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VOLUME TWENTY-THREE

FROM JUNE TO DECEMBER, 1899
INCLUSIVE

RAILWAY
MASTER
MECHANIC

DEVOTED TO RAILWAY MOTIVE
POWER, CAR EQUIPMENT,
SHOPS, MACHINERY AND SUPPLIES.

WALTER D. CROSMAN, Editor

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*Articles marked with an asterisk are illustrated.

PERSONAL MENTION.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

Vol. XXIII. CHICAGO, JUNE, 1899. No. 1

THE LIVEST QUESTION, perhaps, that is to come before the convention at Old Point Comfort is that of meeting the M. C. B. coupler situation; but there is no great promise that it will be effectively met. The problem is still too great for ready solution. It was somewhat generally expected that the Western Railway Club Committee report would help to precipitate matters by calling spades spades; but it was evidently deemed inexpedient to do this, and thus this expected aid fails, although that committee did make a suggestive report—one that should prove fruitful. The M. C. B. committee to report at Old Point Comfort will, without doubt, be pointed in its recommendations; but still the great evil—multiplicity of patterns—will probably be left to menace us when the association in convention gets through, for this year, with the topic. The net result of the year's agitation, to be closed this month, will, however, unquestionably be the distinct advancement of the problem toward its final solution in at least two ways; first, a more general insistence upon the purchase of couplers under strict specifications as to physical tests, and, second, a wider adoption of methods of gaging for wear, and distortion, in service. A contributor to our columns this month urges the machine fitting of the working parts of couplers—this must also come. A speaker at one of the Western Railway Club meetings urged oiling the parts—this may also come. It has been urged that the association should appoint a standing committee on M. C. B. couplers, and this, we have reason to believe, will be done.

Opponents of the M. C. B. coupler have voiced, and re-voiced their views, and with a considerable superficial show of strength. But, as far as we can judge, their points of objection have been quite fully disposed of by authoritative facts and opinions published from time to time—perhaps never quite so comprehensively and exhaustively presented in compact compass as in Mr. Garstang's report on the subject which we quoted in full in our issue of April, 1899.

The fact is that we really have a device admirably adapted to its purpose, in the M. C. B. type of coupler. Wherein it has developed certain inherent faults it has been, or is being, improved and brought nearer to the sought-for perfection; but as to the occasions of the greatest reproach against the type, viz., breakages, and partings due to wear or distortion, nothing can be done until insistence is made that contour lines be followed, that the best metal be furnished, and that this metal be given its best distribution. The rigorous use of drop and pulling tests at time of purchase, and of contour gages at that time and during service, to determine wear limits, is essential. This policy only can result happily with the present situation, gorged as it is with nearly 100 different patterns, and almost as many makes of couplers. But were this policy to be followed up closely we would find ourselves up against the hardest proposition of all—that of price. It should be remembered, throughout all discussions of the M. C. B. type of couplers, that it is not possible to make a silk purse out of a sow's ear.

A RESEARCH LABORATORY, proposed by implication at least, to be established under the auspices of the Master Mechanics' Association, is all very fine in theory; but viewed from a practical standpoint it seems hardly the thing. Years ago, before the full establishment of private testing laboratories on a basis of recognized authoritativeness, and before we had our Purdue, Cornell, Illinois and Columbia University testing plants, and before our large railway systems had fully developed their testing plants, there was good reason for a laboratory to be established and maintained under the auspices of the association. But now we seriously question the advisability—even the necessity—of such a step. We understand that plans are in the minds of some to cause the association to finance the establishment of a research laboratory. One of the arguments in favor of this plan that has been advanced, is that tests made under such auspices would possess a rarely high degree of authority. But the question arises, Who will direct and who perform the work of such a laboratory? Those acquainted with the inner workings of the association are well aware that it is extremely difficult to get members of the association to attend to even ordinary committee duties. All members are very busy men, in the discharge of their own immediate duties. They could not undertake to habitually participate in tests with the thoroughness which they would wish to attach to work which was to bear the stamp of the association. Would it not be better to take available funds, or funds that might be raised, for such purposes and apportion them to the universities that are equipped for research work? Purdue and Columbia have experimental locomotives, Illinois has a dynamometer car, all have working physical and chemical laboratories. If a bit of road testing of locomotives be desired, give it to Illinois; if shop locomotive testing be desired give it to Purdue or Columbia; if any of the wide range of experimental investigations of materials and appliances be desired, give the work to any of the universities equipped to carry them out. Appropriate a given sum for the work, to cover power, fuel, materials, etc., place it in the hands of a small committee—a committee of one is preferable—and instruct the committee to take up its work in conjunction with the university best located or best equipped for the purpose in mind. The university will be found more than glad to give the time, industry and brains of its bright young men to the actual work of conducting and recording the tests, asking only that actual money outlay be defrayed; the committee man or men will be delighted with the facilities placed at their disposal for original work, and the final reported results will, issuing from the association, carry all the weight that they would if the work upon which they were based were performed in an association laboratory.

DYNAMOMETER CARS are now well recognized as very desirable, if not absolutely essential, features of the equipment of the modern railway. It is quite certain that the benefits to be derived from a judicious use of such cars are being appreciated more year by year, and in proof of this we may say that four or five railway companies are, at the present moment, working on designs for dynamometer cars. The latest design that we know of, as having been practically placed in service, is that of the University of Illinois, and this we describe elsewhere in this issue. It is the presentation of this particular design that occasions the offering of some few remarks upon the subject of dynamometer cars in general.

The first question which arises when considering the design of a dynamometer car is: What means shall be provided for measuring the drawbar pull? Some have selected the cylinder and piston and others have chosen springs, but it is probable that a larger number have chosen springs. There are quite a number of advantages to be had from the use of an oil cylinder, such as is used in the Illinois University car; for instance, the recording apparatus and the attachment to the measuring apparatus can be made quite simple and neat, and by draining the cylinder the dynamometer mechanism can be relieved entirely of the buffing and pulling strains when the car is not in use. The most persistent objection raised to the use of a cylinder is that the friction between the piston, which is generally packed with leather, and the walls of the cylinder, is very great sometimes, and quite variable in amount. Errors may also, of course, creep in when springs are used, but it is believed that the errors are not as variable in nature, or changeable in amount, as are the errors resulting from the use of a cylinder. In other words, the errors of a spring, having been determined, may be assumed, until tests made at reasonable intervals show otherwise, to remain constant. The difficulty which arises from the use of springs is that it is impossible to provide without great expense, if indeed at all, springs to the capacity required which will give the same amount of motion for equal increments of load when the load is increasing as when the load is decreasing. The weighing levers, probably the most approved form of measuring apparatus, require springs, but these are so small that they can be graduated much closer. Springs arranged tandem, in such a manner that one is relieved when the other is compressed, tend to correct the errors of single springs and at least one car under construction will be so arranged.

An idea about dynamometer cars that appears to be quite general is that these cars measure the pull and push in absolute pounds, and that a certain number of pounds pull recorded by one car exactly corresponds with the same number of pounds pull recorded by another car; but it is safe to say that the readings from no two cars in use today can be, on such a basis, compared. This may seem to be a rather strong assertion, but it is undoubtedly true. This need not be discouraging, however, because it is very seldom that it is desired to compare the records made by one car with those made by another; the greatest utility of a dynamometer car will be obtained in comparing the records made with various trains and locomotives by the same car.

In referring to the "judicious" use of dynamometer cars, in opening these notes, we used the word judicious advisedly, because a dynamometer car can be made a great nuisance to the operating department; and once the opposition of the operating department is aroused the car might almost as well be provided with permanent storage space. The car must have the good will of the operating department and to gain such good will, the officers of this department must be interested in the work done with the car and be provided with the reports of the results obtained. The work to be done should be carefully systematized and arranged and those interested should be provided with an outline of the work to be done, the manner of doing it and the benefits to be derived from the data to be obtained; then if the time occupied in getting the data is not too long everybody will be left in good humor. Much of the work done by a dynamometer car is of great assistance to the operating department, but on account of the necessity of having trains carefully weighed and their time on the road carefully arranged, this department suffers the most inconvenience when the car is at work; if, however, the operating department is given full benefit of the tests, its good will is sure to follow and much friction be avoided. To put it tersely: get reliable data with your car as quickly as possible, make a thorough report as early as possible, and furnish a copy of that report to everyone on the road who is, or ought to be, interested.

THE extent of the current migration of mechanical men to the East has become something almost appalling. Among those who have gone East of late are Waitt, Brazier, Fitzgibbon, McIntosh, Chambers, Turner, Canfield, and Fildes. And not so very long before them went Herr, Lewis, Apps, Morse, Hawthorne, Symons, Roberts, and McNaughton. And rumor has for some months past been busy with still another prominent change of this nature. It may not be profitable at this time to follow up a query as to what it all means; but at all events it illustrates very strongly the old saying that the tenure of office in railway service is very uncertain. Take the past year's history for instance. We do not recollect a single period that has been marked by so many changes in the mechanical staff of our railways as has been the twelvemonth since last June. A hasty glance through our files substantiates this impression, for, since May, 1898, we have recorded in our personal columns almost 400 changes. Of course the large proportion of these were among the subordinate officials, but among those bearing the titles of chiefs there was a very large number of recorded changes.

Locomotive Progress.

During the past year our locomotive works and railroad shops have been busily employed, and the large product of so many establishments has given abundant opportunity for development and improvement in locomotive design.

In 1898 the locomotive contract shops of the United States built 1,875 locomotives, the largest number since 1893, when over 2,000 were built. The smallest number in the interval was 695 in the year 1894. The production in 1898 was 50 per cent greater than the previous year, and that of the present year promises to far exceed any year in the past decade.

The number of compounds built in 1898 was 373, or 20 per cent of the total, a much larger proportion than in previous years, and this proportion is steadily growing. Notwithstanding the gigantic dimensions of the locomotives described in our review last year, the American locomotive continues to increase in size and weight. In some instances the clearance limits have been so nearly reached that changes in design are required to avoid interference; and rail pressures have far exceeded the limits which were for years fixed as the maximum.

Up to last June the largest locomotives we had to record were the Pennsylvania Railroad mountain helper consolidation, with simple cylinders 23½x28 inches, 56 inch wheels and a total weight of 218,000 lbs.; and the Brooks twelve-wheel engine for the Great Northern, with cylinders 21x34 inches, and a total weight of 212,-000 lbs.

These dimensions have since been exceeded by the Pittsburg consolidation for Carnegie's Union Railroad, which has cylinders 23x32 inches, 54 inch wheels, a weight on drivers of 208,000 pounds, and on truck of 22,000 pounds—a total weight of 230,000 pounds, or 115 tons. The total weight of this engine and tender ready for service is 334,000 pounds. The boiler is 80 inch diameter; its heating surface 3,322 square feet, and its tractive power 53,300 pounds.

The Baldwin Works have built very large consolidation engines for the Lehigh Valley—one a pusher, guaranteed to handle 1,000 tons of train at an average speed of 17 miles per hour on a grade 62 feet per mile, 20 miles long. The drivers of this engine are 55 inches diameter; the Vauclain compound cylinders are 18 inches and 30 inches diameter, and 30 inches stroke. Its boiler is 80 inches in diameter, and has shell sheets ⅞ inch thick. There are 511 2 inch tubes and the heating surface is the largest of which we find any record, viz.: Firebox, 215 square feet; tubes, 3,890 square feet; total, 4,105 square feet. The weights of this engine are: On drivers, 202,232 pounds; on truck, 22,850 pounds; total, 225,112 pounds; total weight of engine and tender, 346,000 pounds. The weight per driving wheel is 25,300 pounds. The other large consolidations for the Lehigh Valley are intended for road service, and are remarkable for the size of the driving wheels, which are 62 inches, the largest ever used in this type of engine. The driving wheels are all flanged, and the total driving wheel base is 16 feet 3 inches. Two engines to these general dimensions have been built, one with Vauclain compound cylinders 17 inch and 28 inch diameter and 30 inch stroke, and one with simple cylinders 21x30 inches. The boiler pressure is 200 pounds, and the maximum draw bar pull, 60,300 pounds. This can only be exerted on a dry rail, as the coefficient of adhesion required will be nearly .30. These engines will handle 2,000 tons of train on a grade 21 feet per mile.

Another interesting example of a large freight engine is the compound consolidation built by the Schenectady Works for the Southern Pacific. The cylinders of this engine are 23 inches and 35 inches, with 34 inch stroke. The low pressure cylinder with a diameter of 35 inches, is, we believe, the largest yet used with the exception of those on the Mastodon engines for the same road, and the Baldwin two-cylinder engines for the Norfolk & Western. The latter are worked with 200 pounds boiler pressure, while that on the latest engines for the Southern Pacific is 220 pounds.

It is instructive to notice that all recent heavy freight locomotives are of the consolidation type. The fear of excessive rail pressures which led to the introduction of Mastodon or twelve-wheel engines, has gradually given way to the more advantageous use of heavy wheel weights by placing the largest proportion on drivers. While the Mastodon engine had but 80 per cent of its total weight on drivers, the new consolidations have 90 per cent.

Not only a consideration of rail pressures, but the necessity for greater heating surface, has in the past led to the construction of heavy ten-wheel engines for freight service; but a change is now taking place in favor of the Mogul engine. In two recent examples of ten-wheel and Mogul engines, each having a total weight of 142,-

000 pounds, the ten-wheel has only 76 per cent of this weight on drivers, while the Mogul has 86 per cent, and the latter has the greatest amount of heating surface.

For freight service the pony truck is the most suitable for either six-wheel or eight-wheel connected engines, and we believe that the Mogul and consolidation types will more largely prevail in the future.

The general practice heretofore with each of these types has been to use plain tires on the middle wheels, as this was thought necessary, to allow the engine to curve easily; but the tendency of recent practice is to flange all drivers, as it is found that the engine tracks more steadily and the flange wear is not so rapid. While a given amount of tire steel may be worn off in holding the engine to the track, if this is divided among eight tires it will evidently be less per wheel than if the whole curve resistance is met by four flanges. It thus appears that with all tires flanged the wheels be kept in service a much longer time between turnings.

This subject has been frequently discussed by the Master Mechanics' Association, and while no definite conclusions have been arrived at, and theoretical treatment has not made the way plain, yet practical experience is steadily showing the advantage of flanged tires on all wheels of six and eight wheel connected engines.

For fast passenger service the "Atlantic" type of engine has rapidly grown into favor, and the Baldwin Company has already built 70 of them. These engines are now operating under the most severe passenger requirements in this country. The new fast mail engines on the Burlington are notable examples of this style of fast passenger engine. The wheels are 84¼ inches in diameter; the cylinders are 13½ and 23 by 26 inch stroke—the largest of the Vauclain compound cylinders thus far made for passenger work. The tubes are 2¼ inches in diameter, and unusually long—16 feet. The total heating surface is 2,510 square feet.

The frames of some of the largest engines have been slotted out of solid steel slabs, while others are made of cast steel.

The use of cast steel for locomotive details is still extending and now includes guide yokes, dome tops and even fluted side and main rods.

In order to get greater power when the engine is under way and cut-off shortened, the cylinder ratio to weight on drivers is increasing and in some engines built this year has probably exceeded proper proportions. The Master Mechanics' recommended practice—$\frac{1}{4.25}$—

is equal to 23 per cent. Ordinary practice is 25 per cent, while some recent engines have 27, 29 and even 30 per cent as ratio of maximum cylinder power to weight on drivers.

With cylinders of large diameter increased power is obtained with some advantages by longer stroke. In this way the wider clearances are not required, the weight of reciprocating parts are but slightly increased, and the stresses in them reduced for a given cylinder power. Claims for economy by better steam distribution in long stroke locomotives, are made by some, but they are not well sustained.

The working pressure of locomotive boilers is now as high as 220 pounds, and plans are maturing for boilers to carry 250 pounds. With 200 pounds pressure the friction of large slide valves is a troublesome matter, resulting in broken valves, valve stems, rocker arms, eccentric rods, and eccentrics. The best remedy for such troubles is the use of piston valves, and we find them getting into more general use on recent locomotives, both simple and compound. The Baldwin Company was the first successful pioneer in this direction, and the Brooks Works have turned out quite a number of piston valves in the past two years. The Schenectady Company is now filling a considerable order for simple and compound passenger and freight locomotives which will all have piston valves.

Previous experiments with piston valves in the old times were made with valves of small diameter, but when taken up again in recent years they were made as large as 10 inches in diameter, and have now reached 14½ inches in diameter—a size equal to the cylinders of 25 years ago.

High boiler pressures have also required an increase in thickness of shell sheets so that ⅞ inch sheets are now used on the larger boilers. In marine practice shell sheets are now used having a tensile strength of 74,000 to 82,000 pounds, an elastic limit of 40,000 pounds, and an elongation of 21 per cent in 2 inches. Steel for rivets, stays and braces, of about the same strength, is used in the same practice. When it is desirable to reduce weight and increase the size of locomotive boilers it seems possible to do it with steel of a quality as above described, and it will doubtless be so used during this busy and progressive year.

American builders are now turning out locomotives for English and French railways, and we trust that the details of these engines will be fully illustrated in our railroad journals. There are certainly some features of these engines which could be used to advantage on

American roads. The journals and bearings on foreign engines are usually of good design, and the lubricating features superior to the common American practice. Such opportunities for a study of foreign practice in locomotive design should not be lost.

Ash-Pan Dampers, or Stack Lids?

There appears in another column of this issue a communication from a correspondent who argues that sufficient care is not taken to properly fit ash-pans below the furnaces of locomotive boilers, and who further argues, in effect, that were more pains taken to make tight joints throughout the pans and tight connections with the lower parts of the fireboxes there might result much saving of fuel. Our correspondent closes his argument with the "fling" that he is not "talking through his hat," so it may be appropriate to present the opinion that the reason he is not "talking through his hat," is because his "lid is off;" and we will make an effort to show that if he puts on a "lid" he will not find it necessary to worry over open ash-pans.

The communication starts out well in presenting the idea that a damper is an air valve, and that unless a valve is tight it is useless. But the succeeding arguments for tight dampers show either that the correspondent is not familiar with road conditions or that he is trying to shield the locomotive crews.

A damper, or a valve, is a first-class device if it is properly constructed, properly located and properly manipulated. Referring to the construction, we would say that it is essential, first, that the fluid, the flow of which is to be regulated by the valve, should be properly enclosed in that passage or space the flow to which, or from which, is to be regulated, so that the proper manipulation of the valve will regulate, always, the flow. It frequently happens that the flow can be controlled just as completely by placing the valve in the *escape* as in the *intake;* and it is the intention to present arguments here to the effect that this is true of the flow of air through locomotive furnaces and tubes. It is true that, in America, the attempt has been general to regulate the flow of air *to* the furnace, and under these conditions it is essential that the ash-pan be tight and the dampers properly fitted, kept in good working order and properly manipulated.

Our correspondent assumes, evidently, that the draft should be regulated at the intake, by the ash-pan dampers, and then argues that the pans and dampers should receive better attention in the shops. Starting with such assumption his arguments are correct as far as they go, but he says nothing about the manipulation of the dampers by the locomotive crews; and it is this omission which leads us to suspect that either he is not familiar with the road practice of locomotive crews or, if he is, he tries to shield the men.

The manipulation of the dampers is the duty of the fireman, and it is all but impossible to get the engineer to give orders to the fireman; the result is that the ash-pan dampers are opened and left open, and whether the ash-pan is otherwise tight or not does not matter under such circumstances. An impartial presentation of the facts requires it to be said that the firemen are not always to be blamed for this apparent apathy and for their inclination to regulate the steam pressure with the injector and the furnace door, because, for one reason, the location of the damper levers is not uniform. On some locomotives the left lever regulates the front damper, and on others the right lever regulates the front damper, and there may be even greater variations, so that in these days of locomotive and crew pools and long lists of extra men, the men getting a different class of locomotive each trip, it generally happens that if the fireman wants to manipulate one damper he must operate one lever and then lie down in the gangway so that he can look under the deck and see if he has moved the right damper. Under such circumstances it is but natural that he resort to the methods standard on every locomotive—the manipulation of the furnace door and, until the boiler is full, the injector, and, after the boiler is full, open the pop.

And what would our correspondent say of the practice on some roads of cutting large holes in the sides of the ash-pans and covering the same with nothing but netting—the netting being used solely to prevent cinders and hot ashes dropping out and setting fires.

All the difficulty and worry which forms the basis of our correspondent's arguments, and of the foregoing, result from what we believe to be the mistaken idea that the draft through the furnace can be regulated only at the *intake*—the ash-pan. As the gaseous products of combustion must escape through the stack, why cannot the draft be regulated just as completely by placing the valve in the *escape*—the stack? It is believed that it can be, and that if our correspondent will put on (the stack) a "lid" he will find that the lack of the "lid" prevented him "talking through his hat." This leads to the second proposition made, viz.: that the valve should be properly located, and to the reasons why the stack is the proper place. The best reason is that it is much easier to provide a tight valve in, or on, the stack because the passage to be controlled is smaller, and a tight valve is an essential to thorough control. Moreover, a valve on the stack could be made to be conveniently operated by the engineer or fireman, and as the engineer should be the responsible party, it would be well to have the operation so arranged. Such a location of the valve would necessitate directing the exhaust from the air pump somewhere other than up the stack, and this would result in even greater economy. Such valves, or lids, are used in Europe; they have been tried in America by covering the stacks while the locomotives were standing, under steam, at division points; we have reports from only the latter, and these reports are most satisfactory.

The third proposition was, that the valves, or dampers, should be properly manipulated; in the foregoing we have presented as a fact that the present ash-pan dampers are not properly manipulated, even when other parts are tight, and it is believed that this cannot be successfully controverted. It is believed that a damper in, or on, the stack would be operated just as frequently as the present ash-pan dampers are and it would certainly be much easier and cheaper to make a stack damper tight and easily operated than to make a tight ash-pan and provide tight ash-pan dampers.

Car Construction for a Year.

The review of the progress made in car construction which we gave last June began with a reference to the unusually fine passenger car equipment which various roads had purchased during the previous year; and it may be appropriate to refer to the passenger car equipment this year, also, even though there is not so much to be said about it now as then. The elegance of this class of equipment has been well maintained in many instances, but there have not been so many "startling effects" as during the previous twelve months; this may be due, largely, to the fact that equipment has not been purchased for so many important trains. However, one innovation has crept in, and no doubt before many years the same will be considered a necessary feature of all first-class equipment; reference is made to the ladies' "retiring" room, let us not say smoking room (but who can tell to what uses these rooms may finally be put?). The broad vestibule is a fixture, and many roads are making special effort to get even some of their older equipment provided with this recognized necessity. There have been some improvements even in broad vestibules, and one of these is so simple and useful that it is surprising it was not thought of and provided before, viz., the doors, or sometimes curtains, at the ends, so that when closed at both ends of a train, both ends are protected from dust.

Heretofore pressed steel construction for cars has been confined to freight equipment, but it is believed that there is a very good field for it in passenger car construction, not so much in the body of the car as in the trucks. A six-wheel truck is a necessity for heavy cars, or heavily loaded cars, in fast service, and while it is true that this type of truck has been provided frequently for cars really not requiring one so heavy, nevertheless there is a large number of cars which should be provided with them. The six-wheel truck, as now generally constructed, is extremely heavy, and anything that will lessen the weight of fast trains must receive favorable attention, so it is believed that here is a legitimate field for the pressed steel companies. Already this subject has received some attention.

There have been a few new ideas in freight equipment, but generally there has been a tendency to permit the newer designs to seek their level and to allow an opportunity for the less fit to disappear and the fittest to survive. Probably the newest idea is the box car of 100,000 pounds capacity, and this is so new that whether or not it will be favorably received must be left for noting in a future review. The 100,000-pound gondola is generally accepted for what may be called "special" loading, but it is believed that the 80,000-pound gondola is in favor for general loading.

Railroad managers appreciate that it is very important to decrease the empty-car-mileage, and they have instigated changes in cars for special service to adapt them to other service; one of the best illustrations of this is the provision by which the upper deck of a double-deck stock car may be raised when freight other than sheep or hogs is to be transported. The double-deck stock car has always been an unsatisfactory car to manipulate on account of the obstruction offered by the upper deck. The removable upper deck is not a new idea, but it seems to be again engaging favorable attention.

There is a tendency in the direction of longer cars which, if maintained, will cause a readjustment in the car-load rates if such cars are offered in interchange. Some roads are building flat cars of extra length for traffic on owner's line and, of course, objection cannot be made to this, but when gondolas sixty-six feet long are offered in interchange, the subject of the length of cars is likely to receive some active consideration. With the increase in the capacity of cars generally, it is believed that the increase in length will first receive attention and that a similar review twelve months hence may place the average length of new cars at forty feet.

It is hardly possible to conclude a review of this kind without reference to the combinations—the car combination, the pressed steel combination, the railway supply combination, and other consolidations of railway supply houses. Probably no one will hazard an opinion as to what final effect these combinations will have on the railway equipment business, but it may be well to point out that many of the consolidated railroad interests are now controlling such large mileage and are such large consumers of material that the question of whether or not it pays a railroad to manufacture its own material is getting to be a far different proposition than it was a number of years ago.

A Supreme Court Insists on Automatic Couplers.

To the Supreme Court of North Carolina will belong whatever credit there is due for first judicially discerning the value of automatic couplers and strenuously insisting on their adoption. Its first, epoch-making, decision on the subject, in Greenlee against the Southern Railway Company, which will hereafter be cited as the leading case on the self-coupler question, was reviewed in the Railway Master Mechanic, of February, 1899.

A second, and likewise very interesting, decision the court handed down March 21, 1899, in the case of Troxler against the same railway company. Here, the court says, the company frankly asked it to reconsider and overrule Greenlee's case. Does it do it? No. It says (we use quite freely the language of the court) that that case was the expression of no new doctrine, but the affirmation of one as old as the law, and founded on the soundest principles of justice and reason, to-wit: That when safer appliances have been invented, tested, and have come into general use, it is negligence per se for the master to expose his servant to the hazard of life or limb from antiquated and defective appliances which have been generally discarded by the intelligence and humanity of other employers. This, it adds, must be so, if masters owe any duties to their employes, and unless economy of expeditures on the part of the railroad management is to be deemed superior to the conservation of the lives and limbs of those employed in their operation. To substantiate its position, it quotes quite freely from the twelfth annual report of the interstate commerce commission (1898), published, as it says, by authority of the United States Government, upon returns made by the railroad companies themselves; just as in its first decision it quoted from a former report.

In this case, in the trial court, the judge held that the absence of automatic couplers, in general use, was negligence per se, and refused to submit an issue whether the injury was not caused by the negligence of a fellow servant, and refused to instruct the jury, as prayed, that the plaintiff was guilty of contributory negligence if he could, by proper care, have coupled the cars by hand without accident. In that, the supreme court holds, there was no error.

The duty to furnish proper and safe appliances is that, the court says, of the common master, and injury caused by their absence cannot be attributed to the negligence of a fellow servant. And where the negligence of the master is a continuing negligence (as the failure to furnish safe appliances, in general use, when the use of such appliances would have prevented the possibility of the injury), it states, there can be no contributory negligence which will discharge the master's liability. This, it explains, has been repeatedly and uniformly held.

Then, after quoting figures from the report above mentioned, the court asks, Can it be seriously contended that the absence of such safety appliances (as automatic couplers) is not a negligence per se, rendering the railroad company liable for damages?

As these appliances have been patented and more or less in use for over 30 years, it should not have required an act of Congress, the court thinks, to enforce their universal adoption. Failure to adopt them, after being so long and widely known and used, it maintains, was negligence in the defendant upon the principles of the common law.

The act of Congress imposing a penalty for failure to add the appliances after January 1, 1898, the court holds, in no wise affected the right of an employe to recover for damages sustained by the negligence of any railroad company to attach them. And the action of the interstate commerce commission in extending the date at which such act should come into force (by virtue of authority given in the act), the court is equally certain, could not set aside the principle of law that failure to adopt such appliances was negligence per se, nor have any other effect than to postpone the date at which the United States Government would impose the prescribed penalty upon all railroads engaged in interstate commerce failing to equip all their cars with automatic couplers—a penalty which is imposed irrespective of whether any accidents occur from such failure or not.

The indifference of railroad companies shown in not adopting these life and limb saving appliances the court pronounces all the greater since their cost is comparatively small. Then, after a further consideration of statistics bearing on the matter, the court declares that, with such an array of the terrible cost of life and limb by failure to use appliances to avoid coupling and uncoupling cars by hand (in doing which the plaintiff was injured), the small expense—nay, actual economy—of adopting them, and the ample means the defendant possesses, it cannot reverse its ruling in Greenlee's case, that it is negligence per se in any railroad company to cause one of its employes to risk his life or limb in making couplings which can be made automatically without risk.

It is because it considers this matter of requiring these great corporations to protect the traveling public, and their employes as well, by the adoption of all safety appliances which have come into general use, is of such transcendent importance, the court says, that it has gone into the subject at such length. Ordinarily owned by great syndicates out of the state in which they operate, and their management, at all events, removed from any subjection to that sound public opinion which is so great a check upon the conduct of individuals, and of government itself, the court continues, the sole protection left to the traveler and the employe alike is the application of that law which is administered impartially, and which can lay its hand fearlessly upon the most powerful combination, and protect with its care the humblest individual in the land.

Quoting again from the last annual report of the interstate commerce commission, the court says that, in view of such mortality, rivaling that of the bloodiest of wars, it cannot reverse its declaration heretofore, which is sustained by every sentiment of justice and humanity, that where a life and limb saving appliance, like automatic couplers, has come into general use, and its partial adoption has in four years, notwithstanding the increase in railroad mileage and employes, decreased the injuries and deaths from coupling cars one-half, the failure to adopt and use it is negligence per se. Considering the economy in money of using such appliances, as well as the ample revenue of the defendant, the court thinks that it is passing strange that it, or any other railroad company, should have delayed till now, or even till 1895, to protect the lives and limbs of their employes in this particular, or that there should have been need of an act of Congress or the verdict of a jury to stimulate considerations of humanity toward their patrons and employes.

Counsel for the defendant, it further appears, read, as part of his argument, a clipping from a newspaper, and repeated in his brief, that a noble English lord, who was a railroad manager, as well as an hereditary member of Parliament, had changed his party affiliations because the one to which he had belonged had advocated the enforced adoption of self-couplers upon English railways. Commenting on that, the court says it simply shows that one such manager, at least, possesses a lordly disregard for the thousands of deaths and injuries of employes yearly caused by the lack of safety appliances; and, it insinuates, it may be there are others who entertain sentiments of higher allegiance to the net earnings of the syndicates that employ them than to those great principles which every political party professes to advocate as being for the best interests of the public. But, it adds, the hostility of one or more railway managers toward the matter cannot affect the impartial enforcement of the sound legal principle that employes and the traveling public alike have a right to be protected against any dangers which can be avoided by the adoption of safety appliances which have been tested by experience, and which have come into general use.

Finally, in this case, the court insists, the defendant had the less excuse because there was uncontradicted testimony, not only that automatic couplers were in general use at the time of the injury (March, 1895), but that the skeleton drawheads, in attempting to make a coupling with which the plaintiff was injured, were defective in that they were of different heights from the ground, and evidence that the cars could not have been coupled with a stick, or in any other manner, except by hand.

A MODEL FLUE PLANT, CHICAGO, BURLINGTON & QUINCY RAILWAY.

At the West Burlington shops of the Chicago, Burlington & Quincy Railway there is in operation a remarkably well-arranged flue plant, which is the subject of our illustration. For convenience, rapidity and economy in the manipulation of flues it meets all the requirements very satisfactorily. For purposes of description we have in our illustration numbered the various tools, etc. Number 1 is an apparatus for testing the flues with 300 pounds water pressure after they are welded. Number 2 is the straightening device. Numbers 3 and 4 are the furnaces for heating the flues. In No. 3 are placed five or six flues and as many safe ends, the blast in this furnace being just sufficient to bring the flues up to a nice white heat, but not strong enough to burn them, even if they are left in the furnace indefinitely. The flues are transferred from this furnace to the small fire, No. 4, one at a time as occasion arises, to heat them to the proper welding heat. No. 5, adjoining the last mentioned furnace, is the Hartz welding machine. No. 6 is simply a stake with a taper point and a scraper on it upon which the end of the flue is expanded and on which also the scale is scraped from the weld. No. 7 is a pneumatic swager. This tool is a parallel stroke hammer, which strikes about 240 blows per minute, and which is so constructed that the hammer advances a given amount with each blow, the amount of advance being capable of adjustment to less than 1-100 inch per blow. It is also so arranged that this advance will continue only to a point at which the flue is swaged to the proper size and then ceases—the hammer continuing to strike, but advancing no further. This hammer has been found to do very perfect work—and it is believed that the flues swaged by it work much better and give much less trouble from cracking when being set in the flue sheet than those swaged on a mandrel or Hartz machine. No. 8 is a revolving rack, which will carry six full sets of flues of 250 flues per set. No. 9 is an Otto cleaner. No. 10 is a pneumatic-hydraulic cutting-off machine. Right in front of No. 6, the scraper, there is to be placed a pneumatic machine for scarfing safe ends. When this is completed and placed in position one heating of the flue and safe end will be sufficient for scarfing both of them, welding and swaging the flue, and completing the job in every particular.

In operation the flues are brought into the shop on a rubble car, made especially for the purpose, and are passed through the cutting-off machine. This is a pneumatic-hydraulic affair that does its work very neatly. The flues are driven against the cutter by a constant water pressure of 30 pounds applied at the lower part of the cylinder, as shown. When the flue is cut off the rollers carrying the flue are driven down by admitting air on top of the piston at 120 pounds pressure. This drives the water back into the pipe so that there is no waste of water whatever and no wetting of the floor or surroundings. It has been found that this works much better than to use air in applying the pressure while the flue is being cut off, on account of the elasticity of the air and the irregular thickness of old flues. After leaving this cutting-off machine the flues are passed to the cleaner, and are then placed in the revolving rack at the side most convenient to this tool. At the proper time the rack is turned around to suit the convenience of the man at the fire, the safe ends are scarfed, the flues are scarfed, welded and swaged and again placed back in the rack. Later on the helper takes the flues from the rack, tests and straightens them and places them on the rubble car ready to go to the erecting shops. It should be explained that one man does all this work at the fire without the aid of a helper. He has nothing whatever to do with the cutting off, cleaning, testing or straightening of the flues. On this plant one man will scarf safe ends, scarf the flue, and weld and swage about 60 per hour—this including all handling of the work, no helper being used at all. We are enabled to present our account of this interesting plant through the courtesy of Mr. J. F. Deems, master mechanic at the West Burlington shops.

AN INEVITABLE CHANGE.

BY EDWIN N. LEWIS.

It should not surprise any one who gives the matter thought that the old and long established methods of doing business are rapidly breaking up. While they were being established there were no railroads, no telegraphs, no stenographers, no typewriters and no telephones. The postal service, even, hardly existed at first and for generations was slow and inefficient. Such a condition of things naturally developed the local business, confined to a small district and restricted by the comparatively few wants of that district in capital and production.

But so thoroughly had the old methods become established during a century or two of existence that they could not be quickly abandoned and new adjustments made to conditions which, in truth, rendered them inefficient. The natural conservatism of men led them to cling to the old methods and resist the changes rendered necessary by the new conditions.

The public has been slow to realize that, owing to the marvelous inventions above mentioned, time and space no longer exist as they did when the old methods of doing business were developed and established. The natural (and proper) attitude of the general public is resistance to change. This is what is called "conservatism" and it is, beyond question, a saving influence. But the time comes when the influence of changed conditions becomes irresistible. Then the haste of the business world to adjust itself to the new conditions is like the breaking away of stored waters. It becomes an excitement, a craze, and though the general results of the movement are beneficial, a thousand foolish and wild things are done. Every forward movement in civilization leaves a mass of debris behind it, the residuum of foolish plans, unfounded hopes and ignorant activities.

Progress always costs much and in its mighty, irresistible movements the individual is often crushed or shoved aside remorselessly. That those who are hurt in such a readjustment of the business world to meet radically new conditions as is now taking place should raise indignant outcries to heaven is not strange nor new. When the rapid building of railroads in England threw out of employment, or threatened to throw out of employment, thousands who were connected with the stage coach industry, the whole land was filled with their indignant clamor. It is true that matters soon readjusted themselves and the most of these frightened men found other and congenial employment, but no doubt some were permanently injured by the change. The making of omelettes necessitates the breaking of eggs. The readjustment of vast industries to new conditions cannot be accomplished without injury to the interests which depend for their existence upon the methods which are being replaced by new ones. That is the price which has, inevitably, to be paid for progress.

That these new and great combinations of capital which are now being made so rapidly and so generally are all wise adjustments of the businesses they represent to the new conditions is not at all probable. Some of them, many of them perhaps, are built upon the sand and when the floods come will be swept away. But this general movement toward the combination of competing business interests into a few large concerns is unquestionably an instinctive effort to adjust these interests to the greatly changed conditions which the railroad, the telegraph, the telephone, and the typewriter have produced. What the final outcome will be no one can foretell, but the old methods will never be restored. That is as certain as the rising of the sun.

The efforts of state legislatures and other forces to prevent radical changes in our business methods will be utterly futile, and the efforts which they are making to make department stores and other convenient and helpful combinations of capital and industries impossible will be laughed at by coming generations. They are Mother Partingtons trying with their little brooms to sweep back the incoming, irresistible tide of the ocean. Behind such legislation and insisting upon it are—not the general public—but only those who are hurt by the changes in business methods now being made. But, in most cases, the hurt will be only temporary and the majority of those who are resisting these changes will soon discover that they are better off than they were under the old methods.

What the final adjustment of the business of the world will be to the new conditions no one can foretell. It is not impossible that wireless telegraphy and the swift airship may present still newer conditions to which business methods must be adjusted. But that the methods which were established when the stage coach, the slow mail service, and the local manufactory and store met all the conditions, will never return is certain. The new methods of large combinations and the repression of competition may be only temporary. They probably are, for competition in business will exist and be powerful as long as the world endures. But the sooner business men, lawmakers and the general public make up their minds that all efforts to resist the readjustment of business methods of all kinds to the new conditions are utterly useless, the better off they will be.

SOME NOTES ON THE M. C. B. COUPLER.

SUGGESTIONS AS TO METHODS OF STRENGTHENING IT.

BY GUSTAVE GIROUX.

At the April meeting of the Western Railway Club Mr. G. W. Rhodes made some remarks which are worthy of consideration by all parties interested in the M. C. B. coupler. The ideas advanced will, if placed in practice, greatly reduce the amount of breakage we now have, as well as tend to avoid much of the trouble that the coupler is now causing. I believe that fully one-half of the troubles that we are now experiencing with the M. C. B. coupler are due to negligence and indifference on the part of those who ought to give it more direct attention. The coupler should receive the same amount of attention as does the air brake, the car wheel, the axle, etc.—indeed more attention than is given to the latter items, on account of its mechanism.

The sense of a portion of Mr. Rhodes' remarks was about like this: "So long as we shall be satisfied and accept, and not demand any more than, what we have and are getting at present we cannot expect much improvement." Mr. Rhodes also made reference to the unnecessary vertical width of the link slot in the couple knuckle. This latter is a point that should receive a large amount of attention.

We must strengthen the knuckle; for it is the weakest part of the coupler and always will be, because it is limited in its shape and size by the lines established and made standard some years ago by the Master Car Builders' Association. As soon as the link slot is done away with, the less will be the number of breakages met with; but then the weakest part of the knuckle will be at the hole for the knuckle pin. Meanwhile all possible advantages should be taken to make the knuckle stronger; and we should not cut any more metal away from the knuckle than that which is absolutely necessary. Furthermore we should always put in the knuckle the strongest material that is now made. The injury done to a knuckle by cutting material from it, especially around the lug, has been fully demonstrated.

Railroad companies that make tests and study these points of how to increase the strength of the coupler will ask for certain changes in the general design of the knuckle from the prevailing practice of the past. Some coupler companies will undoubtedly try to avoid these improvements for the reason that they would increase the weight of the knuckle; they are selling on a small margin of profit and they will try to avoid going to the expense of changing their patterns and of adding the required amount of material. I have known coupler companies to reduce the weight of their knuckles seven or eight pounds, or even more, and, with a similar reduction of weight in the drawbar proper, thus enable themselves to reduce the price of their coupler, and by so doing defeat some other well designed and strong coupler and get the sought-for contract.

