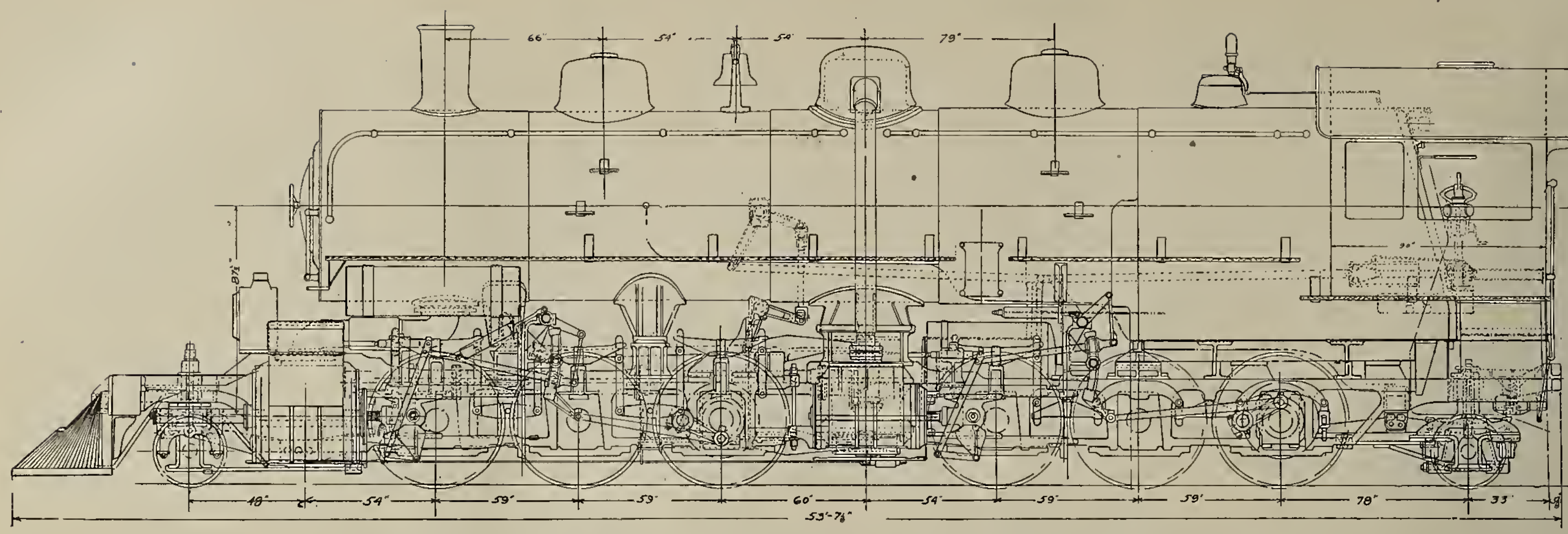
The boiler shell is supported, above the high pressure cylinders, by a cast steel saddle, which is independent of the cylinders, and is made in two pieces placed one above the other. The high pressure cylinders are entirely separate, while the low pressure cylinder castings are bolted together back to back on the center line of the engine. The valve gears are equipped with cast steel links, and the link bearings for both the high and low pressure gears are bolted to the guide yokes. Reversing is effected by the McCarroll power reversing mechanism.

The exhaust steam pipe from the low pressure cylinders to the smoke box has been improved by providing greater flexibility. The pipe is fitted with a ball and socket joint at each end, the joint being kept tight by means of a coiled spring which holds the pipe firmly against its seat. The slip joint in the middle is made tight by means of snap rings and leakage grooves. Oil holes are provided for lubricating this joint.

The centering device is placed under the smoke box, and is furnished with a double helical spring, which is thrown into compression when the leading group of wheels is displaced either to the right or left. The spring is placed between stops which are mounted on



MALLET ARTICULATED COMPOUND LOCOMOTIVE.



ELEVATION OF MALLET ARTICULATED COMPOUND LOCOMOTIVE.

a suitable guide rod, and which may be forced toward the center line of the engine by means of brackets bolted to the frame cross tie. The stops are held between the end walls of a steel casting which remains stationary with the boiler.

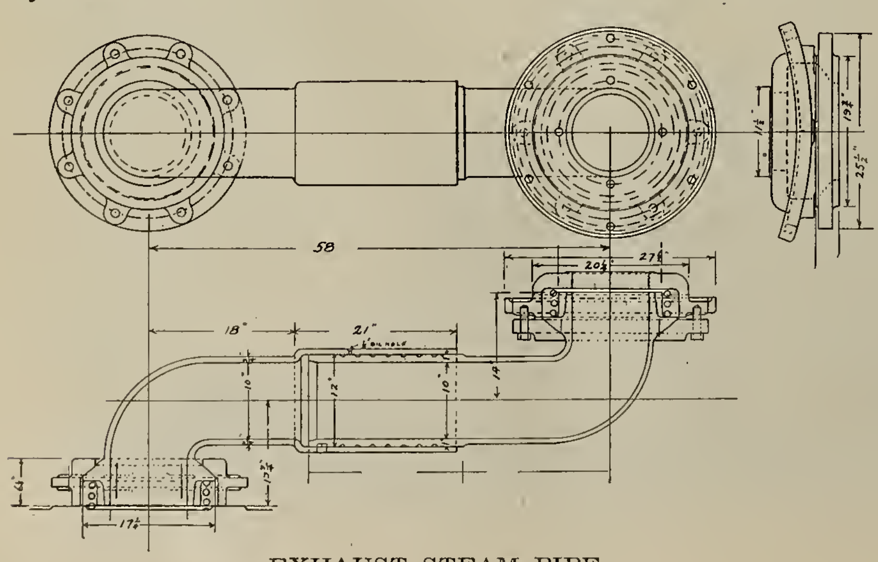
The frames are of cast steel, 4½ ins. wide, and placed 43 ins. between centers. The front and back engine trucks are equalized with the corresponding groups of driving-wheels, the front truck being center bearing, while the rear truck is side bearing. The truck wheels are steel tired with cast iron spoke centers, and, with the tender wheels, were supplied by the Standard Steel Works Co. Among the larger cast steel details used on this locomotive may be mentioned driving-wheel centers, driving boxes, cylinder heads, steam chests and steam chest caps.

The tender has a capacity for 8,000 gallons of water and 3,500 gallons of oil. The tanks are wedge shaped, and placed one above the other. The frame is built of 12-in. channels, and the trucks are of the arch bar type, with cast steel bolsters and rolled steel wheels.

This locomotive has been designed in the light of nearly two years' experience with similar engines in heavy service on mountain roads, and satisfactory results may therefore be expected in spite of the difficult conditions under which it will operate.

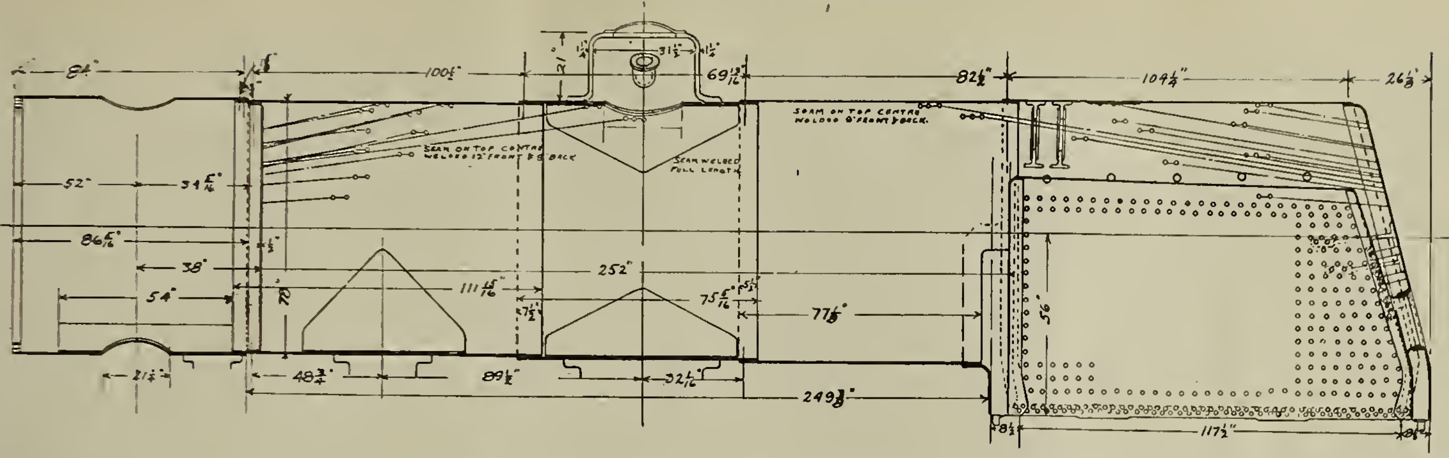
The principal dimensions and specifications are as follows:

Type of engine	Mallet
Service	Freight
Fuel	Oil
Gauge	4 ft. 8½ ins.
Cylinders	21½ and 33 x 32 ins.



EXHAUST STEAM PIPE.

Valves, kind	Balanced
BOILER.	
Type	Straight
Working pressure	200 lbs.
Diameter	78 ins.
Material	Steel
Staying	Radial
Thickness of sheets	¾ and 3/16 ins.
FIREBOX.	
Length	123 9/16 ins.
Width	71 ins.
Depth, front	73 ins.
Depth, back	70 ins.
Thickness of sheets, sides	⅜ ins.
Thickness of sheets, back	⅜ ins.
Thickness of sheets, crown	⅜ ins.
Thickness of sheets, tubes	9/16 ins.
Water space, front	5 ins.
Water space, sides	5 ins.
Water space, back	5 ns.
TUBES.	
Material	Steel
Wire gauge	No. 12
Number	350
Diameter	2¼ ins.
Length	21 ft.
HEATING SURFACE.	
Fire box	201 sq. ft.
Tubes	4,311 sq. ft.
Total	4,512 sq. ft.
Grate area	61 sq. ft.
DRIVING WHEELS.	
Diameter, outside	55 ins.
Diameter, inside	48 ins.
Journals, main	10½x12 ins.
Journals, others	10x12 ins.
ENGINE TRUCK WHEELS.	
Diameter, front	28½ ins.
Journals, front	6x12 ins.
Diameter, back	28½ ins.
Journals, back	6x12 ins.
WHEEL BASE.	
Driving	29 ft. 2 ins.
Rigid	9 ft. 10 ins.
Total engine	44 ft. 2 ins.
Total engine and tender	70 ft. 11 ins.
WEIGHT, ESTIMATED.	
On driving wheels	300,000 lbs.
On front truck	19,000 lbs.
On back truck	19,000 lbs.
Total engine	338,000 lbs.
Total engine and tender	About 495,000 lbs.
TENDER.	
Wheels, diameter	33 ins.
Journals	5½x10 ins.
Water, capacity	8,000 gals.
Oil, capacity	3,500 gals.



BOILER OF MALLET ARTICULATED COMPOUND LOCOMOTIVE.

The Brick Arch vs. Boiler Efficiency *

By George Wagstaff

A FREE steaming locomotive is becoming every day more valuable to the railroad and we realize more and more the necessity of making our locomotive boilers more efficient as we cannot hope to obtain a much greater capacity as the locomotive boiler has now reached its limit in size, on account of the physical conditions of the railroad, consequently we are face to face with the proposition of getting the maximum amount of work from the locomotive boiler; and the object of my paper this afternoon is, to present to you one of what I believe is one of the practical and feasible methods at hand for so doing. Therefore, I will discuss, for a few minutes, the relation of the brick arch to the efficiency of the present day locomotive boiler.

A review of the history of the Bituminous Coal Burning Locomotive brings forth most prominently the importance that the brick arch played in the earliest attempts to burn bituminous coal, and when the problem of changing from wood to coal necessitated the successful burning of bituminous coal, the motive power officials, at that time, used the brick arch as one of the efficient appliances to bring about that result and a careful review of the opinions of motive power men of the period shows the high regard in which the brick arch was held, and clearly demonstrates its recognized value in locomotive operation at that time.

As the burning of bituminous coal became an easier problem with the increased knowledge, gained from experience, the brick arch commenced to receive less attention, and, as the efficiency of the locomotive boiler was not a relatively important factor, the importance of the arch commenced to decline and it commenced to be attacked in the house of its friends, as it became easier to obtain larger boiler capacity by the simple means of increasing the size of the boiler without necessitating particular attention to its efficiency. This condition continued until recent years when we have come face to face with the proposition that the larger boiler capacity cannot be obtained by this simple means and we must work in other directions to obtain increased efficiency for which motive power officials are being called upon to-day as strongly as in former years.

The value of the brick arch in this latter period of the history of the modern locomotive boiler, as a means of further increasing its capacity, has already commenced to be recognized by many of the best railway systems in the country. At the present time, if we may judge from the discussions of this subject by leading mechanical experts and organizations interested, we must conclude that the brick arch has again come into its own and must be reckoned with as an important aid in operating efficiently the modern locomotive.

In studying this subject from all its various standpoints, weighing the advantages and disadvantages and the opinion, pro and con, of those who have used brick arches, I cannot help but express myself strongly in my belief, that, in view of the recent great improvement in boiler care and maintenance, in addition to the successful treatment of water, and the successful improvements in hot water boiler-washing plant, etc., that the disadvantages claimed for the brick arch have almost been practically overcome.

From the earliest history of the arch there does not seem to have been any question about its advantages and its value in locomotive operation, and therefore, with the wiping out of the disadvantages, the non-use of the brick arch means the practical throwing away of a large amount of valuable power. The arch is recognized as the most efficient device for reducing the quantity of sparks thrown from the stack, and, on this account, it becomes directly valuable as a fuel saver. It increases the length of the flame weight, and the finer fuel, when lifted from the grate, is baffled by the arch, and is consumed, instead of passing directly to the tubes and out of the stack in the form of sparks. It causes more equal distribution of the draft over the grate, and thus improves the furnace action. Its function in the firebox being that of a mixer and baffle, bringing about a more complete mingling of the gases, and, thereby aiding combustion resulting in the higher temperature, and the production of a smaller proportion of carbonic oxide. These claims have been fully sustained by the measurements made in the locomotive tests conducted by the Pennsylvania Railroad, at St. Louis in 1904.

*From a paper presented before the Central Railway Club.

The two consolidation locomotives there tested were almost identical in grate area and heating surface, but one of them was equipped with the brick arch and the other was not. The draft riggings in the smoke boxes were not alike: one being arranged to clear the box of cinders, while the other allowed them to remain in the front end. However, the effect of the brick arch on sparks and cinders is shown in the total amount drawn through the tubes, which is given as an average (for the four tests at 150 revolutions) of 380 pounds for the boiler with the brick arch and 505 pounds for the one without.

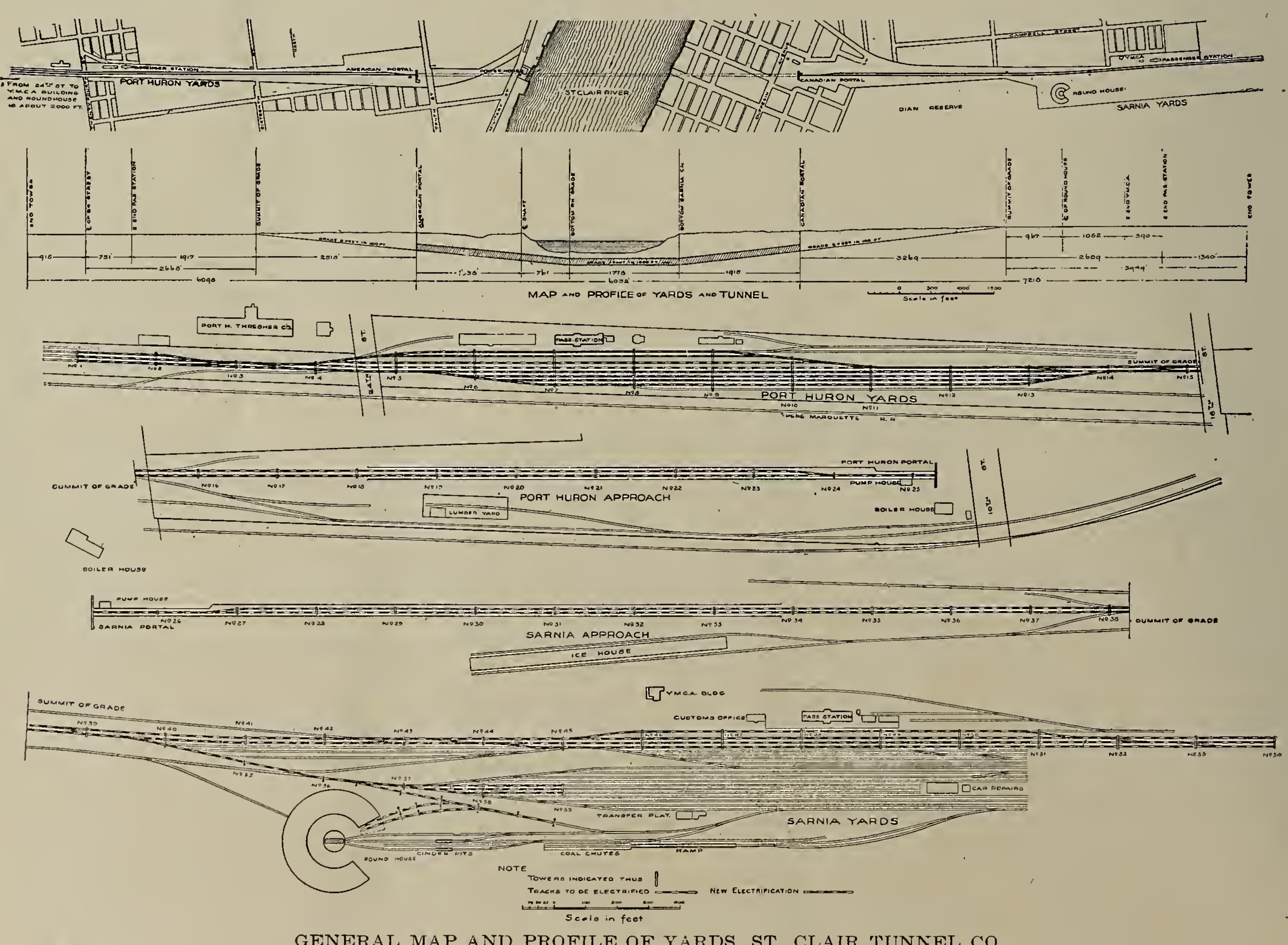
The temperature of the firebox as an average of the above four tests was 2,202 degrees F. for the brick arch, and 1,982 degrees F. for the tests without it. The maximum temperature was 2,312 degrees F. with the brick arch, and 2,112 degrees F. without it. The firebox with lowest temperature had the highest amount of CO due to imperfect combustion. The maximum percentage of loss of heat in coal fired due to imperfect combustion of CO was only 2.09 for the brick arch and 16.33 per cent for the firebox without it.