The tendency with some coupler manufacturers who have been trying to reduce the weight of the couplers is to go so far as to core out the tail and the lugs of the knuckle to such an extent that it is nearly like a shell. When such knuckles are tested either under the drop or in the pulling machine it will be found that they will stand the test, providing the amount of deflection is not taken into consideration, for they will bend very easily and will not break so soon. With a solid knuckle the result would perhaps not be so favorable; that is, the solid knuckle would break before standing the same amount of punishment; but if the deflection is taken into consideration this will be found to be a great deal less than it is with a cored knuckle, and since it cannot bend as much it must do the next thing—that is, break. A strong and stiff knuckle is one very desirable to have in a coupler. As knuckles in service are subjected to very severe blows and jerks the excessively cored or light knuckle will very quickly find its way to the scrap pile, while the solid and heavier knuckle will last longer and give better service. Under these blows and jerks in service the cored knuckle will stretch or bend back and forth, which will result in a "fatigue" of the material to an extent that it will very quickly show a crack and will subsequently break; while the solid knuckle will be firm until it receives a blow severe enough to break it—and this is far better than to have it bend. A bent knuckle has been the cause of cars uncoupling and also of a great deal of trouble in making couplings, through this latter injuring the bars as well as draft rigging and frequently causing a breakage of buffer blocks. The limit the knuckle has to bend in either way so as to make it unsafe while coupled, or troublesome in coupling, is so small that it is difficult to notice it by the eye; and it will not be discovered until it causes some accident. Inspectors cannot very well detect bent knuckles without the aid of a gage. The materials that knuckles are made from must receive close attention, for a solid knuckle can be made of so soft a metal that it will bend nearly as badly as a cored knuckle, and that gives the same trouble. The best knuckle to place in service is the one that will stand the greatest amount of blows and the biggest load and give the least deflection. The table submitted herewith shows the difference between a cored and a solid knuckle

PULLING TEST MADE TO SHOW THE DEFLECTION BETWEEN A CORED AND SOLID KNUCKLE OF THE SAME KIND AND MAKE.

Solid knuckle weighed 49½ pounds and the cored knuckle 42 pounds.

Load. Pounds.	*Deflection.* Solid Knuckle. Inch.	*Deflection.* Cored Knuckle. Inch.
5,000	.03	.02
10,000	.04	.06
20,000	.05	.10
30,000	.06	.14
40,000	.09	.21
60,000	.14	.29
80,000	.25	.45
100,000	.46	.71
141,200	Broke	2.42

The measurements were made as follows: A small center punch mark was put on the top of coupler head and another mark on top of the outer end of the lug of the knuckle and at half of its thickness. A pair of dividers was then used to take the measurements between these two points. The knuckle pins of either coupler were badly bent.

in a pulling test. Under a drop test the deflection of a cored knuckle will be 1¾ inches, while the deflection of a solid knuckle will be about 1 inch under the same given amount of blows. Knuckles that are now placed in service are made of three distinct kinds of material, namely, wrought iron, malleable iron or semi-steel as some call it, and steel. The largest number are made of steel, and as increasing the strength of the knuckle must be effected by the use of high tensile strength material it is very important that all buyers of couplers should know if the knuckles are made of the strongest metal that is available, and when that is done the cost of replacing broken knuckles will be found to be greatly reduced.

There are a few points as to the construction of the bar that ought to be considered as well, and these are as important as those referred to in regard to the knuckles. There has developed a considerable inclination to make the bar larger. This is a questionable move, for it cannot be said that we have reached the limit in the way of strengthening the present bar with a 5-inch stem. Would it not be better to first find out what can be done with the present size of bar before changing, that is, before changing to a larger size of stem, for enlarging the stem means additional expense in the way of necessary changing of draft rigging on old cars. Whatever change is made in the bar will make it heavier, and that cannot be avoided, in fact this is necessary, for the trouble of the present bar is that it is too light through its section.

The greatest trouble with bars that break through the face is that the section at that point is too light; and of course if they are made thicker that trouble will very quickly disappear. Naturally some couplers will always be weak through the head on account of the large amount of metal cut out for the working of the lock mechanism, yet there is room to strengthen these bars at this point by making the upper or lower sections thicker.

The breakages in the guard arms have been greatly reduced of late and they will gradually diminish as the link-and-pin drawbar is done away with, and as buffers are more generally applied on cars. The guard arm can be strengthened some by adding more metal, that is making the section through that point thicker.

I do not see why the stem cannot be made the strongest part of the bar, and it seems unnecessary for us to have so many bars broken in the stem. The stem can be strengthened without changing its size from 5 inches to 6 inches, as has been suggested. As a general rule the plates forming the stem are all made of an equal thickness, and are about ½-inch thick, some being as light as ⅜-inch thick. This practice might be all right if all the four sides of the stem played a similar part, but such is not the case, for a part or side of the bar is subject to more wear than the other part or side, and some parts are subjected to greater strains at times than others. If provision is made for these strains and wears the stem can be greatly strengthened without adding so much metal after all. This is well demonstrated by the accompanying illustration, in which are shown two bars taken from the scrap pile. The square hole worn through the bottom of the stem of the coupler at the right is 1⅛ inches deep and about 4¾ inches long. This hole was worn through by reason of rubbing on the carrying irons while in service. In the bar at the left it will be seen that the upper plate, which was the bottom plate of the bar in service, is worn down to a thin film which extends backward to a distance of about 4½ inches. The first noted coupler was removed from service on account of the wear shown letting the head of the bar drop down too low; while the other bar was broken in service. The section of the plate of these two stems is as follows: worn bar—bottom plate, ¾-inch thick; top plate, ⅝-inch thick; plate on guard arm side ½-inch thick; plate on opposite side 13-16 inch thick. The plates of the broken bar, taken in the same rotation, are: bottom, ½ inch; top, 11-16 inch; guard arm side and opposite side, 9-16 inch thick each, all plates having a small rib.

These two examples may perhaps show an exceptional amount of wear, yet they prove, for one thing, that we must expect to find more metal worn off on the bottom side of the stem than on any other of the three sides, and on that account the bottom plate should be made thicker than the top to allow for wear.

The guard arm always receives a kind of glancing blow when making a coupling, and as that blow is not a central one it affords quite a leverage to help to break the stem, and it is generally just such blows that break the stem. If we examine into the effects that such a blow has on the stem it will be noticed at once that the side plate of the stem on the guard arm side is subjected to a compression strain, while the opposite side plate is subjected to a very severe tensional strain, and for that reason the latter plate should be made stronger. The illustration, I think, shows very plainly the superiority of a well-designed stem, the design of which takes into consideration the points just made.

The superior strength of a stem constructed like No. 1, as compared with a stem constructed like No. 2, can easily be demonstrated in making drop tests on the guard arm—which is the best test to find the strength of a stem. At one time I was testing couplers according to a specification requiring a guard arm test of three blows at 3 feet, and three blows at 5 feet, and had no trouble in getting bars to stand these tests; but after a short time the requirements were raised to three blows at 3 feet, and five blows at 5 feet, and at once I found I had to make lots of re-tests. But the firm making the coupler which I was testing very quickly overcame the necessity of making so many re-tests by making the plates of the stem opposite to the guard arm side a little thicker.

The necessity of testing and inspecting couplers cannot be too strongly urged. Such practice is bound to produce good results, as has been amply demonstrated to both manufacturers and railroad companies that have followed that practice. Manufacturers who have favored tests and have kept improving the shape of the coupler and the quality of the material that is placed in it can to-day sell couplers under guaranty that they will stand a guard arm test of three blows at 3 feet and five blows at 5 feet, and that they will stand a pulling test of 150,000 pounds. In fact, such firms have made couplers that will stand three blows at 3 feet and seven blows at 5 feet, and one or two blows at 10 feet on the guard arm, and that will stand a pull of 190,000 to 200,000 pounds without breaking. Again, we find the opposite to be true with some of the firms that have objected to tests and some such firms cannot to-day sell couplers and guarantee them to stand three blows at 3 feet and three blows at 5 feet, or to stand a pulling test of 135,000 pounds.

As soon as couplers are generally sold and bought upon their own merit the expenses and troubles we have been put to will be greatly reduced. When all companies that buy couplers test them and give them the same close attention that they do to axles, car wheels, boiler steel, etc., the number of couplers we now have on the market will be greatly reduced; in fact, the same result will follow to the coupler as did to the air brake after the great Burlington brake tests of 1886 and 1887. But so long as there are companies that will buy poor material and defective couplers and accept for a first-class article what another company has refused on account of not meeting the requirements of a fair and just specification, so long we will hear the saying that the M. C. B. coupler is "no good," and that it is "a failure." There are some couplers in service to-day that certainly are no good and never will be; but there are others that are good and that can be improved, the same as has been done with the air brake.

Some of the past troubles have been due to poor materials, but for that we ought not to condemn all materials. Let us by all means insist that we get good material. It is made by some firms and can be made by more if they will only try. But a general effort to produce good material will not be made so long as it is not asked for or until couplers are generally bought only on rigid inspection.

I cannot recommend too strongly the necessity of getting the different parts of a coupler well fitted together, without lost motion. Such practice is necessary to make the coupler work satisfactorily and also to make it last longer. The necessity of getting this good work on couplers has not been looked after as it should have been, nor has it been appreciated by either railroad or coupler companies. But one thing that will bring this practice around quicker than all possible talk, is the adoption of a gauge for wear, and a recommendation that all couplers that are so worn, or are so loose, that they will not pass the gauge should be scrapped. We ought to realize that we have in a coupler a piece of mechanism, and that the good working of it depends upon the way it is fitted up, as is the case with any other piece of machinery. I think that the day is not far off when we shall see all the working parts of a coupler machined like any other piece of mechanism. Again, when the coupler is in service we must give it the same attention and treat it as we do any other piece of machinery. It would be a great help in the way of improving the coupler if all defects or breakages should be systematically reported, and broken or defective pieces sent to the superintendent of motive power, who should call in the manufacturers and point out the defects or breakages, so that they may know how and where to make the necessary improvements.

Thanks and credit are certainly due to the Master Car Builders' Association for the good it has done so far in improving the coupler, and it is to be hoped that that association will still keep giving this question its special attention. As a general rule manufacturers make especial efforts to meet the requirements of the Master Car Builders' Association and to coöperate with that association in the effort to attain perfection in the M. C. B. coupler.

PNEUMATIC BLACKSMITH TOOLS—ST PAUL & DULUTH RAILWAY.

On the St. Paul & Duluth road Mr. Geo. F. Hinkens, master blacksmith of that road, has for some time been doing some most excellent work with a pneumatic bulldozer, built at the shops, for which has been designed a wide range of dies. This bulldozer is a portable machine, made entirely of iron. It carries a 14-inch air cylinder, capable of producing an effective pressure of 20,000 pounds, the shop pipe line carrying 125 pounds air pressure. Provision is made for transverse movement of the cylinder, as is indicated in figure 1. The machine is shown here fitted with a die for bending the stirrup end of a brake hanger. This die is shown in detail in figure 2.

Figure 1 — Pneumatic Bulldozer — St. Paul & Duluth Railway

FIGURE 2.

FIGURE 3.

It will be seen that it consists of swinging arms or levers connected with an equalizer by links, the equalizer being connected with the piston rod. The operation of the die is made clearly apparent by figure 2.

A number of dies and the parts that they make are shown lying about the bulldozer. One of these dies—that shown at the extreme left—is a hand tool, operated by hand levers, and is designed for making "S" links, one of which latter is shown resting on the tool. In this tool the revolving part consists of two handles, having two gauge arms standing transversely with the handles. On the handles are pivoted two gripping levers. The stationary or inner cylindrical body is provided with two pins around which the "S" link is formed. The gripping levers are adapted to engage the material by means of revolving the outer part to which the handles are attached. This tool is very valuable, insuring as it does perfect duplication and having a large capacity for producing work.

FIGURE 4.

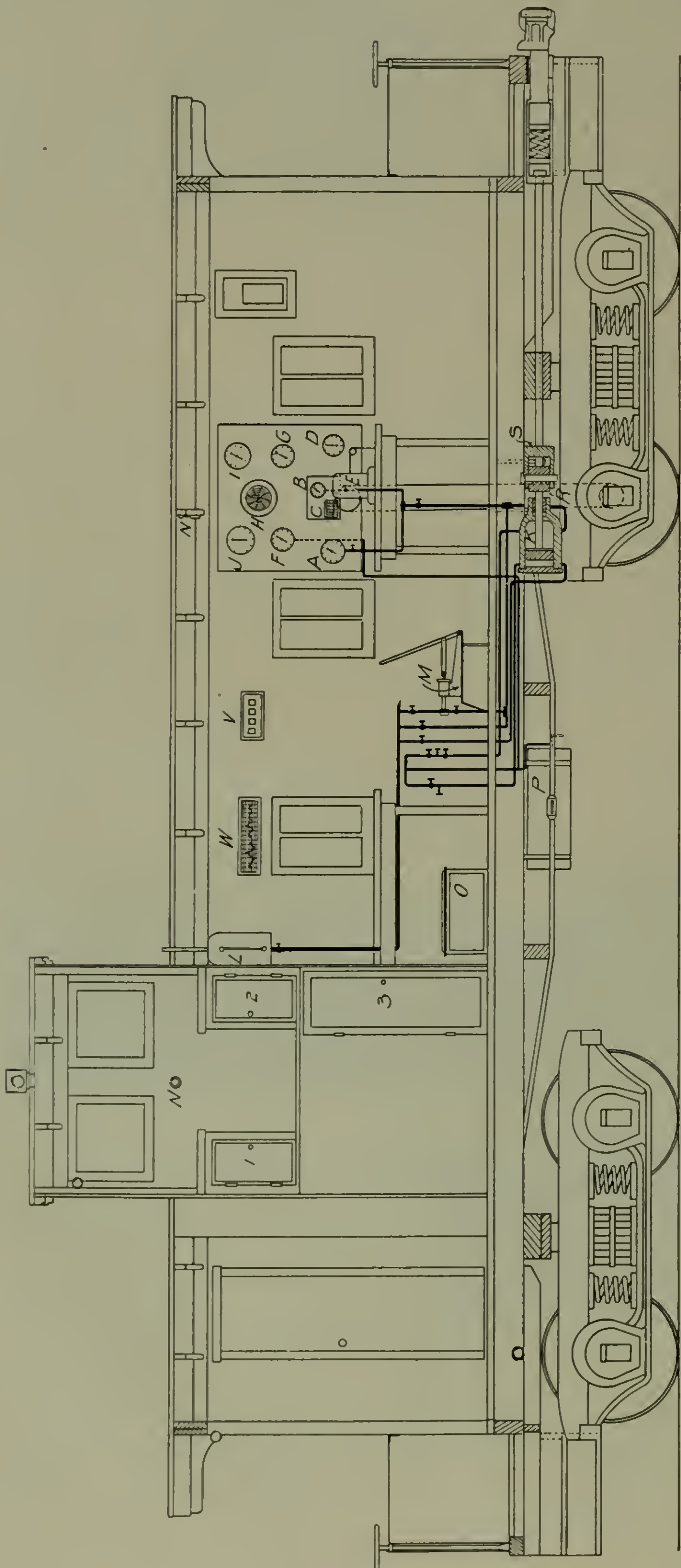
Recurring to the dies for use in the air machine, we give in figure 3 a view of a device for bending the loop end of brake hangers. In this tool the link is connected to the piston by means of a jaw and pin and is also connected to a swing attachment carrying a roller, the attachment being carried around the former, thereby giving the proper form to the loop. The purpose of the roller is to overcome friction and facilitate the bending of the iron by not dragging the material along. With this die 100 hook ends an hour is a fair rate of output.

In figure 4 is given a view of a tool for bending brake lever carriers. This operates upon the same principle as the tool shown in figure 2. The parts are made adjustable, to provide for varying lengths. The two bends are made simultaneously, and the ends are flattened in a suitable die at the steam hammer, both operations being completed in one heat. The output of this tool is about 400 a day.

Mr. Hinkens has a large number of other dies for use on this machine—for forming pipe clamps, bending unlocking pin levers, bending draw bar yokes, quarter twisting iron bars for various purposes, lapping ends of car transoms, and forming links, corner irons and fulcrum brackets. The machine is also used for punching key ways, upsetting light iron, etc. We here show enough, however, to reveal the possibilities of this machine in the way of rapid, convenient and economical shop work in handling a wide range of shop product.

A NEW DYNAMOMETER CAR.

For some months past the department of Mechanical Engineering of the University of Illinois has been, at times, working on the road with a dynamometer car of its own design. This car we are enabled to illustrate quite fully through the courtesy of Professor L. P. Breckenridge, who is at the head of the department mentioned. The car was the outcome of negotiations between the university authorities and the officials of the Cleveland, Cincinnati, Chicago & St. Louis, the parties in interest agreeing that the road should build the car and that the university should equip it with the special apparatus, and that it should be used for their mutual benefit. From data furnished to us by Professor Breckenridge we have prepared the following account of this car:



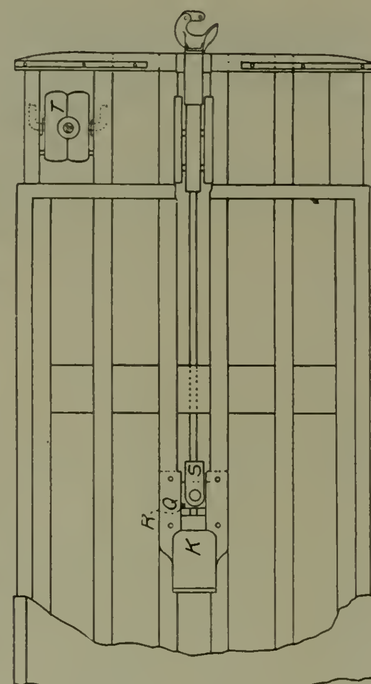


FIG. 1. A NEW DYNAMOMETER CAR.

REFERENCE TABLE.—

A—Dynamometer Pressure Gage, tons and lbs. per sq. in.
B—Dynamometer Pressure Gage, lbs. per sq. in.
C—Dynamometer Pressure Gage, Recording.
D—Boyer Speed Gage, Indicating.
E—Boyer Speed Gage, Recording.
F—Duplex Air Gage.
G—Gage Indicating Steam Chest Pressure.
H—Gage Recording Boiler Pressure.
I—Gage Indicating.
J—Clock.
K—Dynamometer Cylinder.
L—Oil Reservoir.
M—Oil Pump.
NN'—Electric Signal.
O—Tool Chest.
P—Air Reservoir.
Q—Guide Yoke.
R—Cross-head.
S—Yoke.
1, 2, 3—Lockers.
T—Water Meter.
V—Revolution Counter.
W—Road Profile.

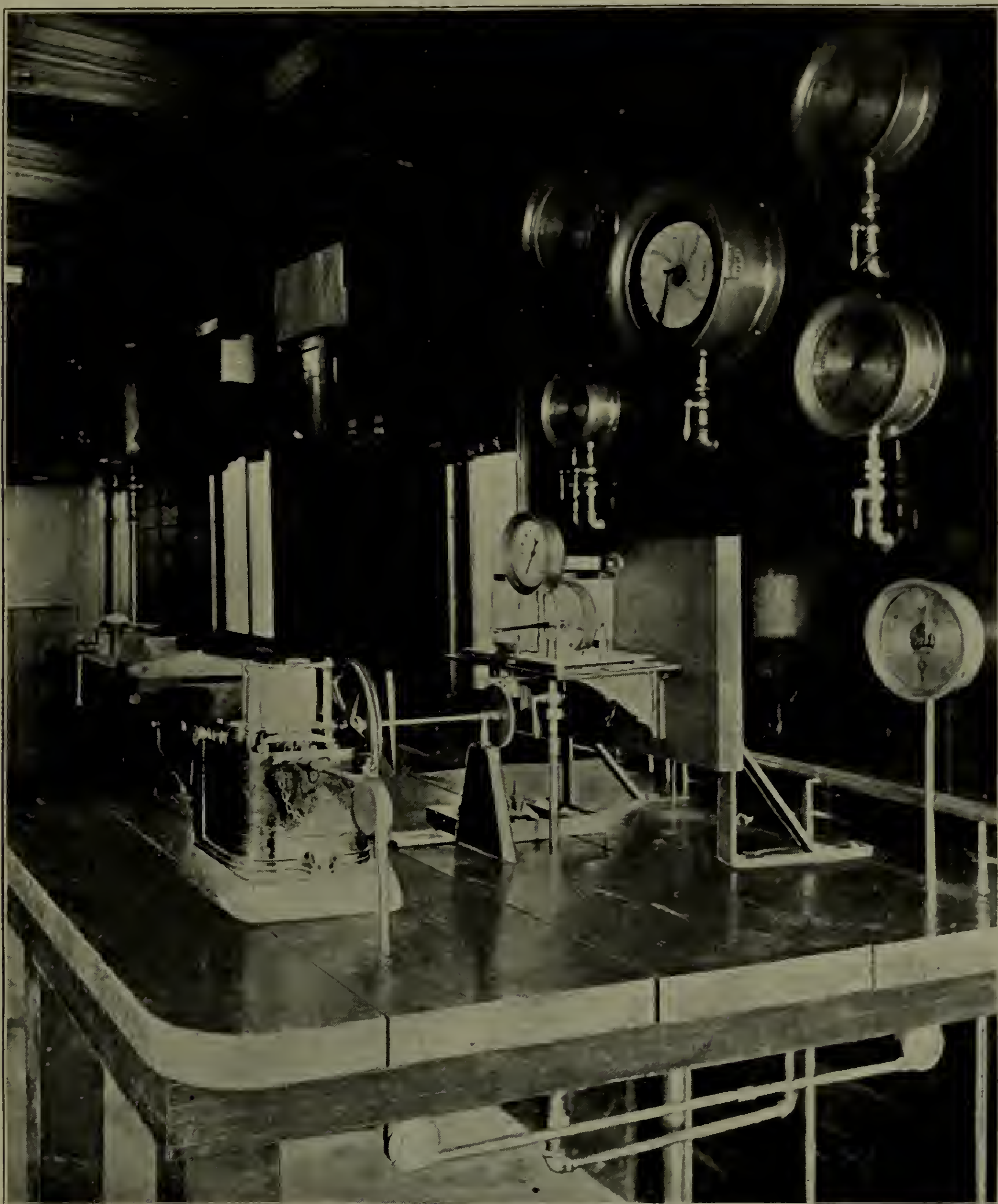


Figure 6—Interior View.

The prime feature of the car—the dynamometer—by which the pull at the drawbar is transmitted to the automatic recording apparatus, consists of a cylinder fastened to the center sills, and carrying a piston whose rod is attached to the drawbar through a cross head. The position of this dynamometer relative to the other apparatus is shown in Fig. 1, and in Fig. 2 its detail of construction is given quite fully. This detail has been very carefully worked out with the result, we are assured, of a piece of mechanism that answers its purpose admirably and stands up to its work fully in every particular. The

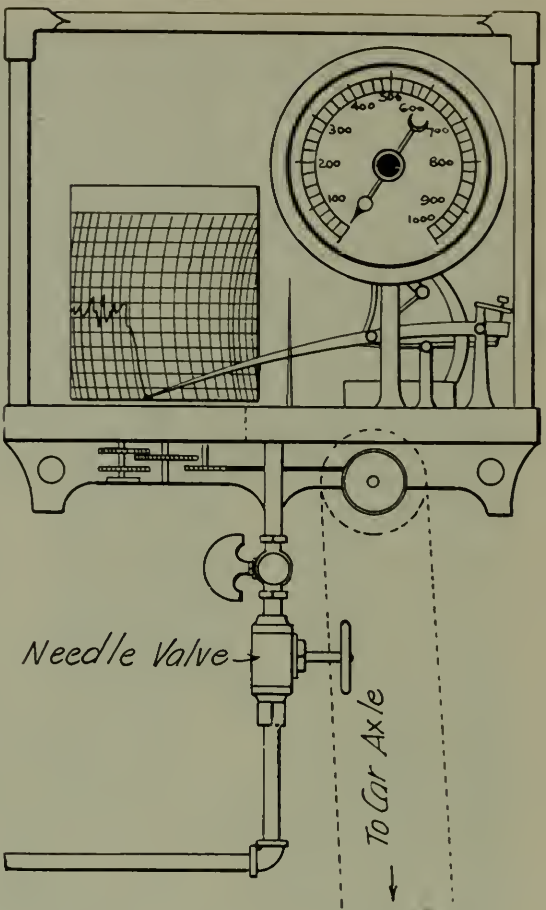


FIGURE 3—GAGE AND RECORDER.

attachment of the cylinder to the drawbar is such that when the chamber in front of the piston is filled with oil none of the load is carried by the buffer springs, but when this oil is discharged the pull is then taken by the springs in the normal way The arrangement is, furthermore, such that the piston never strikes the cylinder head under any circumstances. As will be seen by reference to Fig. 2 the piston is 8 inches in diameter and is packed with a cup leather, the piston rod being packed with a U-shaped leather.

In operation the drawbar pull is taken by the oil in the chamber in front of the piston. This chamber is in communication, through piping as shown, with the recording apparatus (see Fig. 1)—A, being a pressure gage showing tons and pounds per square inch; B, a pressure gage showing pounds per square inch, and C, the recording drum, which latter is operated from the axle, as shown in Fig. 3, the motion being transmitted to the drum by specially designed gearing. Thus the pressures corresponding to the varying pulls on the drawbar are brought directly before the eye of the operator, and are at

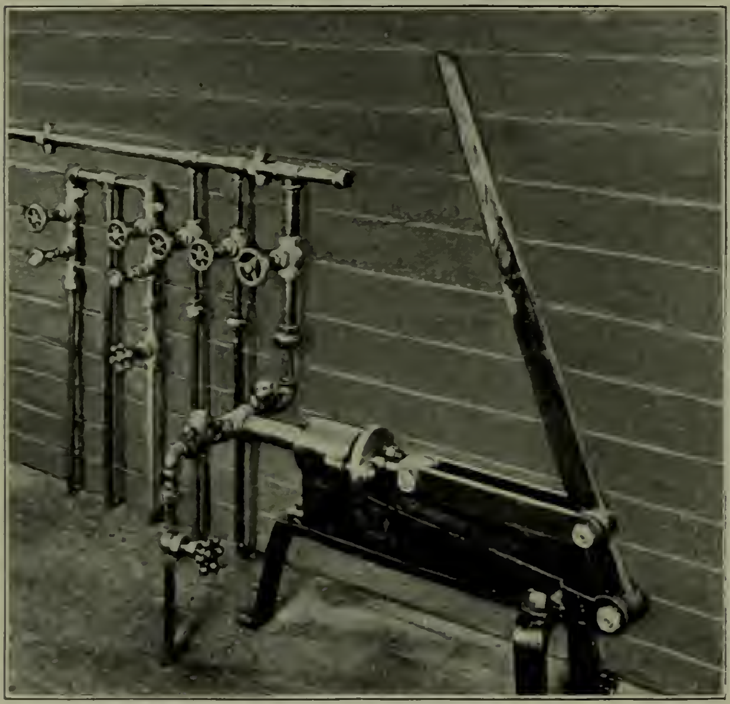


FIGURE 4—THE HAND PUMP.

the same time automatically recorded. When the apparatus is lying idle the oil is raised to the reservoir L, Fig. 1, by air pressure obtained from the auxiliary air reservoir P, and piped into the dynamometer cylinder in the manner shown in Fig. 1, piping being also provided for forcing up any oil that may leak past the piston. In the air pipes are placed two vent cocks which during tests are kept open to prevent possibility of air pressure being exerted on either side of the piston. A duplex air gage, F (Fig. 1), is connected with both train

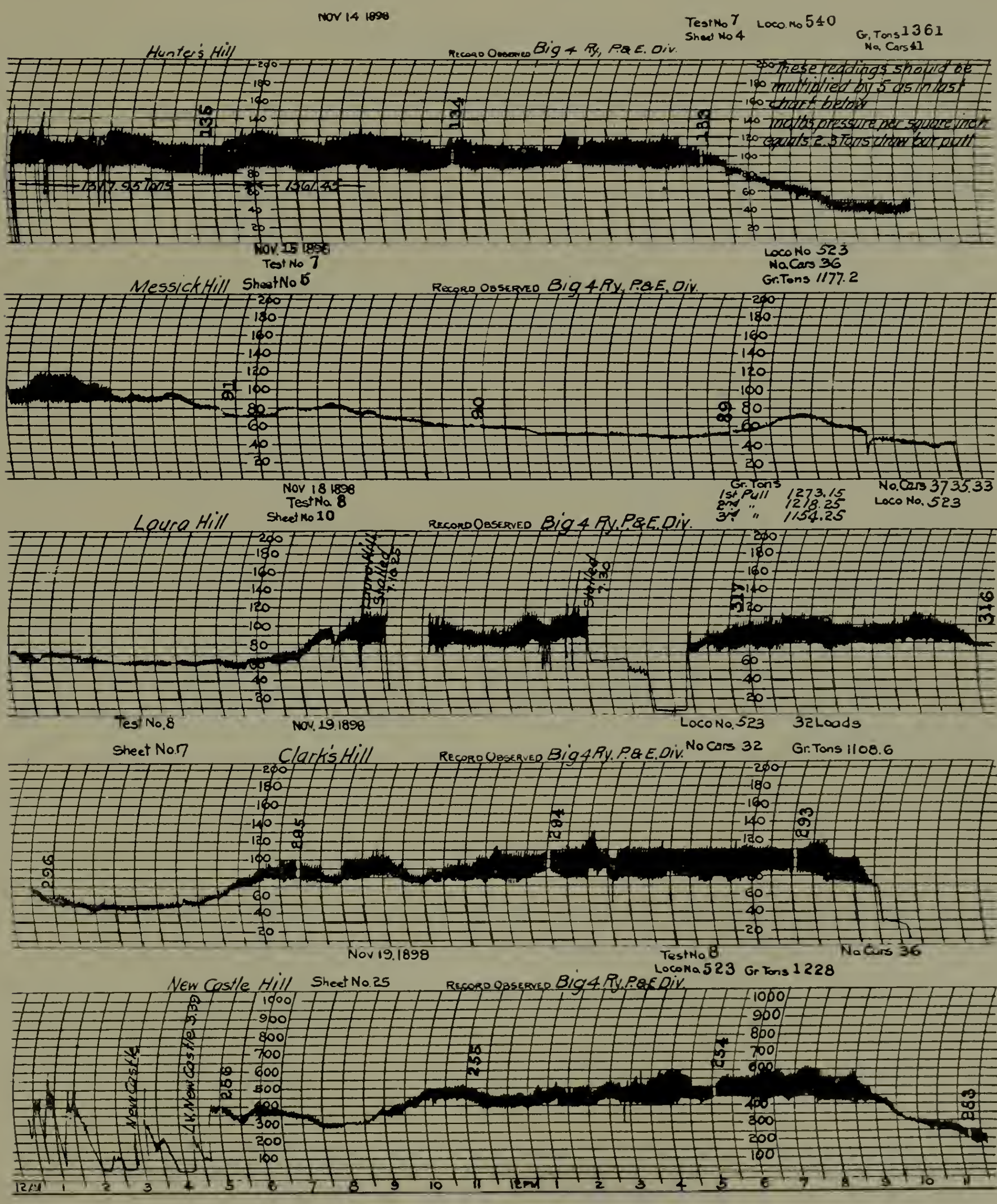


Figure 5—Sample Records.

pipe and auxiliary reservoir. When it is desired to place the dynamometer in use the oil is forced into the cylinder by a hand pump, M (Fig. 1), shown in perspective in Fig. 4.

This is all there is to the apparatus for obtaining and recording the drawbar pull. The records produced are quite interesting. We give in Fig. 5 a reproduction of representative diagrams obtained. A remarkably even record line is shown. The usual experience so far is that the variation of the recording pen does not exceed 5 pounds at speeds over 12 miles per hour. These cards indicate with notable delicacy the variations of drawbar pull, and they frequently indicate

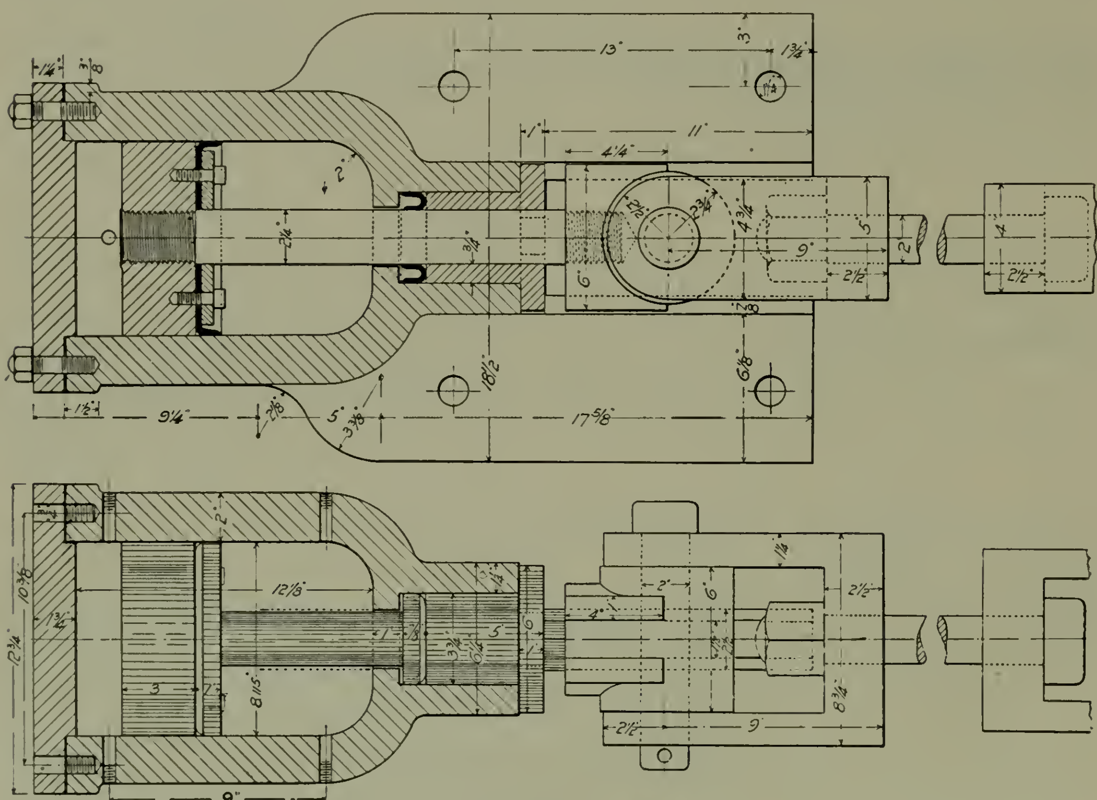


FIGURE 2—THE DYNAMOMETER.

the manipulation of the reverse lever and of the throttle valve of the engine—at slow speeds the revolutions of the drivers are told by the graphic line; especially is this true of a later form of record obtained and of which we will speak presently. In one of the cards shown here the story of an attempt to get over a hill with too many loads is graphically told. Not only does the record given by this dynamometer reflect conditions with remarkable sensitiveness, even asserting itself when the dynamometer car alone is being hauled, but the dynamometer operates with extreme steadiness, as shown by the even record line, and by the steady movement of the gage pointer.

Of late another form of record has been obtained, the mechanism being so speeded that a record 13 inches to the mile is given. This so attenuates the record line that in the dimensions of our page a reproduction would not be profitably available. It is a handsome line and one that permits very accurate reading. It is also readily comparable with the road profile, which is carried in the car at W (Fig. 1), on suitable rollers.

This car carries a number of other pieces of apparatus by which the following information is indicated to the eye or automatically recorded: Locomotive boiler pressure, steam chest pressure, weight of water delivered to the boiler, driving wheel revolutions, train pipe and auxiliary reservoir pressure, speed, time of passing mile posts, etc. Our view of the interior, Fig. 6, shows quite clearly the compact grouping of the main pieces of apparatus.

Taken altogether, it is a very completely fitted out car; and its practical work has proved most satisfactory. Some criticism has been made to the effect that the principle of the dynamometer was such that errors of record would arise through indeterminate friction losses; but Professor Breckenridge is confident that this position is incorrect, although he has not proved the machine by calibration. We may add that the professor does not feel that he has the ideal dynamometer car as yet, and that he expects to make further improvements in due time.

AUTOMATIC COST DISTRIBUTING AND ACCOUNTING PLAN.*

USED BY THE BALL-BEARING COMPANY, BOSTON, MASS.

BY W. S. ROGERS, GENERAL MANAGER.

The method of cost-keeping now used by the Ball-Bearing Company is not the one installed by the writer when he assumed control one year ago. Nor is it the same he has used in other factories during his ramblings of the past 25 years. Realizing for years how difficult it is for the workmen to write down all the details of each day's work and give accurately the time upon each operation and factory order, my aim and desire has been to eliminate, if possible, all clerical work for foremen and employes which is so distasteful to them, and also gain, if possible, absolute accuracy in the daily distribution of the working time that there might be no discrepancy between the hours worked and those paid for.

Not until I saw the Rochester Time Recorder did I feel that the problem could be perfectly solved. With it and a properly arranged working card I believed that the difficulties surrounding the usual methods of endeavoring to honestly charge time to the proper factory orders without having expense time added to them would vanish like mists before a summer's sun.

Experiments covering a period of five years in different places demonstrated clearly that a hearty coöperation of the wage workers was always assured, and the obstacles are to be found: First, from foremen who know nothing of the importance of keeping down factory expense to the minimum, and elevating hours of production to the utmost; second, from those in authority who have hobbies to ride or else care nothing for costs, value of expense and reduced production, and who have the faculty of explaining away their losses in business at the end of the year by using the scape-goat "competition, high wages, and expense of materials," or else charge the deficiency to that easy excuse, "experimental work."

I also realized that the method of transferring the work from the individual cost cards to the different divisions of production and expense must be simplified to such a degree that any person of intelligence and fairly good calculating ability could manage it, thus eliminating the bugbear of high-priced bookkeeping with all its mysteries; in fact, I knew that any method devised must not detract from the value of dividends earned, but in truth be a dividend-increasing element. To make the safety of the plan surer I have separated the pay roll time-keeping from the cost-keeping, thus avoiding all possibility of "balancing" the accounts at the end of each month by additions or subtractions to obliterate any clerical errors.

To prove the simplicity of our present plan, first let me say that the factory of The Ball-Bearing Co. works to-day upon 150 different orders, embracing those for stock, for customers wanting goods out of the ordinary, and orders for jigs and special appliances; while the manufacture of ball and roller bearings necessarily means a multitude of small unit parts to be handled from raw material in the stock room through the various phases of machining, tempering, hardening and grinding, to final inspection and shipping, thus making the labor of

Figure 1.

separating all the minutes of time an arduous task unless the method used was of simplest form. That it is so, the picture in Fig. 1 of the young lady at her desk with the cost distribution rack back of her, proves.

Her first duty every morning, from 8 o'clock until 10, is to match the red, or cost, cards of the previous day with the white pay roll cards to see that every minute of time for which the workman receives pay has been devoted to objects enhancing the company's interests; second, to calculating the cost of each man's time for each operation on each factory order as shown by the red cards; third, distributing the red cards in the cost rack shown in the picture according to their proper factory order numbers or letters; fourth and last,

FIGURE 2.

abstracting the cards from rack for completed orders, totalling up the hours and minutes expended, also the cost thereof, adding the general expense load, obtaining cost of materials from the blue material card from stock keeper, transferring same to back of factory order and in proper page of the cost book, in the last column of which is placed on the same line the selling price, if a custom order, or its stock valuation if intended for the stock-room shelves. The balance of her day's work is spent indexing her letter book, dictation of letters and preparing the day's mail, for she is stenographer and valued office assistant as well as cost accountant.

When it is borne in mind that we care for and calculate the cost of thirty thousand *minutes* per day, and that a woman is fully capable of doing it accurately in two hours' time, the man who "don't believe" in such things, and his more ignorant brother who excuses himself on the grounds that the surroundings and conditions of his own particular line of manufacture makes it "impossible" to adopt such methods, need to don nurse caps and aprons and cease posing as manufacturers, and blaming their competitors for their business losses.

My reasons for adopting the Rochester Time Recorder was not owing to any personal acquaintanceship with its makers, but solely because it was of superior excellence in workmanship, required no attention except winding once a week, possessed features preventing any alteration of the time registered, gave the opportunity of each workman to personally note his arrivals and departures for the entire week and thus calculate his own time, and permitted the abandoning of the system of daily transfer of time to the individual pay roll book or sheet with chances for error and dispute, thus dispensing with the services of a clerk for this purpose, whose salary adds to the general expense account and in many cases is a luxury.

Week ending Feby 25 1899

No. 156

Name.

Wm Brown

Day		In	Lost or Over Time. Out	Lost or Over Time. In	Out	Total.
M	A. M.	6 58			12 00	
	P. M.	12 55/56			6 1	
T	A. M.	6 58/59			12 4/5	
	P. M.	12 57			6 10/11	
W	A. M.	6 57/58			12 5/6	
	P. M.	12 58			3 29/30	2½
T	A. M.	6 52/53			12 2/3	
	P. M.	12 50/51			6 7/8	
F	A. M.	7 30/31			12 3/4	4½
	P. M.					0
S	A. M.	6 56			12 9	
	P. M.	1 2			6 8/9	
S	A. M.					
	P. M.					