The above advantages of better combustion and consequent fuel economy are only a part of the advantages to be obtained from the use of the brick arch, and in my mind, in view of the problem of the present day operation, they are the smallest. We know that the first requirements made of the motive power department, by the operating department, are to furnish efficient power in order to move the traffic, next, to move it expeditiously and, last, as economically as possible.

We know that the economy frequently is, and must be, lost sight of when large movements of traffic confront our railroads and it is in this situation that I believe the brick arch assumes its largest value to the railroad.

We have frequently seen instances where a poor steaming engine or engines have seriously impeded the movement of traffic, resulting in congested terminals, delayed passenger trains and a large amount of over time for the employees in all classes of service. These are losses that can hardly be measured in dollars and cents as the ability of a road to pay dividends is directly dependent upon its ability to handle its traffic with the minimum amount of delay.

It may seem to some that I place an exaggerated importance upon the brick arch in its relation to the modern locomotive boiler, but I cannot see, in view of the present demands made upon the motive power department, how any devices that increase the efficiency of the locomotive boiler from 5 to 10 per cent, can be allowed to pass with any less consideration.



GENERAL MAP AND PROFILE OF YARDS, ST. CLAIR TUNNEL CO.

Electrification of the St. Clair Tunnel *

THE St. Clair tunnel was opened for traffic in 1890 by the St. Clair Tunnel Company, organized as a subsidiary company to the Grand Trunk Railway System. The tunnel, located under the St. Clair river, is the connecting link between the terminal of the Western Division at Port Huron, Michigan, and the terminal of the Eastern Division at Sarnia, Ontario. The length of the tunnel from portal to portal is 6,032 ft. The open tunnel approaches are of considerable magnitude, that on the Port Huron side being slightly over 2,500 ft. in length, while that on the Sarnia side is nearly 3,300 ft. in length, the total distance between the American and the Canadian summits being 12,000 ft., or about 2¼ miles. The grade on the tunnel approaches and the inclined sections of the tunnel is 2 per cent, while the flat middle section of the tunnel, about 1,700 ft. in length, has a grade of 0.1 per cent downward toward the east, just enough to provide for the proper drainage of any seepage water.

A single track extends through the tunnel, while a double track is laid in both of the tunnel approaches. The necessary tracks for handling the freight and passenger traffic are provided in the yards at Port Huron and Sarnia. The map and profile of the zone operated by the St. Clair Tunnel Company is shown in an accompanying illustration. The tracks in the yards and on the tunnel approaches are shown to a large scale in the same drawing. The tunnel shell consists of cast iron rings built up in sections, the inside diameter being about 19 ft. The hydraulic shield was used in advancing the bore from each of the tunnel portals, by which means the entire work of construction was carried on with reasonable expedition. A vertical shaft was sunk near the bank of the river on both the American and Canadian sides.

Four steam locomotives of special design had been in commission since the construction of the tunnel for handling the freight and passenger traffic. They were designed to provide the necessary high tractive effort required to operate the trains over the grades in the tunnel and on the approaches, and arranged to burn anthracite coal, in order to minimize the inconvenience due to excessive smoke in the tunnel. Their maximum tractive effort limited the weight of the trains handled to about 700 tons, and even with this load the speed up the 2 per cent grade was often very slow.

The advantage of the use of electric locomotives, on account of the freedom from smoke and the attendant discomfort, together with the possible greater economy in operation, led finally to the decision to provide an electrical equipment to handle the tunnel service, this equipment to provide for the operation of the trains through the tunnel by means of electric locomotives; the handling of the drainage and seepage water by means of electric pumps; the lighting of the passenger stations, the tunnel and the roundhouses

*From a paper by F. A. Sager, assistant engineer with Bion J. Arnold.

INTERIOR OF ST. CLAIR TUNNEL.

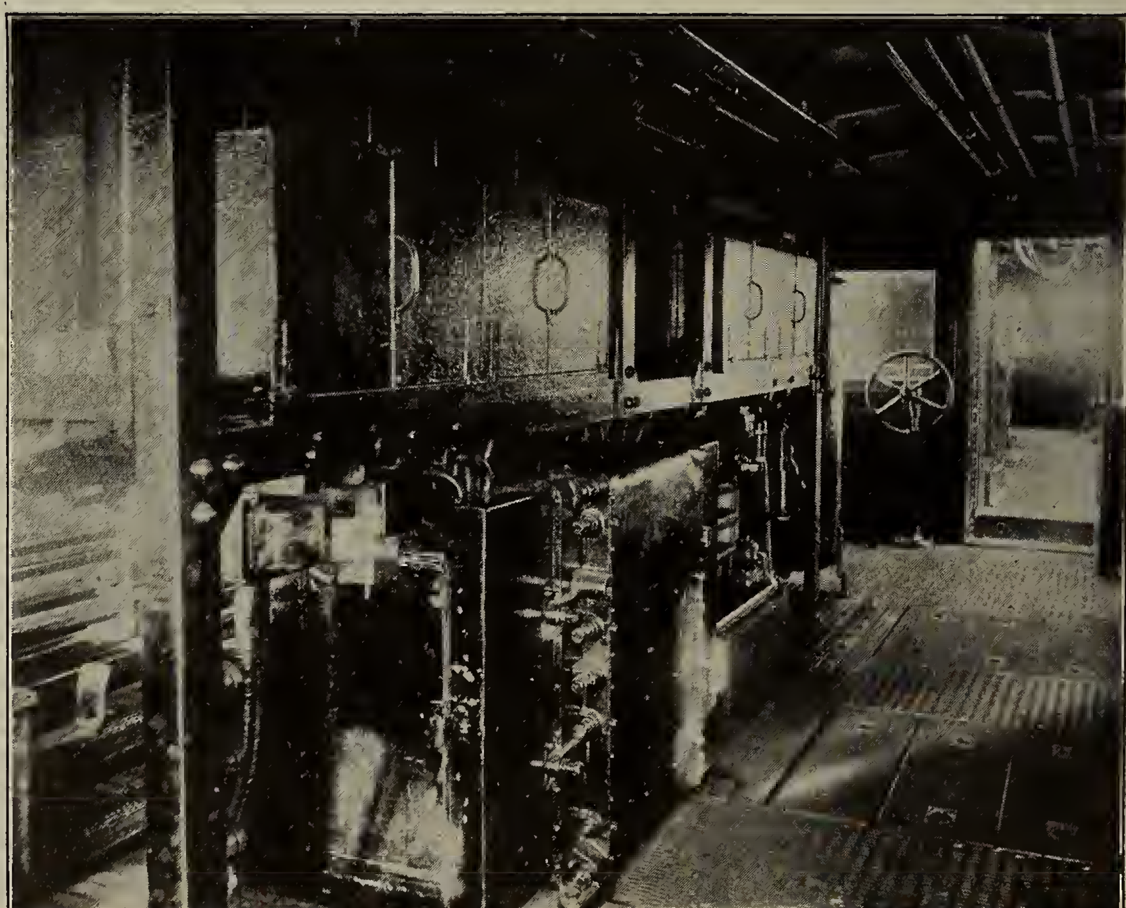
ELECTRIC LOCOMOTIVE, ST. CLAIR TUNNEL.

by electricity, as well as furnishing a certain amount of power to the roundhouses; also, provision was made for a limited amount of outside lighting in the form of arc lamps. The different electrical systems available for such service were considered, and estimates as to the relative cost and efficiency of the various systems were prepared and submitted to the Tunnel Company. These estimates covered the direct current system both with and without battery, as well as estimates on the alternating current systems. Complete specifications were prepared, covering both the direct and alternating current systems, and propositions on these received and considered. Decision was finally made in favor of alternating current, using a 3-phase system for the distribution of power required for pumping and for shop motors with single phase distribution for locomotives and lighting.

The St. Clair Tunnel Company is operated as an independent division of the railroad, the trains being delivered by the Western Division in the yards at Port Huron, and taken by the tunnel locomotives through the tunnel, and delivered to the Eastern Division at the yards in Sarnia, the west-bound trains being handled in the reverse order. The steam locomotives operating on the divisions adjacent to the tunnel are never operated through the tunnel.

In order to increase the capacity of the tunnel, it was desirable to provide for the maximum practicable tractive effort in the new locomotives. The capacity limit was determined by the maximum pull to which it was deemed wise to subject the drawbars on the mixed rolling stock that must be handled, without danger of breaking trains in two. For this reason the locomotives were specified of sufficient capacity to develop a drawbar pull of 50,000 pounds, when operating at a speed of 10 miles per hour. It was estimated that such a locomotive would be able to make the complete trip through the tunnel from terminal to terminal with a 1,000-ton train in fifteen minutes, or four 1,000-ton trains per hour, which would provide a capacity for traffic about three times larger than the actual maximum demands up to the present time.

Three locomotives have been provided for this service, each consisting of two half-units, each half-unit mounted on three pairs of axles driven through gears by three single phase motors with a nominal rating of 250 h. p. each, the nominal horse power of the complete locomotive unit being 1,500. In so far as the electric motors have a very liberal overload rating, it is easily possible to develop 2,000 h. p., and on occasion in excess of this, in one locomotive. The half units are duplicate in every respect, and as the multiple unit system of control is used, they can be operated when coupled together with the same facility that a single phase half-unit can be operated.



INTERIOR OF ELECTRIC LOCOMOTIVE.

OVERHEAD CONSTRUCTION AT PORT HURON STATION.

As previously stated, the locomotives are designed to develop a draw-bar pull of 50,000 pounds at the comparatively low speed of ten miles per hour. The locomotives are powerful enough to start a 1,000-ton train on a 2 per cent grade in case this should be necessary. At a test made on a half-unit, using a dynometer car, it was found that a single half-unit developed 43,000 pounds drawbar pull before slipping the wheels. This was done on a comparatively dry rail, with a liberal use of sand. On this basis it would be possible to develop about 86,000 pounds drawbar pull with a complete locomotive. The maximum speed of the locomotives is 35 miles per hour. However, it is not the intention of the Tunnel company to operate the locomotives at a speed in excess of 30 miles per hour. Speed indicators are provided, which indicate on a large dial located in the locomotive cab near the engine driver's seat the speed at which the locomotive is running, and at the same time record the speed throughout the length of the run. This assists the locomotive driver in keeping the speed of trains within prescribed limits at all times, and furnishes records of the exact speed of the trains throughout all trips, for the inspection of the superintendent of the tunnel.

The locomotive cab is rectangular in section, constructed of sheet metal supported by structural steel shapes. Inside of the cab are located practically all of the apparatus used in connection with the locomotive, with the exception of the motors and the brake rigging. Included in this apparatus is a single phase transformer used for reducing the voltage from 3,300 to a voltage suitable for application to the motor. The transformer, as well as the motors, are air-cooled, the supply of air being furnished by an electrically driven blower, also located in the locomotive cab. The blower is driven by a single phase motor, the current being supplied at 100 volts by a tap from the main transformer. With the moderate supply of cooling air furnished by the blower fan, both transformers and motors are able to operate at full capacity with comparatively little increase in temperature above that of the surrounding air. The air for the cooling is taken through a suitably designed shutter located in the side of the locomotive cab, and is distributed through sheet metal ducts installed under the cab floor to the three motors under the cab and to the transformer. From the latter the air passes either through an opening in the floor of the cab into the open air, or, if desired, into the interior of the cab. In the latter case an appreciable amount of heat can be secured from the main transformer for utilization in heating the cab during cold weather.

Motor driven air compressors are also located in the cab. The air brake equipment is of the standard type used for electric cars and locomotives, with the exception of the motors, which are single phase. They are operated by means of an electric controller, which serves to keep the normal air pressure at about 100 pounds. The compressed air is used for the purpose of operating both the automatic and straight air equipment on locomotive and train, and in addition for a variety of minor purposes in and about the locomotive. All of the contactor switches used in controlling the operation of the locomotives are air operated, the air valves being operated by direct current electrical control. This is also true of ringing the bell, blowing the whistle, raising and lowering the trolley, and the application of sand to the tracks.

Speed control of the locomotive is effected by varying the voltage at the terminals of the motors. This is obtained by making connection with various transformer taps by means of the air operated, electrically controlled contactor switches. Electric control of the contactors is effected through the master controller, which in the electric locomotive replaces the throttle valve in the steam locomotive. The current for the master controller is furnished by a small storage battery operating at about 20 volts, the battery in turn being charged by means of a small motor-generator set provided for the purpose. The electric controller has 21 points in all, 17 of which are running points. This provides for an increase in the speed of the locomotive from the lowest running speed to the maximum speed by very slight gradations, thus making it possible to maintain a practically constant drawbar pull, while the locomotive is accelerating the train. This is very desirable, in so far as the minimum variation in the drawbar pull while handling the train through the tunnel decreases the liability of breaking the train in two. Particular attention was given this phase of the train operation in designing the locomotive, and the resulting remarkable decrease in the number of breaks-in-two since the operation with electric locomotives has been inaugurated is a source of great satisfaction.

On the master controller is also located the reverse lever, which controls through the electrically operated solenoids the air operated contactors used in reversing the motor connections. Here also are located the push buttons, which serve to raise and lower the trolley, operate the front and rear sanders, rest the circuit breaker, and ring the bell. The ringing of the bell and the application of sand by means of the front and rear sanders are also controlled by foot pedals, thus making it possible for the operator to perform these functions while his two hands are employed in operating the master controller and the air.

The balance of the equipment of each locomotive, consisting of the sand boxes, the seats for the drivers, ammeters, voltmeters, wattmeters, the banks of contactors, the preventive resistance coils, circuit breakers, auxiliary storage battery and motor generator set for charging it, are all installed in a compact manner inside of the cab, and are supported on structural steel work.

Each half-unit is arranged for operation in either direction; air valves, a master controller and ammeter being located at each end of the cab. By means of cable couplings, the control system of two or more half-units can be thrown in parallel, thus providing for the operation of any number of half-units from any master controller. In this way the two half-units are generally operated in the handling of freight trains through the tunnel. The passenger traffic can ordinarily be taken care of by a single half-unit.

The current is collected from the trolley wires suspended at a distance of 22 feet from the track by means of a sliding bow pantograph trolley. In so far as the trolley wire extends throughout the length of the tunnel, no additional provision has to be made for the collection of current while the locomotive is passing through the tunnel. Electric headlights are provided, as well as lights for the illumination of the interior of the cab and the dials of the indicating instruments. The heating of the cabs is provided for by means of standard electric heaters. Heat is also available for drying the sand stored in sand boxes. In general, the M. C. B. standards have been conformed with in so far as couplers, wheel treads, etc., are concerned. The general dimensions of the half-units are as follows:

Length over all .... 23 ft. 6 ins.
Height from top of rail to top of roof .... 13 ft.
Height from top of rail to top of pantograph bow when lowered .... 14 ft. 11 ins.
Width of cab over all .... 9 ft. 8 ins.
Total weight of locomotive half-unit, fully equipped .... 67½ tons
(This weight is practically evenly divided over three drivers.)
Weight of complete locomotive unit .... 135 tons
Length of rigid wheel base .... 16 ft.
Diameter of driving wheels .... 62 ins.
Normal speed of train, ascending 2 per cent grade (miles per hour) 10
Normal speed on level tracks (miles per hour) .. 25 to 30

In service it has been found that the locomotives will very readily handle a 1,000-ton train at from 11 to 12, and possibly 13 to 14 miles per hour on a 2 per cent grade, thus demonstrating their ability to more than fulfill the specified performance.

PUMPING.

The second service to be provided for electrically consists of the pumping necessary to free the tunnel approaches from water due to rain storms or melting snow, and the removal of a small amount of condensation and seepage water collecting in the tunnel. For this purpose pumping plants have been installed at both tunnel portals, that at the Port Huron entrance consisting of two centrifugal pumps, each capable of delivering 4,000 gallons per minute, driven by direct connected, 100 h. p., 3-phase, 25-cycle, 3,300-volt, induction motors, and that at the Sarnia entrance consisting of two 5,500 gallon pumps driven by two 200 h. p. motors of the same type. In addition a 150-gallon pump driven by small induction motor is located in each pump house, these pumps serving to take care of the small amount of water that is constantly finding its way into the drainage wells. The motors in the pumping houses are controlled by oil switches located on suitable panels. Provision is made on the panels for connecting the motor bus bars with either of two feeders leading from the power plant.

Incandescent lamps in the roundhouses, the passenger stations, the Young Men's Christian Association buildings in both Port Huron and Sarnia, installed previous to the electrification of the tunnel, are now being furnished with current from the electric power plant by means of step-down transformers, reducing the voltage from 3,300 to 110 volts. In all, 480 lights have been installed throughout the tunnel on either side at a height of 10 feet above the rail. The tunnel lamps are operated four in series from the 440-volt secondaries of the lighting transformers installed in the tunnel. Similar transformers furnish the current supply for the tunnel drainage pump motors.