Total Time, 52 *hrs.*

Rate 19 00

Total wages for week, $ 16 47

FIGURE 3.

To illustrate to my employes that no hardship is asked of them that I would not assume myself, every person connected with the workings of the company's affairs carries a white time card; and I find, for my own personal convenience, this to be an advantage, as our bookkeeper or others wanting me at any time can tell by the clock whether I am at the works or elsewhere. The clock occupies a central position in the factory within easy access of every one, as shown in Fig. 2. The double card racks on either side, as seen in the picture, have numbered pockets, each representing a workman; the two outside ones are for the pay roll, or white cards, illustrated in Fig. 3, and when each employe arrives for duty he takes his card from the "OUT" rack, registers in the clock and places the card in the pocket bearing

WORKING TIME

OF

No. 28

Name

Fallon

DAY		IN	OUT	IN	OUT	Total
M	A.M.	7½				5
	P.M.				3 30 31	2 30
T	A.M.					
	P.M.					
W	A.M.					
	P.M.					
T	A.M.					
	P.M.					
F	A.M.					
	P.M.					
S	A.M.					
	P.M.					
S	A.M.					
	P.M.					

Total Hours 7 30

Rate per Hour 28

Total Cost, $ 2 10

Reverse.

THIS SIDE OUT.

COST CARD

Factory Order 328

Price, $ 2.10

Commenced 5-11-99

Finished yes

X	WORK	PIECES	PARTS	X
	Annealing		*Axles*	
	Assembling		*Balls*	
	Balling		*Bands*	
	Boring		*Bearings*	
	Broaching		*Belting*	
	Cleaning		*Boxes*	
	Converting		*Cages*	
	Cutting off		*Cage Ends*	
	Drilling		*Casings*	X
	Facing		*Collars*	
	Filing		*Discs*	
	Forging		*Furnace*	
	Grooving		*Jigs*	
X	*Grinding*	8	*Light*	
	Hardening		*Machines*	
	Inspecting		*Material*	
	Laying Out		*Office*	
	Milling		*Patterns*	
	Planing		*Posts*	
	Polishing		*Races*	
	Repairing		*Rollers*	
	Riveting		*Shop*	
	Shipping		*Sleeves*	
	Slotting		*Spools*	
	Snagging		*Stockroom*	
	Tapping		*Toolroom*	
	Threading		*Tools*	
	Turning			

Correct T *Supt.*

PATENT APPLIED FOR.

Front.

FIGURE 4.

the proper number on the "IN" rack; reversing the operation when he leaves the factory. During working hours we can easily see which particular ones are absent and as the men employed in the different departments are grouped together the strength or weakness of any department is quickly seen and arrangements made tc equalize conditions tending to delay the daily output. There is also such a moral atmosphere surrounding the clock from the open honesty of the conditions that the employes improve in their desires to be prompt in registering before the beginning of working hours.

The two outside racks and the white cards are wholly under the control and direction of the bookkeeper, who changes them on the proper days and makes up the pay roll. After they are figured for total number of hours and the pay roll check covering the amount called for is made out, they are filed in weekly rotation in a case where they can be easily found should occasion require.

The clock having performed all the functions of a $400 per year clerk, and in much more intelligent manner, this ends all there is to be said on this point and we will note the two inner divisions of the racks marked "red cards only;" the front and reverse sides of these cards are illustrated by Fig. 4, and are similar to any other time card for keeping the record of the workman's daily toil, excepting that the foremen perform what little clerical work is required in filling them out at the time the workman goes to work upon the order, and their labor in this respect is limited to writing the order number, the number of pieces and the workman's number. A cross before the work to be performed and another after the parts worked upon completing their story.

The workman has no clerical work to do whatever, but goes to the clock and registers "in" when he begins work, placing the card in the pocket bearing his number on the "IN" side of the clock. When the job is completed he goes to the clock, takes the card from the rack and registers the time he was through or "out" and places it in the "OUT" rack for the red cards. The clock is doing for him with absolute exactness what he would have to guess at two-thirds of the time; and it is at this moment that a foreman shows his weakness or stands prominent above every other feature of shop economics. To give his employer full value for the ten hours' pay he receives every day, the workman's red cards must match the ten hours called for on the white cards. There must be no lapse of time between the registering "out" of one card and the registering "in" of the next one. There can be but one excuse for any gap in the workman's time, and the foreman must have another job for the workman waiting before he completes the one under way and before he registers "out." The foreman who does this may be ever so modest and retiring in manner, but he is one of the most prominent factors when the cost sheets are balanced at the end of the month; and the workman relieved of the responsibility and bother of endeavoring to keep books with an old slippery pencil, is elevated to a position where he can develop his full mechanical power in producing the results that earn profits.

Should it be necessary to "switch" a workman from one job to another before completion the red cost card must be registered "out" at the same time he begins on the new one and at night ALL red cards must be registered "out" and placed in the "OUT" rack at the same time the white cards are registered after the close of working hours—the foreman having new cost cards prepared for his men for the following morning.

This plan is also possessed of a certain amount of elasticity, as all good things should be, and the shipper, tool makers, subordinate foremen and factory lumper have single cost cards designated by the alphabetical letter pertaining to the division of time to which their labor is charged, running through the whole week; they register only morning and night of each day except, when they are "switched" on to producing work, under which circumstances, they are given a cost card for the special job, registering the same as other workmen and registering out and in during the interval on their weekly cards. When cards for production come in to the cost accountant from these men she goes at once to the clock and notes if they have properly closed and opened the time on their weekly cards to match the ones sent in.

Thus she calculates and balances the working time of each man daily with his paid time and the loss in production if any is found and located at once and a reason given instead of waiting for the grand finale of estimates, approximates and excuses made at the end of each fiscal year when production shortages are either padded out or charged to profit and loss with promises of reform for the ensuing year.

That the recorder has developed a plan of vast value and utility in giving a manager constant knowledge of his cost of production the following monthly statement of production will illustrate. These statements are arranged every month and can be obtained at any time within twenty-four hours' time.

FACTORY PRODUCTION STATEMENT PER MONTH.

Work—	*Cost of Material.*	*Time, Hrs.Min.*	*Cost of Labor.*	*Selling Cost.*	*Minimum Selling Price.*
Fac. Ord. completed....	$267.57	2,974:17	$489.13	$1,245.83	$1,488.88
Stk. Ord. completed....	9.09	128:58	17.91	51.15	56.20
Stk. Ord. under way....	67.36	512:20	82.01	234.85	250.00
Fac. Ord. under way...	274.19	1,201:15	208.03	666.97	874.57
Totals	$638.21	4,816:10	$797.08	$2,198.80	$2,669.65
Coöperative labor..................		1,184:19	$208.16		
Total time and labor..............		6,000:29	1,005.24 (red cards).		
Pay-roll time and cost............		6,000:00	1,005.30 (white cards).		
Loss in production...............		:29	.06		
Production rate, per hour..........					.167 cents.
Expense labor rate, per product hour..........					.041 cents.
Supervision rate, per product hour..........					.022 cents.
Office salary rate, per product hour..........					.07 cents.
Factory expense rate, per product hour..........					.03 cents.
Total cost of production, hour..........					.327 cents.

The production rate is obtained by dividing the total cost of product labor by the time of producing labor; the expense labor rate is obtained by dividing the amount paid for it by the time of producing labor; the same divisor being used for obtaining rates of supervision, salary and all factory expenses for the month. The wise man will readily see that, providing he has the ready capital to carry him along, the easy way to reduce cost of production is to add all hours possible to the producing time and wages without increasing the hours or cost of coöperative labor and other items of fixed expenses.

The important item in the above statement is the closeness of the totals of time and labor as shown by the red cost cards to the pay roll time and cost as shown by the white cards, the loss of only 29 minutes and 6 cents being a small factor compared with other methods of cost accounting when balancing the books at the end of the year. This feature of keeping cost of production by the clock, added to the fact that all writing, calculating and "guessing" of time worked upon different jobs on the part of the workmen and foremen is completely obliterated, and accuracy obtained without a mass of red tape and without increasing the fixed charges, comes almost to the author's ideal of cost accuracy and honest accounting whereby one customer is not charged with time pertaining to another, nor with work that really should have been charged against factory expense.

One might ask if there is not danger of collusion between fore-

SHIPPING ORDER No. 2801. Date

Sheet No. No. of Sheets

Packed by
Shipped by
Date
Pkgs. Boxes.
Bdls. Bbls.
Wt.
Terms
Entered by

Ship via
To
Street Town State
Mark Packages
Charge to
Street Town State
Per order Date Sales Folio
Salesman Commission Charged by

PAC. ORDER	QUANTITY	TYPE	SIZE	SIZE	SIZE	DESCRIPTION	PRICE	AMOUNT

FIGURE 5.

Factory Order 367. Issued
Shipping Order Wanted
Drawing Completed

Enter time, material and cost on back of this ticket. By

Cost per Piece.
No. of Pieces.
EXPENSE.
LABOR HRS.
Waste.
Total.

DATE	REG.	QUANTITY.	MATERIAL	RATE.	AMOUNT.

Front. FIGURE 6. Reverse.

No. Pieces.	Kind of Material.	Weight.	No. Feet.	Cost.

MATERIAL

ORDER NO.

ISSUED

COMPLETED

Stock Clerk.

FIGURE 7.

men and workmen in the registering in and out of the time, and I would answer, yes, if the managers and superintendents were of the easy-going element who start a method and have no care for its safety afterward and were there no *esprit du corp* among the employes;

but I am not explaining the plan to that class of men, as they are few and far between in manufacturing to-day.

When an order is received from a customer that requires a factory order to be issued the bookkeeper at once makes out the shipping order upon the blank shown by Fig. 5, and hands it to the distributing clerk, who makes out the factory order shown by Fig. 6; at the same time making out a blue material card, see Fig. 7, which is the same size as the red cost cards, on which is a complete list of materials needed for the fulfilling of the work. The shipping order goes to the shipping department, the blue card to the stock room and the factory order, with any drawings needed, to the factory foreman, who draws on the stock keeper to the extent of the demands of the blue card, but no more, and should any material be spoiled or lost he must obtain an order from the office before the stockkeeper will deliver the material. This plan eliminates possibilities for waste. He then issues the red cards to the workmen who are to perform the work, which reach the young lady in the routine way previously described. When the order is completed and inspected the factory order and material card are returned to the office with the shipping order. The bookkeeper invoices the goods, the cost accountant enters cost of materials, time and labor with proportion of expense or load, the total

Sales Product

S. O.	F. O.	NOTES	Cost of Material. Dolls.	Cts.	TIME. Hrs.	Min.	Cost of Labor.		Selling Cost.		Selling Price.	
1562	127			69	21	17	3	03	6	75	8	40
1592	134			61	14	04	2	68	5	97	10	00
			1	30	35	21	5	11	12	72	18	40
		44 lines to page.										

FIGURE 8.

Stock Product.

S. O.	F. O.	NOTES	Cost of Material. Dolls	Cts.	TIME. Hrs.	Min.	Cost of Labor.		Mfg Cost.		Minimum Selling Price.	
	877		25	00	52	31	7	82	40	64	60	00
	678		19	77	47	38	7	21	34	39	44	00
			44	77	100	09	15	03	75	03	104	00
		44 lines to a page										

FIGURE 9.

of which makes the selling cost, on reverse of factory order shown in Fig. 6, makes an entry in the production book under "sales product" as shown by Fig. 8, and files the red cards covering the itemized cost with the blue material card in the filing case. If it is a stock order the process is the same except that the entry in the production book is under the head of "Stock product," as can be seen in Fig. 9.

Once every month the cost cards covering coöperative labor are closed up and the entries made in the production book under the heading of "Coöperative labor expense," as illustrated in Fig. 10. There is also a part of the production book set aside for "Sales from stock," as shown in Fig. 11. These methods, in conjunction with the clock's accurate and honest recording of the time of beginning and ending of each different operation or item of work performed, will make a manager sure of his ground every month of the year without waiting for the annual judgment day to "see how he comes out."

Such a plan in vogue in railway shops where the requirements are not so onerous as in manufacturing will develop itemized costs with ease and of interest to all.

Co-operative labor expense

S. O	F O	NOTES	Cost of Material. Dolls.	Cts.	TIME. Hrs.	Min.	Cost of Labor.		Selling Cost.		Minimum Selling Price.	
	A	Shipping & Stock			256	45	35	80				
	B	Errands.			11	20		94				
	C	Cleaning factory			310	53	19	95				
	D	Drawing room			192		60	00				
	E	Experiments										
	F	Furnaces			99	20	13	75				
	J	Jigs & Tools			311	24	88	43				
	K	Care of Tools			260	00	16	00				
	M	Pattern repair			4	54		89				
	N	Erecting new Machy			18	13	3	08				
	O	Equipment repairs			13	02	2	44				
	P	Defective Material										
	Gx	Waiting for work			1	20		20				
	Fx	Supervision			260	00	100	00				
	S	Salaries.			768		360	00				
	001	Special Jigs		90	40		12	00				
	002	" "	1	40	24	30	6	75				
	003		2	30	2562	41	720	13				

FIGURE 10.

Sales from Stock

S. O.	F. O.	NOTES	Cost of Material Dolls	Cts.	TIME Hrs.	Min.	Cost of Labor.		Selling Cost.		Selling Price	
1327									22	10	33	15
1414										45		90
1417		Borings									68	00
1432									12	48	15	60
									35	03	117	65
		44 lines to a page.										

FIGURE II.

The cards may be arranged for either piece work, premium plans, or day work as the users desire, but the writer's experience, covering many years, is that the best results are obtained by having loyal, honest, and earnest workers and pay them for a day's work, and get it. The world is full of them. A piece worker, with a bold bluff, can outwit the shrewdest manager to the disadvantage of the weaker workman; while any man without the slightest knowledge of mechanics, or of the time required to perform labor, or experience in handling men, can work a premium plan that is theoretically heaven to begin with, but develops into an octopus in the end.

The writer has been an enthusiast upon several different methods in the past years and has ventured into this with the Rochester recorder carefully, well remembering the pitfalls of the past, but the even balancing of the cost time and pay roll time for the past seven months in the works of The Ball-Bearing Company has led him to say "Eureka." And should he have control of a plant with many floors or departments, a recorder would be used in every one, that all the horrors of cost-accounting by experts with $10,000 systems could be avoided.

As this article would not be complete without an account of the business debits and credits made, the schedule is as follows:

GENERAL EXPENSE ACCOUNT.

Salaries:
- Office force.
- Supervision.

Wages:
- Producing labor.
- Coöperative labor.

Office operating expense:
- Furniture and fittings.
- Stationery and supplies.
- Postage.

Freight, express, and cartage.
Telephone, telegraph, and messengers.
Interest, insurance, taxes, etc.
Incidents, accidents, and charity.

Sales advertising:

Magazines and catalogues.
Samples and traveling.

Manufacturing expense:

Power, rent, light, and fuel.
Incidental Manufacturing supplies.
Defective materials and workmanship.

Merchandise stores account:

Raw materials purchased (charge).
Finished factory product (credit).

Production account:

Merchandise sales.
Factory order sales.
Stock manufacturing orders.

Plant and equipment:

New machinery.
Belting and pulleys.
Small tools, jigs, dies, etc.
Permanent fixture.
Patterns.

Our monthly statement gives us a clear conception of how we stand and is as follows:

General expenses.
Production.
Sales.
Raw materials.
Plant and equipment.
Bills payable.
Bills receivable.
Receipts.
Disbursements.
Cash on hand.

Thus everything is simplified and made as near automatic as possible so that should any part of the human plan that has part in its workings drop out another with ordinary intelligence could be quickly fitted to the place and the entire mechanism continue in unison with the ticking of the Willard and Frick recorder requiring only the winding key to maintain the tension on every part alike.

COMMUNICATIONS.

ASH PAN DAMPERS AND COAL SAVING.

VALLEJO, Cal., May 6, 1899.—*To the Editor of the Railway Master Mechanic.*—The consumption of coal is a big item in the running expenses of railways, and it appears to me that one of the first places to start saving coal would be in the back shop. A damper is an air valve attached to the ash pan. Unless a valve is tight, wherever it is, it cuts a poor figure as a valve. The dampers of an ash pan should be as nearly air tight as it is possible to make them, but they are not so. I have seen engines go out on the road after a general rebuilding, with scarcely any work having been done on the ash pan. About the last thing that the boiler makers do is to dig the ash pan out of the snow, drag it into the shop, and hand it up in any old way. "It is only an ash pan." Old split keys are picked up, and if they do not draw the pan up, a lot of washers, with parts cut off, are put on the stud to fill up. The dampers are hung up in a slipshod way, and the whole thing, when done, is a careless, shiftless job. The dampers not only do not fit, but they are in many cases cut away for the shaker rod and what not.

An engine that is continually popping at a station is not doing it on an empty stomach; she is burning coal, and the pull of the air pump exhaust is helping burn coal, and the leaky dampers and ash pan are helping burn coal, and the general foreman who allows the engine to go out in that condition is helping to burn coal. Do I hear some say that it is the foreman boiler maker's place to make the ash pan right? So it is, and it is the master mechanic's place to see that the foreman boiler maker attends to this important duty. It is a plain case of "the house that Jack built." It comes back to the master mechanic, and he cannot shirk the responsibility for the carelessness of his subordinates. If you want your engines to stop wasting coal, make the start in the back shop. No; I am not "talking through my hat."

W. de Sanno.

[Some comment upon the subject matter of the above is made in our editorial columns.—Ed].

TWO NEW WESTERN PASSENGER ENGINES.

Two fine examples of modern locomotive design are shown in perspective on pages 52 and 53 of this issue. We append here the more important data concerning these locomotives, and also a few memoranda as to the character of service which they perform upon their respective roads—the Chicago, Burlington & Quincy and the Chicago & North-western.

COMPARATIVE DIMENSIONS.

	Burlington.	North-western.
Type	Atlantic (compound)	Eight wheel
Weight on drivers	85,850 pounds	87,000 pounds
Weight, total	159,050 pounds	137,000 pounds
Cylinders	13½ and 23 x 26 inches	19½ x 26 inches
Drivers	84¼ inches	75 inches
Heating surface, fire box	186 square feet	179 square feet
Heating suface, tubes	2,324 square feet	2,313 square feet
Heating surface, total	2,510 square feet	2,507.75 square feet*
Grate area	33.6 square feet	30.33 square feet
Boiler pressure	210 pounds	190 pounds

CHARACTER OF SERVICE.

	Burlington.	North-western.
Service	Heavy fast passenger	Heavy fast passenger
West bound	Chicago to Burlington	Chicago to Clinton
Length of run	206 miles	138 miles
Schedule time	5 hours (including 8 station stops and 2 crossing stops)	3 hours (including 6 station stops and 3 crossing stops)
Train load, average	371 tons	370 tons

* Water tubes, 15.75 sq. ft.

ATLANTIC TYPE FAST PASSENGER LOCOMOTIVE—CHICAGO, BURLINGTON & QUINCY RAILWAY.

The locomotive shown on this page and that shown on the opposite page have gone into service at about the same time and are engaged in quite similar work. They are the new locomotives built for the Chicago, Burlington & Quincy and the Chicago & Northwestern, by the Baldwin and the Schenectady works respectively—the engines in both cases being built under especial specifications and designs of the mechanical departments of the two roads. The more important data concerning these locomotives are given on page 51 of this issue.

FAST PASSENGER LOCOMOTIVE—CHICAGO & NORTH-WESTERN RAILWAY.

MR. JOHN W. CLOUD,

THE RETIRING SECRETARY OF THE MASTER CAR BUILDERS' AND MASTER MECHANICS' ASSOCIATIONS.

Entrance Palace of Transportation, Paris Exposition, 1900.

RAILWAYS AT THE PARIS EXPOSITION.

BY WILLARD A. SMITH.

I.

The international success of the original department of transportation exhibits of the World's Columbian Exposition of 1893, made it certain that subsequent world's fairs would follow the example. No other department of the Chicago fair was as attractive to foreigners and none was the subject of so many elaborate reports and monographs. Up to that time there had been no opportunity worth mentioning, of comparing the transportation machinery, appliances and methods of Europe and America. Its results upon the foreign trade of American manufacturers and inventors was not immediately noticeable, but it was none the less certain. It has been as marked as the effect of the Centennial Exposition of 1876 was upon American taste in art and architecture.

American locomotives are now shipped to nearly all parts of the civilized world. Questions of efficiency no longer stand in the way—time of delivery and price being now the chief consideration. Ten years ago it was considered possible, but hardly probable, that America might supply motive power for railways in the so-called new countries. No one would have predicted that before the end of the century, half a dozen or more American manufacturers would be shipping locomotives not only to South America, Africa and Asia, but to Russia, Sweden, France, and even England.

In 1893 engineers and traffic managers of European railways came to this country in large numbers. They were heartily welcomed by the railway fraternity here and were hospitably entertained. Credentials presented at the office of the chief of the transportation department secured not only every possible facility for studying that exhibit at Chicago; but also invitations and passes to visit all parts of the United States.

The greatest surprise which awaited our guests, was not, as might be supposed, the unequaled comfort and luxury of travel on our trunk lines. They had heard of this before coming, and while many were enthusiastic in praise of American ideas in this respect, others conservatively held to the superiority of their own methods as best suited to their own countries. As a matter of fact, the chief superiority of the American system is in long distance journeys. For the short distances which are the rule in European travel, many Americans prefer the European style of cars. It is noticeable, however, that practice there is gradually approximating American ideas. Toilet conveniences in cars are much more common than they were a few years ago; and corridor cars are supplanting the small and close-locked compartments. The French government has recently ordered that "wagons couloir," or corridor cars, be supplied on all main lines and express trains before 1900; giving as a reason that the French traveling public can no longer be cramped up and deprived of the opportunity of circulating and using toilet conveniences when trains are in motion. This is perhaps the most marked example of the influence of American methods in passenger matters. French railway officials rather deprecate the idea of an exhibit of an American passenger train at the Paris Exposition, on the ground that it will be likely to breed discontent among the traveling public which will prove expensive to the railway companies. On the other hand, the growing popularity of compartment sleeping cars in this country shows that European ideas of privacy can be successfully provided for in American cars; and that these ideas are influencing American practice.

The fact that that American "abomination," the chilled cast iron wheel, is now manufactured in several European countries, and that other American appliances are gaining consideration and trial is another direct result of the exposition of '93.

But the great surprise of our foreign visitors at that time was the fact that American railways handle freight or "goods traffic" at much smaller cost and charge than any other railways in the world. This fact led to serious investigation; the power of American locomotives, capacity of cars, influence of air-brakes, etc., were investigated. The ultimate result will undoubtedly be that important railways all over the world will join in the tendency which, although already strong here in 1893, has gained in strength every year since. Powerful locomotives were indeed exhibited at Chicago; but there are a score in use now to one at that time. Sixty thousand pounds was then the limit of freight car capacity; while now there are many thousands of cars of 80,000 and 100,000 pounds capacity. Steel trucks were then beginning their successful career and there were indications of the future in steel cars and underframing.

The circulation of American railway and engineering periodicals and other publications in foreign countries received new impetus in '93; as well as the attention to and respect for American railway machinery and appliances in foreign technical publications. As a further result the last session of the International Railway Congress was attended by a respectable American contingent; and the session at Paris next year will not only be largely attended by Americans, but they will participate in an important manner in its proceedings. The real extent of this new community of thought and interest will be best appreciated by reading the Bulletin of the International Railway Congress; and especially noting its indexes of the current technical literature of the world and the large space accorded to that of this country.

The markets of the world are now open to American manufacturers of railway machinery, materials and appliances. Will they enter in and "possess the land"? Just at the present time they seem to have about all they can do to supply the home demand. But conditions now are abnormal. If the demand keeps up as is hoped by all, and believed by many, capacity will be rapidly increased. If the home demand subsides there will be surplus capacity. In either event, therefore, it would seem to be the part of wisdom to enter the foreign doors now open and obtain such a foothold as to insure future export business on a large scale. Never was a greater business opportunity offered. Neglect of opportunity is not characteristic of American manufacturers.

With these conditions prevailing, comes the Paris Exposition of

1900 celebrating the close of the most wonderful of centuries. "Time's noblest offspring is the last." The world-fame of American machinery antedates the recent fame of American arms. It is much more worthy of celebration. Patriotic motives should therefore unite with those of business and personal interests to secure an important, creditable and adequate American exhibit at Paris.

Manifestly it is the duty of the American commission to secure all possible credit for this country at the "World's Assize" of 1900. There are some serious hindrances; not to securing enough in quantity, but to obtaining a *complete representation of the best*, which should be and is the real aim. One of these is the present universal prosperity. Many feel constrained to refrain from exhibiting because they cannot see their way to prepare their exhibits in the rush of orders now flooding their works and straining their capacity; or to spare a competent man to take charge of the work. Another hindrance is found in the fact that many important American inventions will masquerade at Paris under foreign colors. The foreign patents have been sold to local companies who will exhibit American devices "made in Germany" or some other European country. Unless the American makers claim the credit for their country by participating in the American exhibit, it will be lost. The place of manufacture governs under the exposition rules. The efforts of the commissioner-general and his assistants are now directed, not to the general purpose of procuring additional applications for space, but to rounding up the exhibit in the matter of quality, so that it may be representative.

It is the intention of this brief series of articles to convey a fair idea of the plans and prospects of the American exhibit of transportation and civil engineering. This article is merely introductory. But as time is passing and final conclusion must be reached very soon, it is important to state that applications for space will yet be considered, although the total amount at command is more than all applied for. Application, early or late, will not insure space. Regard must be had solely to merit of the proposed exhibit and its relation to the whole. Full information may be had by writing to the Director of Civil Engineering and Transportation, Paris Exposition of 1900, Auditorium Building, Chicago.

In future articles full information will be given regarding the plans of the transportation and engineering department, the buildings, location and division of spaces, etc. It may be said, at this time, that the American exhibit will be large and creditable and will surpass any yet made, except the great one of '93.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

MAY MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, May 11.

President Morris called the meeting to order at 8 p. m. Among those present were:

Alderson, A. P.	Fritz, Chas.	Keebler, C. F.	Schutt, W. F.
Anderson, Geo.	Gehrke, Wm.	Kehm, H. C.	Saum, C.
Blohm, Theo.	Goehrs, Wm. H.	La Rue, H.	Shannon, S.
Brazier, F. W.	Gruhlke, E.	Mathis, W. A.	Schmidt, M. P.
Bundy, C. L.	Green, C. E.	Manthey, H. H.	Saum, G. N.
Bond, L. E.	Gardner, Lewis.	Morris, T. R.	Shaw, M.
Bell, W. A.	Godfrey, E.	Mattes, J.	Spohnholtz, C. J.
Cather, C. C.	Grieb, J. C.	McGrath, Chas.	Thiverge, J. C.
Callahan, J. P.	Groobey, Geo.	Nordquist, Chas.	Utt, A. Y.
Cook, W. C.	Guthenberg, Bruno.	Nightengale, H.	Williams, Thos.
Constant, E. J.	Holtz, Chris.	Olsen, L.	Wolfe, Chas.
Dana, E. W.	Hansen, A. P.	Prickett, J.	Weaverson, F.
Depue, James.	Johannes, Albert.	Richmond, Alex'r.	Wentsel, Geo.
Deen, C.	Jones, R. R.	Rieckhoff, Chas.	Weschler, H.
Etten, L.	Krump, M.	Ryder, John.	Wensley, W. H.
Earle, Ralph R.	Kroff, F. C.	Snyder, R. H.	Wharton, R.

President Morris: The first order of business is the reading of the minutes of the previous meeting. They have been published in the last issue of the RAILWAY MASTER MECHANIC, and if there are no objections we will dispense with the reading, as usual. The next order of business is the reading of the names of new members.

Secretary Cook: The following have made application for membership:

D. G. Roy, L. S. & M. S.; R. D. Smith, C., B. & Q.; Jay G. Robinson, Brown & Co., Pittsburg; H. C. Hopkins, Thresher & Co., Dayton; W. A. Mathis and E. W. Dana, I. C.; John Brandt, Lipton Car Lines; M. Shaw, C. & E. I.; C. E. Warde and D. Thompson, C. & N. W.

President Morris: The next order of business is a report of the committee appointed at the January meeting, on the parting of trains. Mr. Groobey is chairman.

Mr. Groobey presented the report, as follows:

REPORT ON PARTING OF TRAINS.

To the Members of the Car Foremen's Association:

Your committee, appointed at the January meeting to report on trains parting and remedy for same, beg leave to submit the following:

We feel that we should first ask your indulgence for the delay in presenting this report, but will say it has been through causes entirely out of the hands of your committee.

Your committee have asked quite a number of railroads for data, which, they anticipated, would show the number of trains parting, and causes, but, we regret to say, we received a very limited number of replies. We will now express our appreciation to those railroads who did furnish your committee with the data on which this report is based.

The subject of uncoupling of trains has been gone into so thoroughly by committees of different railway clubs that it is difficult to say anything new on the subject. One very important point is the deviation from the M. C. B. contour line by manufacturers, which allows them to uncouple with much less wear than if the M. C. B. contour line had been strictly followed. There is a startling lack of uniformity in the length of the guard arms, a careful measurement of twenty-nine different makes showing a variation of 1 7-16 inches, but as there is no limit given on the M. C. B. drawing, the manufacturers are not altogether to blame. But the coupler with the shortest guard arm will certainly make the best showing as regards broken guard arms. Short uncoupling chains and weak and short draft springs contribute no inconsiderable part to the trouble. Probably the one thing which causes as many parted trains as any other is projecting locks, which are thrown back by receiving a sudden blow from the other coupler. This is a very weak point in some couplers, and should receive immediate attention from the proper persons.

There are some couplers which depend on springs to keep the locks in place. This is very well until the spring weakens or breaks, in which contingency the knuckle opens and the train parts. In view of this, your committee thinks that the use of springs for this purpose should be condemned.

There are several couplers made which give no external evidence as to whether the lock is in place or only partly caught, owing to the presence of ice or dirt. This is a prolific cause of trains parting.

With suitable gauges, it seems that couplers could be kept free from uncoupling due to wear, and after they reach a certain limit, as indicated by the gauge, they should be either condemned, or new knuckles or new knuckle pins applied, or bushing applied to knuckle pin hole in the knuckle or lugs of couplers, or both.

Quite a number of reports received by your committee were under the head of "unknown causes." This, your committee believes, is due principally to the lack of mechanical knowledge, in some cases indifference, on the part of trainmen and switchmen. We are particularly impressed with the large number of trains parting under this heading. Of the total number of trains parting and reported to this committee, we find 35 per cent are under this heading.

Your committee will say, further, that the cause of a number of trains parting is due to conditions for which the coupler—and, we will add, the car department—are in no way responsible, and we would recommend that some means be devised to obtain information from those who are handling the trains or cars at the time the parting occurs.

Why should there be such a large proportion of unknown causes? We will answer that by saying that if a proper system be adopted, this mysterious feature can be practically eliminated. The car department men are not in a position to throw light on this matter, for the reason that they do not see the coupler until a terminal is reached, and by that time the local conditions have changed.

Your committee would refer briefly to a paragraph in the report of the committee appointed by the Western Railway Club to report on M. C. B. couplers. In paragraph 6 they allude to the present uncoupling device as being unsatisfactory. Your committee would strongly indorse this, and thinks that some improvement can be made over the present extremely crude uncoupling arrangements.

We have previously alluded to the wear of parts, meaning particularly the knuckle, and your committee are of the opinion that some limit of wear on the inside face of the knuckle should be established.

Another feature we would draw attention to is the one of using a little oil on the movable parts of the coupler. We think you will all admit that the coupler is made up of mechanical parts, and, taking into consideration the immense amount of money invested in them, a little more care and attention should be given in this respect. And your committee recommend that oil be used on the locking-pin or lock-block, and, in their opinion, this attention would eliminate, to a great extent. the common defect known as creeping lock-pins or blocks. This defect is of a gradual development and if the block or pin was lubricated, it would be enabled to take advantage of any slight reduction of tension, and would resume its normal position.

We would like to see some progressive road make this experiment and report results. The very cheapest kind of lubricant could be used for this purpose, and your committee believe the result would fully justify any slight increase of expense in connection with this.

GEORGE GROOBEY,
R. W. BURNETT.

President Morris: You have heard the report of the committee. What shall be done with it?

Mr. Prickett: I make the motion that the report be received and placed on file, and the committee discharged.

The motion was seconded and carried.

RESPONSIBILITY FOR BROKEN SHEATHING.

President Morris: The next in order is the discussion of the questions as printed and distributed among the members. The first question relates to the responsibility for broken sheathing on the side and end of cars.

Mr. Grieb: Possibly the President knows who is interested in this. It does not seem to me, if there is a case of this kind, that it could be decided except in one way. I would like to inquire if it is a hypothetical or an actual case?

President Morris: An actual case.

Mr. Grieb: It seems to me that there can be no question but that the responsibility rests with the party that delivers the car with the sheathing or siding in the condition mentioned. I take it for granted that the damage was sufficient to warrant the removal of the parts in question.

President Morris: The parts were removed.

Mr. Grieb: And the defense made by A that the sheathing was only slightly broken or simply shoved inward would not cut much figure, so far as the removal of the boards are concerned, would it?

President Morris: The party making the defense removed the material. That in itself was pretty good evidence that it was necessary to do it.

Mr. Grieb: Then again, it seems to me that his argument that he has no record of it, and thoroughly investigated the case, is entirely too indefinite. He is arguing from the negative to the positive, whereas the other party produces the best evidence possible. It seems to me that there is no question but that the line delivering car in that condition is responsible.

Mr. La Rue: I would like to ask if the sheathing is on end, or side, or door of car?

President Morris: I believe it states it is on the end and side and door—three different points.

Mr. La Rue: It seems to me the M. C. B. rules define what is unfair usage. They give us the privilege of breaking certain parts. Now, end posts can rarely be broken without siding. We are allowed to bill against the owner for the siding as well as the end post. Possibly the sheathing in the door was broken by the loading. It seems to me that would be possible.

President Morris: I think, Mr. La Rue, that it is stated very clearly that it was shoved in. The party making the repairs acknowledged that.

Mr. Kehm: I think Mr. Grieb's expression is correct, so far as the side sheathing and end sheathing are concerned. I might take some exception to the side door. If the door was broken through cornering, I should say unfair usage, just as stated. If the door sheathing was broken on account of door falling off, or anything of that kind, it would be fair usage.

Mr. Wentsel: I do not think there is a bit of doubt but that the party doing the damage is responsible for the repairs. We issue cards for all sheathing that is stove in, either on side door or siding or end sheathing. I think the party doing the damage is responsible.

Mr. Goehrs: It occurs to me there is no argument on this, as everything indicates that the sheathing was broken in from the outside, and you will note that the sheathing was on the end of car, which shows it might have been done by a projecting load; on the side it would be difficult to say how it was done. It appears to be certainly a case of unfair usage.

Mr. Deen: I think it is a very clear case. I can't see why A would not be responsible for the whole thing. He admits in each case that the siding was only slightly broken—or, in other words, shoved in. That shows plainly that the damage was done from the outside. If it had been done from the loading, why, I think B would be responsible.

President Morris: I would like to ask what you base your argument on—the construction of any rule, an arbitration case, or custom, or what?

Mr. Grieb: I do not recall any specific rule in the M. C. B. code or an arbitration case. It seems to me to be one of those self-evident cases where common sense ought to dictate.

President Morris: Of course there are two parties to this dispute, and if we put ourselves on record as indorsing one side, we should like to bring as much proof as we can to substantiate the position we take, and if anyone has anything they can use as a basis, we would like to hear it.

Mr. Bundy: Inasmuch as A admits that the sheathing was stove in from the outside, I do not think there is any doubt but that A is responsible. There is a difference where the sheathing might be broken in fair usage. For instance, shifting load, broken end post. Broken sheathing would be chargeable. I think there is no doubt but that A is responsible for the entire damage on car. Any man that has had any experience in car work knows that sheathing cannot be stove in under fair usage. Still, it has been customary with all the roads in Chicago that I have had anything to do with to consider owners responsible for sheathing that is broken by shifting of the load, and that is the way that I look at the matter. When you come to sheathing stove in from the outside, why, you can't do it under fair usage.

Mr. Schmidt: I have got it into my head that sheathing cannot be stove in from the outside on the ends of a car by fair usage. If we should take, say, two box cars in a train and a flat car in between them, the flat car being loaded with telegraph poles and the box car loaded with planed lumber or any other kind of lumber, we know if the lumber shifted in the box car and shoved the end out, the owner of that car is responsible. We have no point, as I see, in the rules, where it says just how much that end must be pushed out. Now, suppose we have next to that box car with the end shoved out, a car that belongs to the same company, and the end of the car that is pushed out is pushed out far enough to damage the end of the next car, I claim that that damage is done by fair usage. Or, if you take the flat car into consideration, there being a box car ahead of it and another one back of it, and the same motion of the train that shifted the load in the box car would also shift the load on the flat car, why should it be fair usage to shift the load on the flat car and not in the box car?

Mr. Brazier: I want to go on record in this case. I claim it never can be done in fair usage—sheathing broken in. Mr. Schmidt's argument that he has just made is entirely wrong, according to my way of thinking. If you have a car loaded with rails or telegraph poles, and the load shifts and runs into the end of a box car, the party handling the car is responsible; that is unfair usage. If the load shifted inside of the car and breaks the end out, the owner is responsible for the load shifting, as I understand it. I am one of the kind that thinks there are too many things charged as unfair usage which are fair usage.

Mr. Grieb: Before the discussion is closed I would like to direct attention to the argument of Mr. Schmidt, where he draws the simile between a load shifting in a box car and a load shifting on a flat car. It seems to me that the horses are of an entirely different color. The load in the box car has nothing to retard its shifting movement but the end, whereas, in a flat car, they usually have stakes and means of wiring or fastening the load down that are supposed to be adequate. The

M. C. B. Association has made definite recommendations as to what they consider proper means for loading cars with such a class of freight, and if these recommendations are complied with, I think we are safe in assuming that nothing but unfair usage will cause that load to shift to such an extent as to damage the neighboring car.

Mr. Prickett: I make the motion that A is responsible.

Seconded.

President Morris: It has been moved and seconded that in the case of damage to sheathing, broken inwardly, that the party doing the damage is responsible—in this case, A.

The motion was carried.

RESPONSIBILITY FOR WRONG ARCH BARS.

President Morris: The next question concerns wrong arch bars. I think we have all been at one time or another put to considerable trouble searching for the responsible party who applied wrong arch bars to our cars, and the absence of a repair card makes it very difficult for us to determine who is responsible. This is something that I think ought to be very thoroughly discussed, and we ought to be put on record as to the position we take.

Mr. Callahan: I think that the party delivering this car with wrong arch irons should be held responsible for them. While the rules say that the party making wrong repairs is solely responsible to the owners, in the absence of a repair card to show where they were made, I think the delivering company should be held responsible, and let them go back on the party they got the car from. If the oil boxes fit the original arch irons and take an M. C. B. wedge, I do not think you could claim anything. This, in my opinion, is the way it should be handled in regard to arch irons in the absence of a repair card showing who did the work.

President Morris: What would you do with Section 34 of Rule 3, which says that the company making improper repairs is solely responsible to the owners, with the exception of cases provided in this rule?

Mr. Callahan: I think that while the rules say the party making the repairs is solely responsible to the owners, yet, in the absence of a repair card on the car and a defect that can be detected as easily as wrong arch irons, I think the delivering company should be responsible. B received that car from C, and if he didn't protect himself, then he should be responsible to the owner when he delivers the car home. That is, in my judgment, the way it should be handled.

President Morris: Don't you think, in case you asked a delivering line for a defect card, he would refer you to that rule?

Mr. Callahan: Yes, sir; I have had cases of the same kind. But I say, in my judgment, that is the way it should be handled.

President Morris: But, you know, we should settle these cases in accordance with the rules, not what we consider equity.

Mr. Callahan: Well, I don't think we could hold him to it, but I think that is the just and right way it should be done.

Mr. Deen: I think the just and right way is for the party making repairs to put on a repair card, and that, of course, makes them solely responsible for the wrong repairs. By their negligence or wanting to slip the matter through without paying for them they missed a repair card, in order to get the responsibility on someone else. Now, persons inspecting cars will frequently miss such defects as these, where an arch bar has only a difference in thickness. If the difference is in the width, it is more easily detected. Take a 1-inch arch bar, and one $1\frac{1}{8}$-inch, and if the difference is in the thickness you would probably not notice it; but if the difference is in the width, you would very quickly notice it.

President Morris: But the question is, Who is responsible, and to whom should A look for protection? That is the meat in the nut.

Mr. Deen: When a case of that kind is taken up with me, I take it up with the road we received the car from, and trace on back until I find who did make the repairs. It is not everybody that is dishonest.