ELECTRICAL DISTRIBUTION SYSTEM.

For distribution of the single phase current to the locomotive, substantial steel towers have been erected throughout the tunnel yards. The steel work used for supporting the working conductor consists of strong lattice columns supporting bridges of trussed construction. The average spacing of the overhead bridges is 250 feet. They are designed to extend over all tracks that are to be electrified, and in case of those located at passenger station extend, in addition, over the platforms thus in no way interfering with the access of passengers to and from the trains. This necessitates a length of about 141 feet, in case of some of the bridges located on the Port Huron side, in which case the bridge spans seven electrified tracks, in addition to the station platform.

Single catenary construction is used throughout, a messenger cable of ⅝-inch extra heavy galvanized steel being suspended on the insulators located on the overhead bridges immediately over the center lines of the track to be equipped. The working conductor is attached to the messenger cable by means of fittings of varying lengths so arranged as to support it at a uniform height of 22 feet above the top of the rail. Number 4/0 hard-drawn grooved copper is used throughout the yards, and at all places, excepting on the tunnel approaches and throughout the tunnel, on which sections two 300,000 cm. conductors have been installed. The messenger cables forming the catenary construction terminate at the tunnel portals, where they are securely anchored to eye bolts imbedded in the heavy masonry portal. At this point the messenger wires supporting the working conductor throughout the tunnel are anchored to special brackets located on the tunnel face. The working conductors in the tunnel are continuous with those on the tunnel approaches.

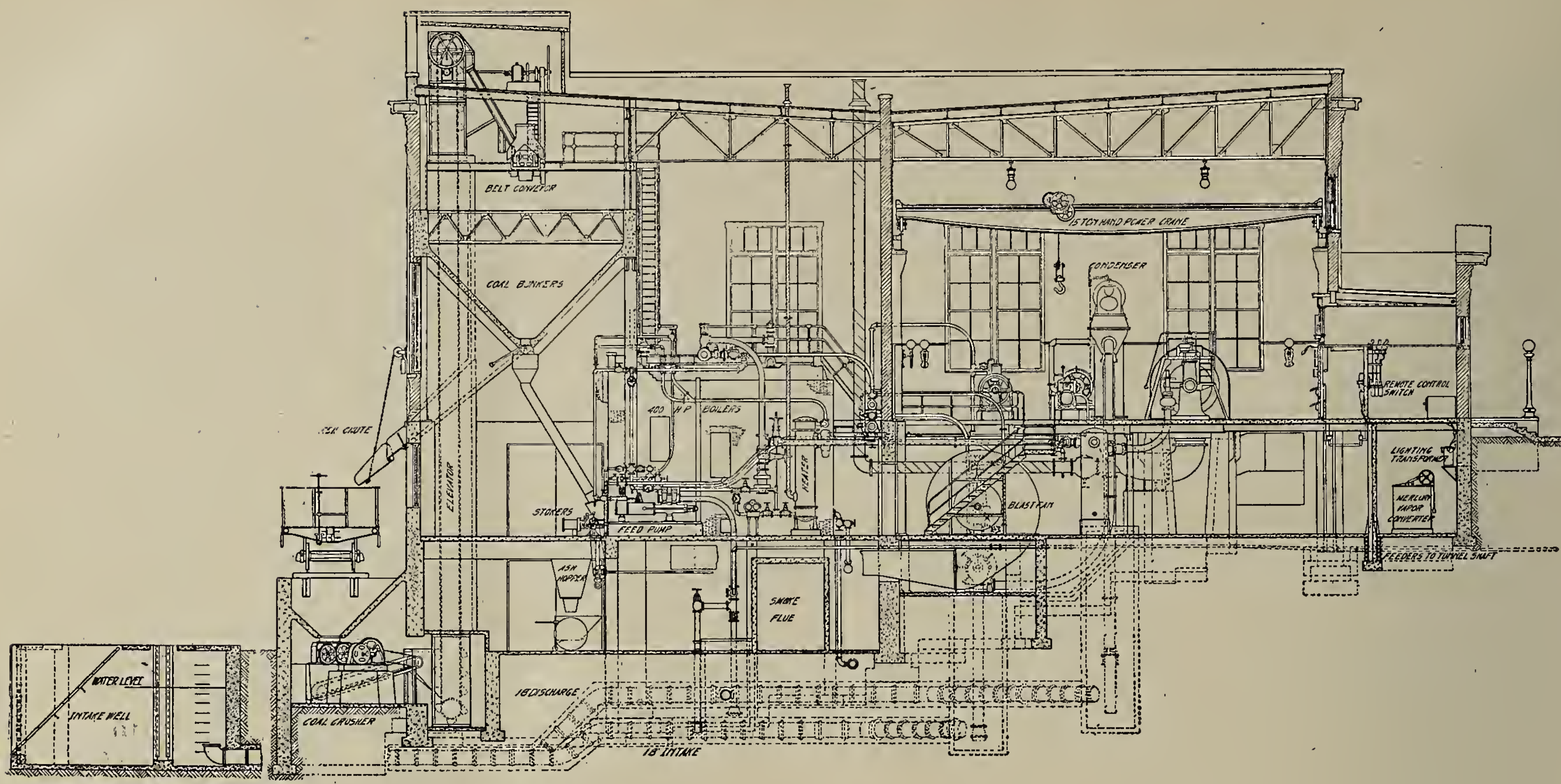
The method of supporting the trolley inside of the tunnel shell was conditioned by the requirements that complete overhead equipment should not encroach on the tunnel opening more than 9 inches. This has been accomplished by bolting to the tunnel shell special iron brackets, each of which supports two spool-shaped insulators. These insulators in turn support steel messenger cables, which are drawn taut throughout the length of the tunnel, and attached at the tunnel portal to special brackets. Special clamps are attached to these messenger cables at points between the insulator supports, and these in turn serve to support the two trolley wires. The insulating supports are attached to the tunnel shell at intervals of 12 feet, as also are the clamps connecting the messenger cable with the trolley. This method provides an attachment at once sufficiently rigid to maintain the proper clearance between the trolley and the tunnel shell, and at the same time sufficiently flexible to provide for the proper operation of the trolley bow on the overhead conductor. Section switches have been provided where necessary to permit of disconnecting the working conductor over any switch track from the main line extending throughout the tunnel.

The columns at one end of the transmission bridges have been lengthened, for the purpose of supporting the transmission wires which supply current for the power and lighting service at the roundhouses and stations, as well as for the arc light circuits. Overhead lines terminate in the pump houses, at either tunnel portal, where they are connected with the underground feeder system at the panel boards.

All feeder lines connecting the various parts of the equipment to be supplied from the power plant are carried in the tunnel conduits. For this purpose four conduit lines have been laid on either side of the tunnel throughout its length. Connection has been made with these conduit lines at a point about 1,700 feet from the Port Huron portal, with a vertical shaft extending from the top of the tunnel to the surface of the ground, terminating at a point about 75 feet from the power plant. The overhead feeders, terminating as above noted in the portal pump houses, are continued as underground feeders down through the tunnel and up the shaft, finally terminating in the switchboard at the power plant. For the pumping service, two independent feeders are laid from each portal pump house, one being installed on either side of the tunnel and both terminating at the power plant switchboard. The heavy feeders for supplying the locomotive current to the trolley extend from the tunnel through the vertical shaft to the power house. This arrangement provides for all feeders leaving the power plant underground. The cables are paper insulated, lead encased, and are installed in tile ducts.

POWER PLANT.

The power plant is located on the Port Huron bank of the St. Clair River, about 100 feet distant from the center line of the tunnel. The building is 50 feet from the street property line, which provides ample space for a lawn in front, while the back building line is about 50 feet distant from the retaining wall, which serves as a dock line along the river. Sufficient space is afforded between the building and the river front for sidetrack, a spur of the Grand Trunk Railway, which is used for bringing in coal and various supplies needed for the operation of the power plant, as well as the removal of ashes. The proximity of the river makes it possible for coal to be received and handled by boat in case this should be found desirable. The power plant building covers a ground area approximately 100 feet square. The building is divided longitudinally by a fire wall separating the boiler from the turbine rooms. In the front elevation, the height of the brick work above the water table is about 36 feet, the water table being about 2½ feet above the grade on the front side of the building. As the building is located on the side of a hill flanking the river, the ground line falls away rapidly alongside of the building until the grade line of the dock is reached, which is maintained for all entrances at the rear, this being 24 feet below the street level. The foundation up to the water table is constructed of mass concrete; the building superstructure is of steel and massive paving brick of dark brown color. The building trimmings are of cut stone and concrete. The general design of the building is along simple massive lines and presents upon completion a very attractive appearance.



ELEVATION OF POWER HCUSE.

Coal is delivered to the plant in hopper cars, which are run over a wooden trestle leading above the receiving hopper, into which it is dumped by gravity. The coal-receiving hopper feeds directly into the crusher, which has a capacity of about thirty tons per hour, and which acts at the same time as a feeder, delivering the coal at a uniform rate to the vertical bucket elevator extending to the top of the building. From the vertical elevator the coal is fed by chutes onto a conveyor belt, from which it is discharged by an automatic tripper arranged to deliver the coal at any point above the bunkers. Slow speed induction motors of the squirrel cage type drive the coal handling apparatus, a 20 h.p. motor being used in the crusher and a 10 h.p. motor installed in the pent house at the top of the building for the operation of the elevator and conveyor.

The coal bunkers are constructed of reinforced concrete resting on the steel building columns. The space occupied by them, located in front of and above the boilers, is separated entirely from the boiler room by metal lath partition, thus practically insuring the exclusion of coal dust from the boiler room. In a similar way the coal crusher pit and the coal elevating mechanism are enclosed as completely as possible.

Coal for firing purposes is drawn directly from the bunkers, through sheet metal chutes, into the stoker hoppers, which are located in front of the boilers. The ashes are drawn from the grates of the boiler furnaces onto the boiler room floor, where clinkers are broken and delivered through a coarse grating into the ash hoppers which are suspended underneath the floor. From the hoppers they fall by gravity through ash grates into the push cars, and are dumped into an ash chute connecting with the coal elevator. The elevator, when handling ashes, discharges into a spout leading to a small ash bunker at the end of the building. From this bunker they can be delivered by gravity into cars alongside the power plant.

Jones Under Feed stokers are installed in the plant, six being used for each battery of two boilers, making a total equipment of twelve stokers. Forced draft is supplied for each battery by an American Blower Company steel plate fan 11 feet in diameter and 3 feet 5 inches wide, driven by 10x10x10 type B enclosed vertical engine directly connected to the fan shaft.

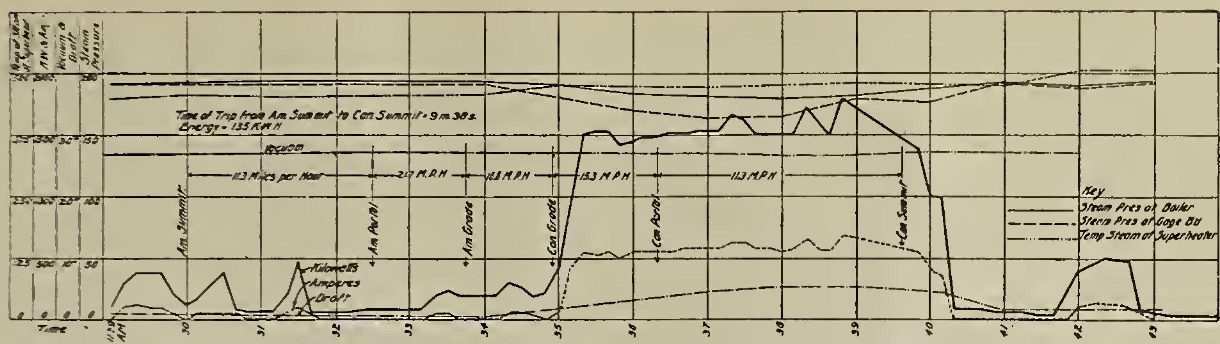
BOILERS.

This equipment consists of four 400 h.p. Babcock & Wilcox sectional water tube boilers arranged in two batteries of two each, each boiler having three drums 42 inches in diameter and 23 feet 4 inches in length. The smoke flue, located in the boiler room basement floor, is built of reinforced concrete. The boiler flues open directly down into the smoke flue, which in turn leads in a straight line through the south building wall to the reinforced concrete stack. The height of stack from the top of the smoke flue is 150 feet, or 162 feet above the basement floor.

The separately fired Foster superheater is located between two batteries of boilers, and was furnished by the Power Specialty Company. The superheater has a capacity to add 200 degrees of superheat to 36,000 pounds of steam per hour.

The steam is supplied by the boilers at 200 pounds pressure, and is delivered through the system of high pressure piping either to the superheaters and thence to the turbines, or through by-pass connections directly to the turbines, steam separators being installed in the piping system adjacent to the latter.

The condensing water is obtained from the St. Clair River, a concrete intake provided with structural steel grid and woven wire screen being installed along the dock line. From the intake the water flows through an



GRAPHICAL LOG OF POWER PLANT OPERATION—RUN NO. 3, MAY 28, 1908, CONDENSING; WEIGHT OF TRAIN WITH LOCOMOTIVE, 1,020.5 TONS.

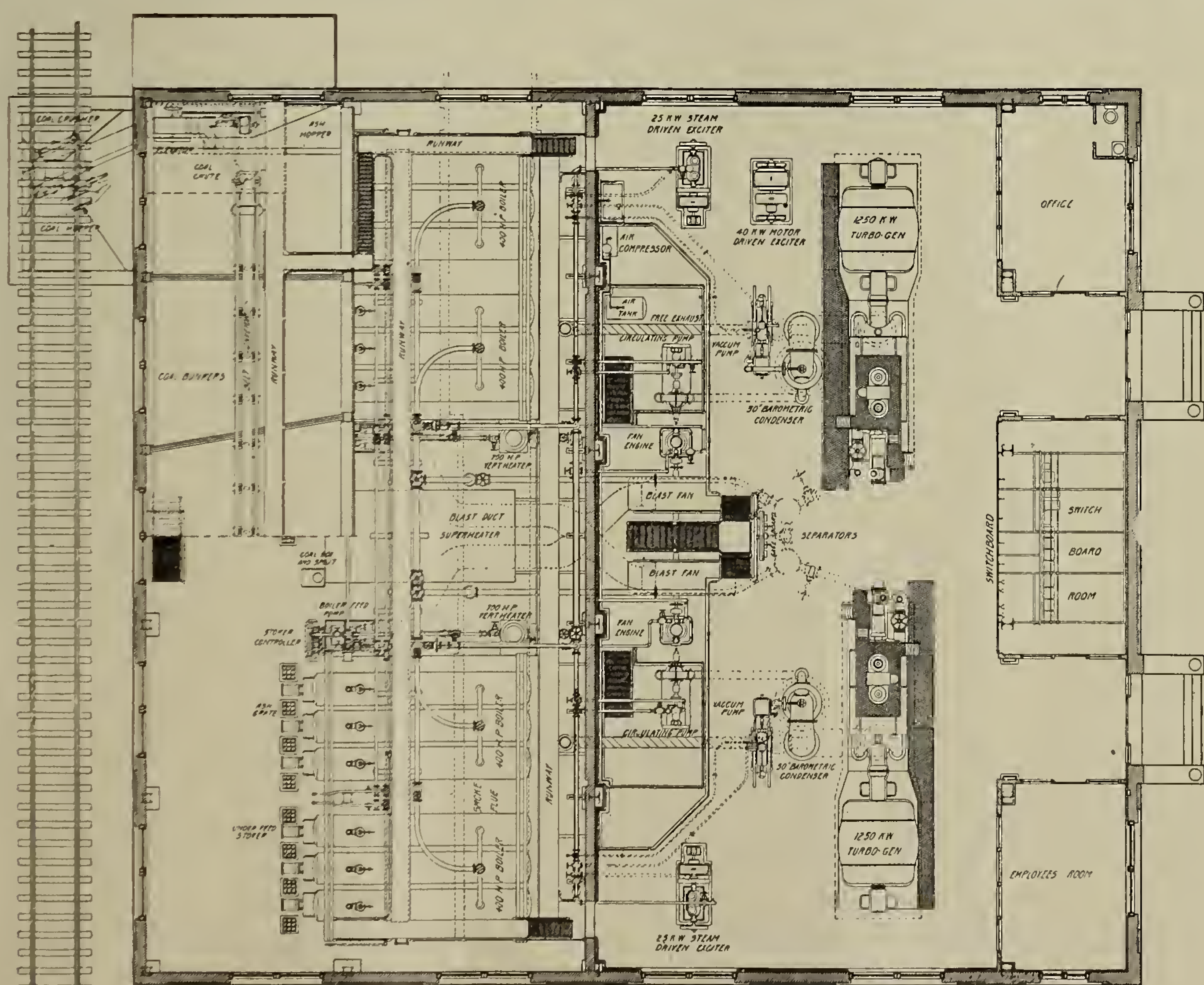
18-in. tile to the cold wells located below the centrifugal circulating pumps in the pit of the turbine room basement. Water is delivered from each of these by the circulating pump through the condenser, and is discharged into the hot well below the condensers. From the hot wells the water flows through an 18-in. pipe into a sump under the boiler feed pumps. These pumps deliver the water through the feed heater to the boilers.

Each battery of boilers is fed by a 12x6x10 duplex outside end-packed Worthington boiler feed pump. In addition water is provided for various other purposes, such as cooling the lubricating oils in the turbines, supplying the glands of the turbines, for hose connections in and about the power plant, all of this being supplied by a small Burnham service pump, drawing supply from one of the cold wells.

Two Westinghouse Parsons turbo-generators have been installed in the plant. The machines are designed to operate at a normal voltage of 3,300 volts, with a frequency of 25 cycles per second. They are 3-phase machines, but are further required by the specifications to furnish their full rated load of 1,250 kw. single phase current. Barometric jet condensers with 30-in. inlet manufactured by the H. L. Worthington Company have been installed in connection with each of the steam turbines.

Two steam-driven exciters have been installed in the plant, each of 25 kw. capacity, this being sufficient to provide excitation for a single turbine. In addition a motor-driven exciter of 40 kw. capacity is installed, and is ordinarily used in the operation of the plant, the two steam-driven exciters being for additional security so far as continuity of service is concerned. The switchboard, also of Westinghouse make, contains ten panels.

The entire electrical equipment has been in preliminary operation during the larger part of the year 1908. The work of construction was done without any ma-



PLAN OF POWER HOUSE.

terial interference with the traffic through the tunnel. The greatest difficulty was experienced in carrying out that part of the installation located in the tunnel proper. For this purpose the tunnel was given over to the contractor for construction purposes for two 2-hour periods each day during the time that actual construction was in progress in the tunnel. The construction of the overhead work in the yards was carried out without any serious interference with the ordinary traffic of the road, and the power plant construction, being entirely removed from any of the properties operated by the St. Clair Tunnel Company, was not subject to any interference on account of railroad operation.

The problem of transferring the operation of the St. Clair Tunnel Division of the Grand Trunk Railway System from steam to electricity gave rise to another problem which was successfully solved by the mutual co-operation of the representatives of the tunnel company and the contractor. No attempt was made to make a sudden transfer, but every precaution was taken, not only to thoroughly test out all electrical equipment before attempting to use it in regular service, but also to allow ample time in which to thoroughly familiarize all those connected with the operation of the equipment with their work. Steam locomotive engineers were trained in the use of the electric locomotives. The force required for maintenance of the locomotives and for maintenance and operation of the power plant were secured and assigned their duties during the time that the first experimental and test runs were made with the equipment. When everything was in readinesss, test runs were made with light locomotives through the tunnel, and later, moderate-size trains were taken through the tunnel as test loads, and finally a limited number of regular trains were handled by the electric locomotives. In this way, by gradually increasing the amount of work done by the electrical equipment, the entire operation was transferred from steam to electricity. The fact that no delays worthy of notice have occurred, either during the time of partial operation, or later, during the time of preliminary electric operation, is worthy of special note, indicating as it does not only the high character of the system so far as design and construction is concerned, but as well the conformity to the operating conditions that must necessarily be made in changing the operation of a division of a railway system from steam to electricity.

Some of the salient features in the operation of the plant may be seen by reference to a typical load curve. This curve is a graphical log of the operation of the plant during the time required for the passage of trains from one terminal to the other. It shows at a glance the power required by the locomotive, and the variation of boiler pressure, forced draft pressure, superheat, etc., during the cycle represented by train movements in the tunnel. The efficiency of all parts of the equipment is fully up to the contract requirements, and in fact in many cases the performance is found to exceed that guaranteed. From the results of preliminary operation it appears that the economies which will be effected by the electrification will be slightly in excess of the attainment estimated at the time the preliminary report on the proposition was submitted. This satisfactory showing, together with the entire elimination of obnoxious gases from the tunnel, is a source of congratulation to the railway company, together with those connected with the enterprise in an engineering or contracting capacity.

Accidents on English Railroads

According to the board of trade report on railway accidents in the United Kingdom, 120 passengers lost their lives on the railways last year, as against 166 in the preceding year. During 1907, 454 employees of railway companies or contractors lost their lives, and 5,813 were injured, as against 439 killed and 4,365 injured in 1906. The average for ten years is 452 killed and 3,972 injured, and compared with these figures the number of non-fatal accidents last year shows a large increase. This, however, is largely only an apparent increase, as, owing to a new board of trade regulation, many slight accidents, involving only a day's absence from work, which were not reported in previous years, have now to be reported. Including passengers, railway employees, and other persons, the total number of persons killed on the railways during the year was 1,117, and of persons injured 8,811, as against 1,169 and 7,212 in 1906.

Mixed Traffic Locomotives

THE description of the 4-6-0 mixed traffic locomotives, Southern Mahratta Railway, in Indian Engineering, is given in part as follows:

For operation on the Southern Mahratta Railway system, the North British Locomotive Company (Limited), of Glasgow, have lately delivered a number of mixed traffic locomotives, of the 4-6-0 wheel arrangement. These engines have coupled wheels 4 ft. and bogie wheels 2 ft. 4½ ins. in diameter. The fixed engine wheelbase is 11 ft. and the bogie wheelbase 4 ft. 9 ins. The cylinders, 14½ ins. diameter by 22 ins. stroke, are outside the frames and have steam chests on the top.

The valve gear is of the Walschaert type with screw reversing gear, whilst the slide valves are of the Richardson's balanced type.

The boiler has a length of barrel of 11 feet and a diameter of 3 ft. 7⅝ ins. and its center line is placed 6 ft. 7 ins. from rail level. The boiler and firebox shells are of mild steel, whilst the inside firebox, which is of the Belpaire type, is of copper. The water space stays are also of copper. A duplex Ramsbottom safety valve is placed on the top of the firebox shell. The total heating surface amounts to 918 square feet, to which the tubes contribute 822.5 square ft. The working pressure is 180 lbs. per sq. in., and the grate area 15 sq. ft.

The tender is carried on six wheels, having a total wheelbase of 11 ft., and there is a capacity for 1,600 gallons of water and space for 4½ tons of coal, whilst there is a fuel fence fitted on the top of the tank.

In working order the engine weighs 32.1 tons, of which 7.8 tons are on the leading bogie wheels. The tender has a weight of 22.525 tons, so that in working order these 4-6-0 locomotives, built for the metre-gauge, have an aggregate weight on metals of 54.625 tons.

A Motor-Driven Lift Bridge

A striking contrast between the cost of electric power and man power is furnished in the operation of one of the Eastern railroad lift bridges over a canal. This bridge has to be raised and lowered from twenty to thirty times a day. It is equipped with counter weights, so that it takes approximately as much work to lower as to lift it. It is now operated by a motor, but when it was first erected it was raised and lowered by hand for a period of one year. This required the services of 16 men at an annual cost of approximately $7,000. In contrast to this, it costs $360 per year to perform the same work by electricity. The wages of the man who operates the motor is not taken into consideration, for his services were required in addition to the sixteen men while the bridge was being operated by hand. The yearly saving is therefore $6,640. The bridge is now equipped with one 15 h. p. Westnighouse tvpe "K" motor, with double reduction gear, so that the bridge shaft runs at 25 r. p. m.

Maintaining Color Standards for Paint

Railroad managers are well aware of the difficulty in maintaining a standard color for car bodies. The general practice is to obtain a paint of a satisfactory shade, and to require that all future shipments match this shade. Frequently the original sample is lost or used up, and even if carefully preserved, the difficulty of determining slight changes in shade and the probable change due to fading frequently results in a gradual change in the standard color. Where specifications are in use the trouble caused in this way is considerable as differences of opinion are bound to arise.

A very interesting instrument is in use at the Arthur D. Little laboratory in Boston, for maintaining a desired shade of paint. This instrument, which was recently invented by Frederick E. Ives, is called a colorimeter and it accurately measures the shades of any color. The method of procedure is as follows: The standard paint being determined, a board is carefully painted in the same manner as a car body and the color measured on the colorimeter. This instrument gives a certain scale reading, and by setting the instrument again at this same reading the original shade is at any time reproduced in the field of the instrument. On subsequent shipments a sample board is prepared in a similar manner and the exact shade measured on the instrument. This method does away with any need of preserving the original sample and eliminates any possibility of change from fading, as the standard is defined by certain scale-readings on the instrument which give the exact color value of the different components which together make up the composite color under examination.

The Railroad Official

IN a paper presented before the New York Railroad Club, Mr. W. J. Harahan of the Erie Railroad outlines the elements which constitute a successful railroad official. The paper is given in part as follows:

What may be designated as the first element, or rather, essential, of success, is common honesty. To state the old maxim: "Honesty is the best policy" is but to reiterate a truism, and to repeat parrot-like the principle that has stood the test of ages. There is, however, a broader honesty than that apparent on the surface that is a requirement. This consists not entirely in the application of the Commandment "Thou shalt not steal" but seeks also for its guiding principle the "Golden Rule." In other words, a studious and persistent effort to render just and fair treatment to all alike whether he or it be great or small.

Loyalty is a predominating characteristic of railroad officers, and it is a necessity to perfectly weld the links of the chain of organization and system.

An element requiring the exercise of a peculiar and really great ability is the gift of creating harmony. It is the keystone of the arch of success without which the structure will not sustain itself. True harmony, when carried to a finality, familiarly known as team-work, engenders enthusiasm on the part of the individuals forming the organization. An organization without harmony disintegrates and soon becomes utterly demoralized so that a disturber should be ejected from it with little ceremony or he will prove its undoing.

It may seem that it should not be necessary to cite the necessity for industry. Much, however, should be said on this important element. It does not merely consist in being prompt at the place of work and remaining the full time required by the letter of the law—but it requires much more to lead to the highest success. It means the earnest, painstaking, patient and persevering effort to accomplish everything well; the putting in of whatever time is necessary to perform those duties which are assigned to the individual officer, and it may even be necessary at times to do something that someone else should have done. It requires, particularly, the doing of these things cheerfully.

Thoroughness is an important adjunct and it is requisite to the fullest extent. Affairs should be closely analyzed. A "touch and go" method of handling matters is not conducive to success because it invariably leads to neglect. Correspondence should not be shifted around simply to relieve desks of the presence of papers, but it should be thoroughly gone into, all questions answered, and, if an answer naturally develops another question, it should also be answered.

As is true in all lines of work, one of the prime essentials is what I may call love of the work. There can be no success without it as indifference is sure to result. There is no line of work more exacting than railroad work and there is no character of work requiring a greater sustained interest.

I regard common sense as one of the very greatest of the elements. I believe that we often fail to realize how much is expressed in these two words. It is the foundation upon which all the professions are laid. Its application is absolutely essential to the proper carrying on of business as it is the rudder of business existence.

One of the elements seriously lacking in many men is originality, evidenced by their easily succumbing to difficulties, or in their inability to keep pace with progress. This is a most important attribute, and without it failure is certain. To do something a certain way because it has always been done that way is not always a good reason for so doing. A thing should be done the way best suited to the present requirements. There is, of course, a great value in precedent, if properly applied, and it would be just as much of an error to cast it to the wind as to always slavishly follow precedent.

A great deal is accomplished by an intimate knowledge of the work, which can only come from experience in the harness, that is, practical experience. Men respect this sort of knowledge and their best efforts are obtained when they feel that an officer possesses it. If one is not in full possession of knowledge on any particular detail, however, it is the greatest mistake not to ask questions so as to become so. It is not a lowering of dignity, nor an indication of incompetency to have to ask for such information, in fact, much can often be learned from even the men of the lowest grade by intelligent questioning. Any other principle of conduct usually results in an ostrich act on the part of he who attempts it, his ignorance being easily apparent.

A 30-ton Steel Underframe Box Car

THE accompanying drawings show the 30-ton steel underframe box car which the South Baltimore Steel Car & Foundry Company is building for the Atlantic Coast Line Rairoad. The car has a length over running board of 37 ft. 10¾ ins., and a width of 9 ft. ⅝ in.

The construction of the car body is shown in Fig. 1, which gives a side elevation, section and plan of the car, and in Fig. 2, which gives an end elevation and section. A Murphy roof is used. Also 1¼-in. ship lap flooring, heavy felt paper lining and clear white oak posts are used in the construction.

UNDERFRAME.

The center sills are made up of two 15-in. 33-lb. channels, placed 15 ins. apart, with top and bottom cover plates. The channels are 29 ft. 9¼ ins. long extending beyond the body bolsters. The ⅜ x 21-in. top cover plate is 32 ft. long and the ⅜ x 21-in. bottom cover plate is 21 ft. long. The body bolsters, shown in Fig. 3, are

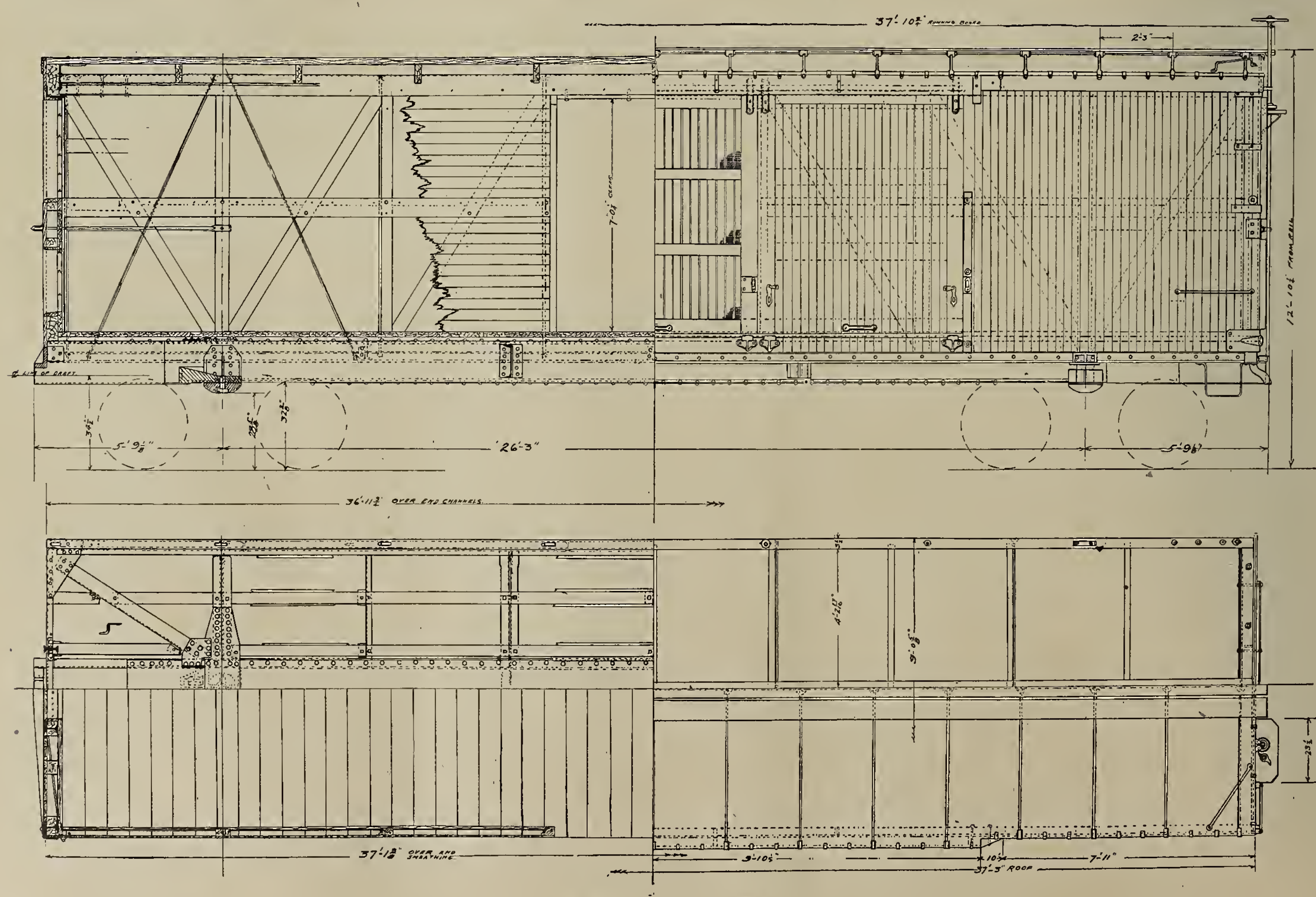


FIG. 1—PLAN AND ELEVATION OF 30-TON BOX CAR.

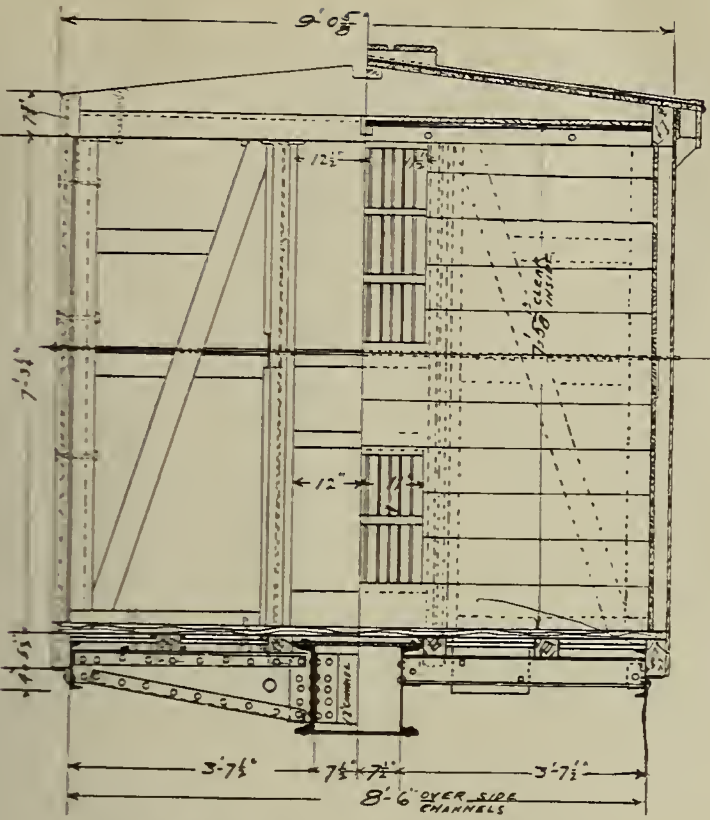


FIG. 2—END ELEVATION OF BOX CAR.

made up of a ½-in. web plate with two 3x3x⅜-in. bottom angles and two 3½x3x⅜-in. top angles, extending from side to center sill on each side. The top cover plate is ⅜x12½ ins. and 60¼ ins. long, and bottom plate is ⅜x13½ ins. and 69½ ins. long. These plates extend over the center sill cover plates and are riveted through them to the channels. The web plate and angles of the body bolster are riveted to 6x4x⅜-in. angles which are also riveted to the side sills of 8-in. 11¼-lb. channels and to the center sill channels at either end. The side bearings are bolted to the body bolster. Two 12-in. 20.5-lb. channels are used as needlebeams and pass through the center sill channels.