Mr. Richmond: The question of wrong repairs is perhaps of more interest, and has been of more interest since the promulgation of these new rules, than any other question that we have had. Mr. Deen says if he has a case of that kind he usually starts tracing, and it generally occurs that he finds the guilty persons. I think, perhaps, that in the handling of such matters, or such questions as these, that the Armour Car Lines have a larger percentage than a good many other companies. I want to say for the information of this club, and I am prepared to substantiate the same as being a fact, that of all the tracing that we do in just such cases as this, we don't locate 10 per cent of the responsible parties. Now, the spirit of the rules is that the party making the repairs shall be held responsible. But after due tracing has been made, and none of the roads who handled the car admit making the wrong repairs, I think it can be clearly taken as the intention of the framers of the rules that the party from whom the car was last received should be held responsible—namely, he is the one that does not show responsibility with any other company handling the car. If a man loses a lot of goods, he probably does not find the thief, but if he finds the party holding the goods or in possession of the goods, he is going to hold him. Now, if you trace a car over half a dozen roads, as a rule every road replies by using the stereotype phrase, "that he has traced it over his road, and finds no record of the car having been in any accident or derailment." That, in fact, has become the stereotyped answer with all roads where there is no desire to admit making the repairs. We have a number of positive cases of roads denying making repairs, after we had proven conclusively that the repairs were made at their works. I recall a case now which amounted to about $197—a matter of wrong repairs to only three or four cars at that. We traced over a number of roads, and we were satisfied of the road that made repairs. That road, however, positively denied making the repairs until we had conclusive evidence showing that the cars were in the shop of that company and were repaired there, and that it was their material that was on the cars when they came home, and then we got them to admit and accept our bill for that amount. It may seem that this is an improbable figure. It is true, nevertheless, and the whole trouble lies in the fact that you cannot get railroads who make wrong repairs to admit it. I do not know why it is. It seems rather strange. Mr. Deen's theory is all right if you could always locate the responsible party, but you can't.

Mr. Kroff: Arbitration case 394 covers a decision in this case.

President Morris: The secretary will please read a synopsis. [Reads case.]

Mr. Bundy: I am of the same opinion. I think that arbitration case fully covers this case, and delivering company is responsible.

Mr. Kehm: The arbitration case referred to was rendered under the 1896 rules. The rules have been changed since that time, and the decision has no bearing under the 1898 rules, or the rules in effect at the present time. At the time the decision was rendered the joint evidence card was final, and authorized a bill against the party making the repairs, or the party whose card was found on the car. Under the present rules the joint evidence card is not final, but it is final so far as locating that wrong repairs were made, but not sufficient authority to warrant holding the party whose card is on car. Section 3c of Rule 5 states that the joint evidence card shall be sent to the company whose card is on car, and it shall furnish a defect card covering the wrong repairs, if it made them. I would say you cannot hold a delivering company under those conditions. You might tie a car up on a transfer and allow it to remain there, and the delivering company would say they would not card.

Mr. Richmond: What are you going to do with that section that says that roads shall deliver cars in as good general condition as they receive them? If a car is delivered with proper repairs, why should not the company be held responsible if it returns it with wrong repairs? It would show to the company owning the car that it is not responsible by other means than simply asserting that it is not.

Mr. Kehm: I will answer that, Mr. Richmond. Each and every inspector is not familiar with all the standards of everybody's car, and the delivering company, or the receiving company prior to delivery of the car to you, might have a record of wrong arch bars, and the company delivering to them would not card the car, and they could not hold them under the present rules, unless they could prove that they had made the repairs; then they might compel them to put on a defect card. Now, it resolves itself into one thing, and that, in my judgment, is this: Each and every railroad company should live up strictly to the rules. They all claim they apply repair cards to the cars; possibly they do, but there is a provision to send repair card stubs for all repairs made, showing whether owner's defect or delivering company's, and we can very easily look up who made the wrong repairs.

President Morris: Mr. Richmond, I would like to ask if you have ever tried to settle such a case by falling back on this decision 394?

Mr. Richmond: Well, we did, so long as it was applicable to the rules in effect. It has the same effect as the decision of a court based on a statute. If a change is made in the statute, the decision of the court is not in effect; and this decision of the arbitration committee is of no effect under the rules now. I differ with Mr. Kehm. While it may be true that an inspector cannot become familiar with all the different parts and different constructions of the various line of cars that pass over their road, it is nevertheless a fact that any inspector can tell whether or not the arch bars are uniform on the car; and, as I said before, I believe it is the intention of the framers of the rules that if the responsibility is not shown by the delivering company to rest on some other company, they must be held responsible, inasmuch as it does not deliver the car to the owning company in the same condition it received it from the owning company.

Mr. Wensley: The gentleman claims that you could catch a wrong arch bar. Two inspectors go over a train in the night with a torch—possibly there are two or three trains in the yard—and they go over that train pretty lively, and inspect it for safety only. I would like to see the man that could tell the difference in arch bars.

Mr. Brazier: The gentleman hit the nail on the head. There is one private line that we do business with that rejects cars on account of the trucks being 1-16 inch out of standard. I would like to see the man that can tell 1-16 of an inch. It is just such microscopic men that we do business with that make so much trouble. I do not believe intermediate roads are responsible for repairs they do not make. Until I became connected with the Illinois Central, I thought that everybody was honest. I used to say that our repair men put repair cards on every car, but Mr. Kehm, who has traveled over the road more than I have, came back with the story to me that when he was in New Orleans he saw the goats go up and eat the repair cards off the cross-tie timbers. If you don't find them, I'll tell you one thing, if you can trace it back to us without any question, we will give you a defect card. But we have some private-line companies that stand out on 1-16 of an inch on arch bars. I have done everything on a railroad, from laying track (when I had to) up, and I can't tell 1-16 of an inch without measuring it. When you come down to 1-16 of an inch on springs, even my friend Mr. Richmond can't do it.

Mr. Richmond: I want to say, in regard to the question of responsibility, that because an inspector inspects a train at night time under adverse conditions, and is unable to say whether or not an arch bar is 1 inch or 1⅛ inch, is no reason why the owner should relieve the company from responsibility, or simply because the inspector has two or three trains to inspect, and has to do it under unfavorable circumstances, is no reason why, because of that inadequate inspection, the owning company should suffer for it. As to the microscopic inspection, I should hardly think that the gentleman who just sat down refers to the Armour Car Line. I believe they are the most liberal company he has to deal with. Some railway companies are very peculiarly made up. Somehow or other they have the notorious habit of saying that they did not do a thing when they did. They are a good deal like the little boy who said he never got whipped but once, and that was when he told his father the truth. The other fellow told him that his father must have whipped the truth all out of him. I think it is about so with the Illinois Central.

Mr. Brazier: I think the gentleman never referred a case to us in the world but that he got justice. It is almost impossible to get repairmen to admit that they made wrong repairs. They generally come back to you with the story that they put back the same stuff they took off. If everybody was as pleasant to deal with as the Armour Car Line, the arbitration committee would have nothing to do.

Mr. La Rue: I think that Rule 1 comes pretty near covering the case. [Reads it.] I don't think any inspector would miss wrong arch bars on his own car.

Mr. Bell: I think we are about as far from determining the real issue in this case as we were at the start. It seems that the fellow that made the wrong repairs was ashamed of them and he didn't card for them as provided by the rules, and we are trying to find out who is responsible for those wrong repairs. I do not think we could determine that if we argued all night, because a man making wrong repairs and not putting a repair card on is not living up to the M. C. B. rules, and is not doing the fair thing. There is only one way to reach him, and that would be to get joint evidence and hold the joint evidence until the bill shows up for repairs, and then produce it.

President Morris: We do not seem to have arrived at any decision as to who is responsible or to whom we should look to for protection. This is an actual case, and the parties interested in it would like to see it settled, especially the one party, and if they can get any information from any of you gentlemen they would appreciate it very much. Mr. Grieb, I would like to ask what the common practice is on the road you represent?

Mr. Grieb: I think if we had a case of this kind we would do pretty nearly as we have done in the past. I am almost positive we have never had a case of this kind since the last revision of the rules; but if there were such a case, we would take it up with the connecting line, and if they stated that the repairs were not made by them, we would ask them to sign a joint evidence card corroborating the statement of our inspector, and then proceed to trace the car from the time it left us prior to its return. We have met with good success in handling these cases in that manner, and tracers from the car accountant's office will always reveal the fact whether a car is moving or lying idle, and if you find it is at some station where some line has car repairing facilities, it is a pretty good scheme to take it up and find out if they did not make some repairs, and in a blanket form ask what repairs they did make. It is assumed that you have not repair card or stub in your office. Most generally, by looking up stubs, you will find a little clue that will greatly assist you, but in the event of not having any information, I think you will get at the bottom and strike the right party by tracing it from the car accountant's office. If a motion is in order, I would like to see my remarks presented in the shape of a motion, in order to get it before the house.

Seconded.

President Morris: As I understand it, Mr. Grieb's motion would be to the effect that the proper course would be to have the owners get a joint evidence card to cover the wrong repairs from the connecting line, assuming that the delivering company had not made the wrong repairs, and for the owner to then trace with a view to finding out, if possible, where the repairs were made, or to hold the joint evidence card in the office waiting for a bill.

Mr. Grieb: To trace by means of what stubs they have on file, for repairs to that car, and also by means of the movements furnished by the car accountant. We find the latter method a very useful one in such cases.

The motion was carried.

THE USE OF BUFFER BLOCKS.

President Morris. The next question is No. 3: Is it advisable to use buffer blocks on freight cars, from the points of protection to car, economy, etc.?

Mr. Bundy: The Rock Island road adopted buffer blocks some three or four years ago. It has been well pleased with them. On its equipment that has buffer blocks I do not think there has been the amount of draft timbers broken there usually is on cars that do not have buffer blocks. Of course, there is a great deal of its equipment that has not got buffer blocks. Probably only one-fourth of their equipment is so equipped.

President Morris: Did you notice any less breakage of draw-bars or couplers?

Mr. Bundy: Well, yes. You see, these buffer blocks set so that just before the spring would shut up tight, the blow would come on the buffer casting; that would direct the blow on a straight line with the sills, relieving it from the draft timbers. I think, from a point of economy on freight cars, that buffer castings are certainly a good thing. Of course, the trainmen are more likely to get hurt.

Mr. Wensley: We have a great number of cars equipped with buffer blocks or castings; the old wooden blocks we have about done away with. We have one class of 500 cars, that are five years old this summer, with buffer blocks. I will say that in twelve months we haven't replaced a coupler in Chicago in these cars, and no end sills whatever. We have 1,000 cars that are three years old this summer, and we have only put in one or two end sills and very few couplers in that time.

Mr. Brazier: I am in favor of buffer blocks, or will be, when all the cars are equipped with M. C. B. couplers.

Mr. Bell: We are not using buffer blocks. I do not think that buffers are a good thing to use until all the cars are equipped with automatic couplers.

Mr. Schmidt: I have had no experience with buffers at all. I asked a man from the C., B. & Q., and he said they were putting them on as fast as they could. They claim that they have noticed a great saving to the guard arm on couplers, yet they admit that it increases the space between the cars thirteen or fourteen inches where a man is liable to get caught. That is the only bad point, and their foreman talked against it.

President Morris: From the remarks made it seems that it is advisable to use buffer blocks, and, in order to close the discussion, I would ask if you would vote on its being advisable to use buffer blocks in connection with M. C. B. couplers?

The association was unanimously in favor of their use.

CREDIT FOR M. C. B. COUPLERS AND KNUCKLES.

President Morris: There is one other question that has been presented here: "What represents proper credit for broken M. C. B. couplers and knuckles removed under Section 10 of Rule 5?"

Mr Grieb: It has been our practice on the St. Paul Railway to interpret that rule literally. I am not prepared to defend the rule as it reads; I do not think it reads right. But we haven't much choice in the matter. We are bound to observe these rules and live by them for one year, and it seems to me that they are so very explicit that credit for nothing more than the actual weight and kind of metal you remove is to be allowed in the case of broken M. C. B. couplers and knuckles. It is not a question of equity at all. Don't put it on that basis. It is what the rule says, and a literal interpretation, it seems to me, can only result in giving actual credit.

Mr. Kehm: The question is one that we have argued considerably, and one that I think we could construe in any way that we saw fit. We take for granted the link and pin drawbar. The rules provide for that very plainly, and say if we remove malleable we shall give the actual weight of it. But in the case of M. C. B. couplers, I think they mean that where you remove a Lone Star, Hien, or Janney, you shall give credit, for instance, for the metal that was in the Lone Star, etc., head. If you break a coupler on your own line, you have got the scrap; either scrap it at the time repairs are made, or it is on your line somewhere and will be eventually picked up and brought to the scrap pile, and I think full credit should be allowed for the coupler removed, and, if steel or malleable iron, at the rate for steel or malleable, but full weight should be given. The same would apply to knuckles.

Mr. Wentsel: Suppose another company should break the coupler and send the car off on a chain, and you applied a standard coupler. Where would your scrap come from then?

Mr. Kehm: The broken part would certainly be missing, and the delivering company should furnish a defect card for the value of the missing scrap.

President Morris: Is that your practice at Chicago?

Mr. Kehm: We have furnished full credits ever since this rule went into effect. We have had two cases of this kind in the last six months.

Mr. Wensley: I have had several cases of this kind—all foreign cars. I asked the gentlemen to return the scrap and they refused. I had to make repairs. I got out of one something like seven pounds, and fifteen out of the other.

President Morris: What is the practice out West, Mr. Schmidt?

Mr. Schmidt: Our practice out West has been this: If we get one of our cars from the U. P. that has a guard arm broken, we allow actual scrap credit. Of course we don't receive the broken guard arm, and I don't see why we should allow scrap credit for it.

Mr. Deen: I think, in a case of that kind, the full amount should be allowed for the coupler that is broken. As a gentleman stated, if it is a Lone Star coupler, full weight of the Lone Star coupler shank should be allowed, or, in other couplers, malleable, steel, or wrought, whatever the coupler is made of, the full amount should be allowed as scrap credit. It evens up in some way.

Mr. Grieb: Can we get a decision on this point? I would make the motion that credit for the actual amount of the material removed, as provided by Section 10 of Rule 5, is correct in the case of the M. C. B. couplers and knuckles.

The motion was seconded and carried.

The meeting here adjourned.

NEW EXPRESS LOCOMOTIVE, PLANT SYSTEM.

The Plant System received some time ago, from the Richmond Locomotive Works, six ten-wheel express engines built from the designs and specifications of Mr. W. E. Symons, superintendent of motive power of that system. Through the courtesy of Mr. Symons we are enabled to present a perspective view and a diagram of this engine, together with some detail drawings of its parts, and complete data of its performance in service.

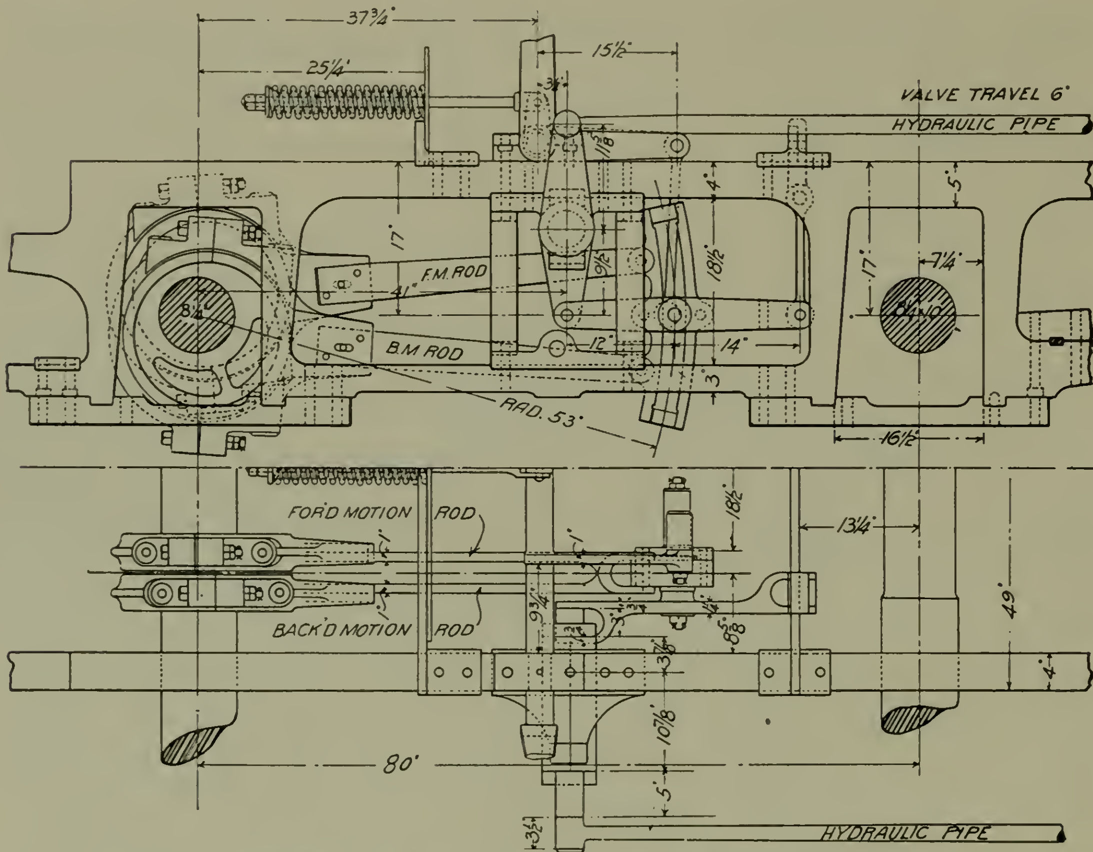
This engine has 19x26 cylinders, 69 inch drivers, and a 60 inch wagon top boiler, designed to carry 200 pounds steam pressure. It has 2,038 square feet of heating surface, and a grate area of 28¼ square feet. It weighs 135,000 pounds, of which 102,000 pounds are on the drivers. The boiler is of ⅝ and 9-16 inch steel; all the horizontal seams are butt joint, sextuple riveted, with welt strips inside and outside. The boiler carries 258 tubes 2 inches in diameter, and 13 feet 6 inches long. The crown sheet is supported by 1⅛ inch radial stay bolts, screwed through the crown sheet and shell, and riveted over, except the six central rows, which have button heads under the crown sheet, and the three front transverse rows are expansion or sling stays. The brick arch is supported on tubes. A rocking finger grate is used.

The frames are of hammered iron, machined all over, 4 inches wide, and are made in two sections, the main frame in one section forged down back of main drivers not less than 8 inches, to allow additional depth of fire box, and with braces welded in and planed full length. The front rails are bolted and keyed to main frames, and with front and back lugs forged into cylinder connections, with stiffening casting between top and bottom rails.

The cross-heads are solid cast steel, in one piece, with wearing surfaces tinned. The axles are steel, with journals 8½x11 inches.

Cast or pressed steel is also used for the following parts, among others, for the purpose of making the engine as light as possible: Smoke box front and door, engine truck center casting, cylinder casings, piston rods, guides, cross-heads, driver centers, and connecting and parallel rods.

A special form of transmission bar is employed by Mr. Symons to obtain a longer link radius than could be otherwise secured, and the details of this are very completely given in the accompanying drawing. Mr. Symons does not claim this as original, but feels that he



TRANSMISSION BAR—PLANT SYSTEM LOCOMOTIVE.

has made a slight improvement over similar designs on the Southern and other roads in that the point of suspension is reversed.

We also show the form of variable exhaust nozzle used on this engine. This, as will be seen, is a neatly worked out method of bridging the nozzle at the will of the engineer at any time on the road. The effects of its use, on the horse power, is shown by the indicator diagrams and data given on another page.

We also give a profile of the division over which this engine is running, and with it a record of a month's performance in everyday service. A Boyer speed recorder on this engine, on this run, has

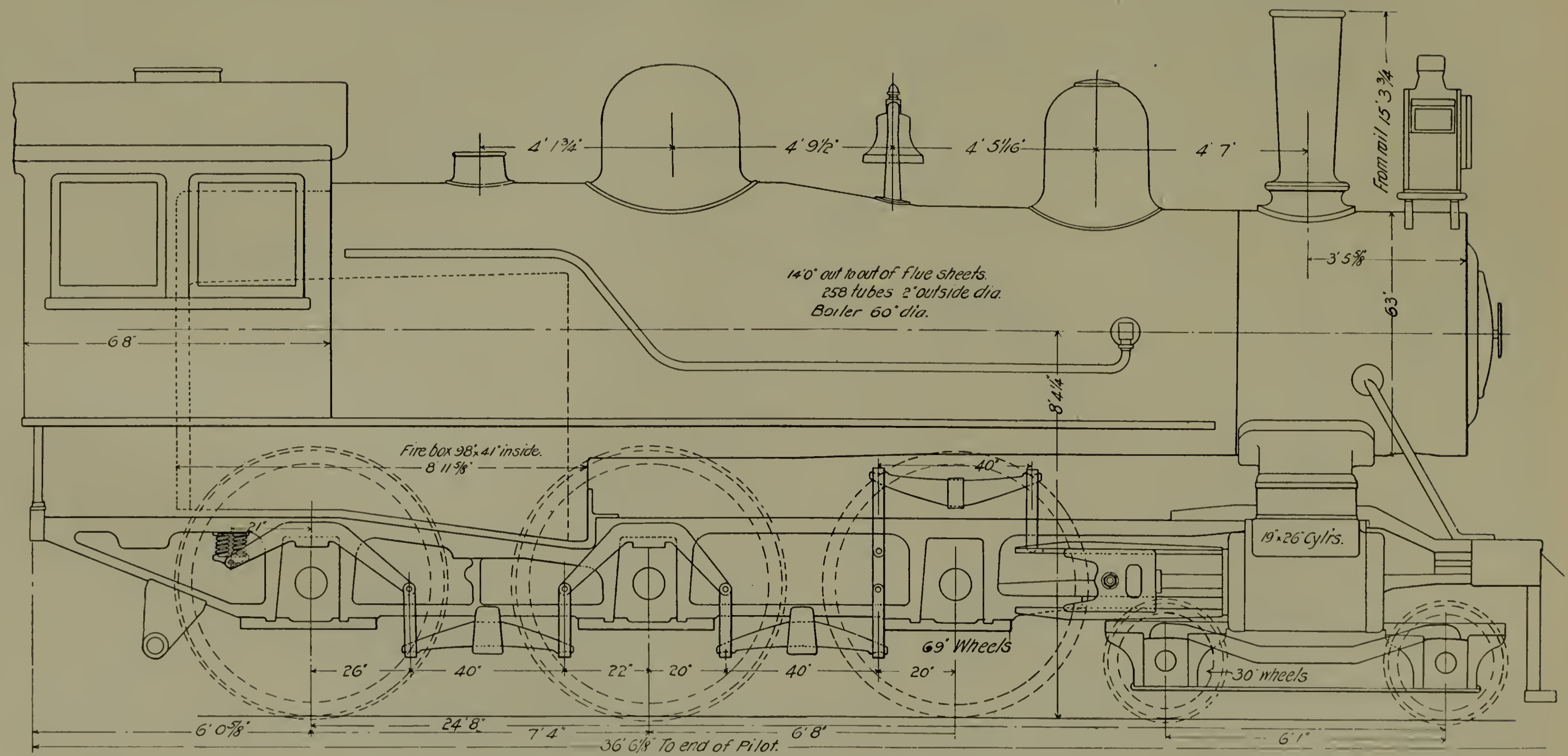
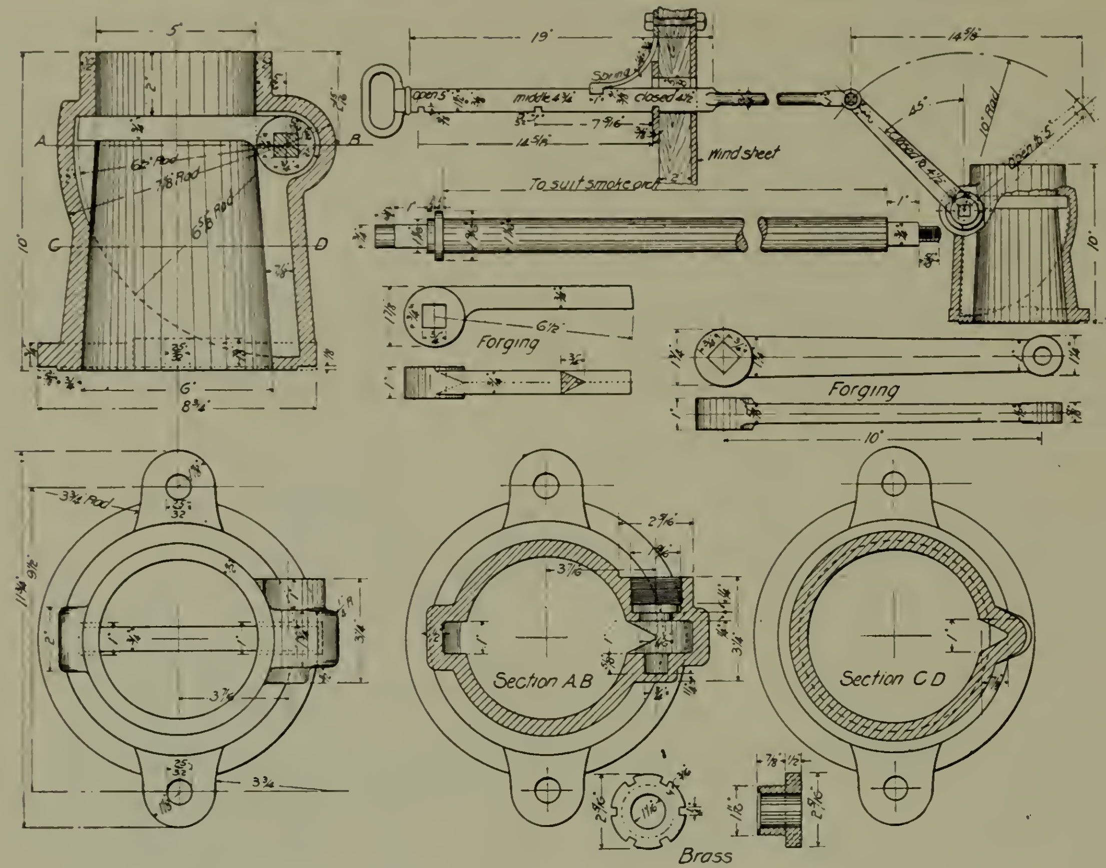


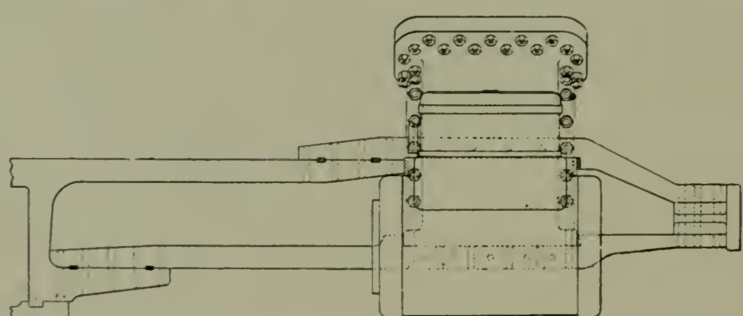
Diagram of Plant System Express Locomotive.



VARIABLE EXHAUST—PLANT SYSTEM LOCOMOTIVE.

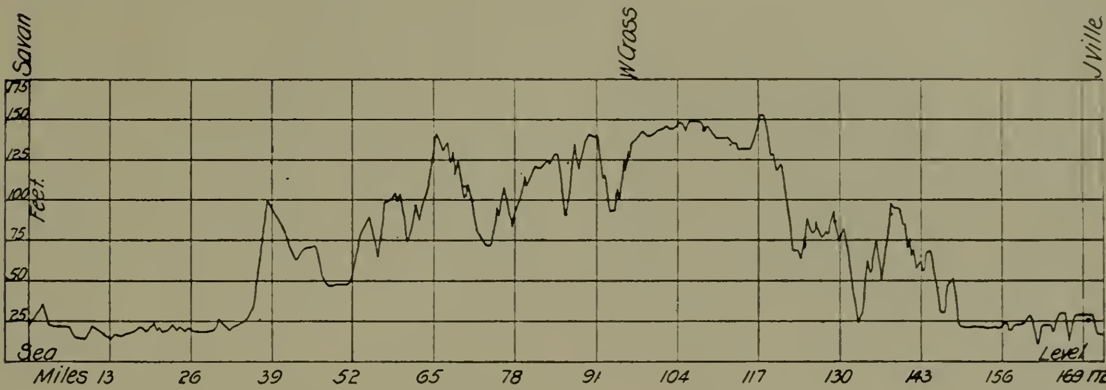
frequently indicated 80 miles per hour, while the engine was hauling eight vestibule Pullman cars, which, together with the weight of the engine, would exceed 500 tons in weight.

The special equipment on these engines includes: National Tube Works tubes, Falls hollow stay bolts, McKee Fuller engine truck and tender wheels, French springs, Nathan lubricators, United States metallic packing, Richardson balanced valves, Latrobe steel tires, Monitor injectors, Crosby steam gages, Janney couplers, Coale mufflers, Leach sanders, Star headlights, Golmar bell ringers, Chapman jacks, Franklin asbestos lagging, American Steel Foundry Company's tender trucks, and Westinghouse brakes and train signal.



THE CYLINDER FASTENING.

The tender frame is of 10 inch channel iron, with collision angle, and the tank is of steel, U-shaped, with a capacity of 4,200 gallons of water and 8½ tons of coal.



Profile of line over which runs below were made.

RECORD OF ENGINE 522, FOR PERIOD MARCH 21 TO APRIL 20, 1899.

WEST-BOUND TRAINS:

Date.	Train.	Left Savh.	Arrd. Wayx.	Left Wayx.	Arrd. Jax.	Dlys on Line Mins.	Running Time Mins.	Average per hour.	Cars in Train.
Mar.									
21	35	8:45a	11:10a	11:20a	1:20p	25	230	44.87	6
23	35	9:52a	11:44a	11:59a	1:28p	10	191	54	6
25	35	8:44a	10:59a	11:16a	12:50p	7	222	46.48	6
29	37	10:34a	12:45p	12:51p	2:25p	------	231	44.68	8
Apl.									
2	37	11:11a	1:25p	1:31p	3:05p	11	217	47.56	8
5	37	9:56a	12:07p	12:13p	1:42p	8	212	48.68	8
7	37	9:18a	11:26a	11:30a	1:00p	5	213	48.45	7
9	37	9:19a	11:20a	11:23a	1:00p	------	218	47.34	7
13	35	8:43a	11:03a	11:15a	12:50p	10	225	45.87	6
18	Spl	3:10p	5:02p	---------	---------	6	106	54.9	8

EAST-BOUND TRAINS.

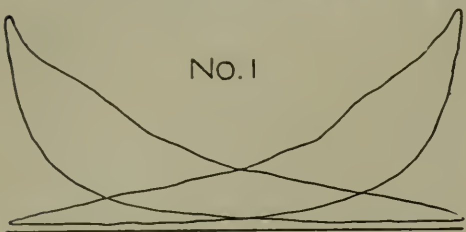
Date.	Train.	Left Savh.	Arrd. Wayx.	Left Wayx.	Arrd. Jax.	Dlys on Line Mins.	Running Time Mins.	Average per hour.	Cars in Train.
Mar.									
22	32	8:20a	10:00a	10:11a	12:23p	13	219	47.12	7
24	32	8:20a	9:58a	10:08a	12:19p	5	224	46	8
26	32	8:20a	9:58a	10:06a	12:15p	------	227	45.46	7
28	38	3:18p	4:59p	5:02p	7:22p	------	241	42.8	8
30	38	3:22p	4:59p	5:02p	7:22p	------	237	43.58	8
Apl.									
1	38	3:27p	4:59p	5:02p	7:22p	------	232	44.48	8
4	38	3:23p	5:06p	5:11p	7:30p	3	239	43.22	8
6	38	3:15p	4:59p	5:02p	7:22p	------	244	42.3	8
8	38	3:15p	4:59p	5:02p	7:22p	------	244	42.3	8
11	38	3:15p	5:10p	5:17p	7:38p	37	219	47.12	7
14	32	8:20a	10:10a	10:19a	12:15p	12	214	48.22	9
20*	Spl	11:03a	1:00p	1:14p	3:05p	41	201	51.34	11

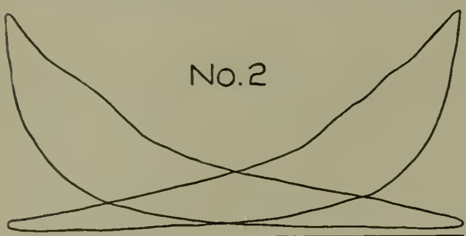
*This is the best record that has ever been made between Jacksonville and Savannah, or over this division, with this number of cars.

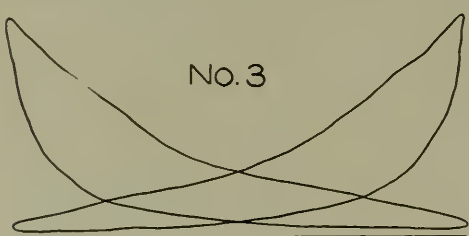
INDICATOR DIAGRAMS FROM PLANT SYSTEM LOCOMOTIVE.

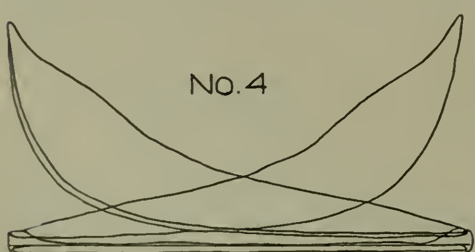
Taken from Engine No. 522. Weight of engine, 115 tons; drivers, 69 inches; piston 19x26; scale of spring, 80.

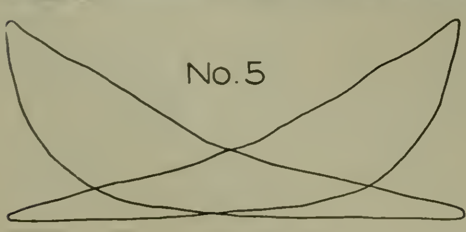
Card No.	Wt. of train in tons.	Total wt. E. & T. in tons.	Speed per hr. miles.	Rev. per minute.	Boiler press. lbs.	M. E. pressure. Lbs.	I. H. P. of engine.	T. P. per lb. of M. E. P.	Ratio of G. A. to H. S.	Ratio of ext. flue area to f. box area.	Miles run per ton of coal used.	Gal. of water used p'r mile run.	Ratio in lbs. coal used to water used.
1	325	440	47	229	160	42.3	721.28	135.64	1 to 73.25	11.8 to 1	Data not taken.	Data not taken.	Data not taken.
2	"	"	51	249	170	44.0	815.75	"	"	"			
3	"	"	59	288	170	43.5	932.86	"	"	"			
4	"	"	45	219	170	{ 44.6 c. / 48.6 o.	{ 727.30 c. / 792.52 o.	"	"	"			
5	"	"	60	292	170	51.5	1119.46	"	"	"			
6	"	"	30	146	165	94.0	1020.84	"	"	"			
7	885	1000	27	132	156	71.9	706.70	"	"	"			
8	"	"	37	180	178	92.0	1233.00	"	"	"			
9	"	"	30	146	165	94.0	1022.46	"	"	"			
10	"	"	27	132	165	98.0	963.24	"	"	"			
11	"	"	32	156	160	106.0	1231.30	"	"	"			
12	"	"	25	122	170	118.5	1081.25	"	"	"			

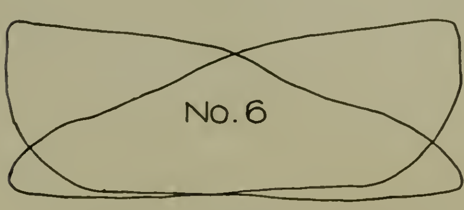




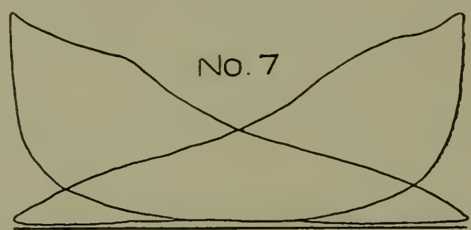


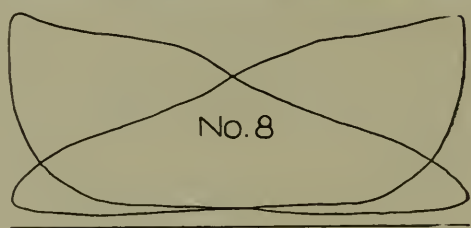


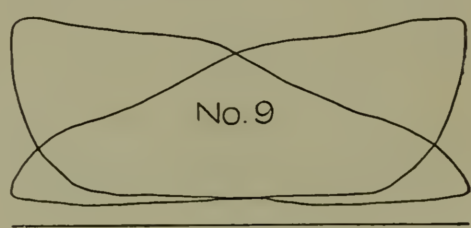


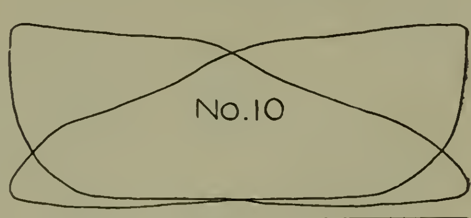


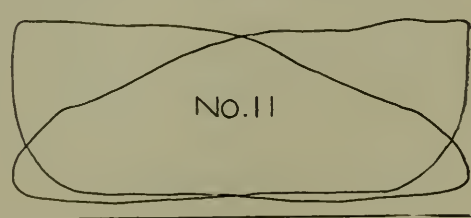
NOTE: CARDS No 4 & 9 WERE TAKEN WITH VARIABLE NOZZLE DEVICE CLOSED.

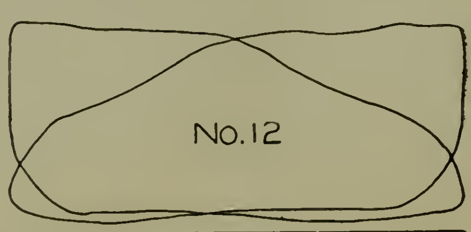








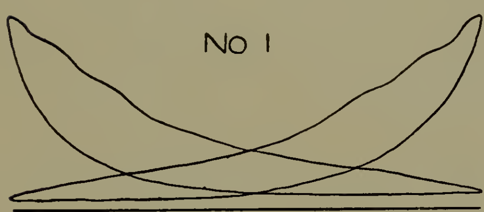


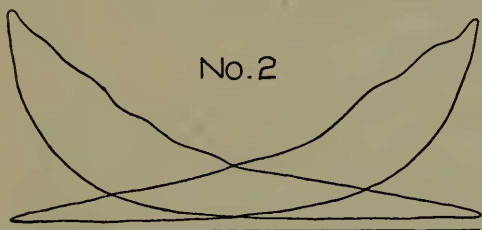


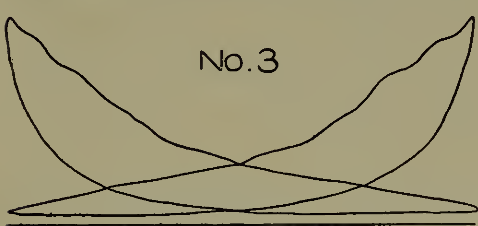
INDICATOR DIAGRAMS FROM PLANT SYSTEM LOCOMOTIVE.

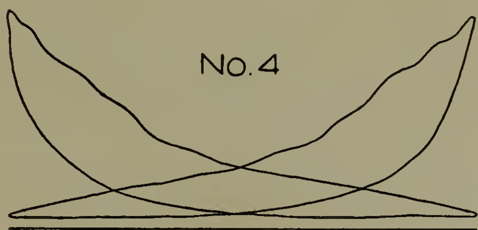
Taken from Engine No. 522. Weight of engine, 115 tons; drivers, 69 inches; piston 19x26; scale of spring, 80.

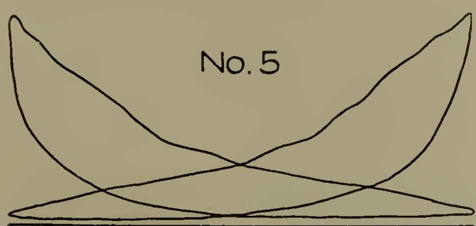
Card No.	Wt. of train in tons.	Total wt. E. & T. in tons.	Speed per hr. miles.	Rev. per minute.	Boiler press. lbs.	M. E. pressure. Lbs.	I. H. P. of engine.	T. P. per lb. of M. E. P.	Ratio of G. A. to H. S.	Ratio of ext. flue area to f. box area.	Miles run per ton of coal used.	Gal. of water used p'r mile run.	Ratio in lbs. coal used to water used.
1	325	440	74	361	165	33.3	894.94	135.81	1 to 73.25	11.8 to 1	35.00	52	1 to 7.1
2	"	"	70	341	170	41.0	1041.25	"	"	"	"	"	"
3	"	"	65	317	165	39.0	920.80	"	"	"	"	"	"
4	"	"	60	292	170	39.0	847.75	"	"	"	"	"	"
5	"	"	60	292	170	42.0	912.92	"	"	"	"	"	"
6	"	"	58	283	170	41.0	860.92	"	"	"	"	"	"
7	375	490	74	361	170	34.0	907.70	"	"	"	"	53	1 to 7.4
8	"	"	74	361	170	38.0	1021.25	"	"	"	"	"	"
9	"	"	74	361	160	38.5	1034.68	"	"	"	"	"	"
10	"	"	73	356	160	38.0	1007.54	"	"	"	"	"	"
11	"	"	70	341	170	39.0	990.50	"	"	"	"	"	"
12	"	"	68	331	170	44.5	1099.00	"	"	"	"	"	"

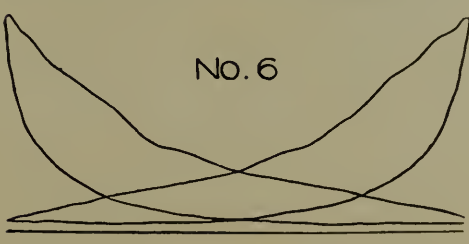




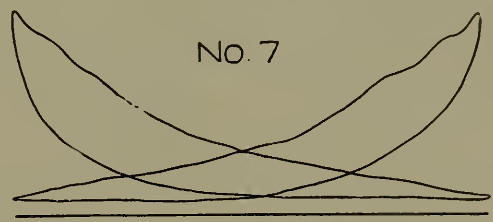


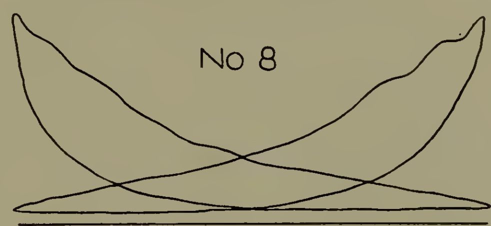


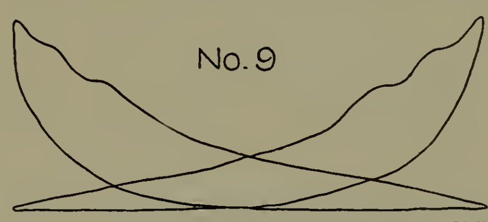


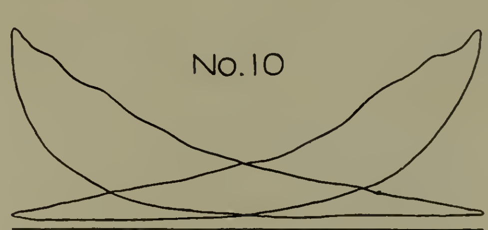


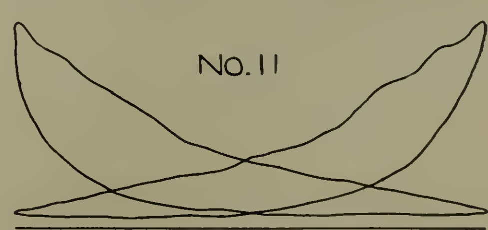
NOTE: CARDS No4 & 7 WERE TAKEN WITH VARIABLE NOZZLE DEVICE CLOSED

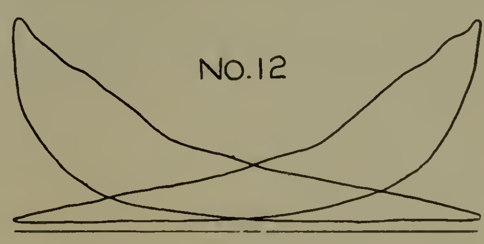


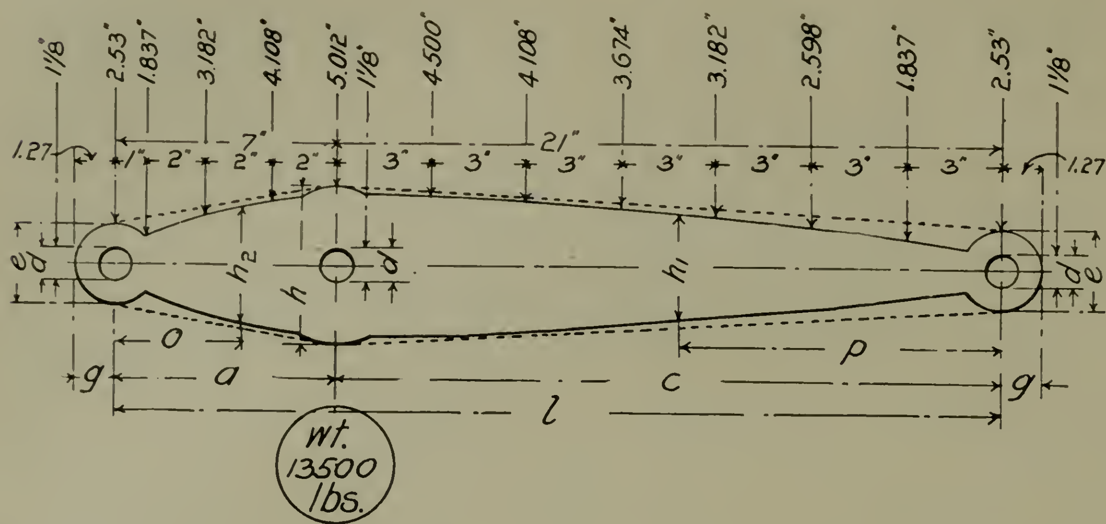












CONSTRUCTION OF THE BRAKE LEVER.

BY THEO. H. CURTIS.

Formula for Pin Hole: When, w = weight applied at pin hole; d = diameter of pin hole; t = thickness of lever at pin hole; b = bearing value of metal in pin hole; then, $\frac{w}{d\ t} = b$ $\frac{w}{b\ t} = d$ $\frac{w}{b\ d} = t$ $t \times b \times d = w$.

To Determine Diameter of Pin Hole: When, w = 15,000 lbs.; b = 12,000 lbs.; t = 1″.

Example: $\frac{15000}{1\ 12000} = 1.25''$, diameter of pin hole.

Formula for End of Lever: $\frac{9\ d}{4} = e$ $\frac{9\ d}{8} = g$ $\frac{e}{2} = g$.

Formula for Lever at Intermediate Hole: When, f = maximum fiber stress in extreme fibers of lever; a, c, h, and l = their respective distances; d = diameter of intermediate hole; w = weight applied at intermediate hole; t = thickness of lever at hole; then,

$$\frac{t\ f\ l\ (h^2 - d^2)}{6\ a\ c} = w \quad \frac{6\ a\ c\ w}{t\ l\ (h^2 - d^2)} = f \quad \frac{6\ a\ c\ w}{f\ l\ (h^2 - d^2)} = t \quad \sqrt{\frac{6\ a\ c\ w}{t\ f\ l} + d^2} = h.$$

To Determine Weight w: When, f = 18,000 lbs.; a = 7″; c = 21″; l = 28″; h = 3¾″; d = 1⅛″ + ⅛″ = 1¼″; t = 1″.

Example: $\frac{1\ 18000\ 28\ (3.75^2 - 1.25^2)}{6\ \ 7\ \ 21} = 7143$ lbs.

To Determine Width h *at Intermediate Hole:* When, f = 18,000 lbs.; a = 7″; c = 21″; d = 1⅛″ + ⅛″ = 1¼″; w = 10,000 lbs.; t = 1″; l = 28″.

Example: $\sqrt{\frac{6\ 10000\ 7\ 21}{1\ 18000\ 28}} + 1.56 = 4.37''$.

Formula for Intermediate Sections of Lever: When, w = weight applied at intermediate hole; f = maximum fiber stress in extreme fibers of lever; t = thickness of lever; a, c, l, h_1, h_2, o and p, represent their respective distances; then, $\frac{6\,w\,a\,p}{t\,l\,h_1^2} = f$ $\frac{6\,w\,c\,o}{t\,l\,h_2^2} = f$ $\frac{t\,f\,l\,h_1^2}{6\,a\,p} = w$

$$\frac{t\,f\,l\,h_2^2}{6\,c\,o} = w \qquad \sqrt{\frac{6\,w\,a\,p}{t\,f\,l}} = h_1 \qquad \sqrt{\frac{6\,w\,c\,o}{t\,f\,l}} = h_2.$$

To Determine Width h_1: When, w = 13,500 lbs.; a = 7″; p = 18″; f = 18,000 lbs.; l = 28″; t = 1″.

Example: $\sqrt{\frac{6 \;\; 13500 \;\; 7 \;\; 18}{1 \;\; 18000 \;\; 28}} = 4\tfrac{1}{2}''.$

TABLE OF SQUARES.

d^2 for 1⅛ = 1.27;	1¼ = 1.56;	1⅜ = 1.89;	1½″ = 2.25	
1⅝ = 2.64;	1¾ = 3.06;	1⅞ = 3.52;	2 = 4	
h^2 for 2¼ = 5.06;	2½ = 6.25;	2¾ = 7.56;	3 = 9	
3¼ = 10.56;	3½ = 12.25;	3¾ = 14.06;	4 = 16	
4¼ = 18.06;	4½ – 20.25;	4¾ = 22.56;	5 = 25	
5¼ = 27.56;	5½ = 30.25;	5¾ = 33.06;	6 = 36	

The full lines show a lever designed as per formulas for a uniform fiber stress f, of 18,000 lbs. per square inch; 1¼″ diameter of intermediate hole; 1″ uniform thickness of lever; 13,500 lbs. weight at intermediate hole. In a lever having a straight taper, as per dotted lines, the weight produces an unequal stress in the extreme fibers of lever. For satisfactory service the bearing value b should not exceed 12,000 lbs. per square inch.

With 1″ thickness of lever, bearing value of metal not over 12,000 lbs. per square inch, and applied weight at intermediate hole—

From 00000 lbs. to 13500 lbs. use 1⅛″ pin hole and 1 3/32″ pin;
From 13500 lbs. to 15000 lbs. use 1¼″ pin hole and 1 9/32″ pin;
From 15000 lbs. to 16500 lbs. use 1⅜″ pin hole and 1 11/32″ pin;
From 16500 lbs. to 18000 lbs. use 1½″ pin hole and 1 15/32″ pin.

The Master Car Builders have adopted 1″ thickness of lever, 1⅛″ diameter of pin hole, and 1 3/32″ diameter of pin, as the minimum size to be used. For wrought iron the fiber stress f can be assumed to be from 15,000 to 18,000 lbs. per square inch for "emergency application" of brakes, and this will allow 12,500 to 15,000 lbs. stress for "service application." If the car is equipped with "high speed brakes," then use 12,500 to 15,000 lbs. for "emergency application." From the second example it will be seen that a lever having centers 7″ and 21″, and 3¾″ width at intermediate hole, 1¼″ pin hole, and 1″ thick, should not be subjected to over 7,143 lbs. at intermediate hole.

HANDLING ENGINE-MEN ON THE BALTIMORE & OHIO.

A new policy of handling engine-men has been inaugurated on the Baltimore & Ohio—a policy the results of which will be awaited with considerable interest. On May 1 Mr. Harvey Middleton, general superintendent of motive power of that road, announced the new plan in the following words:

"Mr. W. C. Hayes has been appointed locomotive superintendent, and will have charge of all engine-men and engines when on the road. His instructions as to their handling, etc., shall be final.

"The positions of supervisors of engines and trains are abolished; in their places will be appointed, by the locomotive superintendent, as many traveling engineers as may be necessary, who shall report to the locomotive superintendent and perform whatever duties are assigned to them, by him.

"The traveling engineers will be appointed from any division of the road for service on the same or any other division without regard to their rights in locomotive service, but if, for any reason, they are returned to locomotive service, they will take their positions on the division from which employed, to which they are entitled by age in service.

"The locomotive superintendent will not directly administer discipline to engine-men, but will make recommendations to the master mechanics, or traveling engineers, in case of violation of instructions, incompetency, etc. Upon the recommendation of the master mechanic, or traveling engineers, the offender shall be given a further trial, but if no improvement is made, or if he still fails to perform his duties to the satisfaction of the locomotive superintendent, or traveling engineers, he shall be relieved on the grounds of incompetency. This shall not apply to men who are obviously incompetent.

"All locomotive firemen shall be employed by the traveling engineers, subject to the customary physical and educational examinations now in effect.

"On May 1, 1899, a traveling engineer shall be employed for each of the following territories: Philadelphia to Washington, Baltimore to Brunswick, Brunswick to Cumberland, Cumberland to Grafton, Grafton to Benwood and Parkersburg, Pittsburg to Cumberland and Wheeling, Wheeling to Sandusky and branches, Chicago to Akron Junction."

PERSONAL MENTION.

In the death of Mr. C. M. Higginson, assistant to the president of the Atchison, Topeka & Santa Fe, who passed away at his home in Riverside, Ill., on May 6, the railway world lost one of its most valuable members. Mr. Higginson was a most remarkable man in many ways. He possessed in marked degree the enviable qualities of untiring industry, extreme thoroughness, notably methodical habit and rigid integrity. These severely business-like characteristics were, however, always lightened by a warm geniality, and a form of light joviality that was peculiarly his own, and that made it difficult for the moment, sometimes, for one to realize how tremendously in earnest he always was. He always wanted exact facts, and if he did not at once find them he would "dig" for them—to use one of his own favorite terms. Thus it was that he developed, as he passed upward through his railway career, the faculty of finding out where things in railway administration were amiss. If he had no remedy himself to offer at once for the trouble, he would secure one from some source. It was his mission, in his railway life, to stop leaks and to expand productive agencies. He browsed around in all departments—(save that of traffic, which he left severely alone, for the good reason, as he expressed it, that he did not know enough about it to meddle with it), and he produced results. For the past nine years he had been officially assigned to such duties—to reform ways and means wherever he saw need for it. On two great systems—the Burlington and the Santa Fe—he did this kind of work, and he did it so well that he attracted the favorable attention of the great railway capitalists of the East. He had produced such remarkable records of economies that his business future was assured beyond peradventure, and held alluring possibilities. Mr. Higginson was a leading authority on combustion, and his small work on "Soft Coal Burning," published by this journal, has gone through several large editions. He was, for several years, a frequent contributor to the railway press upon this and other topics involving railway economy. Mr. Higginson was a born natural scientist, and his recreation always took the form of work upon some branch of that science. He had been for years an active member of the Chicago Academy of Sciences, of which he was for a long time president. He was a fellow of the Royal Society of Great Britain and a member and contributor to the work of the Western Railway Club. He loved his home, and there the gentle side of his nature came out at its truest, and was evidenced, among other ways, by his fondness for flower culture, the careful breeding of choice fowls and allied pursuits. He possessed one of the finest private mineralogical collections in the country, and was especially fond of, and a connoisseur in, opals. Mr. Higginson was a truly unique character; he accomplished great things; but always very quietly and smoothly; the present writer has sat by his desk many times, but he never saw anything on the desk—it was always clean. A mystery was, always, to his visitors as to how he discharged the vast amount of work that he was known

Mr. C. M. Higginson.

to without a sign upon his desk of what was going on. Mr. Higginson's business career may be briefly sketched as follows: He entered railway service in 1865, in the engineering department of the Burlington & Missouri River Railroad; in 1875 he was purchasing agent for the Toledo, Peoria & Western Railway, and in 1876 was appointed purchasing agent for the Chicago, Burlington & Quincy. During this connection he started the testing laboratory of that road at Aurora. In 1879 he was transferred to the position of assistant auditor of the same road, in charge of statistics, and in 1890 was made assistant to the vice-president, where he remained until the reorganization of the Atchison, Topeka & Santa Fe, when he was made assistant to the president of that system.

Mr. F. W. Brazier, assistant superintendent of machinery of the Illinois Central, has resigned to accept the position of assistant superintendent of rolling stock of the New York Central & Hudson River, vice Mr. S. A. Crone, resigned. Mr. Brazier was originally an Eastern man, his twenty-one years of active railway service having been commenced with the Fitchburg Railway. He was with that road for fifteen years, during eight of which he was general foreman car department. In 1893 he resigned that position and was appointed superintendent of the Chicago, New York & Boston Refrigerator Company, at Elsdon, Ill. In 1896 he resigned this position to become general foreman car department of the Illinois Central, at Burnside, Ill. In October of 1896 he was appointed assistant superintendent of machinery of the same road, holding that position until called to his new position in the East. Mr. Brazier has made many friends during his stay in the West, who, while regretting to see him go East again, are greatly pleased that he has been given such an important position.

MR. F. W. BRAZIER.

Mr. James Slavin has been appointed master mechanic of the Spokane Falls & Northern, Nelson & Fort Sheppard and Red Mountain Railways, with office at Spokane, Wash., vice Mr. C. H. Prescott, resigned.

Mr. F. J. Pease, formerly acting master mechanic of the Toledo, St. Louis & Kansas City, has been appointed master mechanic of the Milwaukee, Benton Harbor & Columbus, with headquarters at Benton Harbor, Mich.

Mr. R. F. Kilpatrick, general foreman of the Chicago, Rock Island & Pacific at Horton, Kan., has resigned to go to the Delaware, Lackawanna & Western.

Mr. W. H. Garlock has been appointed master mechanic of the Port Angeles Eastern, with headquarters at Port Angeles, Wash.

William A. Dewey, formerly superintendent of locomotive service of the Chicago & Eastern Illinois, died at Goshen, Ind., on May 1, of Bright's disease.

Mr. J. S. Chambers has resigned as master mechanic of the Buffalo division of the Lehigh Valley to accept the position of division master mechanic of the Central of New Jersey, at Elizabethport, N. J., vice Mr. N. E. Sprowl.

Mr. Thomas Fildes, who recently resigned as division master car builder of the Lake Shore & Michigan Southern at Chicago, has been appointed assistant superintendent of motive power and equipment of the Long Island Railway. This should be a very congenial connection for Mr. Fildes, for, while he has been of late years employed distinctively in car work, he is also well trained in locomotive work. Mr. Fildes learned his trade in the Lake Shore machine shops at Elkhart during the years 1872 to 1876. From 1877 to 1882 he was in the shops of the Indianapolis, Peru & Chicago at Peru, Ind. For the next three years he was general foreman of the Wabash at Indianapolis, and in 1885 he went to the Monon as general foreman at Lafayette. In 1886 he was appointed general foreman of the Lake Erie & Western at Peru, remaining there until in 1888 he came to Chicago as general foreman of the Chicago & Erie. This position he held until 1891, when he was made master car builder of the Lake Shore at Chicago. Mr. Fildes, in joining the rapidly growing colony in the East of Western men, leaves many warm friends behind him who wish him well in his new field of work.

Mr. Thomas Fildes.

Mr. Waldo H. Marshall, assistant superintendent of motive power of the Chicago & Northwestern, has, we understand, accepted a proposition from the Lake Shore & Michigan Southern to assume charge of its mechanical department, vice Mr. G. W. Stevens, resigned. Mr. Marshall will, we further understand, have control of both the motive power and car departments of the Lake Shore. The new appointee has held his present position on the Northwestern for just about two years. Mr. Marshall's first work in connection with railways was with the Rhode Island Locomotive Works. He later for a number of years was mechanical editor of the Railway Review, then editor of the Railway Master Mechanic, and then editor of the American Engineer, which latter connection he left to enter the service of the Northwestern in the position that he will soon relinquish.

Mr. C. J. Clifford has resigned as master mechanic of the Chicago, Lake Shore & Eastern Railway, the occasion being the virtual consolidation of that road with the Elgin, Joliet & Eastern under the recent operations of the Federal Steel Company. Mr. J. Horrigan, master mechanic of the Elgin, Joliet & Eastern, becomes superintendent of motive power and car departments of the two roads. Mr. Clifford is one of the very few who have had foreign railway service, having been mechanical superintendent of Henry Meiggs' railways in Peru and of the government railways of Costa Rica. He has also seen service in Spain, going there in the service of the Rogers Locomotive Works to set up locomotives at Barcelona.

Mr. William A. Foster has resigned as superintendent of motive power and machinery of the Fall Brook Railway, on account of the absorption of that road by the New York Central & Hudson River Ry. Mr. Foster has had a long and most honorable record in railway service. He served with the Fitchburg Ry. for many years, working up from the shops to the head of the mechanical department of that road. In 1885 he went to the Fall Brook Ry. to take the place which he now resigns.

We learn as we go to press that Mr. Frank Thomson, president of the Pennsylvania Railroad, died suddenly on June 5th, aged 58 years. Mr. Thomson was a graduate of the mechanical department of that road, and in our next issue we will give some account of his interesting career.

Mr. George W. West, superintendent of motive power of the New York, Ontario & Western, has been appointed American Reporter on Brakes and Couplings for the International Railway Congress, which meets at Paris next year.

Mr. Joseph Elder, whose resignation as superintendent of motive power and machinery, and master car builder of the Rock Island & Peoria we noted in our last issue, has accepted the position of Commissioner of Public Works at Peoria, Ill.

Mr. J. L. Whitsitt has been appointed master mechanic of the Central of Georgia, with headquarters at Savannah, Ga., vice P. J. Milan, resigned. Mr. W. E. Chester, hitherto foreman of machine shops of the same road, at Columbus, succeeds Mr. Whitsitt as master mechanic at Columbus.

On the Mobile & Ohio Mr. M. T. Carson, superintendent of machinery, has been given the title of superintendent of motive power and car equipment, and Mr. J. D. Gurganus, master car builder, has been given the title of assistant superintendent of motive power and car equipment.

Mr. G. W. Stevens, purchasing agent of the Mobile & Ohio, has resigned and has been succeeded by R. H. Duesberry, as acting purchasing agent.

Mr. E. M. Roberts, who for the past four years has been connected with the St. Louis Southwestern at Jonesboro, Ark., has been appointed master mechanic of the White & Black River Railway, with headquarters at Brinkley, Ark.

Mr. M. T. Phillips has been appointed master mechanic of the St. Louis & Hannibal, with headquarters at Hannibal, Mo. Mr. Phillips has hitherto borne the title of general foreman mechanical department of this road.

Mr. R. L. Herbert, master mechanic of the Southern Pacific (Atlantic System) at Victoria, Tex., has been appointed master mechanic of the same company at El Paso, Tex., vice O. De Young, deceased. Mr. A. Verhelle succeeds Mr. Herbert at Victoria, with the title of acting master mechanic.

Mr. C. Colmey has been appointed road foreman of engines of the western division of the Pittsburg, Fort Wayne & Chicago, vice Mr. P. Ray, transferred.

Mr. C. F. Winn, hitherto master mechanic of the El Paso & Northeastern, has been appointed master mechanic of the Chesapeake Beach Railroad, with headquarters at Washington, D. C.

Mr. A. McCormick has been appointed master mechanic of the Rock Island & Peoria, with headquarters at Peoria, Ill., vice Joseph Elder, resigned.

Mr. William H. Whalen, of the purchasing department of the Chicago, Rock Island & Pacific, has been appointed general purchasing agent of the Delaware, Lackawanna & Western, vice Mr. W. D. Hager.

Mr. George Thompson has been appointed division superintendent of motive power of the Pennsylvania division of the New York Central & Hudson River, extending from Lyons, N. Y., to Newberry Junction and Mahaffey, Pa. He will have supervision of the repairs and maintenance of motive power and rolling stock on his division, with headquarters at Jersey Shore, Pa. The appointment dates from May 18th. Mr. Thompson has hitherto been master mechanic of the Beech Creek road.

Mr. Edwin T. James has been appointed master mechanic of the Lehigh Valley at Wilkesbarre, Pa., vice H. D. Taylor, who has resigned to enter private business.

Mr. De F. Lillis, who was private secretary to Presidents Newell, Caldwell and Callaway, of the Lake Shore, and who has been a clerk in the auditing department of the same road lately, has accepted a position as private secretary to A. M. Waitt, superintendent of motive power and rolling stock of the New York Central.

Mr. William Hays, for some time gang foreman in the Monon machine shop at Lafayette, has been appointed foreman of the Monon round house and shops at Bloomington, vice Arthur Orr, deceased.

On the Baltimore & Ohio, Mr. W. C. Hayes has been appointed locomotive superintendent, in charge of all engine men and engines when on the road. He has appointed the following traveling engineers: W. J. Duffy, Parkersburg and Wheeling division; W. B. Blackwell, second division; M. Carey, Pittsburg to Cumberland and Wheeling; D. E. Fisher, third division.

Mr. H. M. Wissimer, for many years connected with the Baldwin Locomotive Works, has been appointed master mechanic of the Ohio Southern vice Mr. S. C. Sehart.

THE JONES CAR DOOR.

The Jones car door, the successor of the Moore car door, has some late improvements of marked merit. As the Moore door it has in long service demonstrated its mechanical worth; but the late developments give it added practical value. The present construction is shown in our engravings. Figure 1 shows the door closed, and held tightly between the stop and the permanent cleat. It is so held when in this position that it is practically a flush door, cinder, rain, and dust proof. The door is held tight through the combined action of the hanger, shown at the top of the sectional view, and by the inclined face of the lower brackets, gravity doing the work. In opening the door, see figure 2, the handle of the vertical connecting-bar is

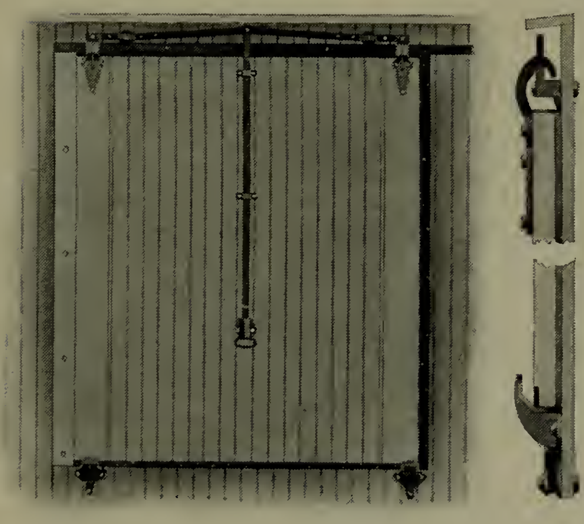


FIGURE 1.

THE JONES DOOR.

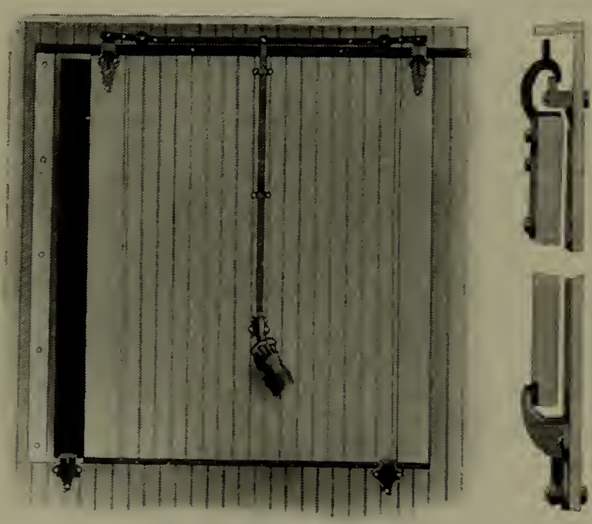


FIGURE 2.

pulled down a few inches. This operates the top levers, throwing the door in bearing on the wheels. The door in moving up to this bearing engages the wedge and is thus thrown out clear of the cleat to the position shown in the sectional view in figure 2. The hanger has a lip lying on the top of the door and the edge of this lip forms the wearing surface opposed to the wedge. The opening between the top arm of the hanger and this lip is such that the door cannot leave the rail. The vertical connecting-bar is in one piece, with a three-link chain and handle, which latter is concealed in the center bracket, as shown, when not in use. This door is, it will be seen, very simple, almost entirely without mechanism, and easily applied. The well known burglar proof bracket of the old Moore door is retained. The castings are all of malleable iron. This door is sold by the Jones Car Door Company, Gaff building, 234 LaSalle street, Chicago.

SUPPLY TRADE NOTES.

By an arrangement recently made, the Chicago Pneumatic Tool Company have arranged with the National Pneumatic Tool Company to sell the entire output of their factory in connection with the large line of pneumatic tools now handled by the Chicago Company. This gives the Chicago Pneumatic Tool Company control of the sales of the Phœnix rotary drills, the new Haeseler piston drills and the appliances manufactured by the National Pneumatic Tool Company, as well as the Boyer riveters, hammers and piston air drills. Orders to the National Company will receive prompt attention as heretofore, and the Chicago Company are prepared to supply any tools wanted in either line. The arrangement is amicable on both sides, and is for the purpose of reducing selling expenses on both lines of tools. The Chicago Pneumatic Tool Company has purchased the patents formerly owned by the Consolidated Pneumatic Tool Company, now defunct. These patents include all the Keller and Wolstencroft types of tool construction and in addition several new applications which have not yet been taken out. These patents are said to have originally cost the Consolidated Pneumatic Tool Company about $40,000.

A pamphlet that is not only amusing, but pleasing, comes to us with this title: "A Lecture upon a Remarkable Example of American Developments and Processes in the Production of Hematite Malleable Iron and Steel Castings. Delivered before the British Society of Uncivil Engineers by Sir Ponsonby Hawkesworth. A.R.A., K.C.B., etc." A good many attempts to make humorous trade circulars and booklets are dead failures; but this particular one is a success. The reading matter is good and the pictures are excellent. The Pratt & Letchworth Company is to be heartily congratulated for getting up a "skit" which is really funny. That they do make good steel and malleable iron is known to everybody, and their position as manufacturers is so well established that they can safely make a little fun of themselves and a lot of it for other people. Those who have not received this "lecture" should send for it and assure themselves of a half hour in which the cares of life will be forgotten. It is hardly necessary to add that the address of the Pratt & Letchworth Company is Buffalo, N. Y.

The Pneumatic Supply & Equipment Company has been organized under the laws of the State of New York, and has opened an office at 120 Liberty street, New York. It is the purpose of this company, as its name implies, to deal generally in compressed air equipment, and it will make a specialty of the installation of complete plants, eliminating the division of responsibility which has heretofore existed in the trade. Those who decide to use compressed air for any purpose whatever can, through this company, secure promptly a complete installation, ready for service, of the best and most approved equipment suited to the special work to be done. The company is bringing out several specialties in the compressed air line, such as pneumatic oil rivet forges and quick acting hose couplings and has, in addition, closed agencies for several standard types of compressors. Mr. J. W. Duntley, the president of the Chicago Pneumatic Tool Company, is the president of the new company. Mr. E. B. Gallaher, formerly with Messrs. Patterson, Gottfried & Hunter, is the vice-president and engineer, and Mr. W. P. Pressinger, formerly manager of the Clayton Air Compressor Works, is secretary and treasurer. The rapidly widening scope of compressed air application opens a large field of usefulness for the new company, and the character of its incorporators is an assurance of its ability to meet the requirements of the trade.

The Magnolia Metal Company has opened an office in Montreal, Canada, for the benefit of its Canadian trade. The office is located at room 524, Board of Trade building.

At a meeting of the board of directors of the Ajax Metal Company, May 31st, Mr. F. J. Clamer resigned as director and vice-president of the company. On the same date the following officers were elected: J. G. Hendrickson, president; J. R. Neison, first vice-president and treasurer; G. H. Clamer, second vice-president and secretary. The retiring vice-president has been actively associated with Mr. Hendrickson for nearly twenty years in the work of building up the business of the Ajax Company to its present high standing, and while he now gives up his active part in the work he still retains his former interest in the company.

A report just made by the Julius Pintsch Company, of Berlin, shows in detail all the cars equipped, on each railway in the many countries of the world, with the Pintsch system of car lighting; also the locomotives, gas buoys and beacons and gas works. This report shows that there are 90,890 cars, 3,650 locomotives, and 892 gas buoys and beacons using the Pintsch system, with 303 gas works to manufacture the gas required for the illumination of these equipments.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

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THE CONVENTION WORK of both associations at Old Point Comfort was marked by two leading features: one the presentation of a fine lot of reports, and the second the absence of extended discussions thereon. The reports were as a whole exceptionally "clean cut," and decisive in their conclusions. The discussions were meager, largely for the reason that the reports, in most cases, were so thorough that little was left to be said—little at least that could be presented off-hand on the floor of the convention. These conditions at the conventions were contributed to undoubtedly by the excellent work of the railway clubs. These clubs do clean up a wonderful amount of underbrush during the year, particularly in all those matters relating to the interchange rules.

The coupler committee did a noble piece of work. Much of the merit of this report is due to the fact that Chairman Atterbury detailed Mr. William Elmer, jr., a special apprentice in his shops at Altoona, to undertake various lines of original investigation of the coupler question. The existing situation was quite thoroughly covered, and then the results were carefully digested, with the result of a report that presented well-defined recommendations. The reasons for these recommendations were fully given in a series of admirable appendices to the report. The whole forms a monograph on the M. C. B. coupler situation that rivals the reports of years ago on automatic brakes. A strong second to the coupler report was Mr. Manchester's report on water purification, which covered this important topic in an exceedingly thorough way; and Mr. Lyons' report on the generally unfamiliar topic of nickel steel is also worthy of special commendation, for bringing into compact form a mass of valuable information. This latter we comment upon more fully on a later page. Other reports were particularly thorough and able, such as Mr. Lawes' report on stay-bolt practice, but those above mentioned were rather distinctive leaders.

The master car builders did well when they moved the air brake testing matter along a peg. It is not well for the association to take the action that it has in prescribing air brake tests, and then continue to quietly pass by without notice the introduction of brakes that have not officially met these tests. The New York Air Brake Company has placed its apparatus in service to some considerable extent, and is offering it on all sides; and there has been not a little wonder that it has not submitted its triples for test by the master car builders' standing committee assigned to such work. It transpired at the convention that it had reasons for not submitting its triples to that committee, and these reasons were apparently considered by the committee as possessing some weight. The association graciously voted to undertake to remove these objections if possible. It now remains to be seen how this magnanimous act will be met. The committee and the association have evidenced a desire to be entirely fair in the matter, and the New York company may be expected to meet their action in the spirit in which it is offered. Of late the standing committee on brake tests has been something of a figure-head—a fact that is very distasteful to that committee, especially to Chairman Rhodes, who has devoted some of the best work of his prime to the development of the modern air brake. It is felt that if the committee is to be given no work to do it might as well be dispensed with. It is known that there is work that it should be asked to do; and it is hoped that that work will be soon presented to it.

The work of the first week's convention would have been sadly impaired by the extremely hot weather, were it not that railway men are accustomed to attend strictly to business, no matter if the heavens threaten to fall. That first week was something dreadful. It is liable to be hot almost anywhere in this country in June, but at Old Point when it is hot it is d—esperately hot. The members did good work in the convention hall, though they had to grit their teeth to do it; but the exhibits drew few callers the first week, for the first time in many years. It was risking life to go to the exhibits during some of those days. The experience had this year should definitely bury all chance of Old Point Comfort ever again entertaining our conventions —in June at least. That first week's torture brought out many expressions to the effect that Saratoga was *the* place for future conventions.

The presidents' addresses were both models in their way. Mr. Schroyer dwelt particularly upon the immediate work of the association, and fearlessly expressed his views on some of the points that were to come up. Mr. Quayle, on the other hand, entered upon a review of the past year's developments in railway motive power.

The project of merging the two associations, which some thought to be quite imminent, appears to still belong to an indefinite future. A majority of the executive committees of both associations are not in favor of it, and it is apparent that there is a strong feeling in both associations against the proposed consolidation. Plans have, however, been adopted by both associations which will in all probability insure the transaction of all convention business in one calendar week, the master car builders having the first half and the master mechanics the second half of that week. This should meet the chief desires of those moving for a consolidation. As a matter of fact, the two associations, although representing very largely the same interests, have their distinctive lines of work (the master car builders working particularly for uniform practice and the master mechanics working largely as an educational body as do the mechanical and civil engineers) and there is thus good reason for the associations to maintain their separate identities.

The committee report on standard sections for car sills was so thoroughly prepared that its recommendations were, practically without discussion, ordered sent out to letter ballot for approval as standard. This was one of the distinctively happy outcomes of the convention work of this year. There is no question but that the ballot should be in favor of those who thus consistently urge true reforms. It is with pleasure that we recall that early in the discussion of this important matter the RAILWAY MASTER MECHANIC placed itself on record in favor of standardizing these parts. We then gave —for the first time, we believe—a tabulation of sizes of car sills, and pointed out the desirability of securing greater uniformity in these parts. It was stated at the convention this year that there was probably nothing to be gained in price by using more uniform sizes, but that the lumber dealers were agreed that such practice would result in better grades and more prompt deliveries. It was suggested that uniformity in section of siding and roofing would also be a good thing, and it may be noted that the committee on subjects for next year has recommended that this topic be considered.

The dummy coupling for air brake hose seems to have lost almost all of its friends. The committee on air brake appliances found from replies to its circular letter of inquiry that there was only a small majority of those reporting remaining in its favor. Those representing about one-half of the cars reporting have discarded the dummy coupling. In this connection, this committee offered the opinion that if a coupler for air brake hose could be devised that would be automatic, so that it would not be necessary for operators to use it, such a device would be of undoubted advantage. We may add that we feel that there is little doubt but that the time will come when the coupling up of train pipes, air signal pipes, and steam hose pipe must be effected automatically, as is now done with the car coupler proper.

The customary complaint of lack of replies to circulars of inquiry was made this year. But there was one shining exception "to prove the rule" in the responses to the committee on standard sill sections. This committee was favored with forty-eight replies, and they were from leading roads, too. The replies represented 853,014 cars of 50,000 pounds capacity and over, out of a total of 1,252,219 cars.

The loyalty of members of the Master Car Builders' Association was indirectly appealed to by the committee on uniform car sill sections. This brings up the threadbare question of why will members go to conventions with the avowed purpose of securing unison, vote with hearty unanimity for reference of a proposed standard to a letter ballot, go home and vote aye on this ballot, and then calmly disregard the standard thus supposedly established. The naive appeal modestly slipped into the phraseology of the report referred to should have its effect. The standing committee on supervision of standards, we may add here, gave some slight comfort in regard to this matter, for it reported finding that 17 of the 25 standards were in general use, as were 14 of the 27 items of recommended practice.

The information given by the committee on the causes of trains parting was interesting as far as it went, but, unfortunately, it covered a comparatively small field of service. The committee gave one particularly interesting tabulation, however, showing that in about 1,500 cases of trains parting that were equipped with M. C. B. couplers, defective locks were responsible for 17 per cent of the cases, worn knuckles, 13 per cent, and broken knuckles, 14 per cent—other features contributing very much smaller percentages. It will be seen that troubles with the locks were the chief causes for trains parting.

It is thus quite evident that the lock to the lock is a feature in couplers that requires continued close attention, as does the design and location of the lock.

The question of allowing a differential in car repair prices in the far West was settled very definitely in the negative. The question came up, it will be remembered, last year, and was presented in a rather aggressive manner by the Western contingent. It then received no favorable attention, but was accorded the courtesy of a committee of investigation. The committee reported adversely this year, and the Western men thereupon gave up the contest, although they very properly retired facing their adversaries, making a very dignified retreat from the arena.

Fifty-ton Box Cars.

For a time it was thought that 60,000 pounds was the maximum limit for wooden cars, and that, when larger capacities were required, they would be constructed with steel underframes, and possibly entirely of steel. Coal, flat and box cars of 70,000 and 80,000 pounds capacity have been built of wood in large numbers in the past year, but some roads have drawn the line at 80,000 pounds, and built their coal cars of that capacity of steel. A bold step has now been made by a California road in contracting for a large number of grain cars 40 feet long and of 100,000 pounds capacity, with the frames built almost entirely of wood, with numerous truss rods in the side and end posts. The body transom is of ordinary width and the draft timbers are of usual construction. The surprising thing is the light weight of the car, which is actually lower than that of a good 30-ton car. The saving in weight is largely obtained by using sills and posts of small section, depending on light truss rods for requisite strength.

The service of these cars will be watched with interest, for if they are found adequate for so large a lading, and repairs are not expensive, they will demonstrate that much useless timber has been used in wooden cars in the past. We believe, however, that wood is not the proper material for cars of 50 tons capacity, and that such cars will soon fail in the underframe, as well as in the superstructure. The satisfactory performance of 50-ton steel coal and ore cars should soon lead to the construction of steel underframes for box cars. How a light box shall be built so as to carry 50 tons of grain successfully and with light repairs is one of the interesting problems now before our car builders. Shall it be of wood or steel, or a combination of both? The wooden box is already on trial.

The Master Mechanics' Report On Nickel Steel.

IT is surprising that the report on nickel steel in locomotive construction, at the master mechanics' convention, excited so little interest, and no discussion from members of the association. The only remarks on it were made by a representative of a manufacturing concern, and in the interest of that company.