The Farlow-Westinghouse draft gear, which is used with these cars, is shown in Fig. 4. The Farlow draft keys and links, draft cylinder supports and coupler carry iron are forgings. The cheek plate, striking plate and the front and back follower blocks are castings shown in the drawing.

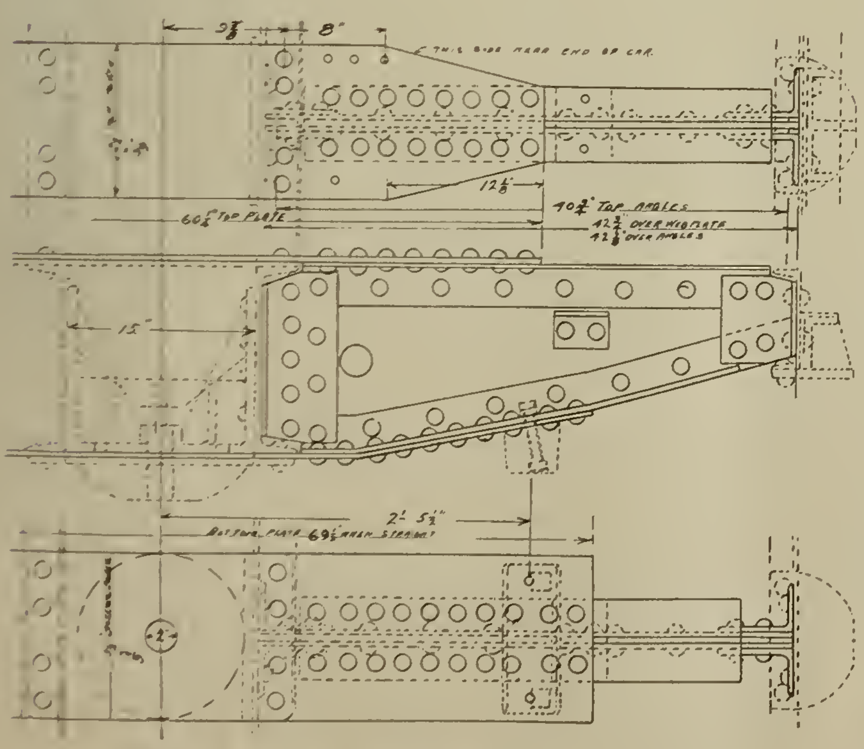


FIG. 3—BODY BOLSTER, 30-TON BOX CAR.

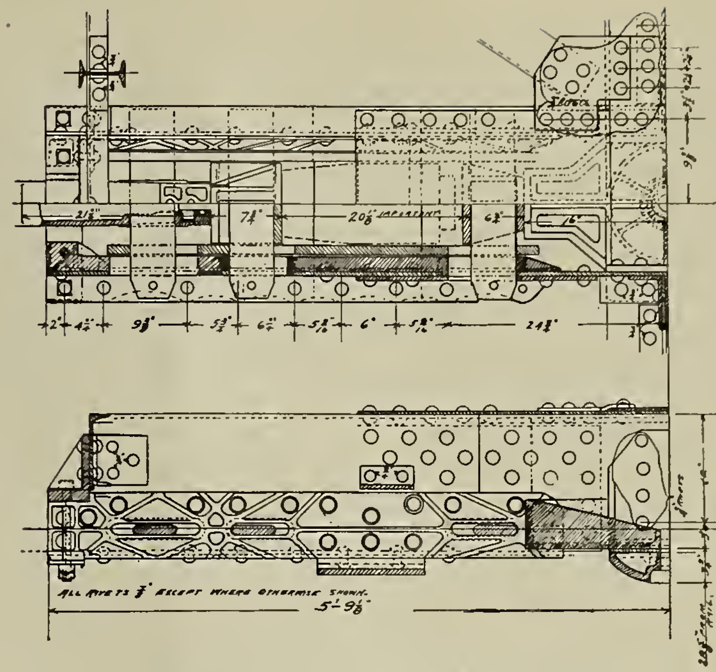


FIG. 4—FARLOW-WESTINGHOUSE DRAFT GEAR.

TRUCK.

An elevation and vertical section through the truck is shown in Fig. 5. The wrought iron arch bar is 1¼x4 ins., inverted arch bar is 1⅛x4 ins. and pedestal tie bar is ½x4 ins. The distance between arch bars is 18 ins. The Jones nut lock is used on truck column bolts and journal box bolts. The Pennsylvania deck brake beam is used with this truck.

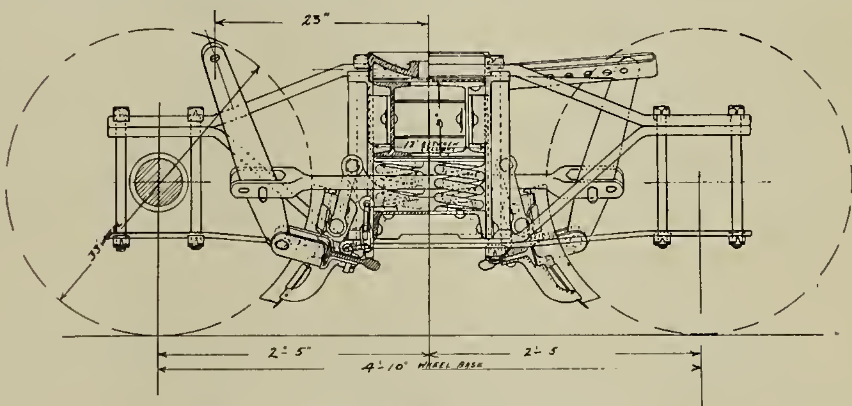


FIG. 5—TRUCK, 30-TON BOX CAR.

The truck bolster is made up of two 8-in. 18-lb. I-beams, 7 ft. 2 ins. long, with two top plates and two bottom plates. One top plate is 5/16x12 ins. by 5 ft. 7½ ins. and the other is ¼x12 ins. by 2 ft. 11 ins. One lower plate is 5/16x12 ins. by 5 ft. 3 ins. and the other is ¼x12 ins. by 2 ft. 9 ins. The distance from center to center of arch bars is 6 ft. 3 ins. The bolster guide blocks are riveted to the I-beams with two ¾-in. rivets.

The spring plank is a 12-in. 20¾-lb. channel which is riveted to the column. Spring lug washers are riveted to the spring plank.

Transcontinental Mexican Road

It is stated in the Consular and Trade Reports that the line from Tuxpan to Colima is vircually finished. This section of the main line is 43 miles long and cost about $3,000,000. Steel bridges span 11 gorges, from 200 to 600 ft. deep and from 100 to 2,000 ft. wide, through which lava from Mount Colima passes to the Tuxpan river. The existing route from coast to coast is 1,031 miles long, but a cut-off is to be built which will reduce this distance to 800 miles.

The Railroads and the Business Revival *

At a time when disaster has flooded the land, the first signs of returning prosperity are greeted as Noah received the dove bearing the olive leaf, with abounding joy. A real order for goods, after months of idleness, is an event. There is a temptation at such times to be thankful for small favors, forget past troubles, and settle down to an enjoyment of such benefits as may be vouchsafed, without asking whether we are receiving all that we are entitled to.

Far be it from my purpose to sound a sour note of pessimism, while the orchestra is doing an optimistic "stunt." But business men who depend upon the prosperity of railroads for their profits and prosperity must not fool themselves by the thought that one election has brought or can bring about the railroad millennium. It is not here yet, and it will not arrive until many things happen. Is it not absurd to assume that the recent election hinged principally upon the question of fairer railroad regulation, or that it was one of the issues that divided the country between Taft and Bryan? If it were a fact, then we who are so directly interested in the welfare of railroads might well view with alarm the rolling up of more than six million votes against the railroads.

Anti-railway legislation is not a disease afflicting one political party alone; it is too common among the adherents of all parties. Blows have been dealt railroads by both democrats and republicans.

There was received at the office of the Railway Business Association a few days since, from a manufacturing company producing railway material, the following letter:

"If the Railway Business Association had been formed a year ago it would undoubtedly have done considerable good, but we think the results will be lost at this time on account of the election of Taft, as it will probably produce normal business in a short time."

Evidently the morning mail of the writer had contained an order or an inquiry. He was happy. He imagined that the rising sun of prosperity was shining in the windows, and that the night of commercial gloom was wholly past.

Did all antipathy to railroads vanish from our land on the night of November third? Have all anti-railroad agitators been put to sleep? Does the placid smile of affection for railroads play upon the features of all those who by the recent election have been given commissions of power over our railroads? Are there no vexatious problems of transportation yet to be solved, no differences to be settled requiring patience, knowledge and persuasion? Is the public mind converted to the idea that anti-railroad agitation is against the public interest? If all these beneficial things have come to pass, then there is no reason for the existence of the Railway Business Association, with its gospel of conciliation, nor is there necessity for any further effort by any one in behalf of railroads. The day of miracles is past. By no jugglery of words, or fantastics of imagination, can we avoid the stern reality that the conditions which have led to the existing state of public feeling as to railroads, which is the growth of many years, cannot be eradicated in a day, month or year.

It is a matter of supreme satisfaction that since the election the president-elect has expressed the hope that as a result of that event "investors may feel justified in investing capital, and in putting out funds for railroad construction, while giving assurance that under his administration "all men who conduct a legitimate business may understand that the government is back of them." So far as the authority and influence of the federal executive extend, it is most gratifying to learn that this subject is under consideration by the incoming president and there is sound justification for cheerfulness in the outlook relating to federal executive activity. Presidents are powerful—that we know, but if railroads are to have the opportunity to do the things that must be done for this country, to keep pace with its transportation needs, they must have the friendly co-operation of men of all the political parties, men in all the states; not alone presidents, but governors, senators, congressmen, members of the legislatures, and federal and state railroad commissioners. All these officials in the end will represent pretty accurately the temper of the public from which they spring. If the gallery to which they play is unfriendly to railroads, they will speak the speech and enact the laws that will win them applause. If the political atmosphere from which they emanate is calm and reasonable regulation of railroads is what their environment favors, then their official conduct will be attuned to fair play.

If there ever was a time when organized effort for the bringing about of a better relation between the railroads and the people was absolutely necessary, it is now. He lives in a fool's paradise who deludes himself with the belief that there can be substantial, continuing prosperity for railroads and cognate interests until it is the permanent policy of our nation that conciliation is a better way to get transportation facilities than warfare. Conciliation must be worked out as a practical plan—it must be tried, and it must be found feasible, before those who have been addicted to other methods will join those who seek to end rancor, ill-feeling and recrimination.

Be it understood clearly that in this scheme of conciliation the railroad managers have to shoulder a great, big share of the conciliating. They must be open and above board in all their dealings with the public, and when in contact with the people their pose should be that of kindliness and not of hauteur. The rights of the railroads which should be accorded them cheerfully should not be caused to be withheld by any acts which chill the hearts of those with whom they deal. What a

*Address of George A. Post, president of the Railway Business Association, before the Western Railway Club.

splendid thing it would be for the country if the people at large could come to think of the railroads as their railroads! Not, of course, in the sense of government ownership, but as guardian fully alive to the responsibility of giving them support, sustaining and encouraging them, and planning with them that they may become powerful doers of good for the country. Everybody knows, when he stops to think, of the magic transformation of our country wrought by the railroads. But wondrous as that has been, greater wonders are yet to be, if we can gain a clear foresight of the changed conditions that must be met in the future.

The problems of the future are radically different from those of the past. Not the conquering of the wilderness; not the connecting of the east and west, but the development of a vastly improved system which shall concentrate every device of modern science to the increase of celerity in the movement of traffic. We must have more tracks; freight tracks independent of passenger tracks, devices of acceleration at junction points; time-saving mechanism at terminals, and more and better equipment. It is upon these great problems of transportation that the American people and their representatives should concentrate their attention, dismissing the phantom problems, born of pique or prejudice, which have made recent railroad discussion at once tragic and ridiculous.

These mighty projects call for money by the millions upon millions. Will capital be attracted to railroad investment if larger profits can be made in other enterprises? Facing the future, with its colossal demands and infinite possibilities, how fatuous the thought of crippling our railroads by fixing niggardly rates through arbitrary legislative edicts.

But, says some cynical critic, you are not disinterested in your devotion to the welfare of railroads. To such a charge we plead guilty with enthusiasm. Do you know of any one who is? No such person exists in our country. Where in this broad land is there a man who will not benefit if railroads are prosperous? What of the thousands of retail tradesmen who thrive when railroad employes and employes of railroad supply concerns have steady employment at good wages? I point to the waving wheatfield, the husbandman assured of quick, safe and cheap carriage to market if railroads are prosperous; to the humming factory and busy foundry, if railroads are prosperous; to the unimproved real estate, leaping in value as demand increases under vigorous industrial expansion, if railroads reach it; to mercantile establishments enlarging and employing more people, if railroads are prosperous. Oh, we are all in it, only some people don't seem to know it.

It is from such and their mistaken views that the country has suffered and will suffer more unless our people are brought to a realizing sense of their error. That is the task that we have undertaken, and we are not going to quit just because there has been an election.

How much of a business revival, think you, we shall have unless the railroads shall have restored to them their borrowing power, which will simultaneously restore their purchasing power? The power to borrow implies that somebody is willing to lend. That frame of mind toward railroad investment will be attained by the possessors of capital when there is a demonstration by the public, which holds the fate of such investment in the hollow of its hand, that no hostile legislation shall imperil the investment.

The current earnings of a railroad cannot by any possibility provide funds for development to meet future demands. They can only convince the investor of the probable profit from prospective enlargement of operation. If the attitude of the public toward railroads is devoid of imagination as to the future, and insists upon reducing present revenues to the smallest possible amount, the investor will turn to other fields for investment and woe be to America if he does!

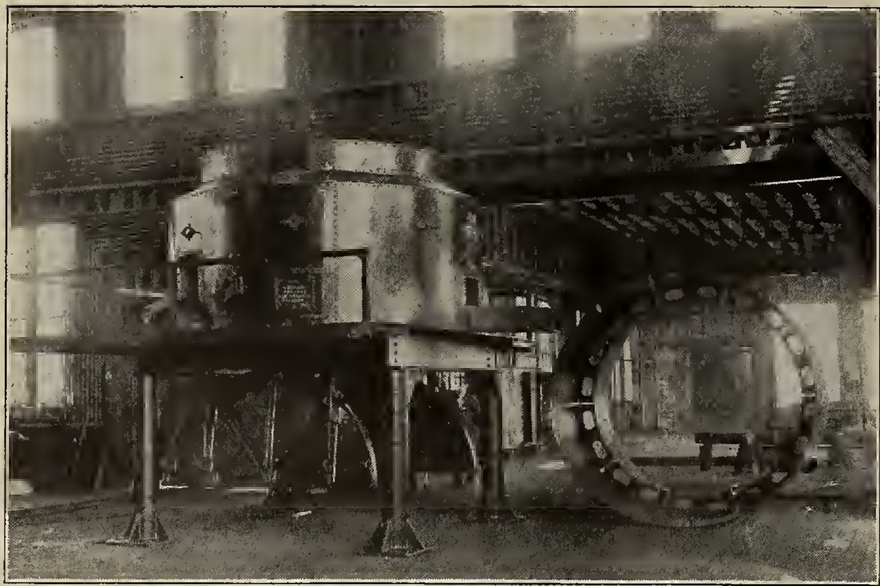
The crying need of the hour is that government officials and the public generally, in considering railroad problems, shall show, not their power, but their wisdom.

It is for railroads as America's most potent means to national prosperity and growth that I am an advocate; railroads with Herculean financial strength to cope with the problems of the future. Our mission is to clarify the atmosphere so that the people will look upon railroads as tremendous agencies of civilization, which have a record of glorious achievement, with their mental vision undimmed by too much contemplation of mere human error in their administration. Railroads must, of course, be operated by men, men with knowledge and genius, intermixed with human frailties. But men come and they pass, adding their mental mite to the great work, while railroads must go on forever, growing greater and greater, and doing greater things as years go by. If Americans are wise to their own selfish interests they will foster, they will guard them with the jealous care of patriotism and see that no harm shall come to them. No popular clamor which loses sight of their intimate relation with our national glory should be permitted to put these greatest agencies of progress in chains.

Telephone Equipment

REGARDING the destruction by fire of the Paris telephone exchange, the Western Electric Company has furnished the following information which presents a clear idea of the speed possible in equipping a large exchange.

On September 20, 1908, there occurred in Paris a fire causing a direct loss of about six million dollars' worth of property. While this in itself seems a trivial matter in comparison with calamities such as have befallen other cities, yet the results were such, that commercially Paris was placed in a more helpless condition than has been any other city in modern times with the exception of San Francisco at the time of the earthquake. The particular building and equipment destroyed by this fire, that of the Central Telephone Ex-



NO. 12 CUPOLA, FOUNDRY EQUIPMENT.

change, was the one and only building in Paris the destruction of which could "paralyze her business," as the daily papers expressed it at the time.