The severe service now demanded from the machinery of modern locomotives is equal to, if not greater than, that of marine engines. Nickel steel is now regularly specified for all important engine forgings used in the United States Navy, and the same reasons which have led to its use in marine service apply with equal force to locomotive service; but the necessity for using high strength steel does not seem to be so well appreciated by railroad men. The rapid strides which locomotive construction is making in this country in the direction of greater power and higher speed, will create a demand for such a high grade in steel forgings that it can only be met by nickel steel, oil tempered and annealed.

As the merits of good nickel steel become better known its use for locomotive machinery will grow rapidly and will soon become the general practice. Mr. Lyon's report has done a good service in presenting a general introduction of the subject, in which the physical qualities of nickel steel are described, and representative tests are tabulated in compact shape. The peculiar quality of nickel steel is, that high ultimate strength and elastic limit are obtained without increasing the content of carbon beyond 0.25, the use of 3 per cent nickel securing a strength greater than that of ordinary steel containing .50 carbon. The brittleness due to high carbon steel is thus avoided and the usual elongation is obtained. The valuable feature of nickel steel is its remarkable toughness, due to this high elastic limit, *combined* with good elongation.

The elastic limit of nickel steel will average 70 per cent of its ultimate strength, and it is possible to obtain machinery forgings of this material with an elastic limit of 65,000 pounds. This is about equal to the ultimate strength of ordinary steel forgings and double the elastic limit of such material. When such strength is combined with an elongation of 21 per cent in two inches it will be understood why nickel steel is so well adapted to resist alternating stresses of great magnitude.

The specifications given in the report as recommended by an American manufacturer as proper for locomotive forgings, are subject to criticism in several respects. Here was an opportunity for members of the association who are experts in test room work to add a valuable discussion to this interesting report. The timidity which has so long been evidenced by users being content with steel of ordinary strength, and by their hesitation to use high strength steel on account of its brittleness, seems to extend to the use of nickel steel, and accordingly we find strength specified for nickel steel which is actually lower than that of carbon steel which has been used for years by some of the more progressive builders. The specification calls for steel of the highest strength for crank pins and piston rods, the limits being 78,000 minimum, and 84,000 maximum, with 25 per cent elongation in two inches. The next grade is for driving axles—74,000 minimum and 80,000 maximum, with elongation of 30 per cent in two inches; and still lower we have a grade of nickel steel proposed for side rods, where the minimum strength is 60,000 and maximum 68,000, and the elongation 25 per cent in two inches. These figures, we understand, are all for oil-tempered steel.

The objections to the specification are that there is no good reason for grouping these different details as they are and requiring much lower strength for side rods than for piston rods, and lower strength for driving axles than for crank pins. The highest strength required by the specification is not as high as it should be and not too high for any of the parts mentioned. The elastic limit required is one-half the ultimate strength, which would admit steel having an elastic limit of only 34,000 pounds for side rods. The specification as a whole can easily be met by ordinary carbon steel, and we regard it as one not calculated to secure good nickel steel, which should have an elastic limit equal to 70 per cent of the ultimate strength.

Contrasting this specification for locomotive machinery with the government specification for nickel steel for marine forgings, given in the committee's report, we find the latter requires a minimum of 95,000 pounds, an elastic limit not less than 65,000 pounds, and an elongation of 21 per cent in two inches for steel oil tempered and annealed. Such steel is required for marine engine shafts, cross-head pins, connecting rods, piston rods, valve stems, links, eccentric rods, etc., and we believe it is a more suitable grade for similar parts of locomotives than that recommended by the "prominent American manufacturer" quoted.

The report closes with the record of a few samples of nickel steel which have been used experimentally on locomotives, for piston rods, crank pins, and rod bolts, showing that the experience thus far has not been very favorable. It is possible that some of these tests have been made with parts of poor design or insufficient sectional area, and others with a poor grade of nickel steel, or that the heat treatment has not been correct. Such experiences are unfortunate, as they tend to give nickel steel a "black eye," as the speaker at the convention expressed it. It is the principle object of this article to try to counteract if possible, even to a slight extent, the bad effect which statements like those at the end of the report may have.

We are strong in the conviction that good material, like good character, will be ultimately successful, and a material which possesses such remarkable qualities as good nickel steel must give results in service, when properly used, superior to anything which can be obtained from carbon steel. The fact that some tests of nickel steel have been disappointing, shows that there was something wrong with the test, and we can only say, with Faraday: "The experiment has failed, but the principle remains the same."

THE MASTER CAR BUILDERS' CONVENTION.

The Master Car Builders' Association met in its thirty-third annual convention at Old Point Comfort, June 14th, with a very large attendance and President Schroyer occupying the chair and Secretary Cloud at his desk. The sessions lasted through three days and the work done was, in sequence, as follows:

GENERAL OPENING BUSINESS.

After the opening prayer by Rev. J. J. Gavatt, the convention was addressed by Hon. Charles T. O'Ferrell, ex-Governor of Virginia, whose remarks took the form of a ringing address on patriotism. President Schroyer followed with his address.

The financial reports showed the present membership of the association to be 458, of which 260 are active members, 191 representative members, and 7 associate members. It was shown that there is now a total of 1,348,171 cars represented in the association. It was also shown that the association has now in its treasury a balance of $8,893, with all bills paid.

Mr. J. A. Gohen, representing the Master Car and Locomotive Painters' Association, addressed the convention briefly, asking the Master Car Builders' Association to extend indorsement and aid to the work of the former association.

Topical discussions were then taken up, as they were on each succeeding day of the convention, but we are obliged to defer an account of these valuable discussions until a later issue.

The report of the committee on supervision of standards and recommended practices of the association was then presented. We append the recommendations of this committee as follows:

SUPERVISION OF STANDARDS AND RECOMMENDED PRACTICE OF THE ASSOCIATION.

[A. M. Waitt, G. L. Potter, William Apps, Committee.]

This committee had given members an opportunity to suggest any desired modifications of the standards and the various recommended practices of the association, and had made inquiry as to the extent to which the various standards and recommended practices are used, and after reporting in detail upon the various items, it closed with the suggestion that the following recommendations be submitted to the association for adoption by letter ballot:

1. That drawing for standard journal boxes, 3¾ by 7 inches, show size of bolt-hole 1 1-16 inch instead of 1 inch, to provide for the 1-inch bolt ordinarily used.

2. That Sheet 15, showing journal box in details, for journals 5 by 9 inches, give the general dimensions only for journal bearing, eliminating the general construction of bearing, with lead lining.

3. That the word "coupler" be substituted for "drawbars" in the title and description of the standard height of drawbars.

4. To eliminate guarantee for cast-iron wheels from the list of recommended practice.

5. Substitute the word "couplers" for "drawbars" in the title and text in connection with the recommended practice "Adjusting height of drawbars."

6. Eliminate the drawing and description of the Fletcher journal box lid for 80,000-pound capacity cars from the recommended practices.

The committee also suggested that the following subjects be referred to committees to investigate and report at the next convention:

1. Design for wheel circumference measure.

2. Revision of specifications for car wheels.

3. Design for the journal bearing and wedge gauges for 80,000 and 100,000-pound capacity journals.

4. Revision of rules for loading poles, logs and bark on cars.

5. Revision of recommended practice on springs for freight cars, including the consideration of designs for springs for 100,000-pound capacity cars.

The convention indorsed the first, third, and fifth recommendations and ordered the second and sixth recommendations sent out to letter ballot for standards. The five suggested subjects for discussion were ordered referred to the committee on subjects.

TRIPLE VALVE TESTS.

Mr. G. W. Rhodes then reported for the standing committee on triple valve tests, stating that the association's testing plant had been removed from Altoona to the Purdue University at Lafayette, Ind., and stating further that no tests of triple valves had been made during the year. Mr. J. N. Barr wanted to know why tests had not been made and went on to state that the New York air brake was now being offered on the market generally, and at a lower figure than the Westinghouse brake, and stated that if tests would show that the New York brake was as good as the Westinghouse brake there should be some authentic information to that effect. Mr. Rhodes replied, stating that the New York Air Brake Company's triples had not been tested because that company had objected to submitting their triples for test. The New York company had based its refusal on two points. One was that its triple would not meet the requirements of test No. 2, where it is specified that the final maximum pressure must not be less than 15 per cent nor more than 20 per cent above the pressure given by the same brake in full service application. The company, moreover, did not consider this as a vital or essential feature of standard brake specifications. This company's second objection to having its triples tested was that on the present committee on tests there was no representation from any road which had experience in the use of the New York triples. Mr. Rhodes considered that both of these points were legitimate objections. Upon motion of Mr. Barr it was voted that there should be added to the present committee two members who are familiar with the practical workings of the New York air brake in actual service and in considerable quantities. Mr. Barr made this further motion, which was adopted, namely, "that the committee on tests of triple valves be instructed to carefully consider the present recommended practice with a view of determining if any modification of the same is allowable, that they obtain sets of triple valves and make such tests of same, both on rack and on trains, as may be necessary to give this association full information as to the construction, and that they be authorized by and with the consent of the executive committee to make the necessary expenditures from the funds of the association, the same not to exceed $5,000."

INTERCHANGE RULES.

The convention then took up its annual revision of the interchange rules, basing its work upon the reports of the committee on arbitration, of the committee on prices in master car builders' rules and on the report of the committee on compensation for car repairs done west of the 105th meridian. After a discussion of something like two hours the rules were adopted as modified in convention. As is our custom, we omit the first two named reports, but we append the conclusions of the committee on the last topic as follows:

COMPENSATION FOR CAR REPAIRS DONE WEST OF THE 105TH MERIDIAN.

[J. N. Barr, S. P. Bush, L. C. Haynes, T. B. Kirby, Committee.]

This committee presented an exhaustive report accompanied by elaborate tabulations showing the costs of labor and of the various items of car repairs on over thirty roads in various sections of the country; the freight car mileage and amounts paid for same; the amounts paid and collected for repairs; freight earnings per ton per mile and percentages of cost of maintaining equipment to whole cost of operating, etc. The committee carefully considered all these factors in their bearing upon the request made by the Western lines for a differential to give them relief from the condition which imposes a loss upon them in repairs, and closed its report as follows:

"In conclusion, in view of the complexity of the differential question, of the variation in remuneration and cost of repairs, which varies in all sections of the country, your committee feels that it cannot recommend any change in the established policy of uniform prices for all parts of the country."

Mr. J. H. McConnell, a member of this committee, declined to sign the report.

The conclusions of the committee upon this subject were formally adopted by the convention, and this ends the matter as far as the association is concerned. During this interchange discussion a report on the passenger interchange rules was submitted by Mr. H. J. Small of the special committee on this subject. This committee recommended the insertion of a paragraph in the rules providing for the furnishing by the receiving road of an M. C. B. defect card as authority for bill for gas in the reservoirs of cars interchanged. This recommendation was referred to a committee to investigate and report upon next year.

STANDARD WHEEL AND TRACK GAGES.

Mr. J. N. Barr then reported for the committee on standard wheel and track gages (to confer with the American Railway Association). The substance of Mr. Barr's report was that he had communicated with the American Railway Association, that there had been certain figures adopted by that association and that the matter had been referred back to the Car Builders' Association without any apparent idea of further conference. It appears that the master car builders' figures were satisfactory. There is still a proposition to have a train test of fifty cars on the Muskingum Valley Railroad. On motion this report was accepted and the committee was discharged.

The next business was the presentation of the report of the standing committee on brake shoe tests, the substance of which follows:

BRAKE SHOE TESTS.

[S. P. BUSH, R. P. C. SANDERSON, GEO. GIBBS, Committee.]

At the last convention this committee reported that arrangements had been made for the transfer of the brake shoe testing apparatus to Purdue University, where it was to be properly cared for by the University and protected from loss by insurance, under a written agreement. The transfer of the testing apparatus has been effected, and it is now in operation at the Purdue University, which is using it for instructive purposes and will be glad to make tests for any manufacturers that may wish to have tests made, upon the payment of a nominal fee which will cover the expense that the University may be put to.

Since the original tests made by the committee there has been considerable activity in the way of developing brake shoes to produce greater efficiency, with the view particularly of obtaining greater durability of brake shoes in service. This effort has been in the direction of composite, or composition shoes, and while greater durability is very much desired, it is also important to the railways in general that durability should not be obtained at the sacrifice of proper braking power. There are perhaps three or four new shoes being produced to-day which it might be well for the association to have tested under the direction of its committee, with the view of determining their frictional values, comparing them with the original tests of hard and soft cast iron, and the committee recommends that it be instructed to test such brake shoes as may be presented to it for that purpose and which may seem to have made sufficient departure from those previously tested to have affected their efficiency or durability.

This report was received without discussion and the committee continued.

The committee on trains parting then presented its report, the substance of which follows:

TRAINS PARTING.

[G. N. DOW, JOHN HODGE, D. HAWKESWORTH, J. M. HOLT, Committee.]

The committee's circular of inquiry was answered by 8 roads, representing 130,074 cars, or 4.23 per cent of the roads and 10.38 per cent of the cars represented in the Master Car Builders' Association. Following is a summary of the reports received:

Total number of cases of trains parting between December 1, 1898, and April 1, 1899, 2,606. There were 47 per cent of the break-in-twos caused by the forward car of the two between which train parted. There were 46 per cent of the cases that occurred when trains were pulling out, and 25 per cent when trains were slacking up. There were 21 per cent of the cases that occurred through draft rigging breaking, 10 per cent through knuckles breaking, 1.28 per cent through difference in height of cars, 1.41 per cent through foreign matter, such as ice, gravel, etc., in coupling, 9 per cent through worn condition of knuckles.

Of 2,342 of the cases of trains parting reported, 66.90 per cent were with cars equipped with M. C. B. couplers, and 41.75 per cent with cars equipped with link-and-pin drawbars or with one link-and-pin drawbar and one M. C. B. coupler.

Cause for trains parting that were equipped with M. C. B. couplers in detail for 1,506 cases, as follows:

1. Defective locks....263 cases, or 17.46 per cent.
2. Worn knuckles....197 cases, or 13.08 per cent.
3. Defective uncoupler attachment.... 84 cases, or 5.58 per cent.
4. Broken coupler body....120 cases, or 7.97 per cent.
5. Defective draft rigging....147 cases, or 9.76 per cent.
6. Broken knuckles....208 cases, or 13.81 per cent.
7. Miscellaneous causes....487 cases, or 32.34 per cent.

[The committee presents a mass of other miscellaneous information which, however, is of no conclusive value because of its varying nature; and then closes as follows—ED.]

In view of the information obtained your committee would respectfully submit the following recommendations:

Maintaining spindles not less than 2 inches diameter, and keys not less than ½ by 2 inches. Also more care to be used in making pockets, avoiding sharp corners on rear end of pocket.

In the inspection of cars a close inspection to be made of knuckles and locks, with view of reducing unnecessary play in knuckles and locks.

The committee believes that it is necessary to make a systematic inspection of couplers in service, with a view of limiting the variation from the M. C. B. contour line, using a special gauge for the purpose.

Committee would recommend M. C. B. buffer blocks on all cars to relieve the shock to draft rigging in slacking up, thereby reducing to a minimum break-in-twos induced from such causes. (Mr. Hodge excepted.)

Consideration of this report was deferred until such time as the report on car couplers be taken up.

Mr. B. Haskell then presented the report of the committee on square bolt heads and nuts. The substance of this report follows:

SQUARE BOLT HEADS AND NUTS.

[B. HASKELL, W. H. LEWIS, THOS. FILDES, Committee.]

In outlining the work of this committee it was thought best to work jointly with a committee from the American Mechanical Engineers' Society, and the Bolt Manufacturers. We were not successful in getting the American Mechanical Engineers' Society to take up the subject, but succeeded in getting the Bolt Manufacturers to do so. The subject was taken up with individual members of the Manufacturers' committee, and all claimed that they should have to charge from ten to fifteen per cent more for bolts made with M. C. B. heads than for those with Manufacturers' heads, on account of the increased amount of metal in the head and the extra labor and time consumed in making them, and in changing dies. It was also claimed that there was very little call for bolts with M. C. B. or U. S. standard heads, but that the Manufacturers' standard was just as strong and serviceable and answered all requirements.

In order to determine whether or not this was true it was thought advisable to arrange for a comparative test of both standards.

This test was made at Purdue University, through kindness of Professors Goss and Hatt, to whom the thanks of the Association should be extended. It is a valuable report and the only one of its kind that has ever been made. [Here follows Professor Hatt's valuable report, covering elaborate tension and eccentric tests of bolts. Professor Hatt's final conclusion was that the Manufacturers are correct in their statement that the Manufacturers' standard head is better than the larger U. S. standard head.—Ed.]

It will be seen from Professor Hatt's report that there is evidently ample strength in the smaller heads, and that as far as the question of strength is concerned, there is no reason why a smaller head than the M. C. B. or M. M. standard cannot be used, and we recommend the following standard for square bolt heads:

The side of head shall be one and one-half times the diameter of the bolt, and the thickness of head shall be one-half the side of the head.

As regards square nuts, we recommend that no change in present standard be made, as it is believed that there is no demand for it, and the replies from the different roads show that there is no difficulty in getting them of M. C. B. standard.

While it is true that there may be some disadvantages in having bolt heads and nuts of different size on account of difficulty in using wrenches, it is believed that wrenches can easily be made in "S" form, fitted at one end for the nut and at the opposite end for the bolt head. It is also believed that it is not safe to make the short diameter of the nuts any less, as this would result in greater liability of the nut splitting.

In support of our recommendations, we submit the following:

First. The statements of Professor Hatt that the test shows that the Manufacturers are correct in their statement that the Manufacturers' standard head is a better head than the larger U. S. standard head. The results of the test show that this recommended standard is amply strong, and that therefore the extra amount of metal in the M. C. B. standard is uncalled for and that the extra amount of labor and loss of time necessary to make the M. C. B. standard is uncalled for.

Second. The evident fact that it is impossible to maintain the present M. C. B. standard, due to extra cost of bolts, and inability at times to obtain them.

Third. The evident fact that the results of tests made and information contained in this report will make it more difficult to maintain present M. C. B. standard, as car builders and bolt manufacturers will be in a position to claim and prove that the M. C. B. standard is uncalled for as far as strength is concerned, and to substantiate their claims in regard to increased cost of M. C. B. standard.

[This committee also suggested the use of a standard bolt head and nut gauge, and submitted a sample gauge, a cut of which we expect to give later.—Ed.]

It was voted to refer this report to the American Society of Civil Engineers and to the Mechanical Engineers' Association, and it was also voted to refer to letter ballot for recommended practice the recommendations of the committee, which committee was then discharged.

COUPLER PRICES.

A supplementary report from the committee on prices was then received. This committee recommended that for all malleable or wrought iron parts of couplers the price be 3½ cents per pound, and for all steel parts of couplers 4½ cents per pound, while the price of the shank and the coupler complete should remain as now in the rules, namely, $4.50 and $7.50. The committee also recommended 4½ cents a pound as a price for steel castings and that the rules be changed where necessary to conform to this figure. Upon vote these recommendations of this committee were formally adopted.

JOINT MEETINGS.

The report of the conference committee on joint meetings of the two associations was here taken up. The committee had reported, recommending a joint opening session of both associations to be held on the second Tuesday in June, the remainder of the week, to and including Friday, to be allotted in half day sessions alternately to the two associations. This recommendation was not favorably received and it was finally voted that the Master Car Builders' Association meet on Monday and complete its business during the first three days, with the hope that the other association would adopt the last three days. It was further moved that the executive committee, having this vote in mind, should be given power to act finally in conjunction with a similar committee of the Master Mechanics' Association when making the necessary arrangements for the meetings next year.

At this point a vote of thanks, offered by Mr. J. H. McConnell, was extended to Mr. Cloud, the retiring secretary, for the faithful and efficient manner in which he had performed the duties of his office.

The report of the committee on M. C. B. couplers, to define contour lines more fully when new and when worn and to propose specifications for couplers, was then presented by its chairman, Mr. W. W. Atterbury. This was a very elaborate and very thorough report, but unfortunately we cannot now give it space. We, however, append the recommendations made by the committee, as follows:

M. C. B. COUPLERS.

[W. W. ATTERBURY, W. P. APPLEYARD, W. S. MORRIS, Committee.]

The subject as assigned to your committee may be divided into three parts: 1, to define the contour lines more fully when new; 2, to define the contour lines more fully when worn; 3, to propose specifications for couplers.

1. To define the contour lines more fully when new. This part of the subject can again be divided into four parts, none of which are covered by present M. C. B. standards: (A) To fix the length of the guard arm; (B) The vertical dimension of the knuckle; (C) The vertical dimension of the end of the guard arm, and, (D) To

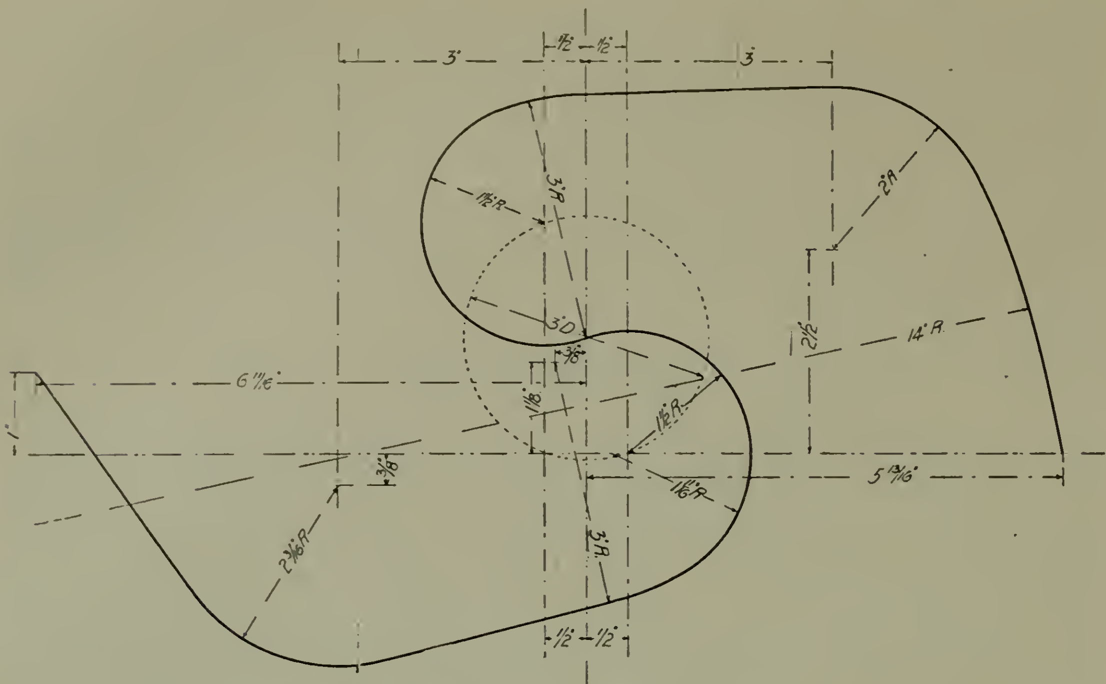


FIG. 1.—PROPOSED CONTOUR LINE.

It will be noted that in this contour the reverse curve of 8 inches radius has been straightened out and continued as a tangent to the arc drawn with the $2\frac{3}{16}$-inch radius. It is also reduced in flare so as to hold the couplers together better.

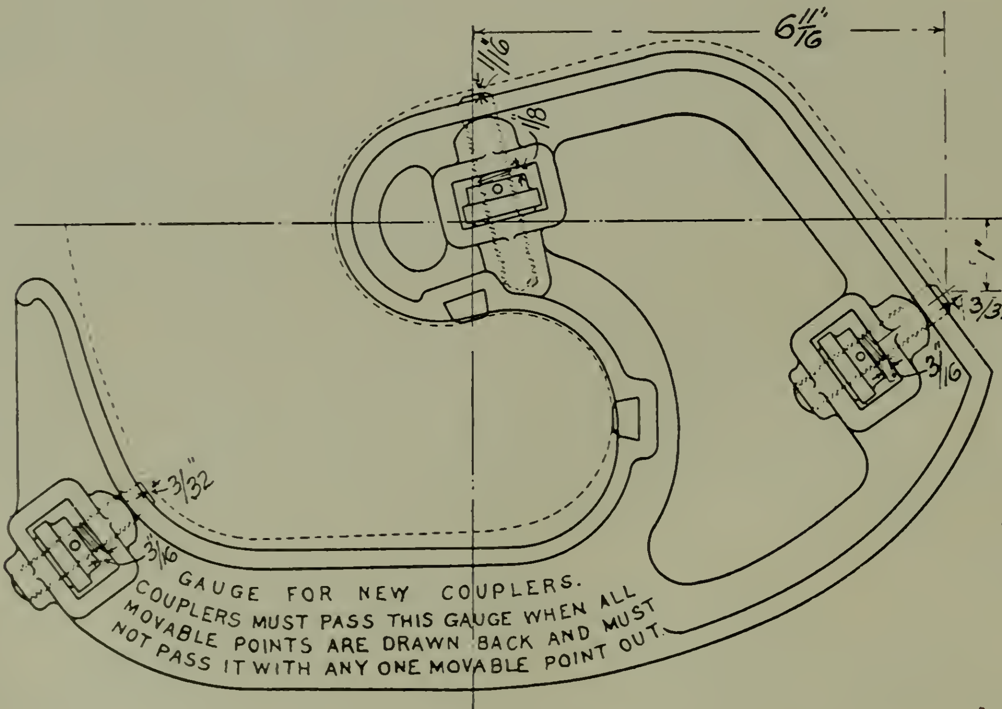


FIG. 2.—PROPOSED GAUGE FOR NEW COUPLERS.

The change in the gauge is the extension of the frame and the re-location of the present guard arm limit screw so as to control the end of the guard arm contour. By placing the limit screw at the extreme end of the proposed new guard arm, manufacturers will be compelled to keep the contour correct ; for, by the terms of the gauging, if the gauge passes with any one movable point out, the coupler is rejected.

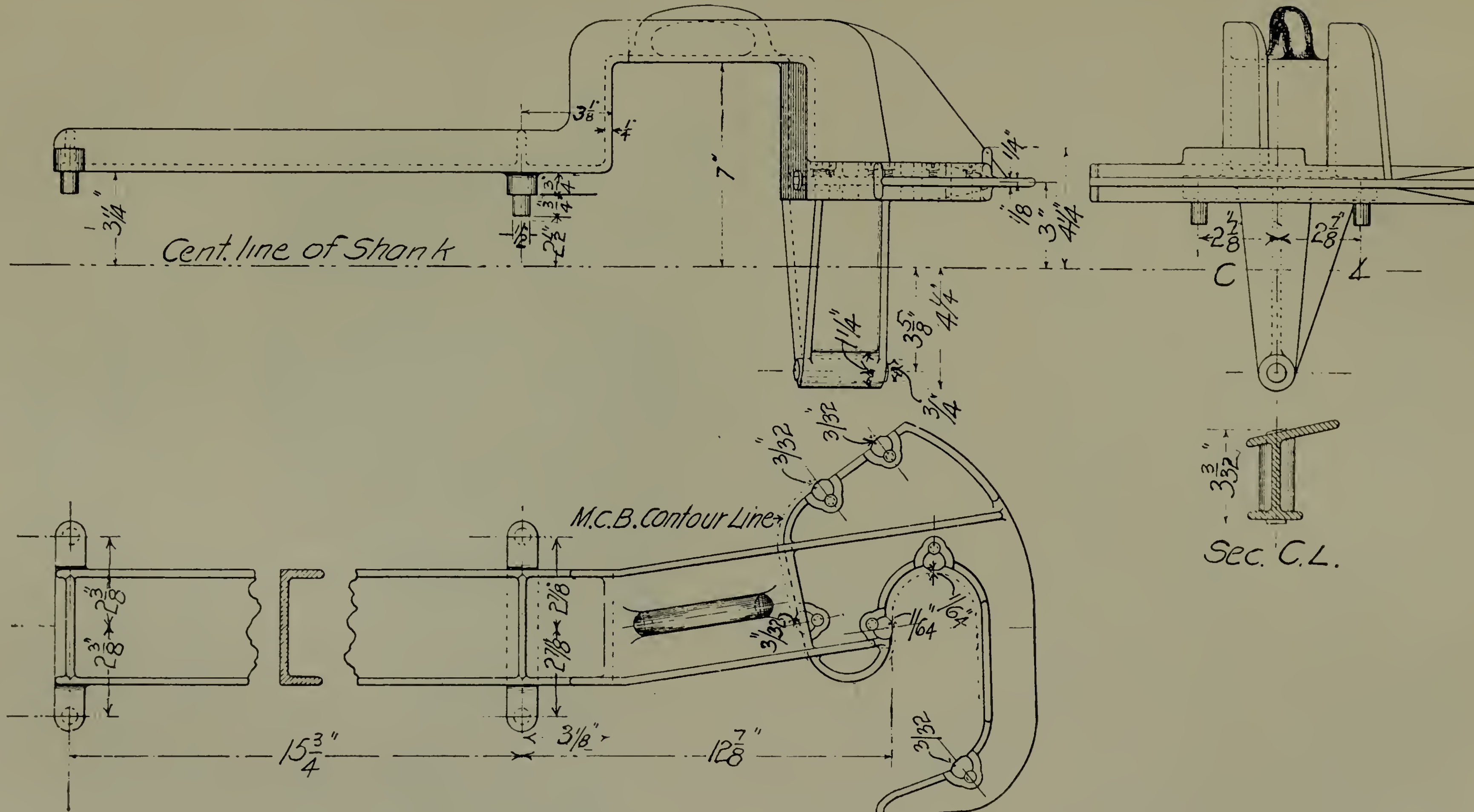


FIG. 3.—PROPOSED TWIST GAUGE.

The body of the gauge is a duplicate of the M. C. B. gauge for new couplers, provided with the long guard arm, and the contour is the same as the M. C. B. gauge with all movable points drawn back. It is, therefore, sure to enter every coupler that has been properly inspected by the other gauge. The arm extending back over the shank is provided with hardened steel pins, one pair of which must drop down over the square part of the shank immediately behind the head, and the other pair over the block upon which the yoke is riveted. There is sufficient play between these pairs of points to allow manufacturers proper variations, but badly distorted castings are discovered when the pins interfere with the proper seating of the gauge. The arm extending downward insures that there shall be no twist in the vertical plane, and the raised rib on the front of the gauge prevents the coupler head from being displaced bodily, up or down. The knuckle should stand ¼ inch above the top of this rib in a perfect coupler. Manufacturers are therefore allowed ¼ inch variation.

refer the axes upon which the contour lines are constructed to the axis of the shank of the coupler.

(A) In regard to the length of the guard arm, it is recommended that the contour lines be extended about one inch beyond the point where they at present terminate, and that the M. C. B. standard limit gauges for new couplers have the guard arm screw moved from its present position to a new one at the end of the proposed new contour lines. [See Figs. 1 and 2.]

(B) It is recommended that the vertical dimension of knuckles be fixed at nine inches as a minimum.

(C) It is recommended that the vertical dimension of the end of the guard arm be fixed at seven and one-half inches as a minimum.

(D) It is recommended that a twist gauge for new couplers [shown in Fig. 3],

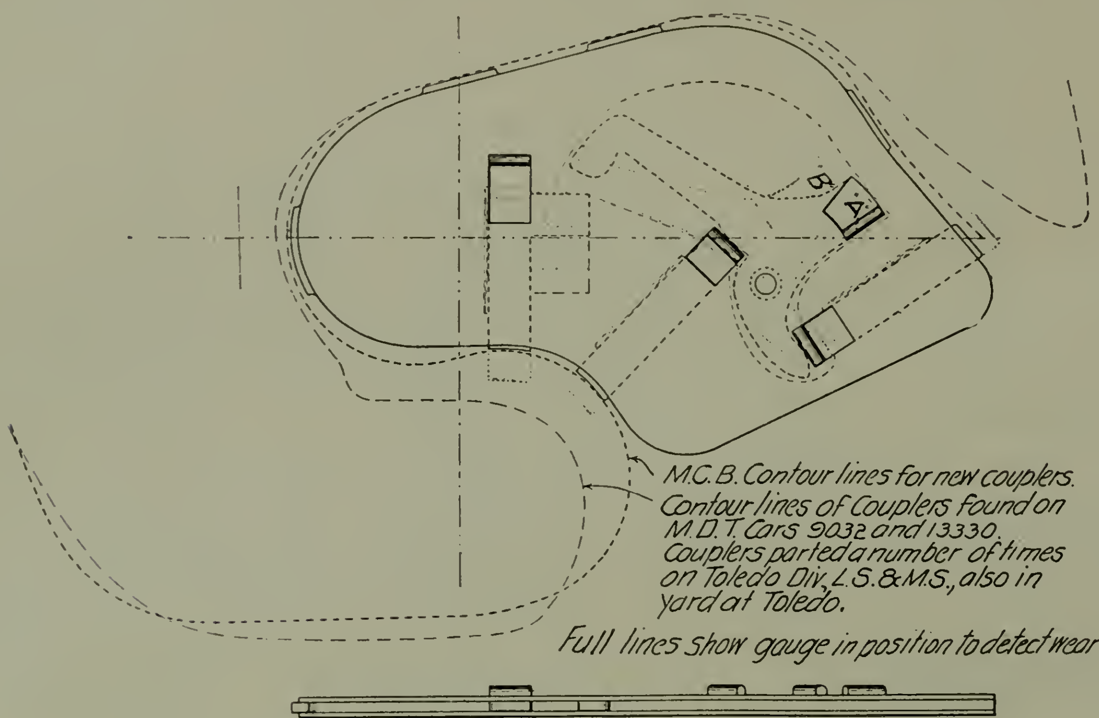


FIG. 4.—PROPOSED GAUGE FOR WORN COUPLERS.

Providing for combination of wear. When the cam-shaped lever A is pushed over to the end of its curved slot to the point B, it throws all the slides part way out. Couplers must be repaired if gauge passes with any slide fully out, or with the curved slide A moved to B.

be used so as to insure that the heads are neither twisted nor displaced sidewise with relation to the shank.

In addition to these matters relating strictly to the contour line, there are others that require attention:

(E) It is recommended that the horizontal plane containing the axis of the shank of the coupler bisect the vertical dimensions of the knuckle and end of guard arm.

(F) It is recommended that the gauge for new knuckles be used on all knuckles purchased separately for renewals. [This is the present M. C. B. standard gauge shown on M. C. B. Sheet 11 in M. C. B. Proceedings for 1898.—ED.]

(G) It is recommended that the vertical height of the stop shoulder or horn of coupler be not less than three and one-half inches, and that the horn be arranged to touch the striking plate before the back of the head of the coupler strikes the ends of the draft timbers.

2. To define the contour lines more fully when worn. This takes in the subject of gauges for worn couplers, and it is recommended that a gauge [shown in Fig. 4] be used. These gauges are cheaply made of sheet metal stampings, and it is earnestly recommended that they be immediately put into use at all interchange points, and that the same care be given to the examination of couplers as is given to any other portion of the car. We have no doubt the use of this gauge will put a stop to a large percentage of the instances of trains parting on the road without couplers unlocking.

3. To propose specifications for couplers. This part of the subject has received very careful consideration. It has been difficult to reconcile the diametrically opposite opinions which have been expressed by various railroad men and manufacturers. It is believed, however, that rigid specifications and tests will do much to weed out the poorer makes of couplers at present being furnished, and it is recommended that in the future all couplers be purchased subject to the provisions of the following standard specifications and tests.

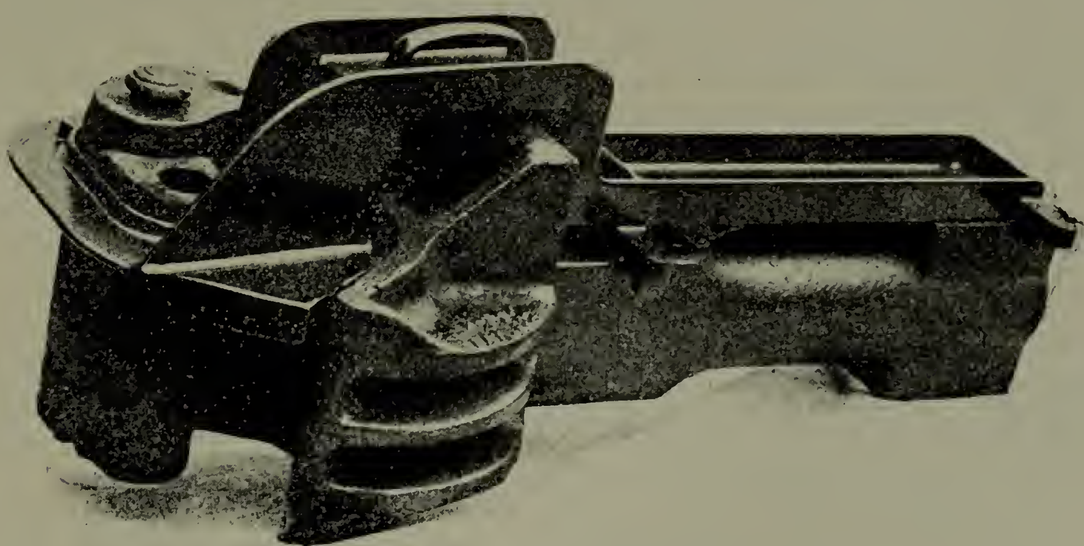
A. B. & C. R. R. CO.

Specifications for M. C. B. Automatic Car Couplers.

After September 1, 1899, all M. C. B. automatic car couplers purchased by or used in the construction of cars for the above-named company must meet the requirements of the following specifications:

Couplers shall be subject to the inspection of the representative of the above-named company as to their mechanical workings, general conditions, and tests.

The bars and knuckles must be fitted together in a workmanlike manner. Knuckles and locking pins or blocks must work freely and without any lost motion between knuckle and bar, or lock, which would permit the knuckle to drop forward beyond the proper contour line. But ¼ to ⅜ inch lost motion in the opposite direction is not undesirable.



THE TWIST GAUGE IN POSITION.

The coupling or contact faces must be smooth and clean, free from grit, sand, scale, etc. The face to be square with axis of bar. All couplers must be free from surface defects. Couplers must conform to M. C. B. contour lines, dimensions and gauges. They must couple and uncouple with each other (with either or both knuckles open) and with the master or sample coupler. They should unlock easily, and should lock with freedom when the knuckle is pushed in by hand. They must have complete locking fixtures.

They must have steel pivot pins 1½ or 1⅝ inches in diameter, and of a uniform length of 13½ inches from the under side of head to the center of pin hole for ⅜-inch cotter. Pivot pins, after being heated and having the head struck up, must be carefully and properly annealed.

The hole for pivot pin in bar or knuckle should be drilled (or, if cored, must be drifted out) so as not to be more than $\frac{1}{16}$ inch larger than the pin. The hole to be parallel with the face of the bar or knuckle and at right angles to the axis of the bar or knuckle.

Knuckles must conform closely to dimensions and fit neatly in coupler head, so that the contour will conform strictly to M. C. B. gauges. They will not be accepted if distorted by improperly matched flasks or any other defects caused by molding, and must be free from shrinkage cracks, flaws and checks, and sand, scale or blow holes. The coupling pin hole must not be less than 1 $\frac{9}{16}$ inch nor more than 1⅝ inch in diameter, and must be parallel with the face of knuckle and at right angles with the axis of the knuckle.

The name of the coupler and class of bar must be cast upon the top side of head of bar in letters and figures ¾ inch long and raised $\frac{1}{16}$ inch. Each drawbar must also have the maker's mark and date of manufacture plainly cast or stamped upon it at some point where they will not wear off. Each knuckle must have the serial number of class or style and maker's mark either cast or stamped upon it at some point where it will not be worn off.

The weight of the coupler complete to be not less than ...... lbs., and of bar without any of the attachments not less than ...... lbs. The minimum weight of each knuckle to be ...... lbs.

As many drawbars and knuckles as possible must be cast from each heat of steel or melt of iron used. All parts to be well annealed throughout.

Couplers and parts will be submitted to the following five distinct tests:

1. Striking test on closed knuckles of complete coupler.

Coupler to be held in machine so that the axis of the coupler is in the center line of drop, and the axis of the coupling pin hole passes through the center lines of the legs of the machine and the shank of the coupler rests solidly on the anvil. Blows to strike directly on knuckle.

Three blows of 1.640 lbs. weight falling 5 feet.

Three blows of 1.640 lbs. weight falling 10 feet.

A coupler will be considered as having failed to stand this test when it is broken before it has received three blows at 5 feet and three blows at 10 feet, or when any cracks appear more than 1 inch long or open more than $\frac{1}{16}$ inch, or when the center line of the shank is distorted more than 1 inch from its original position, or when the knuckle is found to have closed more than ¾ inch from its original position when pulled out against the lock after having received the three blows at 5 feet.

2. Jerk test of complete couplers.

Two couplers to be supported in the machine by the yoke forgings and draft springs provided. Blows to strike directly on the equalizer bar connecting the two couplers and resting on their closed knuckles.