Realizing as they did the serious aspect of this situation from the subscriber's standpoint as well as their own, the telephone company lost no time in making preparations to renew the service. The one important problem with them now was to replace the complicated switchboard and wiring system, by means of which the thousands of subscribers calls were handled. Aside from the fact they must secure reliable equipment that would insure satisfactory service such as their customers had always been getting, the one idea they had in mind was speed.

As it happened, the largest telephone manufacturing company in the world, namely the Western Electric Company, an American concern, had a house conveniently located in Paris, and knowing as the telephone company did, that these manufacturers held all records, and was equipped as no other company in the world was for rapid work, they naturally turned to them.

On September 29, the order was placed and transferred to the New York house by the Paris house of this company. The New York house immediately telephoned the factory at Chicago, requesting them to begin work on the switchboard. The information received from the telephone company concerning the equipment required, was far from definite as yet, but the facts concerning delivery were more than clear; namely, that the Paris house had promised the completed equipment, ready for service, within sixty days, with a penalty of $600 per day for all time taken over that specified.

The finished board, one hundred and eighty feet long, requiring ninety operators to operate it, was completed and ready for shipment a little over three weeks after work was begun.

The shipping of this big switchboard was greatly facilitated through the co-operation of the Grand Trunk, Delaware, Lackawanna & Western railroads with our traffic department. Together they made all the necessary arrangements so that when the 234 boxes containing this switchboard were received at the Hoboken terminal of the Delaware, Lackawanna & Western Railroad, only about two days had elapsed since they were loaded onto the cars at the Hawthorne works of the Western Electric Company.

Foundry Equipment

THE design of the two No. 12 cupolas, furnished to the Standard Cast Iron Pipe & Fdy. Co., Bristol, Pa., follows the same principles as the standard Whiting cupola. Several new features, however, are added:

The shell is 10 ins. in diameter and wind box 130 ins. in diameter with a 10½ in. lining; it has a capacity of 27 to 30 tons per hour. It is fitted with two rows of tuyeres, eight in each row.

The bottom plate presents some new features in cupola construction. On account of extreme loads carried, bottom plate and framing are made entirely of structural steel. It consists of a heavy steel plate securely riveted to shell and wind box sheets, and bolted in turn to the bottom frame which consists of heavy steel beams, securely riveted together. Hinge plates for bottom doors are steel castings riveted to structural steel frame.

For the usual curved columns, straight case iron columns of circular hollow section are substituted. Each of these columns is provided with a large flange, making the use of a separate base plate unnecessary.

The safety tuyere on this cupola is provided with a spout projecting through the shell of wind box. This spout is lined and is provided with the usual safety slide. It is located so that it can be always under the eye of the cupola tender.

Owing to the size and height required for bottom doors, the standard cupola is provided with an operator's platform built up of structural material and checkered plate floor and substantial hand rails. The illustration represents the No. 12 cupolas of the Whiting Foundry Equipment Co., Harvey, Ill.

Fox Milling Machine

THE simplicity of a machine designed for a wide range of speed is well shown in the accompanying illustration where the Fox light milling machine is shown fitted with a Westinghouse type "S" direct current motor. The specifications under which this machine was manufactured require the speed of milling spindle to be adjustable over a range of 20 to 1, namely from 21 to 425 revolutions per minute. Although but 16 speeds were called for in these specifications and these were obtained by using back gears and speed cones of four steps, it was decided to supply an adjustable speed motor.

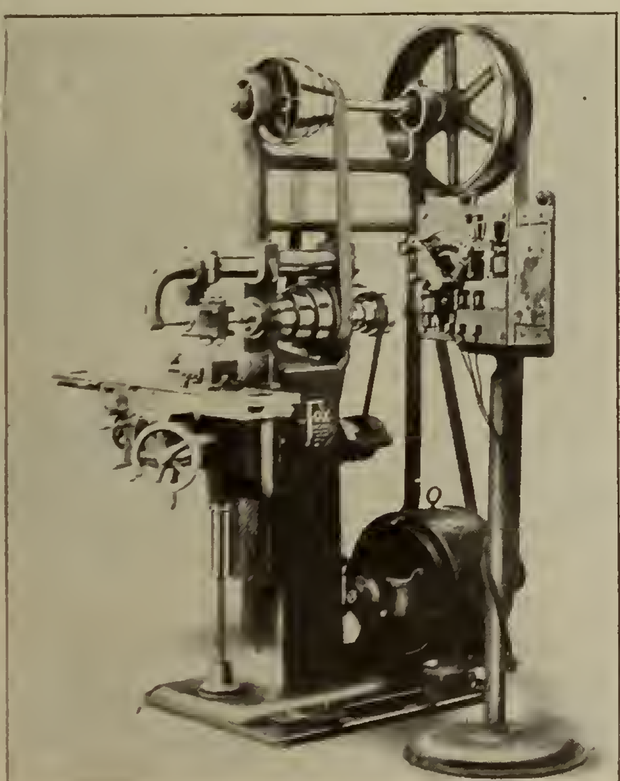
This motor has a speed range of 2 to 1, that is the speed may be varied from 660 to 1320 revolutions per minute in 14 steps. This permits much finer adjustments in the speed of the spindle than would be possible with a constant speed motor. This means that the cutter may at all times be run at the maximum speed which it can stand, whatever the type of work it is performing.

The speed of the motor is controlled by means of field regulation, that is, the controller varies the resistance in the field circuit and the motor changes its speed accordingly. This controller is mounted on a pedestal that is independent of the motor and may be moved somewhat and located at the most convenient point for the workman.

An interesting feature of the outfit is the method of mounting the motor, on an extended sub-base which is pivoted at one side. The free end of the motor bracket is supported by the short arm of a foot lever which raises the motor and slackens the tension on the belt and allows the spindle of the machine to come to rest without waiting for the motor to stop. The motor is held in the raised position by a foot catch on the foot lever. Depressing the catch allows the motor to settle and tightens the belt.

This outfit was supplied by the Fox company to the United States government for use at the navy yard at Charlestown, Mass. It is supplied with several special attachments which extend its range of work very largely, particularly adapting it for cutting small gears, milling squares, hexagons, etc., including taps and reamers, as well as a large variety of similar work.

This outfit represents the application of a motor to a standard belt driven milling machine with a special modification of the base for mounting the motor, and shows how compact the complete outfit with a motor may be, even when the method of applying the power has not been altered. The convenience of electric drive is clearly shown, for the speed may be varied within the range of the motor by the movement of the controller handle which the operator may locate wherever it will be most convenient to reach while at the tool.



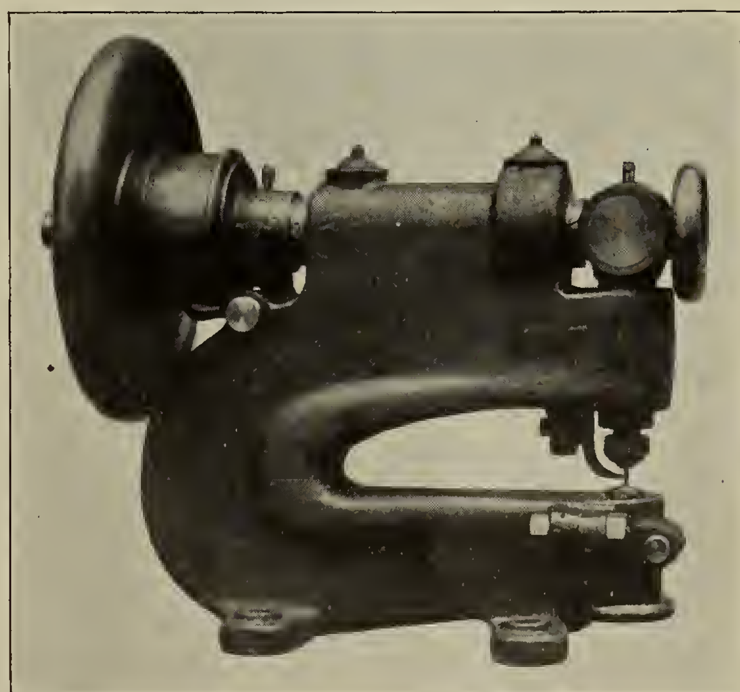
FOX MILLING MACHINE.

Methoh of Cutting Out Metal Sheets

THE machine, shown in the cut, is especially constructed to cut out metal sheets into any desired shape, such as templates, sweeping boards for foundries and all kind of curved shapes required in every-day show practice. It is not a machine for repetition work, such work being more suitably done by means of special dies and punches, but it is essentially a machine to replace the hammer and chisel work which has been necessary when only one or two pieces of a similar shape have been required.

The No. 1 machine has a gap of 12 ins. and is suitable for plates up to ⅛ ins. thick. The No. 2 machine has a gap of 24 ins. and is suitable for plates up to ⅛ ins. thick.

The machine runs at high speed, 300 revolutions for the No. 1 machine and 250 revolutions for the No. 2, and is furnished with a punch of a special shape. The cutting edge of the tool is in front and the back of the punch is prolonged to act as a stay. The cutting edge can be set in any direction to suit the work.



MACHINE FOR CUTTING OUT METAL SHEETS.

The stroke of the machine is slightly greater than the thickness of the piece to be cut and the movement is obtained by a special eccentric motion, the whole arrangement being of a circular construction.

The end or tail of the punch of the machine works in a die which is placed in the anvil of the machine just below the punch and the tail of the latter is long enough to work up and down in this die throughout the stroke so that it affords a very efficient stay for the punch. The die can be raised or lowered by means of a screw to enable the operator to pass a sheet of metal under the punch and so he may begin to cut in a hole in the middle of the plate.

This punch is quick acting. The groove left by the punch acts as a guide and the operator has simply to place the plate under the punch and turn it slightly in pushing to obtain any desired shape.

After a few minutes practice a boy can cut out any shape on this machine, to a mark so closely that a smooth file will finish the work. This machine is made by the Societe Anonyme des Etablissements Ph. Bonvillain & E. Ronceray, Paris, France.

High Speed Reamers

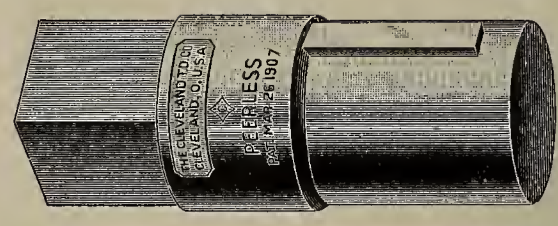
THE high speed problem as related to tools is probably attracting more attention from manufacturers and inventors than any other problem connected with tool making. How to produce high speed cutting tools at a minimum cost is one way of stating it. The Cleveland Twist Drill Co. are offering as one solution their "Peerless" High Speed Reamers. The special construction of these reamers is claimed by them to increase their efficiency.

EXPANSION SHELL REAMER.

Blades of high speed steel are fitted into and solidly joined to a special soft steel body by a process called "Brazo-Hardening," developed and patented by this company. This process is said to unite the high speed steel of the blades with the soft steel of the body into one solid, inseparable whole. The high speed blades only are hardened, so that while "Peerless" reamers have all the hardness and cutting qualities of solid high speed tools they are at the same time less brittle than reamers of carbon steel.

Not the least interesting of the "Peerless" tools are the high speed expansion reamers, made possible only by the soft bodies. The expansion takes place at the cutting end and answers a double purpose. First, to keep the reamers up to size at the point where they are most subject to wear; second, to vary the amount of longitudinal clearance according to the material to be cut and prevent jamming in the hole.

Shell reamers, as well as hand and chucking reamers are made in the expansion style. These shell reamers fit a special arbor with a two sized plug and are adjusted by means of a special wrench. The expansion reamers are made to stand more expansion than carbon steel reamers of similar design and have as many cutting edges as a solid reamer.



WRENCH FOR EXPANSION SHELL REAMER.

Car Cleaning Outfit

THE electrically operated railroad car cleaning outfit, shown in the accompanying cut, is built by the General Compressed Air & Vacuum Machinery Co., St. Louis, Mo. The machine is made in either one or two-operator capacity and has a complete equipment of tools for cleaning carpets, rugs, upholstery, draperies and bare floors.

There are no wet and dry tanks in the dust collecting outfit that would cause trouble in winter by freezing. There is a single dry tank on the apparatus and the machine is guaranteed to collect 100 per cent of the dust.

The one-operator machine is operated by a 3-h. p. motor. The machine is compact and can be pulled by two men. It weighs about 1,000 lbs.

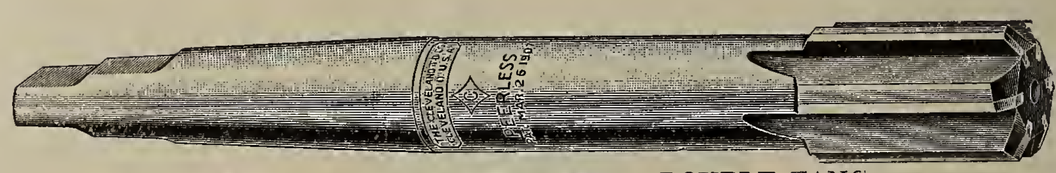
Where yards are not piped for compressed air, a compressed air-vacuum outfit, not illustrated, may be used to advantage. This compressed air is controlled by an automatic control valve which shuts off the consumption of air at a predetermined amount of vacuum when the cleaning tools are not in operation.

The moment this vacuum goes down by reason of one or more cleaning tools being put into operation, the automatic control valve turns on enough compressed air to maintain the proper vacuum in accordance with the number of tools in operation, so that there is no waste of power.

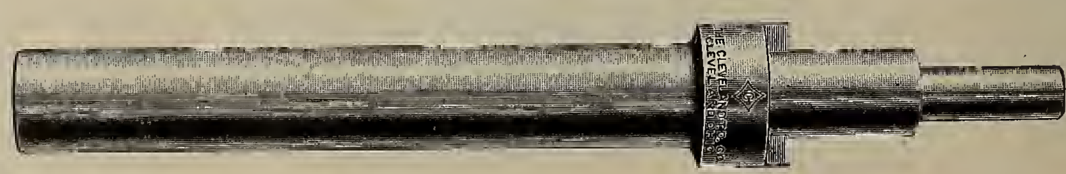
Two lines of vacuum hose are run from the tank into one or two cars and all dust, germs and grit are sucked out and deposited in the tank.

The first part of the cleaning should be done by blowing the cinders and dust out of the ventilators and crevices. This can only be done by compressed

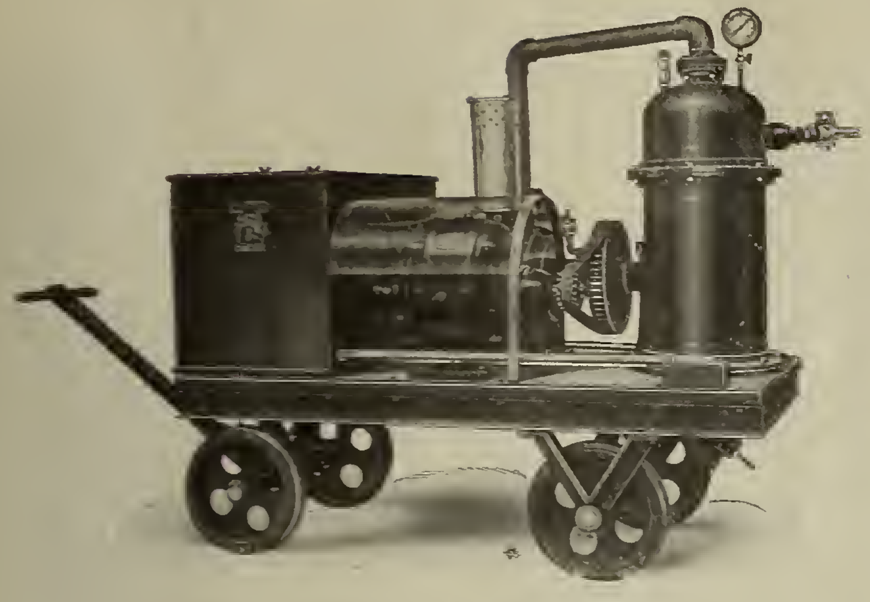
STRAIGHT SHANK EXPANSION CHUCKING REAMER.



TAPER SHANK CORE REAMER, DOUBLE-TANG.



ARBOR FOR EXPANSION SHELL REAMER.



CAR CLEANING OUTFIT.

air, as vacuum tools, to be effective, must have contact with the surface to be cleaned. After this part of the cleaning is done, the compressed air hose is attached to the vacuum producer and the cushions, bedding, floors (either wood or carpet) and in fact anything in or on which dust can accumulate is then cleaned by suction.

A New Riveter

THE riveter, shown in the accompanying cut, is an improved design of the alligator riveter, built by John F. Allen, New York. This machine was designed especially for car work at the Altoona shops of the Pennsylvania Railroad Company, and embodies in its construction all of the distinguishing features of the regular Allen tool, including universal suspension, etc.

It will be noted, however, that it has some additional features which fit it especially for the class of work on which it will be employed. This new riveter is equipped with two sets of arms which are interchangeable. The "A" set has 16-in. reach, which is the largest reach of any machine of this kind on the market, being operated within very restricted quarters. The "B" set of arms has 13-in. reach but differs from the "A" set particularly in its ability to operate between narrow longitudinal sections. While originally designed for car construction, this riveter is adapted for structural work in general.