Three blows of 1,640 lbs. weight falling 5 feet.

Three blows of 1,640 lbs. weight falling 10 feet.

A coupler will be considered as having failed to stand this test when it is broken before it has received three blows at 5 feet and three blows at 10 feet, or when any cracks appear more than 1 inch long or open more than $\frac{1}{16}$ inch, or when the knuckle has opened more than ½ inch from its original position or so that the equalizer bar will not stay in place when struck.

3. Pulling test for complete couplers.

Two couplers to be suported in the pulling machine by yoke forgings, to be locked together as in the running position, with their axes in the same straight line.

Couplers to stand a steady pull of 120,000 pounds if fitted with steel knuckle and 85,000 pounds if fitted with wrought-iron knuckle.

A coupler will be considered as having failed to stand this test when it is broken before it has been pulled the prescribed number of pounds, or when any cracks appear more than 1 inch long or open more than $\frac{1}{16}$ inch, or when the knuckle is found to have opened more than ¾ inch from its original position when pulled out against the lock, or when the couplers slip apart in the pulling machine.

In case of the failure of any part of the complete coupler under tests 1, 2 and 3, those parts which may not have failed may be submitted for a future test, providing such parts shall not be condemned by the individual tests hereinafter specified.

4. Guard arm test of drawbar.

Drawbar to be held vertically in machine so that the edge of guard arm is in the line connecting the centers of the legs of the machine, and so that the shank rests solidly on the anvil. Blows to strike directly on the edge of the guard arm.

For Malleable Iron Couplers.

Three blows of 1,640 lbs. weight falling 3 feet.
Two blows of 1,640 lbs. weight falling 5 feet.

For Steel Couplers.

Three blows of 1640 lbs. weight falling 3 feet.
Four blows of 1640 lbs. weight falling 5 feet.

A drawbar will be considered as having failed to stand this test when it is broken before it has received the prescribed number of blows, or when any cracks appear more than 1 inch long or open more than $\frac{1}{16}$ inch, or when the center line of shank is distorted more than 1 inch from its original position, or when the head is distorted sufficiently to allow the hammer to hit on the face of the bar, or the lugs of the bar to strike against the hammer.

5. Separate knuckle test.

Knuckle to be laid horizontally on one of its lugs, upon a solid anvil, and given the following blows upon the top of one lug:

Knuckles pivoted 2 inches or less from center of pivot pin hole to face of knuckles to stand—

Three blows of 1640 lbs. weight falling 3 feet.
One blow of 1640 lbs. weight falling 4 feet.

Knuckle pivoted 3 inches or less from center of pivot pin hole to face of knuckle to stand—

Three blows of 1640 lbs. weight falling 3 feet.
Two blows of 1640 lbs. weight falling 4 feet.

Knuckles pivoted over 3 inches from center of pivot pin hole to face of knuckle to stand—

Three blows of 1640 lbs. weight falling 3 feet.
Three blows of 1640 lbs. weight falling 4 feet.

A knuckle will be considered as having failed to stand this test when it is broken before receiving the proper number of blows, or when any cracks appear more than 1 inch long or open more than $\frac{1}{16}$ inch.

At the end of all the above tests, except No. 5, couplers will be tried for disablement. Knuckles must open and locking devices be operative after the coupler has received the specified test.

Before testing, couplers must have a row of center-punch marks put upon the center line of top of shank, so distortion can be detected.

Couplers will be chosen for test as follows:

One complete coupler shall be taken at random by the inspector from each lot of 100 couplers offered for test. The pivot pin and locking parts may be returned to the manufacturer. The knuckle will be tested as in test No. 5 and the drawbar will be subjected to the guard-arm test as in No. 4. If the test part fails to stand the prescribed test, a second coupler will be taken from the same lot from which the first test part was taken, and if it stands the test and if at the same time the first part tested has attained an average of 75 per cent on the basis of 100 per cent as meeting the full requirements, then the lot will be accepted; but if the second part fails to stand the test, then the lot will be rejected.

For each 1,000 couplers offered, or fraction order, five complete couplers shall be taken at random by the inspector. One shall be submitted to the striking test, No. 1; two to the jerk test, No. 2, and two to the pulling test, No. 3. If any coupler should fail to stand the prescribed test, another coupler or pair of couplers will be taken from the same lot from which the first test couplers were taken, and if it stands the test, and if at the same time the first tested has attained an average of 75 per cent on the basis of 100 per cent as meeting the full requirements, then the lot will be accepted; but if the second coupler fails to stand the test, then the lot will be rejected.

All drop tests shall be made on an M. C. B. standard drop testing machine. Bar to be held firmly in machine with all iron blocks and wedges sledged down tight.

Couplers and knuckles will be tested and inspected preferably at the works where they are made.

Manufacturers must furnish, free of cost, test couplers, testing apparatus, and assistance necessary to make satisfactory tests and inspection.

Approved,

Specification No......... .... *Supt. M. P.*

.............., *Sept. 1. 1899.*

In addition to these matters pertaining strictly to its subject, the attention of the committee has been called to the fact that in some cases couplers with shanks of dimensions differing from the standards of the association are being made and introduced in service. As this change will affect the standards of the association and work possible hardship to other railroads in the way of interchange of cars, we call the attention of the association to this, with a view that the subject of increased dimensions of the shank be referred to a committee for further investigation, and report what changes, if any, should in their judgment be made in present standards of the association.

It is also suggested that the back corners of the yoke in the pocket attachment be changed from ¼ inch radius to ⅝ inch radius.

It is further suggested that the play of the shank of the coupler in the carry iron be not less than ½ inch on each side.

Another matter which has claimed considerable attention is a standing committee on couplers. It is recommended that such a committee be appointed, whose duty it shall be to test couplers submitted to them. A standing committee on coupler tests has been suggested from time to time, somewhat after the manner of the Standing Committee on Triple Valve Tests, and Brake Shoe Tests. There ought to be some way of certifying to the proper design and quality of so important an appliance as a coupler, and this committee would prove a very valuable addition to the others.

In conclusion, the situation in regard to the multiplicity of couplers and parts is brought to the serious attention of the association. There should be some way of reducing the present uselessly extravagant manner in which repair parts for the seventy-seven different kinds of couplers with their ninety-three different knuckles have to be carried at the hundreds of interchange and repair points throughout the country. For this reason it is recommended that pivot pins should be of one uniform length and of only two sizes. A pivot pin 1½ inches in diameter is small enough for use in a coupler, and by making one length sufficient for the coupler, having the greatest distance over the lugs, it can easily be put into any coupler in which this distance is less. This multiplicity of repair parts should be done away with, and by a process of evolution, a few standard couplers should be retained, and these gradually introduced throughout the country as breakages make replacements necessary.

The convention took action on these various recommendations as follows: The recommendations in sections A, B, and C were ordered sent to letter ballot for adoption as standard, the committee being requested to complete the length of the guard arms, as near as they can to the general average of the day, and to give the radius of the curvature.

Section D was ordered sent out to letter ballot for recommended practice. Section E was ordered sent out to letter ballot for standard. The recommendation in section F was formally indorsed. Section G was ordered sent out to letter ballot as standard. The gage for contour lines recommended in paragraph 2 was ordered sent out to letter ballot as recommended practice. The full specifications presented by the committee were ordered sent out to letter ballot for recommended practice. The suggested subject of increasing the dimensions of the shanks was ordered referred to the standing committee on couplers, which was to be appointed later on. The suggestions as to the radius of the back corners of the yoke in the pocket attachment and as to the play of the shank in the couplers were ordered sent to letter ballot as standards, as was the recommendation that pivot pins should be of one uniform length and of only two sizes. Mr. Waitt then moved, following the suggestion made by the committee, that this association appoint a committee on coupler tests to consist of not less than five members to whom shall be committed from time to time the testing of couplers, the committee to certify to the association all couplers that have satisfactorily passed the requirements of the standards of the association and the recommended tests. Further, that this committee be authorized to arrange for the construction of standard machinery for testing couplers, the same to be paid for by the association. This motion was carried.

Mr. McCarty then presented the report of the committee on air brake appliances, the substance of which follows:

AIR BRAKE APPLIANCES.

[A. L. Humphrey, A. M. Parent, H. C. McCarty, Committee.]

Your committee has endeavored to locate a line of consistency between two extreme ideas, one side appearing to favor the idea that the cylinders should be located entirely with a view of making it more convenient and less hazardous for the repair men; while the others think the location of the cylinders should be determined entirely by the design of truck and body leverage used, so as to get as straight a pull on the rods as possible, regardless of the repairs necessary to be made from time to time. We therefore recommend:

First.—The adoption for clear bottom cars of a location of the air cylinder and triple valve between the needle beams, with a clearance of not less than 12 inches between the needle beam and the end of the cylinder head, and located about 20 inches from center of car to center of cylinder, longitudinally. This position renders it convenient for cleaning and repairing, and at the same time makes it possible to arrange a very convenient system of leverage.

Second.—Cars not having clear bottoms, as hoppers and center-dump gondolas, should have the cylinders located on the side of the car, as near the inside of the side sills as the design of the car will permit. This will avoid the danger incident to the repairs of cylinders and triple valves located at the end of the hoppers.

Third.—Your committee is of the opinion that a very large percentage of the repairs necessary to the air-brake apparatus is caused by the insecure application of same to the framework of the car, and the number of screw joints that it has been customary to apply in the past, thus permitting the different parts to become loose, causing the joints to loosen and rendering the brake inoperative. The committee therefore recommends for standard design of piping for clear-bottom cars design as shown in Fig. 3, in which we have endeavored to do away, as far as practicable, with all screw joints, substituting pipes with bends of as great a radius as possible. [The piping shown is in general lines the same as the standard general arrangement shown on M. C. B. sheet 9, except that larger radius is given to bends and that the cylinder is placed 20 inches from longitudinal center line of car.—ED.] Your committee has not deemed it advisable to recommend a standard design of piping for cars other than clear bottom, as it is absolutely necessary to be governed, in such design, entirely by local conditions and design of car. The location of the pipe hangers at the ends of cars when applied to the end sill is considered as contributing largely to the trouble experienced in loose pipes, and it is recommended that the hanger be attached to one of the longitudinal sills.

Fourth.—It is recommended that the location of the main air pipe at the ends of cars be determined by a horizontal measurement [to be 13 inches] from the center line of the shank of the drawbar to the center line of pipe, and also a measurement [to be 13 inches] from the inside face of the M. C. B. knuckle to the center of the plug of angle cock.

Fifth.—The committee has been especially impressed with the insecure manner in vogue of fastening the air cylinders, reservoirs, retaining valves, pipes, etc., to the framework, and would therefore recommend that the bolts fastening the cylinders and reservoirs be either double nutted or cottered, so as to prevent same from working loose, and that the air pipes be securely fastened to the framework of the cars with a liberal number of clamps. The application and care of retaining valves has, in the opinion of your committee, been badly neglected. It would recommend that only one elbow be applied to the retaining valve pipe, that being located at the end sill of the car where pipe turns upward; and that one union be applied as close to the triple valve as practicable, to permit easy removing of same; and that pipe be carried along the under side of the intermediate sill when practicable, from triple valve to end of car, and be supported by either staples or clamps, not to exceed six feet apart.

Your committee calls attention to the common practice of marking air-brake hose now in vogue in a large number of the hose manufactories which gives the manufacturer's name, the railroad company's name, and the dates of application and removal, whereby the age and general service of the hose may be intelligently determined, and recommends that such label be submitted to letter ballot for recommended practice.

Your committee recommends the appointment of a committee for next year for conference with representatives of air brake manufacturers relative to a further recommendation for the adoption of their recommended practice, with such modifications as may be considered advisable.

The first six recommendations of this committee were ordered sent to lettter ballot as recommended practice. The seventh recommendation was adopted and the present committee was continued, with instructions to report in line with the suggestions in paragraph 7.

It was here announced that there was no report from the committee on ladders and running boards, and the committee was accordingly discharged and the subject dropped.

The report of the committee on wheels and axles—specifications for wheels and axles for 60,000, 80,000, and 100,000-pound cars—was then taken up, being presented in summary by Mr. Nelson. The substance of this report is as follows:

WHEELS AND AXLES: SPECIFICATIONS FOR WHEELS AND AXLES FOR 60,000, 80,000 AND 100,000 POUND CARS.

[E. D. NELSON, WM. GARSTANG, J. J. HENNESSEY, Committee.]

Specifications for Cast Iron Wheels.

A report was read at the Convention of 1897 on "Specifications for Cast-Iron Wheels." This report brought forth some discussion, but its recommendations were not submitted to letter ballot, and therefore not adopted by the association. Your committee has gone over the report of 1897, and has concluded that it cannot do better that to present the same report with some minor changes. These changes are as follows:

First.—To include only 33-inch wheels, because this diameter has become universal for cars of 60,000, 80,000 and 100,000 pounds capacity.

Second.—For the drop test where the wheel is struck centrally on the hub, it is recommended that the wheel must stand 10 blows instead of 5, of a 140-pound weight falling 12 feet.

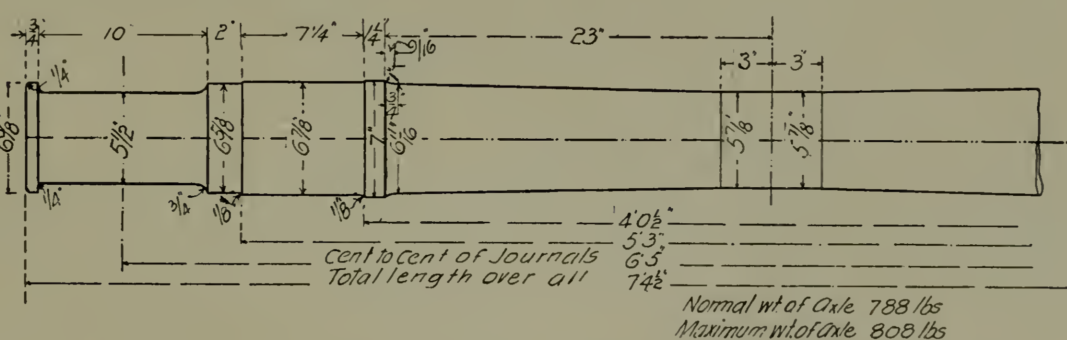
Third.—For the drop test where the wheel is struck on the plate, close to the rim, your committee has added wheels of 625 pounds and 650 pounds.

Fourth.—The form for the face of the weight used in the drop tests is specified. [Lower face of weight of 140 pounds to be 8 inches in diameter and crowned ½ inch; lower face of weight of 100 pounds to be 6 inches in diameter and crowned to a radius of 3 inches.—ED.]

Fifth.—The thermal test is made compulsory with either the drop test on hub or drop test on plate. [For the original report see M. C. B. Proceedings for 1897.—ED.]

Axles.

At the convention of 1898 a voluntary report was made to the association recommending a design for an axle for cars of 100,000 pounds capacity. Your committee presents with this report a design for such an axle, it being the same as referred to in the report mentioned.



AXLE FOR 100,000-LB. CARS.

Concerning specifications for axles, your committee has gone over those contained in the report of a Committee on Axle for Cars of 80,000 Pounds Capacity, made in 1896, and would submit the following revised specifications.

Specifications for Steel Axles.

[These specifications are practically the same as those given in 1896, except sections 7 and 8, which we append.—ED.]

7. It is desired that the axles, when tested under the drop test as specified above, shall stand the number of blows at the height specified in the following table without rupture and without exceeding as the result of the first blow the deflections given:

AXLE.	NO. BLOWS.	HEIGHT OF DROP.	DEFLECTION.
M. C. B. 4¼ by 8 inch journals for 60,000-pound cars...............	5	34 feet.	7 inches.
M. C. B. 5 by 9 inch journals for 80,000-pound cars...............	5	43 "	6 "
M. C. B. 5½ by 10 inch journals for 100,000-pound cars.............	7	43 "	4½ "

8. Axles will be considered as having failed on physical test and will be rejected if they rupture or fracture in any way, or if the deflection resulting from the first blow exceeds the following:

M. C. B. axle, 4¼ by 8-inch journals.......................8 inches.
M. C. B. axle, 5 by 9-inch journals.........................7 inches
M. C. B. axle, 5½ by 10-inch journals....................5½ inches

For iron axles the following specifications are recommended:

Specifications for Iron Axles.

[These are practically the same as those given in 1896 (see M. C. B. Proceedings for that year), except two clauses, giving the drop test specifications. The committee will supply these figures later.—ED.]

As the Master Car Builders' Association now has adopted, as standard, 3 axles, it is recommended for the purpose of identifying these more readily that they be designated by numbers, as follows:

M. C. B. No. 1.—Axle with journals 3¾ by 7 inches.
M. C. B. No. 2.—Axle with journals 4¼ by 8 inches.
M. C. B. No. 3.—Axle with journals 5 by 9 inches.
M. C. B. No. 4.—Axle with journals 5½ by 10 inches.

The proposed specifications for 33-inch cast iron wheels were ordered sent to letter ballot for recommended practice. A similar disposition was made of the axle for cars of 100,000 pounds capacity and of the specifications for steel axles and the specifications for iron axles. It was also voted to mark axles as suggested in the last paragraph of the committee's report.

The report of the committee on uniformity of sections for car sills was then presented by Mr. Sanderson. The substance of this report follows:

UNIFORMITY OF SECTION FOR CAR SILLS.

[R. P. C. SANDERSON, J. S. LENTZ, N. FREY, Committee.]

The two principal purposes which your committee aimed to accomplish were:

First, to recommend such sizes of sills as would be suitable for general use in the design and construction of all new flat-bottomed cars having timber sills, trusting that, if adopted, the loyalty of the members would induce them to prefer these sizes to any others in all new work hereafter.

Second, to choose such sizes that would be most generally suitable for the repairs of the great majority of the cars now in service.

In preparing the circular of inquiry your committee did not think it advisable to consider any cars below 50,000 pounds capacity, less than 32 feet in length, or of special construction. The railroads that have replied represent a total of 853,014 cars of 50,000 pounds capacity and over, out of a total of 1,252,219 cars. The information has been condensed in the tables which follow. [We omit the tables.—Ed.] As the result of the study of these tables your committee feels justified in recommending the following finished sizes for sections of longitudinal car sills:

For box, stock, flat, long gondolas, refrigerators, etc., 32 feet and over in length, but under 40 feet:

4 by 8 inches.	4 by 9 inches.	4 by 10 inches.	4½ by 12 inches.
4½ by 8 inches.	4½ by 9 inches.	4½ by 10 inches.	5 by 12 inches.
5 by 8 inches.	5 by 9 inches.	5 by 10 inches.	5 by 14 inches.

For cars 40 feet long and over, such as furniture and special long gondolas:

4½ by 8 inches.	4½ by 9 inches.	6 by 9 inches.	6 by 12 inches.
5 by 8 inches.	5 by 9 inches.	6 by 10 inches.	6 by 14 inches.
	5 by 10 inches.		

It is believed that the above recommendations afford a sufficient range of sizes to cover all requirements of design; they are good merchantable sizes, and if adopted and used as suggested, we may expect that car repairs will be greatly expedited, as there will be less delay in getting special sizes of lumber, and we will be able to get our requisitions for regular sizes filled more promptly, as the lumbermen can saw in advance of orders with a reasonable certainty of selling their stock.

To further expedite the general introduction of standard sizes for car sills to facilitate car repairs, and reduce stocks of lumber, your committee further recommends that the following paragraph be introduced into the Master Car Builders' Rules of Interchange, to follow Section 3 of Rule 4:

"When renewing long sills in foreign cars requiring odd sizes of lumber, the next larger suitable M. C. B. standard size of sill may be used and considered as proper repairs."

After brief discussion the various sizes recommended by the committee were ordered to be submitted to letter ballot for standards.

The report of the committee on height of couplers was then presented by Mr. McConnell, and is in substance as follows:

HEIGHT OF COUPLERS.

[S. Higgins, J. S. McConnell, C. M. Mendenhall, Committee.]

The committee has decided not to confer with the American Railway Association and the Interstate Commerce Commission, to get the limits of height of couplers changed to 31 inches minimum, and 35 inches maximum. The investigation made by the committee has satisfied its members that any increase in the present limits is not advisable at this time. With knuckles divided in the center by the slot for coupling link, any increase in the limits for height of couplers will result, in many cases, of only one knuckle lug of each coupler being in contact. Any increase in the limits of height of couplers will tend toward a greater number of trains parting, due to one coupler passing over the other. For some time to come there will be a number of link-and-pin couplers in service, and for this reason it is not advisable to make any recommendations toward closing the slot in the knuckle. The committee thinks that after January 1, 1900, will be time enough for the Master Car Builders' Association to take up the matter with a view of closing the slot in the knuckle, and at that time any increase in the limits for height of couplers should be considered. The committee desires to make acknowledgement at this time of the valuable assistance rendered by Mr. G. W. Rhodes in making the investigation.

This report was received and the committee was discharged.

The convention then proceeded to the election of officers, which resulted as follows: President, C. A. Schroyer; first vice-president, J. T. Chamberlain; second vice-president, J. J. Hennessey; third vice-president, W. J. Robertson; treasurer, G. W. Demarest; members of the executive committee to replace retiring members, S. P. Bush, A. E. Mitchell, William Garstang. (These officers subsequently elected Mr. Joseph W. Taylor as secretary.)

The convention then adjourned.

ENTRANCE PALACE OF TRANSPORTATION, PARIS EXPOSITION, 1900.

RAILWAYS AT THE PARIS EXPOSITION.

BY WILLARD A. SMITH.

II.

FIFTY-FOUR nations will be officially represented at Paris. These include practically all those which now present open or opening markets for American products. They go to Paris to exploit their own resources, to extend their markets, and to attract capital and population. Naturally they expect also to learn of others and to be greatly assisted in determining their future policy as to the purchase of machinery or materials.

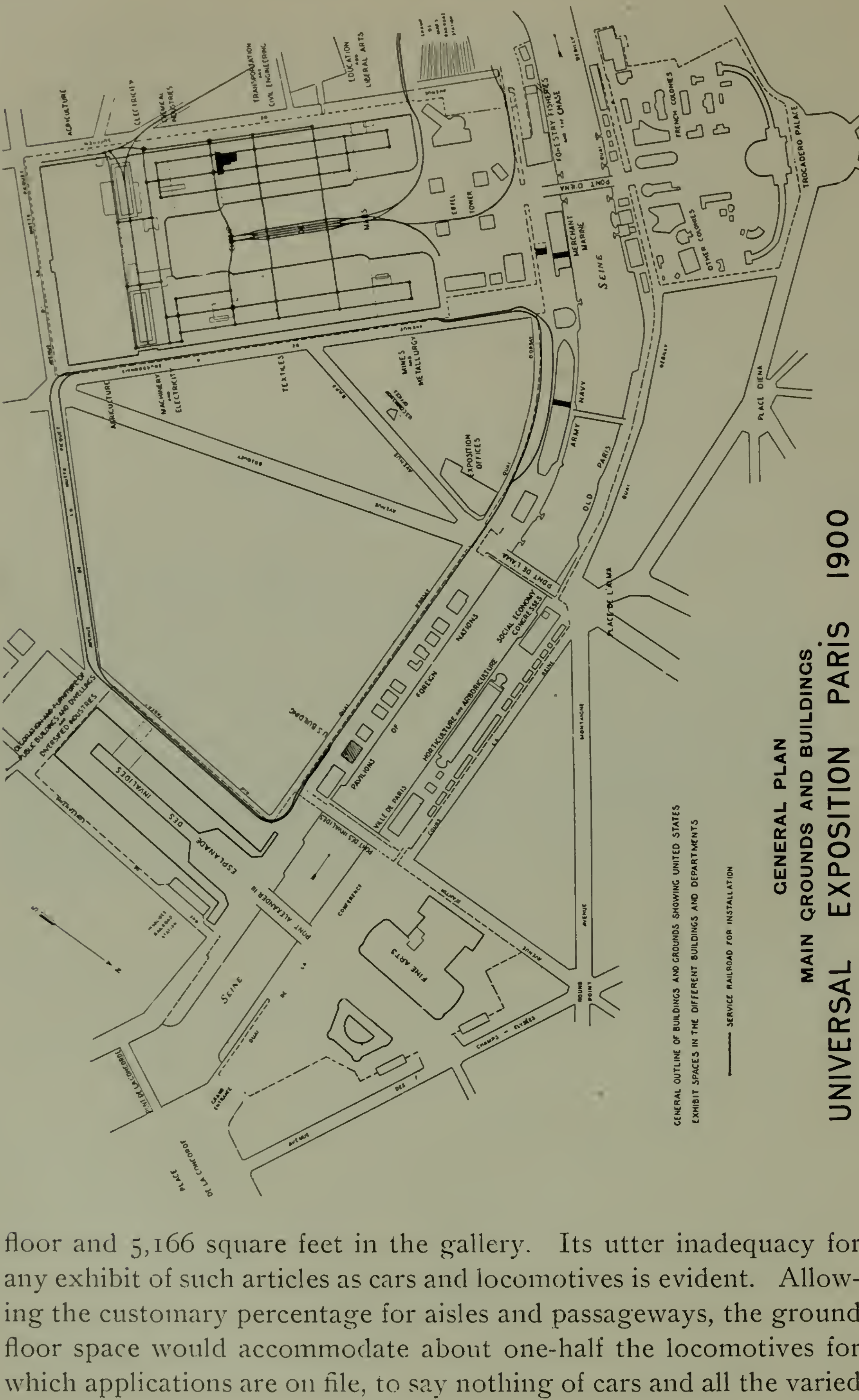
The audience—the prospective buyers—will be present. The next question is what facilities will there be for properly presenting our case and demonstrating our claim. It is generally known that the Commissioner-General of the United States has been very energetic and persistent in securing space, and has perhaps been more successful than the representative of any other government. Is the space now secured adequate in amount and in every way desirable?

In the preliminary agitation of each Paris exposition, the suggestion of a new location "outside the walls" is made and urged on the grounds of the necessity of more space than can be obtained in the old central location, and the better effect obtainable from an artistic point of view. But the exposition is primarily a Parisian business enterprise—intended to fill the pockets of the innkeepers and traders of all kinds in this bazaar of the world. Paris comes first in all things, France next, and the rest of the world afterward. The old location is therefore chosen, with such additions as it permits without permanent damage to the city. Indeed the addition of some permanent work of public value is always sought for. In the present case the permanent works are the new Alexander bridge across the Seine, the art palaces on the Champs Elysée, improvements of the quays, and the new railway improvements.

A glance at the diagram given on page 114 will give a fair idea of the general plan to any one who has been in Paris. The Esplanade des Invalides, the Champ de Mars, the Trocadero Palace and grounds are used as heretofore. Both banks of the Seine are, however, used this time; and the art buildings occupy the site of the old Palais d' l'Industrie—an old-time exposition building which has for many years been occupied by the annual Salon. A broad avenue leads from the Champs Elysée and the Art Palaces to the Esplanade des Invalides, crossing the Seine by the new Pont Alexander III., probably the most ornate highway bridge in the world. The principal exposition buildings face on courts of the two parade grounds—an arrangement which permits of great economy of space and money, as the three sides fronting on public streets are made very plain and inexpensive.

The entire space, as shown in the map, is less than half of that used at Chicago in 1893. In spite of every possible effort to utilize it to the best advantage and to secure selection and condensation, the Exposition boiled over these limits. It became absolutely necessary to secure an annex, and to go to one of the parks for it.

The "palace of civil engineering and transportation" is shown on the right of the Champ de Mars. The space allotted to this country is indicated in black. It amounts to 7,640 square feet on the ground



floor and 5,166 square feet in the gallery. Its utter inadequacy for any exhibit of such articles as cars and locomotives is evident. Allowing the customary percentage for aisles and passageways, the ground floor space would accommodate about one-half the locomotives for which applications are on file, to say nothing of cars and all the varied materials and appliances. At an early date it was announced that all railway exhibits on wheels would have to be provided for elsewhere, not only on account of lack of room, but also because no suitable method of installation could be arranged. This met with considerable opposition among the representatives of other nations, which was exaggerated by the rumor and belief that French exhibitors would be allowed to show machinery and appliances of this kind in the Champ de Mars building, while others were to be relegated to a remote annex. This was finally settled by the official announcement that all railway equipment and machinery of all countries must be shown in a building to be erected for the purpose at the park known as the Bois de Vincennes, seven miles from the main ground. Objection was still made to this comparative isolation, but as the arrangements have gradually developed it has become apparent that it was the only thing which could be done, and that in fact it possessed many advantages. The Bois de Vincennes is a beautiful park, embracing an artificial lake, known as Lac Daunesnil. It has not been as accessible as a part of the Exposition ought to be, but this is being remedied in part by new railway lines. The favorite route is likely to be one which will carry the American flag. It consists of a fine line of steamers in the Seine, running from the main Exposition grounds and other landings in the city to Charenton, distant about one-half mile from the exhibition grounds in the park. The American Commissioner-General endeavored to secure a franchise for an American street railway line, covering this distance, intending to operate it as an exhibition line, but carrying passengers—the earnings to be used for defraying the expenses. When this plan was presented, local companies at once perceived its advantages and bestirred themselves to secure the franchise for themselves. The Thomson-Houston Co. of Paris secured it, and will, of course, use only their own system of motive power. It will, however, be equipped with American-built cars and be essentially an American line. The trip to Vincennes will be short and very pleasant. In this beautiful park will be not only the railway building and exhibits, but an American machine tool shop in active operation, the automobile building with a track running around Lac Daunesnil, a general bicycle building, and the American bicycle building on a fine velodrome or exhibition track, the life-saving service exhibit of this and other countries, the exhibit of water craft on the lake, etc. It will thus be seen that the Bois de Vincennes will be about the "livest" part of the exposition.

Final plans of the buildings and laying out of the grounds at the Bois de Vincennes have not yet been received from Paris, and this is the principal reason why allotments of space have not yet been made to American exhibitors. The space provided for the United States at Vincennes is as follows: Railroads, 21,400 square feet; automobiles, 4,300 square feet; bicycle building, 8,600 square feet; life-saving service, 2,691 square feet.

The exhibits of this department in the main grounds will occupy the space named above in the Champ de Mars building, 1,862 feet in the Merchant Marine building, and (probably) 4,500 square feet in the Merchant Marine annex, both of which are indicated in black on the map. The Army and Navy exhibit (4,500 square feet), while under the director of this department, is properly a department by itself. A portion of the ground floor space in the "palace of civil engineering and transportation" will be devoted to carriages and accessories. The remainder, together with the gallery, will be devoted to civil engineering and smaller railway materials. A collective engineering exhibit is planned which promises to be very large and representative, and will be participated in by many railway companies, as well as engineers and manufacturers.

THE MASTER MECHANICS' CONVENTION.

The American Railway Master Mechanics' Association met in its thirty-second annual convention at Old Point Comfort on June 20th, with a large attendance. President Quayle occupied the chair, and Secretary Cloud was at his desk. The sessions lasted through three days, and the work done was, in sequence, as follows:

GENERAL OPENING BUSINESS.

The opening prayer was offered by the Rev. Charles S. Walkley, post chaplain of the United States army, and this was followed by an address from the Hon. Joseph Bryan, president of the Richmond Locomotive and Machine Works, which address was pleasantly responded to by Mr. W. S. Morris. President Quayle then read his address.

The financial reports were then presented. They showed that the membership of the association was now 653, of which 609 are active members, 26 honorary, and 18 associate. The association was shown to have on hand the sum of $3,116, with all bills paid.

The conference committee on joint meeting of the two associations reported on lines identical with those made the week previous to the master car builders. The matter was referred to the executive committee with power to act. Mr. J. H. Leeds, an associate member, was elected an honorary member, and the following were elected associate members: Prof. R. A. Smart, Strickland L. Kneass, and Clement F. Street.

The National Association of Master Railroad Blacksmiths submitted a communication asking for the encouragement and coöperation of the Master Mechanics' Association, and Mr. Barr made some remarks warmly commending the work of the blacksmiths' association. This matter, together with a request presented by Mr. Gohen that the Master Car Painters' Association be more fully recognized and encouraged, was referred to the executive committee with power to act.

The noon hour topical discussions were taken up, but we are obliged to defer an account of those treated on the first and on the subsequent days until a later issue.

The committee on a research laboratory under the control of the association presented a report through Mr. G. R. Henderson. The conclusions of this committee we append:

A RESEARCH LABORATORY.

[G. R. Henderson, W. F. M. Goss, John Player, Committee.]

The committee presented a thorough argument on the proposition of a research laboratory, entering into the need of such a laboratory, the measure of the problem, plans, costs, etc., the report being supplemented by appendices going more into detail. The committee in conclusion recommended the passage of the following resolutions:

Resolved, That in the opinion of this association there is need of more concerted action in the development of such practical and scientific facts as are needed to direct practice in the design and maintenance of railway equipment; and,

Resolved, That the executive committee be and hereby is directed to carefully consider the plan for a research laboratory under the direction of the association; and is authorized to formulate a plan of organization; to ascertain by what methods the necessary money can be assured; and, so far as may be practicable and expedient, to proceed with the actual work of organization;

Resolved, That it is the desire of this body to have presented a report of progress at the next annual convention of this association.

The conclusions of this committee were discussed adversely at some length by various speakers, including Mr. R. P. C. Sanderson, Mr. F. A. Delano and Mr. Angus Sinclair. Mr. Barr expressed himself as believing in a laboratory of this kind, but thought that we were not ready for it now. The discussion was closed by passing the resolutions recommended by the committee.

At the opening of the second day's session the convention was treated to an address from Captain "Bob" Evans of the United States navy, and it *was* a treat.

WATER IMPURITIES.

The report on best methods of preventing trouble in boilers from water impurities was then taken up, being presented by Mr. Manchester. This was a very meritorious report, and in a later issue we shall give portions of it, together with the substance of the very extended discussion which was accorded it.

The report on the relative merits of cast iron and steel tired wheels for locomotive and passenger car equipment was then presented by Mr. Barr, and the concluding paragraphs of this report we append.

RELATIVE MERITS OF CAST-IRON AND STEEL-TIRED WHEELS.

[J. N. BARR, H. S. HAYWARD, A. M. WAITT, Committee.]

The committee presented an elaborate report, comprising much data, which, however, was rather inconclusive. In closing, the committee said:

First—It is not able to decide from the facts presented whether steel-tired wheels are safer than cast-iron wheels, except in case of engine trucks.

Second—For engine trucks it would recommend steel-tired wheels from considerations of safety.

Third—Cast-iron wheel service is cheaper than that obtained from steel-tired wheels.

Fourth—It would recommend that at least the method detailed above be used for determining wheel mileage.

Fifth—That a careful record of breakages be inaugurated and maintained.

[The method referred to in the fourth paragraph is substantially as follows: Make record of all tenders running with thirty-three-inch cast-iron wheels; also of all wheels removed from these tenders during the year; obtain the mileage of these tenders for the same period and multiply by eight to obtain the total wheel mileage; divide this sum by the number of wheels removed, and the result will approximate closely with the actual wheel mileage obtained.—Ed.]

After some discussion this committee was continued, it being provided that two additional members be appointed, to be selected from roads having heavy grades. The committee was particularly instructed to consider the different weights of wheels for the tenders, including the distribution of the metal in the hub and the plate and the tread.

TON MILE BASIS FOR LOCOMOTIVE STATISTICS.

After the passage of some very pleasant resolutions indicating the appreciation by the association of the excellent work done by the retiring secretary, the association took up the consideration of the report of the advantages of the ton mile basis for motive power statistics, Mr. Small presenting the report. Some extracts from this report will appear in a later issue. The report was but very slightly discussed, but the committee was continued and suggestions were unofficially made that the committee should consider the question as to whether the weight of the engine should be included with the train, also whether the speed or time element should not be included in figuring tonnage. It was voted, upon motion of Mr. Quereau, that "it is the sense of this association that the ton mile basis for motive power statistics is the most practicable, and encourages economical methods of operating, and that it is desirable that the heads of motive power departments urge its adoption on their managements."

THE USEFULNESS OF THE ASSOCIATION.

Mr. L. R. Pomeroy moved the adoption of the recommendation in the president's address that a committee be appointed to report at the next annual convention on the subject of "What can the Master Mechanics' Association do to increase its usefulness," which motion was carried.

Prof. H. Wade Hibbard offered a resolution, which was carried, to the effect that a standing committee of two members be appointed by the president to report at each annual convention upon the extent to which the recommendations of this association have been put in practice. The duty of this committee being further, in gathering information, to impress upon the members of the association the value of the findings of the association in its committee reports and discussions.

MAKING AND APPLYING STAY BOLTS.

The convention then took up the report upon the best method of applying staybolts to locomotive boilers, including making the bolts and preparing the staybolt holes, Mr. T. A. Lawes presenting the report. This report comprised a considerable amount of very valuable practical information, which we hope to present in a future issue. The committee gave to its report an added value by closing it with definite recommendations as to what it considered the best practice in the making and applying of staybolts. The report was accorded a quite considerable discussion, and this topic proved itself, through the report and its treatment on the floor of the convention, to be one of the livest topics before the years' conventions.

NICKEL STEEL FOR LOCOMOTIVES.

The next subject was the "use of nickel steel in locomotive construction; its advantages and the proper proportion of nickel." Mr. Lyon's admirable report upon this subject was read by title, in his absence. It was evident that the members were unprepared or unwilling to discuss this report, and after a brief talk on the subject by Mr. H. F. J. Porter, discussion was indefinitely postponed. We shall give the substance of this report in a later issue.

The question "Is it desirable to have flanged tires on all the drivers of moguls, ten-wheeled and consolidation engines; if so, with what clearances should they be set?" was then taken up. The substance of the conclusions of the committee report on this subject is as follows:

FLANGED TIRES.

[S. HIGGINS, W. GARSTANG, W. H. THOMAS, Committee.]

The committee's report included an account of tests made with a consolidation engine on a 14 and 15 degree curve, with first and fourth, first, third and fourth, and all four pairs of wheels flanged. Dynamometer readings showed the power required to pull the engine through the curve with the different arrangements of tires to be practically the same. The committee closed as follows:

The members of the committee are not prepared at this time to make any recommendation as to the desirability of using flanged tires on all driving wheels of mogul, ten-wheel and consolidation engines, but suggests the advisability of the investigation being continued, so that a final report can be made to the convention to be held in 1900.

The committee would recommend the use of a self-registering dynamometer, and that tests should be made on straight track, as well as on a curve, an attachment to be used so as to indicate the lateral motion of the engine on straight track, at maximum speed, with the different tire arrangements.

This report was given considerable discussion, varying views being advanced by several members. Upon motion of Mr. Quereau the committee was continued for another year, and, in the light of a suggestion made that it was the practice in some quarters to set in the middle tires closer than the front and back tires, Mr. Quereau moved that the committee get the views of the operating department as to the possible effect of this in creating trouble in crossing switches. The motion was carried.

THE BEST FORM OF FIRE BOXES.

The next report on the list was "the best form of fire box to prevent cracking; is it advisable to use one piece for crown and side sheets?" A communication was read from Mr. Monkhouse, the chairman of this committee, stating that he had been unable to prepare a report.

STANDARD PIPE FITTINGS.

The report of the committee on standard pipe fittings was then presented by Mr. Quereau. The question as to square head bolts and nuts was also assigned to this committee, but that portion of the subject had been left to a similar committee of the Master Car Builders' Association, and the present committee confined itself entirely to a consideration of standards for pipe fitting. The committee gave a brief history of the present standard known as the Briggs, and stated that it found that there was a general understanding that the Briggs standard of threads and dimensions is the general standard. It therefore recommended the adoption of the Briggs standard as determined by the Pratt & Whitney Co. gages as the standard threads for wrought iron pipe and couplings. The committee was not, however, prepared to make any recommendation concerning standard threads for wrought iron pipe unions. The report of the committee was adopted by the association, which further voted that the committee be requested to furnish the names of the manufacturers of pipe fittings and pipe tools who do adhere, and also those who do not adhere, to the Briggs standard. It was also voted that the report of the Master Car Builders' committee on square bolt heads and nuts be printed together with the present report, and that the secretary of the Master Mechanics' Association send a circular letter to the heads of motive power departments, notifying them of the action of this convention.

The election of officers resulted as follows: President, J. H. McConnell; first vice-president, W. S. Morris; second vice-president, A. M. Waitt; third vice-president, J. N. Barr; treasurer, George W. West. (These officers met later and elected as secretary Mr. Joseph W. Taylor.)

The convention then adjourned.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

JUNE MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, June 8.

President Morris called the meeting to order at 8 p. m. Among those present were:

Anderson, Geo.	Ashcroft, Norman.	Bundy, C. L.	Bates, G. M.
Appleton, I. B.	Alderson, A. S.	Blohm, Theo.	Blackburn, D. W.