Roofing Materials

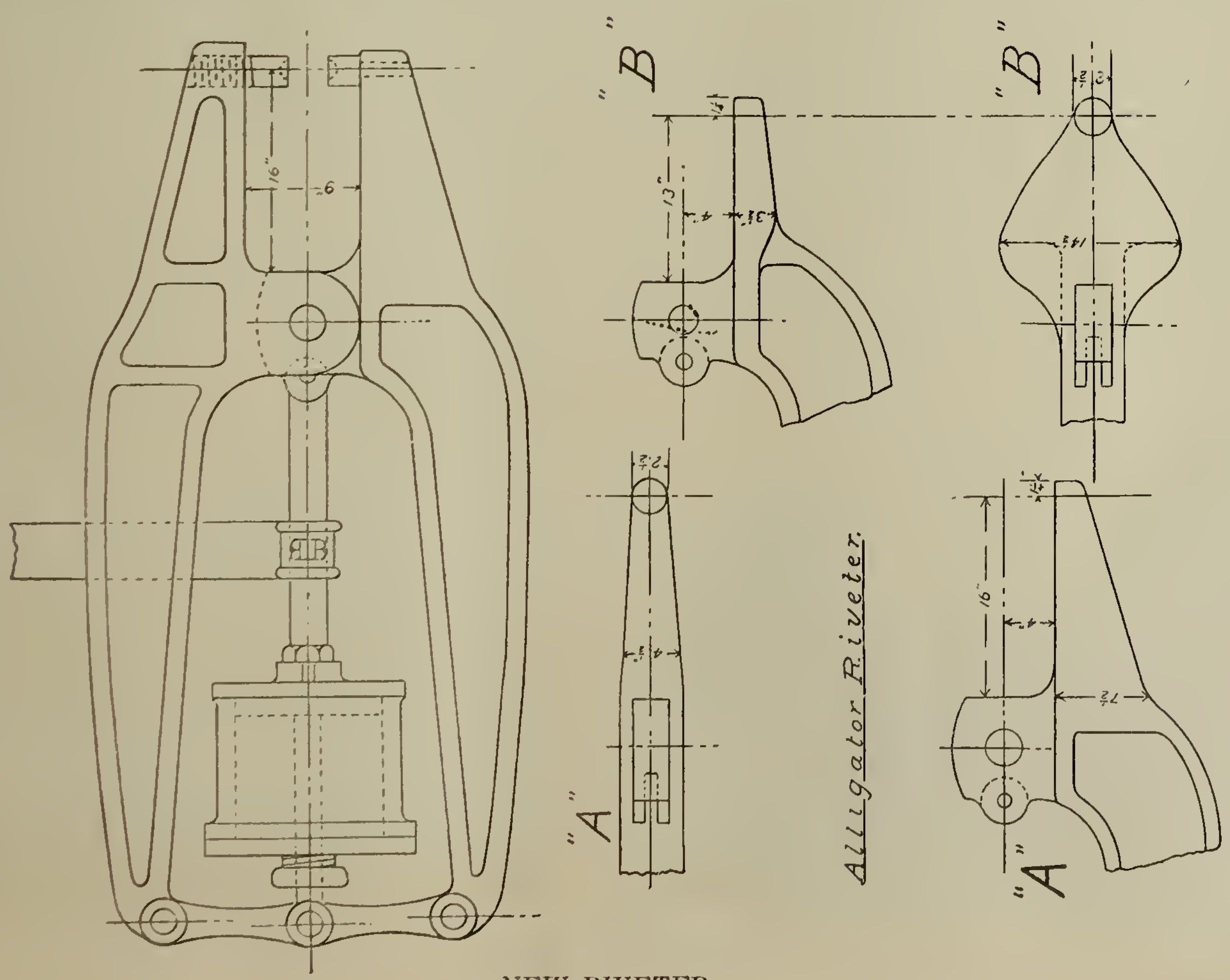
A few interesting notes on Amatite roofing are contained in the following paragraphs contributed by the Barrett Manufacturing Company, New York:

The resisting ability of a roofing depends largely upon the amount of material there is in it—not upon the thickness nor upon the number of layers, but upon the actual density of the roof—that is upon its weight. A light weight ready-roofing may be as thick as Amatite, but if it is not as heavy, roll for roll, it can't have as much good stuff in it. Amatite weighs as much as roofings that cost three times its price.

The makers of Amatite roofing have advertised their goods very extensively, but the mineral surface proposition is unfamiliar to many people who do not see how it is possible to make a flexible, pliable roofing with a surface of real stone.

Any man will recognize that a mineral surface will wear longer, for instance, than a painted surface, but one has to see how Amatite is made to really appreciate it.

Amatite is a self-reliant roofing. You don't have to go out and coat it every few months or patch it up to stop leaks. After it is laid, you can go off and forget about it and it will stay at its post and do its duty year after year.



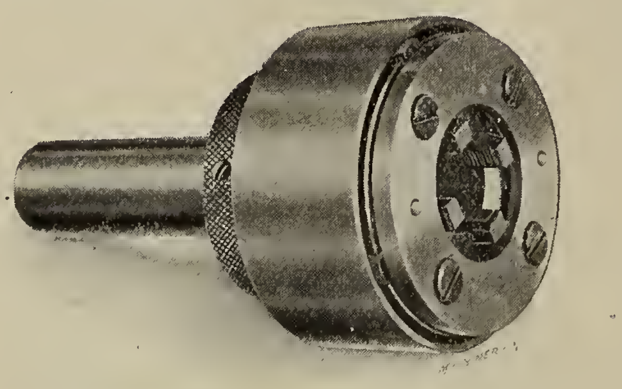
NEW RIVETER.

Adjustable Threading Die

THE adjustable threading die, illustrated herewith, is manufactured by the Adjustable Collet Co., Cleveland, Ohio. Several of the features of this tool may be said to be quite distinctive. The "A.C." adjustable die is made for use in turret lathes where adjustable round dies or solid dies are used.

The dies themselves and the tool are so constructed that a wide range of diameters is covered by one set of dies of the same pitch.

The adjustment is easily made by loosening up the front clamping plate and turning the outer hardened hood to either the right or left and then pressing the dies or chasers against the inner bearing. When set to the required diameter, the hood is tightened by means of a set screw provided for this purpose, and the front clamping plate against the chasers.



ADJUSTABLE THREADING DIE.

The dies are of the chaser style—made of the finest tool steel, carefully tempered. These dies can be easily and quickly removed and sharpened on an emery wheel or grindstone like a chisel.

The dies have a slight clearance in the threads which makes them cut free—with no drag, and they are claimed to be the easiest thread cutting dies made.

The quality of the materials has been made up to the highest demands in tools of this kind. Durability and strength have not been slighted in the selection of materials and in putting them into useful form.

The chasers are made of high grade tool steel or high speed steel if desired. All sizes are made with any length of head that may be required to accommodate long pieces for threading pipe. This tool is also made with plain chasers to be used as adjustable hollow mills.

FIG. 2—COMBINED PLANING AND SAWING MACHINE.

Combined Rotary Planing and Rotary Sawing Machine

THE heavy type of combined rotary planing and rotary sawing machines, illustrated, has been developed by the Newton Machine Tool Works, Inc., to meet the requirements of structural work due to the demand for Bethlehem special structural shapes.

This special saw for the Bethlehem special shapes is very similar in design to the standard line of combination cold saw cutting off machine, built by the same company, and is sufficiently large to handle most of the new Bethlehem sections. The saw spindle of this machine is 5¾ ins. in diameter, mounted in bearings of an average length of 9¾ ins. on each side of the driving spindle gear, this gear being placed in the center of the spindle to equalize the pressure on the bearings.

The drive is from the pulley shown (which is con-

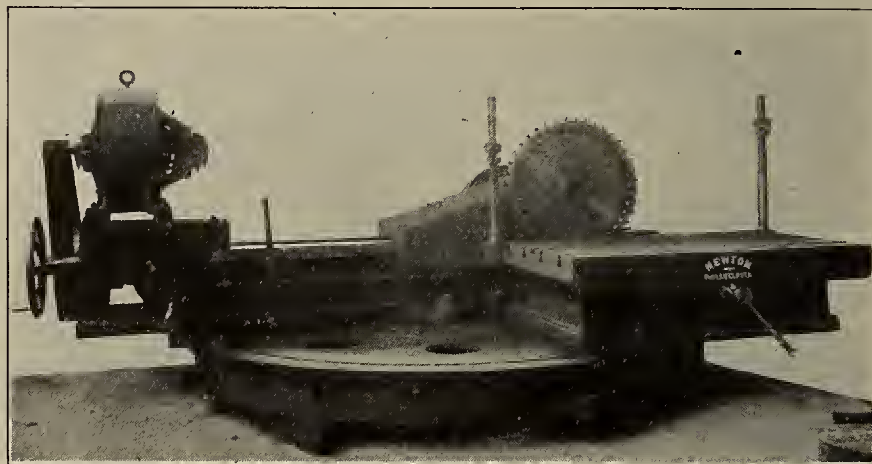


FIG. 1—COMBINED PLANING AND SAWING MACHINE.

nected to the armature shaft by belt or chain drive as desired) through worm and worm wheel and intermediate gearing. This worm wheel is bronzed. The teeth are double lead of steep pitch and the worm is of hardened steel and continually runs in oil. The thrust of this worm is taken by a roller thrust bearing.

The saddle is of massive design, having a larger bearing surface on the bed and has variable automatic friction feed and power quick return. The top work table of this machine is 48 ins. square and can be adjusted sidewise on the bottom table, which has in and out adjustment for convenience in setting the work for correct depth of cut when using the rotary planer head. The bottom table is 67½ ins. long and 47 ins. wide. The V-block has capacity for round stock up to 11½ ins. in diameter. This machine is to be used ordinarily with a 36-in. blade, but has ample power to drive a 40-in. blade, which will be used in the fabrication of some of these new shapes. The floor space occupied by this machine is approximately 14 ft. by 7 ft. The machine, as illustrated mounted on the circular base, has hand circular movement through an arc of 90 degrees, 45 degrees on each side of the center or can be furnished, if desired, with adjustment through an entire circle with the hand adjustment or power motion.

Fig. 2 illustrates machine fitted with pump, piping and attachments for lubrication and the application of same. This machine will require a 10 h. p. motor to drive the saw and a 15 h. p. motor if machine is to be used for rotary planing. The machine is converted into a rotary planing machine by placing a rotary cutter head on the saw spindle.

Milling Machine Attachments

SEVERAL new milling machine attachments, built by the R. K. Le Blond Machine Tool Company, are illustrated and described herewith. The worm and spur gear hobbing attachment is a new device in milling machine construction: The principle involved is analagous to that of the gear hobbing machine, which at present is being introduced quite extensively. This method has the following advantages:

First, a single hob will cut all numbers of teeth of a given pitch; second, the action of the hob, passing through the work, generates the tooth correctly; third, a larger output is obtained by this method, and since the hob is cutting continuously, there is no time lost in returning the cutter and indexing the blank; fourth, in the cutting of worm wheels the hobbing attachment is particularly efficacious, as the preliminary operation of gashing each tooth is entirely dispensed with, resulting in gears being produced in one-fourth or one-fifth of the time—depending upon the gear.

A very fine feed is provided, and the work can be fed into the hob with automatic feed, and tripped when the proper depth of tooth has been cut.

The attachment provides means for connecting the driving spindle of the milling machines with the main spindle of the dividing head, through flexible bevel gear joints and shafts that give positive motion to the dividing head spindle. Various ratios of speed between the two spindles for cutting various numbers of teeth are obtained by quadrant and change gears. The attachmen is bolted to a standard plain dividing head. The upper end is supported by the over-arm of the machine, and the attachment is driven by a gear screwed onto the spindle nose. The splined shaft on the attachment is connected at either end by two pair

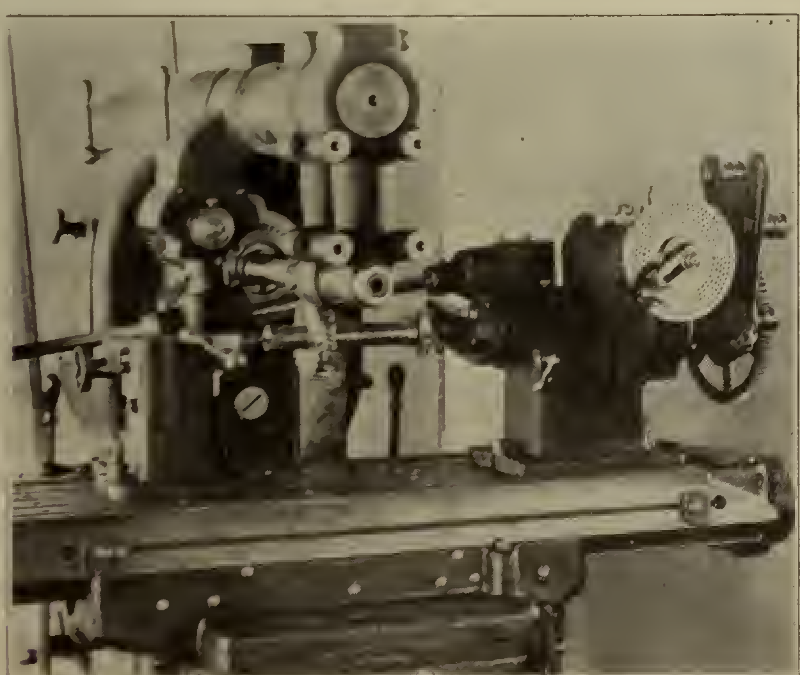


FIG. 1—SHOWING METHOD OF CUTTING A COARSE PITCH WORM OR SPIRAL GEAR.

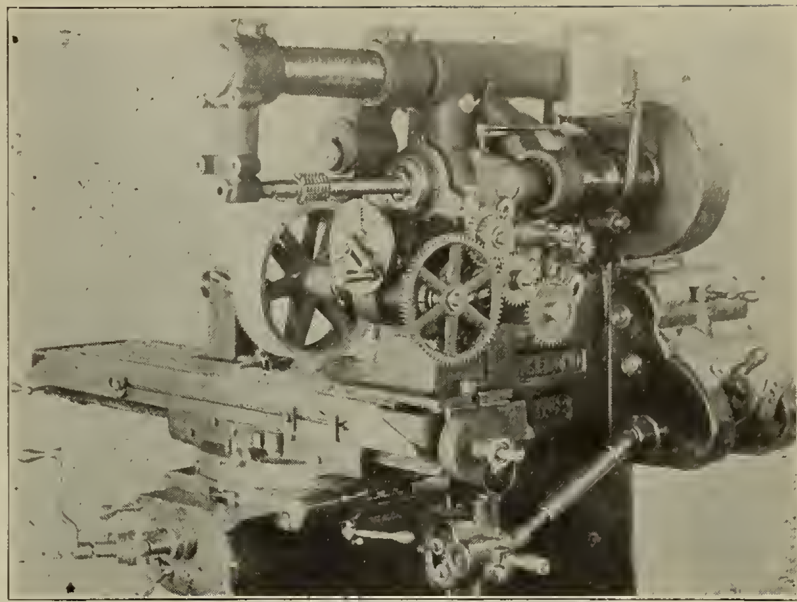


FIG. 2—SHOWING METHOD OF CUTTING LARGE SPUR GEARS.

of miter gears, supported in swivel bearings. This combination makes a universal joint, which, unlike a knuckle joint, transmits motion evenly and positively in any position. The quadrant and change gears are carried on the end of the attachment, and are so arranged that the driving shaft can be connected either directly to the spindle for cutting low-numbered divisions, or through the worm and worm wheel for large numbers of teeth.

A set of compound gears is furnished for reducing the feed about twenty times. The reason for this is that the feed, per revolution of cutter, is in proportion to the number of teeth in the gear. If a spur gear, with sixty teeth, is being cut, and it is desired to feed the work past the cutter at .060 per revolution, it will be necessary to set the feed equal 1/60 of this amount or .001 of an inch to obtain the necessary feed to the table. Change gears are furnished for cutting all numbers from 9 to 100.

The photographs show the attachment in use on various classes of work. Figure 1 shows the method of cutting a coarse pitch worm or spiral gear. The gear has twenty-six teeth, six pitch, quadruple thread, and is 2⅝ ins. in diameter. The attachment in this case is geared direct to the spindle at a ratio of 6½ to 1. The work is fed into the hob with power feed, and when the proper depth is cut, it is automatically tripped. These gears are hobbed complete in twelve minutes apiece. Figure 2 shows the method of cutting large spur gears eight pitch, 102 teeth. The drive in this case is through the worm and worm wheel of the dividing head. Gears 16 ins. in diameter can be cut this way.

The universal spiral gear cutting attachment, shown in Fig. 3, is designed for cutting spirals or worms on the plain milling machine. The swivel movement to the cutter head, which can be turned completely around through an arc of 360 degs., makes it also well adapted for cutting rack, screws, etc. It can be used on universal milling machine for cutting gears of greater angle than 50 degs., such as gas engine spiral gears, which

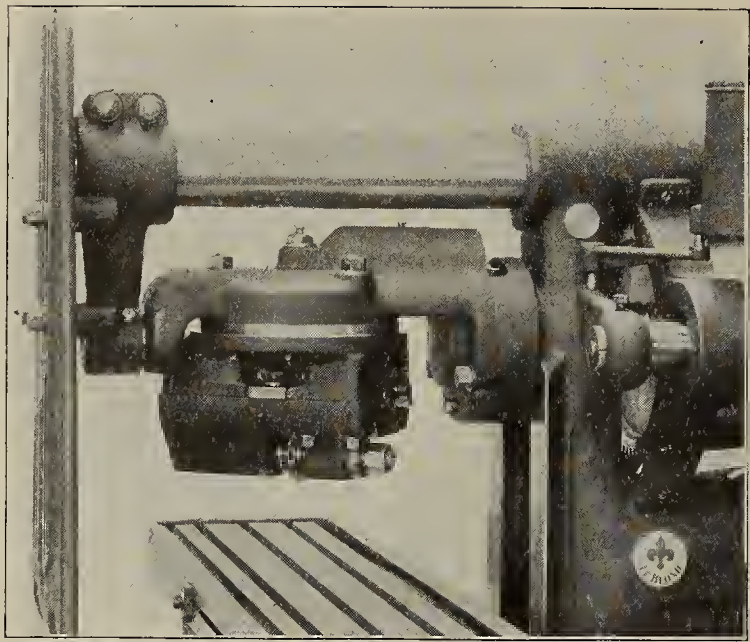


FIG. 3—UNIVERSAL SPIRAL GEAR CUTTING ATTACHMENT

cannot be cut on a universal milling machine, owing to the limited swivel movement to the table. There are several novel features embodied in this design. The attachment is bolted to the column and the outer end is supported by the over-arm of the machine. The drive is from a clutch gear on the spindle, through a series of spur and bevel gears to the cutter spindle. The cutter spindle is carried in a slide which can be adjusted laterly with an adjusting screw. When the required adjustment is made the slide is clamped in position. The cutter is carried central between two bearings. The outer bearing is carried in the removable head so that the cutter can be inserted. In setting the cutter the main slide is adjusted laterally until the center line on the cutter coincides with the swivel axis of the attachment. This is done by first setting the point of the footstock center to coincide with the line on the attachment. and then adjusting the cutter to suit. By this method when the cutter is once set, the attachment can be swiveled to any angle, and the correct relation of the center of the work and cutter is always maintained.

The universal milling attachment, shown in Fig. 4, is so designated because the cutter spindle can be swiveled to any position in a horizontal or vertical plane. Being fully universal it is applicable to a large variety of work,

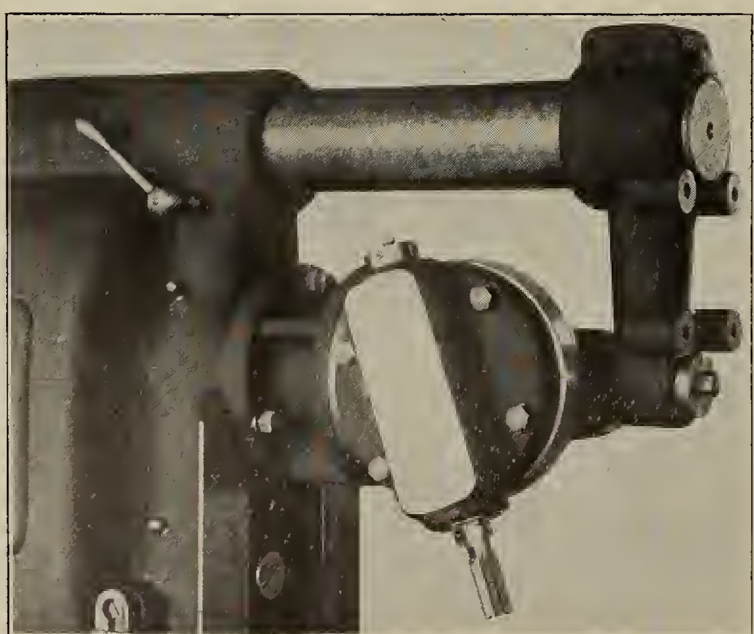


FIG. 4—UNIVERSAL MILLING ATTACHMENT.

such as drilling, milling, key-seating, milling angular slots, rack, etc. The attachment is bolted to the column of the machine, and the outer end is supported by the over-arm. The spindle is driven by a clutch on the spindle through two pair of mitre gears. The front bearing, which is taper, is hardened and ground. The rear bearing is straight and is adjusted by drawing in a taper bush.

The circular milling attachment, shown in Fig. 5, is very compact. The height is condensed as much as possible to give the maximum distance for work when

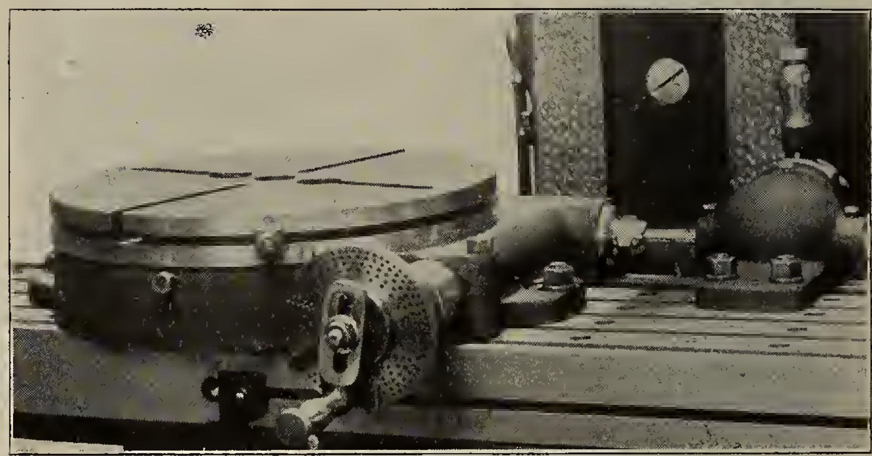


FIG. 5—CIRCULAR MILLING ATTACHMENT.

used in combination with the vertical attachment. The worm wheel, which is large, having 120 teeth, is driven by a worm made solid with the shaft. The worm is carried in an eccentric sleeve by which it can be adjusted into the wheel and thrown entirely out of gear, permitting the table to be turned by hand. The end thrust of the worm is taken against ball bearings. Means are provided for attaching power feed. This is driven by an independent shaft from the feed box of the machine, and does not interfere with the regular feeds to the table, permitting pieces of irregular shape or both straight and circular outline to be milled with automatic feed. The attachment can be operated in either direction, and has trip dogs which automatically trip the feed to a line at any point. The feed is reversed by bevel gears. This attachment is arranged for spacing. The hand wheel can be removed and index plates or sector substituted. Accurate dividing can be done; the same number of divisions obtained as on the standard dividing head. The table is bored taper to receive a plug for use in gear cutting.

Differential Axle Coupler

CONCERNING the Seabrook-Box Differential Axle Coupler, M. H. Mount of the Western Engineering Company gives the following information:

The Santa Fe Railroad is equipping in its shops at San Bernardino, Cal., a 100,000-lb. capacity oil car with the Seabrook-Box differential axle couplers. They are also going to equip a train of thirty 100,000-lb. capacity coal cars, a passenger car, and the pony truck axles on a locomotive and the axles on the tender. A series of tests will be made with this equipment and it is the consensus of opinion that this device will meet all requirements of a differential axle.

This coupler possesses many unique and essential advantages. By putting it in use, it requires no standard parts to be done away with or changed in their manufacture. The old axle will be used, it being necessary only to cut it in two near the middle and remove a small amount of metal to receive the coupling. The coupling consists of but three parts, two sleeves, which are mild steel castings annealed, and a collar which is a steel forging. The entire coupler, when assembled, covers 25 inches in length in the middle of the axle.

For lubrication, graphite is used, which is put into the journal under heavy pressure. There are cavities provided to hold a sufficient amount of graphite. The differential coupling never requires any further lubrication or inspection so it is no more trouble or expense to maintain than the rigid axle now in use.

There is very little motion required in the Seabrook-Box coupling, it being enough simply to adjust the difference in revolution of the two wheels. The journal is 5 ft. by 18 ins. which will stand a working speed of 10,000 periferal ft. per minute. The coupling reinforces the axle and it is entirely under the control of the designer as to how strong he wishes to make it.

Personal Mention

The offices of Mr. M. S. Monroe, master mechanic, Chicago, Lake Shore & Eastern Railway, and Mr. J. P. Callahan, master car builder, have been moved from South Chicago to Gary, Ind., where the new C., L. S. & E. shops have been built.

Mr. Geo. J. Duffey has been appointed assistant master mechanic of the Lake Erie & Western, with headquarters at Lima, O.

Mr. F. H. Reagan has been appointed assistant superintendent shops, Collinwood, O., Lake Shore & Michigan Southern, vice Mr. A. R. Ayers, promoted. Mr. B. F. Kuhn has been appointed general foreman, Collinwood shops, vice Mr. F. H. Reagan, promoted. Mr. W. S. Jackson has been appointed enginehouse foreman, Ashtabula, vice Mr. B. F. Kuhn, promoted.

Mr. G. W. Foster has been appointed general foreman, Lake Erie, Alliance & Wheeling, with headquarters at Alliance, O., vice Mr. W. S. Jackson, transferred.

Mr. J. E. Hickey, master mechanic of the National Lines of Mexico, has been appointed superintendent of the Mexican Central shops at Aguascalientes, Mex. Mr. Hickey succeeds Mr. G. F. Filton, who has been assigned to other duties.

Mr. A. J. Wade has been appointed master mechanic of the Louisiana & Arkansas at Stamp, Ark., succeeding Mr. F. A. Symonds, resigned.

Mr. J. T. Robinson, master mechanic of Seaboard Air Line at Savannah, Ga., has been transferred to Jacksonville to take charge of the new shops at that point. Mr. Robinson will succeed Mr. H. P. Latta, and will in turn be succeeded by Mr. J. W. Sasser, general foreman of the shops at Raleigh.

Mr. D. E. Meyers has been appointed foreman of the motive power and car departments of the Louisiana & Arkansas, with office at Minden, La.

Mr. Allen Vail, master mechanic of the Buffalo and Allegheny divisions of the Pennsylvania R. R., has retired from active service under the pension rules of the company. Mr. Vail will be succeeded by Mr. J. H. James, master mechanic at Olean, N. Y.

Mr. J. T. Connor, general foreman of the Houston & Texas Central at Ennis, Tex., has been appointed acting superintendent of motive power and machinery in place of Samuel Millican, deceased.

Mr. J. F. Schneider has been appointed foreman of the machine shop of the Texas & Pacific at Marshall, Tex.

Mr. William Daze, road foreman of engines of the Atchison, Topeka & Santa Fe at Winslow, Ariz., has been appointed master mechanic at Winslow. Mr. C. C. Reynolds succeeds Mr. Daze.

Mr. D. D. Robertson has been appointed master mechanic of the Wyoming division of the Lehigh Valley, succeeding Mr. A. M. Gill, promoted to general inspector of motive power and rolling stock.

The following appointments have been made on the Missouri Pacific-Iron Mountain: Mr. F. K. Tutt, master mechanic at St. Louis, in place of Mr. J. J. Reid, resigned; Mr. M. M. Myers, master mechanic at Osawatomie, Kan., in place of Mr. Tutt, transferred; Mr. P. J. Contrath, promoted to master mechanic at De Soto, Mo., in place of Mr. M. M. Myers, transferred.

Mr. C. F. Smith has been appointed master mechanic in charge of all steam and electrical equipment of the Tombigbee Valley, with office at Calvert, Ala. Mr. Smith for the last three years has been special representative for the Cataract Refining Co., Buffalo, N. Y.

Mr. T. P. Dunham, foreman of the Hollidaysburg shops of the Pennsylvania, has been transferred to Roundhouse No. 3 at Altoona.

Mr. P. C. Staley, foreman of the Mifflin shops of the Pennsylvania, has been transferred to the Altoona car shops. Mr. E. H. Newberry, assistant engine house foreman at Derry, Pa., succeeds Mr. Staley.

Mr. R. D. Smith has been appointed master mechanic of the Canadian Pacific, at Medicine Hat. The position of road foreman has been abolished.

Mr. J. E. Muhlfeld, general superintendent of motive power of the Baltimore & Ohio, has resigned to take service with another company. Mr. J. D. Harris, manager of the Pittsburg works of the Westinghouse Air Brake Co., has been appointed to succeed Mr. Muhlfeld. Mr. Harris was formerly with the Baltimore & Ohio, having occupied the position of assistant to general superintendent of motive power in

1901-03. His early railroad experience was with the Pennsylvania R. R. rising to the position of master mechanic at one of their important shops, from which position he resigned to enter the service of the Baltimore & Ohio.

Mr. W. J. Spearman has been appointed general foreman of the Missouri Pacific and St. Louis, Iron Mountain & Southern, with office at Kansas City, Mo., succeeding Mr. A. Hewitt, assigned to other duties.

Trade Notes

The American Blower Co., Detroit, Mich., closed a large number of important contracts between the 1st and 24th of November. These contracts include 3 special dryers, 5 brick dryers, 2 steam traps, 4 tilting traps, 18 engines, 17 installations of forced draft apparatus and 3 induced draft, 46 installations of heating and ventilating apparatus, etc.

Mr. John L. Walker, formerly auditor for The Buda Foundry & Manufacturing Company, has resigned to accept a position as manager of the "Use-Em-Up" Socket Department of the American Specialty Company, Chicago, Illinois.

The Independent Pneumatic Tool Company, Chicago, advises that the sale of Thor pneumatic tools and appliances during the month of October, 1908, showed an increase of 25 per cent over any other month during the present year. A large number of orders were received from railroads, foundries, machine shops, and boiler and iron works, indicating a steady increase in this line of business.

Mr. Edward Elden, formerly master mechanic of the New York Central Lines at Buffalo, N. Y., has associated himself with the Dodge Manufacturing Company, Mishawaka, Ind., as chief of sales of their railroad department. The many friends of Mr. Elden in both railroad and supply business will be pleased to learn that he has connected himself with this reliable firm.

The Hanna Engineering Works, Chicago, issued a third edition of catalog No. 3, which contains excellent descriptions of all types of Hanna riveters, reamers, shakers, etc.

The C. W. Hunt Company, New York, issued a pamphlet on "Stevedore" manila rope for the transmission of power, pile driving, hoisting, etc.

The Brass Founders' Supply Company, Newark, N. J., issued a new catalog on equipment and supplies for the modern brass, bronze, aluminum, iron and steel foundries.

The Buffalo Forge Company, Buffalo, N. Y., issued a large catalog on the Buffalo fan system of heating and ventilating, giving a general description of the various systems as well as a scientific treatment.

John F. Allen, New York, has made recent sales of a riveter each to the National Tube Company, Lorain, Ohio, and the C. & O. R. R., Richmond, Va., also Acme Harvesting Machine Company, Peoria, Ill.

The H. W. Johns-Manville Company, New York, is placing on the market a compound for repairing iron and steel under the name "Leak-No-Metallic Compound." Leak-No is a chemical compound resembling powdered iron. When mixed with water and applied like putty to defects in iron or steel articles, the manufacturers claim that it metallizes and becomes a permanent part of the article to which it is applied. In color it very much resembles iron, when hard.

At a meeting of the directors of the Barney & Smith Car Co., on Nov. 10, Mr. J. D. Platt, who for many years has held the presidency of the concern, resigned, owing to ill health, and Mr. A. M. Kittredge was elected to fill the vacancy. The latter has been prominently identified with the company for some time.

The Lima Brake Shoe Co., Lima, Ohio, has increased its capital from $10,000 to $25,000.

The Sheffield Car & Equipment Co. is adding to its plant at Kansas City, Mo., a new car repairing and rebuilding department. The two new buildings, which are 70x90 feet, are completed and ready for machinery, and the company will make a specialty of rebuilding freight cars for which it will have a capacity of 300 a day.

The Illinois Car & Manufacturing Co., Chicago, Ill., has been incorporated with a capital of $100,000 to engage in general manufacturing business. The incorporators are P. H. Joyce, George J. Kuebler and P. J. Finnegan.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has taken over the sale and manufacture of Wolff truck side frames, which were formerly handled by the Wolff Truck Frame Co. of Chicago.

The Kellogg Car & Equipment Co., Kankakee, Ill., has a contract for repair work which includes 100 cars for the New York Central Lines.

The Patent Financing & Manufacturing Co., Tacoma, Wash., has been incorporated to assist local inventors in placing their inventions on the market.

The Galena Signal Oil Co., Franklin, Pa., reports an increase in orders, necessitating a plant at New York to handle foreign business.

Mr. A. H. Sisson, general manager of the St. Louis Car Co., St. Louis, resigned to become general manager of Forsyth Brothers Co., Chicago.

The Union Malleable Iron Co., East Moline, Ill., reports a large increase in business recently.

Mr. Benson E. Brown has resigned as vice-president and manager of sales of the J. B. Sipe Co., Pittsburg, Pa., and has been elected president of the Regal Paint & Oil Co., 475 Trombley avenue, Detroit, Mich., which makes railroad paints, oils and varnishes.

The Joliet Railway Supply Co., Joliet, Ill., has been incorporated with $50,000 capital by Messrs. C. W. Brown, Frederick A. Jackson and Fred Bennett.

The Asbestos Protected Metal Co., Canton, Mass., has recently filled orders for material to be applied on structures along the right of way of the Atlantic Coast Line at Jacksonville, Fla., Lakeland, Sanford and Florence, S. C.

The General Railway Supply Co., Chicago, has received contracts for its National steel trap doors for 15 cars for the Central of Georgia to be built by the Pullman Co. and for four cars for the Colorado & Southern to be built by the Pullman Co.

Williams, White & Co., Moline, Ill., have established an office at 808 House building, Pittsburg, Pa., in charge of Frank Ryman. Mr. Ryman was formerly connected with the Oliver Iron & Steel Co. and has had many years' experience in the forging machine business.

The Ritter Folding Door Co., Cincinnati, Ohio, has the contract for the erection of Ritter folding doors in the new freight depot of the Baltimore & Ohio at Gary, Ind.

During the past year the Joseph Dixon Crucible Co. has completed three extensions to its several factory buildings in Jersey City, N. J. This work was planned before the business depression and completed, while business was slack, in anticipation of the revival of business.

The Philadelphia office of the Ridgway Dynamo & Engine Co., Ridgway, Pa., has been moved from the Girard building to 1017 Witherspoon building, and put under the management of Mr. Robert S. Beecher. The company is now making additional lines of side crank engines.

The National Paint Works, Williamspoint, Pa., has just shipped C. & O. standard silver gray paint for the bridge over the Kanawha river at Charleston, W. Va., being constructed by the American Bridge Co. for the Kanawha Bridge & Terminal Co.