Constant, E. J.	Gruhlke, E.	Kramer, Wm.	Smohada, Jas.
Cather, C. C.	Gardner, L. S.	Kamen, Fred.	Smith, R. G.
Cardwell, J. R.	Hunt, T. B.	Metz, C.	Spohnholtz, J. C.
Callahan, J. P.	Hultman, Chas.	Mercatoris, M.	Stagg, C. S.
Cook, W. C.	Holtz, Chris.	Mattes, J.	Swift, C. E.
Deen, C.	Helwig, H.	Morris, T. R.	Showers, G. W.
Depue, Jas.	Hansen, A. P.	McAlpine, A. R.	Schultz, Aug.
Earle, Ralph.	Jones, R. R.	Nelson, Fred.	Saum, Chas.
Etten, L.	Johannes, A.	Nordquist, Chas.	Schutt, W. F.
Fritz, Chas.	Jones, A. A.	Olsen, Louis.	Sharp, W. E.
Gehrke, Wm.	Kehm, H. C.	Rieckhoff, Chas.	Van Vleit, John.
Grieb, J. C.	Kroff, F. C.	Reinhard, F. B.	Wensley, W. H.
Green, C. E.	Keebler, C. F.	Smith, E. B.	Weschler, Henry.
Guthenberg, B.	Kershaw, J. A.	Saum, Geo. N.	Wentsel, Geo.
Godfrey, J.	Krump, M.	Stuckie, E. J.	Williams, Thos.

The reading of the minutes of the previous meeting was dispensed with, they having been published in the June issue of the RAILWAY MASTER MECHANIC. The secretary read the following names of new members, which had been approved by the executive committee:

Chas. Bossert, C. T. T. R. R. Co.; R. G. Stripp, I. B. Appleton, and C. C. Cather, Illinois Central; A. R. McAlpine, Burton Stock Car Co.; C. Metz, Swift Refrig. Line; E. C. Dodge, Armour Car Lines; Chas. Hultman, C., M. & St. P. Ry.; J. R. Cardwell, American Cotton Oil Tank Line; J. L. Woods, Steel Tired Wheel Co., Chicago.

President Morris referred to the fact that the question box had been neglected, and urged members to proffer more assistance to the officers in suggesting topics for discussion.

BROKEN CHECK VALVE CASES.

President Morris: We will now take up the regular program. The first is a discussion of case No. 1 in regard to a broken check valve case:

"A" receives one of his cars from "B" with broken check valve case and requests defect card covering. "B" declines to furnish card on the ground that he had received the car from "C" with these defects and that "C" refused to card, claiming that the defect was caused by fair usage and was chargeable to the owners. Can a check valve case be broken by fair usage? Is the owner, in this case, entitled to defect card? Check case submitted for inspection.

Mr. Stagg: We have had several check valve cases similar to the one lying on the table. We have never made any requests for a card; we have simply made repairs and said nothing about it. It has never come to my notice that anybody demanded card for a check valve case. In my opinion a check valve case could not be broken by fair usage.

Mr. Hunt: I have looked at the check valve on the table. It is my opinion that it indicates unfair usage. The metal seems to be good, and the check valve is located at a point on car where it would not be broken in fair usage. Switching would not affect it scarcely any; and really I do not know how it would get broken in fair usage, in fact, I do not think there are many of them broken. I do not know but that is about the first one that I have seen broken as that one is while in service. They might be found in the scrap pile, sent there for some other defect and broken afterward.

President Morris: How about the owner being entitled to a defect card, Mr. Hunt?

Mr. Hunt: Well, I think he would be, if it was offered to him in that condition.

Mr. Bundy: I do not believe that a check valve case could be broken in fair usage. In all my railroad experience I have never seen one that I considered was broken in fair usage.

Mr. Kramer: I think the delivering road is responsible for it and should furnish an M. C. B. card.

Mr. Kershaw: This certainly is the first case which has come to my notice where a check valve was broken in that way, and without any marks, and claimed to be so broken by fair usage. If this case came to my notice and I did not know how the damage was done, I would think that the coupling had stuck and that an effort had been made to loosen up the nut, and that thus the nipple of the check valve was broken off. If the damage was done by fair usage the pipe connected to it would naturally not be unscrewed. The pipe being clamped up very rigid on the car, the jar and strain on the thread might possibly break it off. It is impossible for any one to determine the rights of this case by simply looking at the check valve as it is, without seeing the connecting parts on the car.

Mr. Kehm: I never before saw a case broken in this manner.

Mr. Stuckie: I have seen several cases similar to this, though some were broken closer to the thread. The cause that I assigned was that the cylinder being rigid and the train pipe loose, and the elbow being rusted and in such condition that it would not give anywhere only at that point, that the strain all came on the emergency valve and something had to give, and the train pipe being out, perhaps eight inches on one end, shoved through, the cylinder being rigid. I have had several cases like this come in on our own cars as well as on foreign cars. It happens very frequently on our own, and it is caused by the train pipe being loose and the cylinder being rigid. That is my experience with check valves. We never request any cards, and we have received them coming home with check valve cases broken.

Mr. Gehrke: Is there anything in the correspondence concerning this case to show that the pipes were loose, or were not fastened properly?

President Morris: There is nothing here to show that.

Mr. Gehrke: It appears to me that if the pipes are fastened up properly the check valve case should not break under fair usage. I think it should stand the strain if the casting is perfect.

President Morris: The supposition is that there was nothing of that nature noticed, or else it would have been brought forward as an argument. Everything was supposed to be in good order.

Mr. Showers: Some of the theories that have been advanced this evening do not seem to meet with my ideas. The check valve, as it stands there, is a circular casting of about three-eighths inch iron, which would make it stronger than it would in a sheet. The length is only about one inch to one and one-fourth; and it does not seem possible to me that the train pipe by being loose, would break off one and one-fourth inches of circular cast iron in preference to working loose the thread on the branch pipe. For that reason I am of the opinion that the check valve was struck with something. The check valve may have come from a car that has a cylinder placed in a peculiar position. We have some dump cars, with the cylinders placed out near the side sills, where the check valve may be struck by stake slipping off and striking it. We have put ourselves on record as saying that staking a car is legitimate and right, and if the check case was broken by staking car, it would be considered fair usage. But if the cylinder was placed in the center of the car, I would be in favor of calling this a case of unfair usage and of ruling that the receiving road be entitled to a defect card.

Mr. Sharp: This check valve case shows very clearly that it was a good piece of cast iron; and on account of the location of the check valve I am of the opinion that this is a case of unfair usage and that the owner, in this case, would be entitled to a defect card.

President Morris: It seems to me there is one point here that has not been covered, and that is in connection with section 20 of rule 3, in regard to delivering line being responsible for defective brakes. Do you think that has any bearing on the question?

Mr. Sharp: Section 20 of rule 3 states specifically, "missing or worn-out parts of brakes caused by fair usage, except on cars offered in interchange." If the valve case was broken by fair usage—if it could be shown that it was so broken—the delivering company would have authority to render bill against owner for such repairs, but he has no authority to deliver the car in interchange with this defect.

Mr. Stuckie: Are there any marks about the valve to indicate unfair usage?

President Morris: I believe not.

Mr. Stuckie: I do not see where there is any proof to show that this is a case of unfair usage.

President Morris: Section 20 of rule 3 says, "defective, missing or worn-out parts of brakes caused by fair usage, except on cars offered in interchange." It would naturally be taken for granted that if this occurred in unfair usage the delivering line would be responsible, and even if it occurred under fair usage the delivering line would be responsible on cars offered in interchange. I would like to hear from some of the members as to whether they consider that has any bearing or not.

Mr. Hunt: I think that section 20 of rule 3 would govern in this case, and in that event the delivering company would be responsible, as it cannot deliver cars with defective brakes and consider the defects owner's defects. But there seems to be some difference of opinion here, and I would like to ask how a check valve case could be broken in fair usage?

Mr. Stagg: I am of the same opinion as Mr. Hunt. I would like to have some member express an opinion how this case was broken in fair usage. If the car was derailed, certainly there would be some other defects on car. I think Mr. Stuckie gave a very good view of how it could be broken in fair usage.

Mr. Showers: I have seen a number of cases, where not only check valve cases, but cylinder and reservoirs, have been broken; but whether they were broken in fair usage or not is a matter to be answered. They have been broken by couplers pulling out; by rocks sliding under cars and striking the check valve; in fact they have been broken time after time by train pipe tearing out and brake rigging falling down. There are many ways, whether those ways be fair or unfair. But there are two questions asked. First, "Can a check valve case be broken by fair usage," and second, "Is the owner entitled to defect card?" I think the first question should be answered first and then the second one taken up.

Mr. Depue: In this case I think the delivering road is certainly responsible for the check valve broken. I do not see how a check valve could be broken by fair usage.

Mr. Jones: There is more than one way in which a check valve case could be broken. If you go through the yard when they are testing the brakes you will find that when a valve sticks the inspector comes along and strikes the valve, and, as is generally the case, breaks it off. I have had two such cases in the last six months.

A Member: If an inspector, in order to start the valve, hits it so hard as to break it, that is clearly unfair usage.

Mr. Kehm: I move that it is the sense of the meeting that a check valve case cannot be broken in fair usage, and that the owner is entitled to a defect card from the delivering line.

This motion was carried by a rising vote of 46 to 9.

RESPONSIBILITY FOR BURST AIR HOSE.

President Morris: We will now take up case No. 2, which also relates to air brakes:

"A" loads one of his own new cars on its initial trip, equipped with two new 1¼ inch air brake hose and delivers it to "B." "B" hauls and delivers the car to its destination, and thirteen days later delivers the car back to "A," at the original receiving point, equipped with one of the original and one worn out and burst hose, and declines to make good the defective hose on the ground that the owners are responsible for burst hose. He offers a joint evidence card which "A" refuses to accept, as he has traced the car to its destination and return and the railway companies hauling the car claim to have made no repairs. Should "A" be entitled to card for hose? If not, why? Air hose submitted for inspection.

[Discussion on this we are obliged to defer until our next issue. It was finally voted that under section 20 of rule 3 the delivering line is responsible, and that "A" is entitled to card for burst hose.]

MISSING REPAIR OR DEFECT CARDS.

President Morris: We have another question here before us, that is a new departure in the way of M. C. B. rules, or rather a recommendation that is entirely new, and the intention is to have it brought before the Master Car Builders' Association for adoption, if it is approved by the association here. You all know the trouble that has been experienced in locating wrong repairs. We have a letter from Mr. Pulaski Leeds, of the Louisville & Nashville, on this trouble, in which he urges, in substance, that a card shall be demanded for any car that has had any kind of repairs made upon it, unless it is already covered by a repair or defect card. The executive committee has considered this matter and has prepared the following paragraph designed to cover it, together with a certificate of missing repair or defect card intended to assist in locating these wrong repairs:

"Any company receiving a foreign car from its connection with repairs which appear to be wrong or improperly made, and without a card having been attached, as provided for, shall attach to the car, in the same manner as M. C. B. repair cards and defect cards are attached, an Inspector's Certificate for missing repair cards or defect cards, which shall be 3½x8 inches in size. The filling out and attaching of this card or certificate shall exempt the company receiving the car from responsibility to the owners in all cases of wrong or improper repairs."

A. B. & C. D. RY.

Inspector's Certificate of Missing Repair or Defect Card.

....................................Station. Date, ...189....
.... Car No. .... was received at this Station from the
............................Railroad with apparent wrong or improper repairs made without card attached covering the same.

Description of Repairs..
....
....

....................................Inspector for A. B. & C. D. Ry.

Mr. Sharp: I have been interested in reading what other people thought about Mr. Leed's letter, especially joint inspectors and men located outside of Chicago. I want first to read some of their remarks: Mr. B. W. Burke, Foreman Mechanical Dept., C. N. O. & T. Ry.—"I do think there should be some stringent measure taken in this matter to make or compel every one making repairs of any kind to apply a repair card. If the rejection of cars at interchange points were put into practice on account of not having repair cards attached to them, it would be but a very short time until the repair cards would all be applied at the time repairs were made." Mr. F. G. Swepton, Foreman B. & O. S. W. Ry., at Cincinnati.—"What is needed is something to force the parties making repairs to apply cards according to the rules now in force." Mr. James Clare, of the C. H. & D. Ry., at Cincinnati.—"I have always been of the opinion that something should be done to force the use of repair cards and defect cards when necessary for repairs made." Mr. Dietz, of Cincinnati.—"My opinion is that something must be done to force the railroad companies to use repair and defect cards as provided in the M. C. B. rules." Mr. W. H. Cressey, Foreman J. C. I. Association, South Omaha.—"If some means were taken to enforce section 14 of rule 4 of the code of 1898, it would be a step in the right direction." Mr. Charles T. Stark, Chief Joint Inspector, B. & O., P. & W. and P. J. Ry., Willow Grove.—"I would highly approve of it, as it would not only relieve the company delivering car but would enable the owner to locate the road making the wrong repairs."

I also have letters from several others, namely, Mr. J. F. Courson, general foreman, Wall shops, Penna. R. R.; Mr. J. A. Holmes, foreman car inspectors, Penna. R. R., and Mr. O. D. Krause, foreman car inspectors, Allegheny Valley R. R.; all express themselves as being highly in favor of the movement.

In talking to some of the members of the club about Mr. Leeds' letter there were some objections raised, apparently pretty good objections. The first one is that the car inspector of to-day has too much clerical work. We quite agree with this, because the car inspector does have considerable clerical work, but on the other hand there are objections to releasing the inspector of this clerical work and putting it on the office. It has been my experience that tracing for wrong repairs is very unsatisfactory. We will take, for an illustration, a practical case and see what we get out of it. Suppose, for instance, the St. Paul (we will not suppose that Mr. Morris or Mr. Grieb made the wrong repairs) get an N. P. car and they make repairs that are not standard and they deliver it to the P. F. W. & C. and the car goes east, and on its return trip it will go over the Northwestern road to its owner. Now, that car has wrong repairs and no objections have been made. When the owner receives his car he gets a joint evidence card from the party delivering the car to him. It is necessary then for him to ask the Northwestern to make a tracer to prove that they have not made these wrong repairs. They start out a round robin letter and it winds up that they did not make the wrong repairs. Then it is referred back to the owner and from him to the road that hauled the car into Chicago, who makes a similar tracing with same results, and finally and lastly it comes back to the St. Paul railway, which made these wrong repairs. By the time it gets back to the St. Paul railway the tracer has grown to such size that it will take an inspector an hour to read it over, which he must do, as he doesn't want to write a letter unless he knows what he is writing about. These tracers, in my mind, are more expensive than the use of a certificate card similar to this, that submitted here, which, it occurs to me, would eliminate all this trouble. When the car arrives here in Chicago, east bound on the St. Paul road, and is delivered to the Fort Wayne, the Fort Wayne inspector places this certificate of missing card and apparent wrong repairs on the car, and when the car gets home the owner takes it up with the St. Paul road direct, and the intermediate roads that are innocent know nothing of it and are put to no unnecessary expense in tracing for wrong repairs.

As Mr. Leeds states, the rules cover it. The M. C. B. Association has made a rule that, if it were carried into effect, would render unnecessary such recommendations as this. In the first place, it is said, in rule 1, that "each railway company shall give to foreign cars while on its line the same care as to oiling, packing, and inspection, that it gives its own." Now, if the road does that, it applies repair cards when repairs are made, as is provided for in rule 4, section 14.

Mr. Showers: I agree with Mr. Sharp in some respects; yet it seems to me, as he stated, that the inspector has almost too much clerical work. But as to whether the expense of applying it be placed on the office or on the inspector, is a matter that I am unable to answer. Yet I am of the opinion that we have such a class of freight going over a great many lines that should the inspector take time to give the cars a rigid inspection and to apply the cards that have been recommended here or reject the car, it would cause an expense that would overcome the clerical work of perhaps three times as much. I agree that something should be done to compel the railways, and in fact, all people making repairs, to apply the repair cards when they make repairs, but as to what it should be I am unable to say.

Mr. Stagg: The question in my mind is whether this card would be used to any greater extent than the card we are using at present. The rules say if the St. Paul made wrong repairs on that car they certainly should have put on a repair card. Now, the question is, when the St. Paul turns the car over to the Ft. Wayne, how is the Ft. Wayne to know whether these repairs are wrong or not and whether to demand card? It seems to me that this proposed plan will only put more clerical work on the inspector, and the inspector is not hired to do that kind of work. All we want is to live up to the rules, as printed, in carding cars and put cards on as we are required to put them on.

Mr. Cardwell: I disagree with the gentleman to a certain degree. As I understand this case, if this card was not applied to the car, the Northwestern road would be responsible for the wrong repairs when the Northwestern made delivery; because it should have protected itself from the road that delivered car by one of the cards like this. I do not think that this will give the inspectors any more clerical work—indeed, I think it will take more clerical work off of their hands.

Mr. Stuckie: What is the M. C. B. card for? If the roads put them on you won't need the other. I think the inspectors have enough grief now without tacking any more onto them.

Mr. Wensley: We have from three to five trains in the yard at once to inspect and we have from fifteen to twenty-five minutes to go over a train. If we hold them longer we are censured for it. I think the inspector has about all he can look after without looking out for wrong repairs.

Mr. Grieb: It seems to me that Mr. Stuckie has hit the nail on the head and driven it home. I believe that the rules as they stand now are all right. The only trouble is that people do not live up to them. That is the cause for what little trouble we now have. It also seems to me that possibly under the existing rules there are too many cards required; that is, at least more than some people are willing to put on. In our experience there is but one railroad that sends in the stub of cards in case they are unable to put them on cars, and I am not quite willing to believe that it is the only road that is so unfortunate in not having time to put them on. Again it seems to me that the proposition now under discussion is unfeasible for this reason: During the month of May we had upward of 4,400 stubs pass through our office to check against bills. I do not believe we had cards for 50 per cent of them. Now, then, if this rule were put into effect, somebody would be liable for 2,200 cards of this description to be put on our cars, and I think it would require an increase in force at some inspection points to live up to the requirements of this rule if it were put into practice. Our friend, Mr. Sharp, has cited various opinions in support of the idea he favors, but it seems to me the best opinion is expressed by the Southern and Southwestern Club, to which this recommendation was made. This club very properly and promptly sat down upon it. I think that is what it deserves. Aside from it being impracticable, the present rules fully cover any loop-hole that this new card would cover. It is not the fault of the rules that they are not complied with, it is the fault of the individuals, and in attempting to correct that fault, the matter ought to be taken up with the individuals instead of with the rules.

Mr. Sharp: I would like to ask Mr. Grieb what method he has of checking his bills. He says there were 4,400 bills passed through his office for which there were repair cards for only half. How does he check the bills and pass them?

Mr. Grieb: Apparently I have not made myself clear enough. We passed 4,400 repair card stubs on which we had received bills. We make it a point not to pass a bill under any circumstances unless we have the stub.

Mr. Sharp: That is strictly in accordance with the rules; but you made the statement that it would have been necessary to issue 2,200 of these new cards.

Mr. Grieb: We received but one-half of the cards for which we paid bills. Possibly they were lost off the cars and possibly they were not put on. We will leave that to individual imagination.

Mr. Sharp: Mr. Grieb stated that the rules cover that. I think that I admitted that point in opening this subject. So do the laws of the city of Chicago cover certain things, yet it is necessary to enforce those laws, and so we find it with the M. C. B. rules. The M. C. B. rules are quite clear and if strictly lived up to this would be unnecessary; but they are not lived up to. Mr. Showers states that the inspectors would have no opportunity to apply the cards; and Mr. Stagg says that they would simply be burdened with another card and that they are not using the cards they have. That is just what this card is for—to make them use the repair card. Frequently the repairman at a middle station makes wrong repairs and lets the car go forward as in good condition, and very rarely reports it to his superior officer, and he knows very well that the repairs were wrong. If this card or a similar one were used, when the car leaves his division, the inspector there would put on one of these cards, and when the superintendent of motive power would get hold of the tracer he would know right where the repairs were made, and this would tend to bring about the desired effect.

Mr. Stagg: I said before that I thought it would be a burden to inspectors and I still say so. Take our inspector at Elsdon. That man frequently has to send word that he was able to inspect the train only on one side. The engine stands ready to pull out and he has to go over the train as rapidly as possible. How would that man put on one of those cards when he can inspect only one side of the train? And the men in the Illinois Central yard have scarcely time to inspect a train with two men to a car. It seems to me that if the rules were lived up to and the repair cards put on the cars when repairs are made, that this business would be covered.

Mr. Stuckie: Would you have any more assurance that this card would be put on more frequently than the M. C. B. defect card now is? You can make laws from now until doomsday and if they are not lived up to what good are they? You have got good laws if you would only live up to them.

Mr. Grieb: We find that 60 per cent or 70 per cent of the repairs made are for wrong journal bearings, and to draft gear. This new card presupposes that the inspector has full knowledge of what is standard to everybody's car, otherwise he could not comply with this rule; and further, even if he attempted to leisurely inspect a car to find out what repairs had been made in order to write out this card, I am satisfied—and I believe anybody in the room here to-night will substantiate my position—that he has insufficient knowledge of what constitutes proper repairs to everybody's car, and that the limited amount of time at his disposal is entirely insufficient to comply with the requirements of this card. Then again, taking the experience of the St. Paul road, when we monthly make request on foreign roads for at least forty-five joint evidence cards and get only about three ourselves, there is something wrong in the matter of living up to this rule. When it comes to a question of wrong repairs and it is referred back to our road, it is too late to say we did not make the wrong repairs. We have the evidence of two unbiased witnesses and their evidence is final. The following out of that principle has brought such elegant results that it is well worth while to imitate it.

Mr. Sharp: Some of the members seem to have the idea that failure to apply this certificate makes the delivering line responsible. I do not understand it so. If you fail to apply the certificate, it is simply a question of tracing the matter over all the different roads that the car has traversed, the same as we do to-day.

Mr. Kehm: I think that the position assumed by Mr. Grieb is the right one. I do not think we need anything in addition to what we have at the present time to give the desired results. All roads make improper repairs; I know we do, a great many of them. We furnish our defect card when we are called on. But I do not believe the delivering road should be held responsible for improper repairs made by everybody, simply because they are the delivering road. We locate the party who made the improper repairs on our cars very readily, and in the past year I do not think we have had over six or eight cases in which we have been unable to locate the party and secure protection. With that small number I certainly should not favor any other manner of handling these matters than that at present in vogue.

Mr. Showers: We have on our line cars a number of wrong repairs made, as well as other people, but in the past year, I am ready to say, we have had but four cases of wrong repairs that we have been unable to locate. I had a case two months ago that I thought I would be unable to locate, but with the assistance of the roads centering in Chicago I located the wrong repairs at Boston, Mass., and received a defect card yesterday for them. Under the present method of tracing wrong repairs the matter can be overcome without putting additional work on inspectors. I move that this association go on record as being of the opinion that the present rules are amply able to protect car owner in wrong repairs.

Mr. Sharp: The motion hardly covers, it seems to me, the question as it was sent out. The motion should be whether we adopt such a card as that proposed or not. I would like to see the association specific in this matter—showing whether we approve of Mr. Leeds' recommendation or reject it.

Mr. Kroff: As I understand this card, it is simply a tracer. No road is responsible except the one that makes the wrong repairs. We will say that we receive a car from the Milwaukee and we discover wrong repairs—say a U. R. T. car or any other private line or railway company's car. We would simply stick on one of these cards specifying what wrong repairs were on car. Now, then, if we run the car to New York and back again and deliver it to the Northwestern or C., B. & Q., when the U. R. T. inspector looks at this certificate card he knows just where to trace from. He starts his tracer on the Milwaukee instead of starting with the road he received the car from. That is the idea of this card as I understand it. But I would prefer that there be a stub attached to it, and that the stub be sent to the owner. Now, Mr. Grieb says that he has received a lot of stubs that bills were rendered on, but he didn't get any cards on the cars. How can he say that his bills were all right? If they were for wrong repairs, he would have to get joint evidence and then trace it. I do not think Mr. Grieb meant what he said. Now, if a stub be used and sent to the car owner, just the same as you would on a repair card, that would locate who is doing these wrong repairs in case card or car is lost off. In addition to this I also think that cars ought to be stenciled on the ends, No. 1 and No. 2, so as to distinguish where repairs were made. There is no way to distinguish that and it has caused a good deal of trouble. We will say, for instance, that we get a Milwaukee car and we apply two cheek castings to No. 1 end, but as the ends are not marked we don't say anything about the end; we simply say, "applied two cheek castings." Car goes to the Rock Island and the Rock Island breaks the same end and applies two cheek castings. The Rock Island delivers it to the Lake Shore and it breaks end No. 2 and applies two wrong cheek castings. Then it gives this man a chance not to put on a repair card, and there will still be two cards on the car covering four cheek castings applied. I think if the ends were marked "End 1" and "End 2" it would be readily seen where the repairs were made. If there is a brass applied, you have got to look over all the eight boxes; there is nothing to indicate which end. There are probably two or three cards for brasses applied You will look all around and find one or two applied. What are you going to do about it. I think if the ends were marked you would not have to go to all that trouble, but could locate the brass at once.

Mr. Stuckie: I think the speaker is no friend of the car inspector. We would need a pack mule to carry all the cards around that we are required to use. I have trouble at home, having my pockets mended because of wearing them out carrying cards around, and now he would heap on a stub.

Mr. Hunt: I have listened with a great deal of interest to what has been said and I really think that the card would save an endless amount of work. Now, as I understand Mr. Leeds, I believe he wants to make the delivering lines responsible for wrong repairs not made by them in the absence of repair card. Now I do not believe there is a man in the house that will agree with Mr. Leeds; I do not agree with him; but his letter is what has brought this card out. I believe the card to be a good thing and I will state why I believe so. In the first place, these tracers take up time when they get big and heavy. It takes time to look them through and refer them to the inspector, car shop man and everyone who had anything to do with the car; and they spend half an hour or more on them trying to get some information out of them to square themselves or to make an intelligent report in the matter. A great deal of that, by the use of this card, would be done away with. This card really has nothing to do with Mr. Leeds' letter. Mr. Leeds wants to make the delivering company responsible for wrong repairs as I understand it. The rules now say the delivering company is not responsible. They say that the man making wrong repairs is solely responsible to the owner. What then has the intermediate man to do with it at all? The object Mr. Leeds had, no doubt, was to work it up and get it in the new rules. But of course it is not now in and therefore cuts no figure. But suppose we adopt this card; now we are all liable as individuals to view this thing from our own standpoint. We may say we have so much to do we could not apply this card. We might not get many of them on here in Chicago, etc. We don't hold a person responsible because he don't get this card on. That is not the idea at all. If he did have some leisure time and got it on he has done a great deal of good in the way of helping to locate where the wrong repairs were made. Now if we would not put many cards on at Chicago, there may be hundreds of places outside of Chicago where these cards could be put on. There may be inspectors who receive, at small places, from 20 to 50 cars a day. They have time on their hands, time going to waste. They would find all the wrong repairs to these cars, and when the cars would get distributed around to home roads the card would nearly locate where these repairs were made and would make unnecessary a lot of intermediate tracing. For example suppose the Milwaukee at Omaha received a car from the Union Pacific with wrong repairs; the inspector sees this and says: "I will just put a certificate card on car." He has to make no record of it. If he don't have time he don't put any card on; no harm done. If he has time he simply pulls a card out of his pocket and says "received from the Union Pacific such a date with so and so, wrong repairs." Car goes on. It may belong in Mississippi or Florida. But it is allowed to go home and when the man away in the southern part of Florida, or where ever his home is, sees the card, he don't have to trace through the south, over the L. & N., P. F. W. & C. or P. R. R., etc., back to the Milwaukee to see who made those wrong repairs; he knows these repairs were on the car when received by the Milwaukee at Omaha. He says: "I can send to the Union Pacific at once; they may have got it from some of their connections." He may thus strike it first shot. Aside from that it will force people to put on the repair cards; in other words, it will enforce the law that is not being lived up to—and I guess you will all agree with me that it is not lived up to by all. You all say we have got the law; that is true, it is enforcing it that the card is for. If the Union Pacific made these wrong repairs, they will say "we did, but failed to put card on." Next week comes another car, another Union Pacific car. (This is figuratively speaking.) You would not have to send back over all those roads, but immediately go to the Union Pacific, or whatever road it might be, and it would say "I guess we had better get this thing settled; people will think we are not putting on these cards at all; we are getting it pretty thick; we had better get these cards on"; and it would have a tendency to force the cards on. Getting the certificate cards on is not what Mr. Leeds was after; it is something proposed to solve the problem advanced by Mr. Leeds. I think it will prove a good thing. If you don't get these cards on you are not held responsible.

Mr. Grieb: It seems to me that Mr. Hunt's acknowledgment that there will be little hope of any cards of this kind being applied at Chicago, if this rule were put into existence, settles the matter so far as the Chicago Car Foremen's Association is concerned. I am rather inclined to think that other people will find the same excuse that the Chicago inspector would—they are too busy.

Mr. Hunt: The argument was that the inspectors had so much to do at Chicago. I say it might be possible that the Chicago inspectors would not have time to put many of them on. If a few Chicago inspectors are so busy they could not get them on, other people at other points would, and I have no doubt that there would be lots of them put on in Chicago.

Mr. Davis: According to Mr. Leeds' idea the man would be responsible who received this car without a card on it, and the road he received it from would know they would have to explain how the wrong repairs were made. But, then again, that is really going back to the rules of '92 when you had to card for everything. Why not go back to them?

Mr. Showers' motion was here put and carried.

The meeting then adjourned.

REPAIRING WRECKED STEEL CARS.

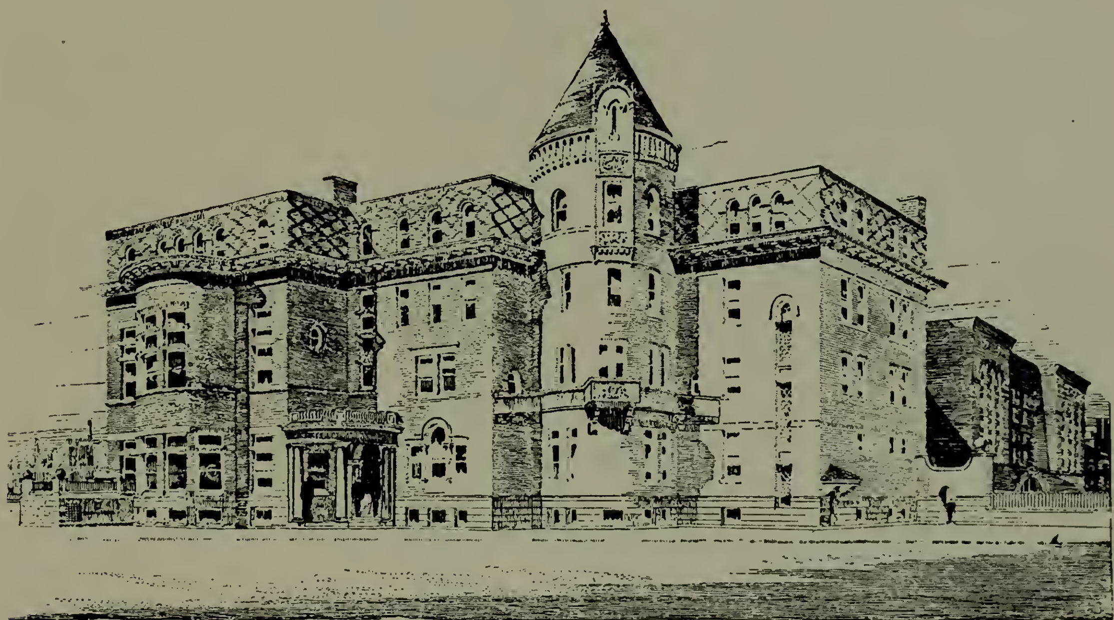
In our May issue we had something to say concerning the repairing of wrecked steel cars. We are advised that no plan has as yet been definitely decided upon as to the methods to be employed in fixing up the cars that we then referred to. But meanwhile we receive from the Baltimore & Ohio a short account of the handling of wrecked steel cars on the Pittsburg & Western (a B. & O. line) which presents some interesting statements. This account was written by Mr. Thomas Anderson, master car builder of the Pittsburg & Western, and is as follows:

"One of our trains of Schoen steel cars, 100,000 pounds capacity, was going up an 80 to 90 foot grade when ten cars broke off and ran away from the rear part about 90 car lengths. Four more of the steel hoppers ran back down this grade, striking the rear part, and damaging P. and W. steel car No. 4001 to the extent of two center sills badly damaged and buckled so much that it was necessary to cut them off and have the bent parts straightened and replaced by riveting on a plate both inside and outside of the channel. It required a new end sill, but the old end sill removed was in shape to be used in repairs to other cars, as we straightened and plated the fractured part so as to have it ready for other damaged cars. The material required amounted to $12.70. The labor amounted to $27.60, making a total of $40.30 to put car in good first-class condition.

"Steel car No. 4351 was in accident on the Baltimore & Ohio Railroad. The cause of accident is not known, but car was sent home for repairs, having end sill, side sill, corner post and stake very badly damaged, and it had the appearance of going to be a very hard job to make necessary repairs. But we found that we made the necessary repairs very easily and put car in good first-class condition by using one end sill, one corner post and one side stake, and straightening out side sill by building fire under same and using hydraulic pressure for straightening it out. The material used on this car amounted to $10.40, and for labor $28.00, making a total of $38.40.

"Steel car No. 4211 left the track known as our Negley Stone Track, which is about ten to fifteen feet higher at the point where car left track than our main line. Car went over the bank, landing on main track, and blocked the road. Our superintendent happened to be on board a passenger train which came up behind this trouble, and cleared the track by use of engine and chains. This car was under load of 100,000 pounds of crushed stone. The sides were crushed in about eighteen inches, bending all the side stakes on each side of the car, and breaking four journal boxes, one brake shaft, two hand holds, one winding shaft bent, drop door attachments bent, brake levers and guides torn off, truck channel bent and brake beams torn off. The pressed steel diamond truck under this car was subjected to a great deal of rough usage in getting main track cleared, as it would be reasonably supposed that the body of car received some very rough handling to avoid delay to trains. I supposed that I would have to remove all side stakes on account of their bent condition, but, fortunately, we made a good, first-class job by using hydraulic jacks and hammering on stakes until we got the side straightened. The material required amounted to $8.37; labor, $30.60; total, $38.97.

"I might also add, for your information, which is very important, that if a train of wooden cars had been subjected to the punishment that car No. 4001 was subjected, there would have been nothing left but the scrap. In this case this car was the only car damaged in the train, it being so solid, substantially built, etc., that all other cars behind it were protected. A wooden car would not have stood the punishment that No. 4211 went through under such heavy load."



RAILWAY Y. M. C. A. BUILDING AT ST. LOUIS.

IT is pleasing to note continued evidences of the growth of the movement for the establishment of railway Y. M. C. A. buildings in the West. It will be remembered that we have in recent months illustrated two such buildings, one at the Chicago shops of the Chicago & Northwestern Railway and the other on the Atchison, Topeka & Santa Fe Railway at Argentine, Kan. These were illustrated in our issues of February, 1897, and February, 1899, respectively. A very fine building of this nature is now proposed to be erected in St. Louis, and through the courtesy of Mr. George T.

Coxhead, general secretary of the St. Louis Y. M. C. A., we are enabled to present a view of the exterior of this building as designed. The building, which will, it is expected, be erected on the corner of Clark avenue and Twentieth street, will be constructed of buff brick and sandstone, and will be four stories in height. The building will be thoroughly up to date in all details. The floor plans are not available, but we are informed by Mr. Coxhead that the interior will be divided into a reception room, auditorium, reading room, and library, recreation and smoking rooms, lavatories, baths, bowling alleys, gymnasium, restaurant, barber shop, class rooms, and about 100 sleeping rooms. The cost of the structure will be about $75,000. The funds for its erection will be provided by the sale of bonds, both the principal and interest of which will be guaranteed by the several railroads using the Union Station in St. Louis, the consideration given to these railroads being that their employees shall be given the privileges of the building. We most sincerely hope that the present plans for this beautiful building will not miscarry, and that it will be pushed forward to construction at an early date.

PERSONAL MENTION.

Mr. E. E. Davis, heretofore assistant superintendent of motive power of the Philadelphia & Reading, has resigned to accept the same position with the New York Central & Hudson River Railroad.

Mr. G. R. Henderson, formerly mechanical engineer of the Norfolk & Western. but since March last mechanical engineer of the Schenectady Locomotive Works, has resigned the latter position to accept that of assistant superintendent of motive power and machinery of the Chicago & Northwestern, with headquarters at Chicago, vice Mr. Waldo H. Marshall, resigned to go to the Lake Shore.

Mr. W. H. Reilly has been appointed master mechanic of the Fort Worth & Rio Grande, with headquarters at Fort Worth, Tex., in place of Mr. T. J. Shellhorn, resigned to accept service elsewhere.

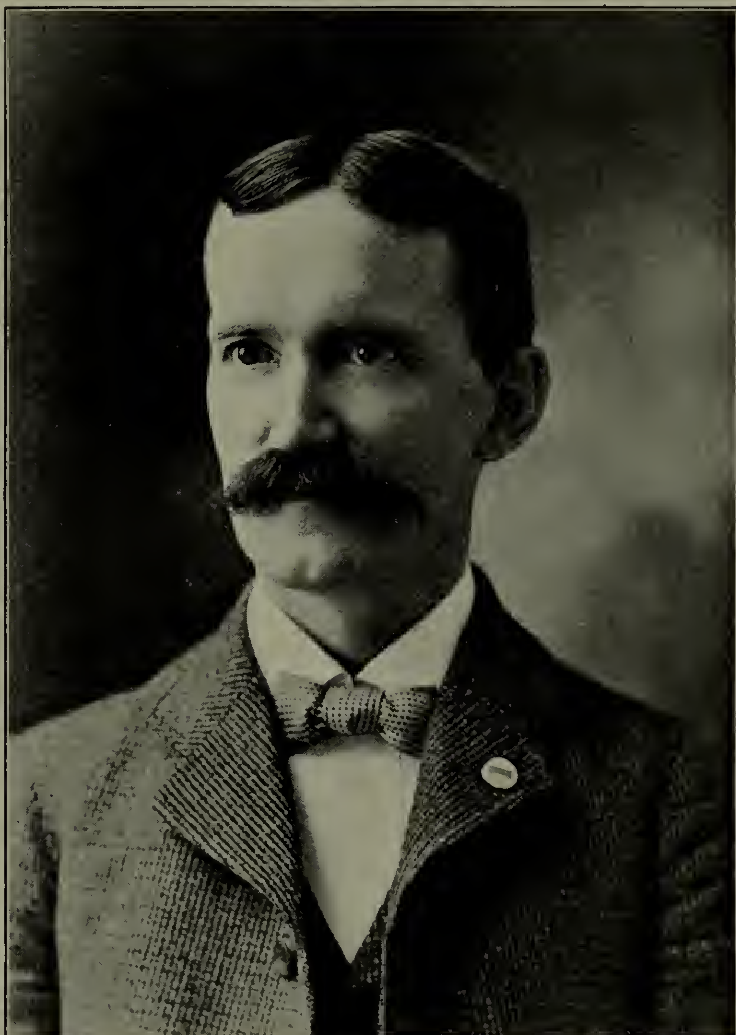
Mr. L. E. Butler, general foreman of the Louisville, Evansville & St. Louis Railroad shops, at Princeton, Ind., has resigned to accept the general foremanship of the Cypress shops of the Missouri Pacific, at Kansas City. Frank W. Moorehead, a department foreman, has been appointed to succeed Mr. Butler.

Mr. Abram Gould, purchasing agent of the Missouri Pacific System, the St. Louis Southwestern System, and the Texas & Pacific Railroad, died at Salem, N. Y., on June 22d. Mr. Gould was born at Roxbury, Delaware county, N. Y., March 3, 1843. In early life Mr. Gould taught school and later was timekeeper in the Rutland & Washington shops. Some time after he was connected with the Fall River line, and in 1873 he became purchasing agent of the Pacific Mail line of steamers. For eight years, beginning with 1876, Mr. Gould was manager of the coal departments of the Union Pacific in Salt Lake City. Since then he has been connected with the first named railroads as purchasing agent.

On the Baltimore & Ohio the motive power, car department, and maintenance of way shops have been merged into one department, known as the mechanical department, in charge of a mechanical superintendent. Mr. Harvey Middleton has been appointed mechanical superintendent, with office at Mt. Clare; Mr. I. N. Kalbaugh has been appointed assistant mechanical superintendent of the trans-Ohio division, with office at Newark, and Mr. E. T. White assistant mechanical superintendent of the lines east of the Ohio, with office at Mt. Clare. The offices of superintendents of motive power are abolished.

Mr. J. R. Slack, mechanical engineer of the Central Railroad of New Jersey, has been appointed assistant superintendent of motive power of the Delaware & Hudson, with office at Albany, N. Y.

Mr. Joseph W. Taylor has been chosen secretary of the Master Car Builders' and Master Mechanics' Associations to succeed Mr. J. W. Cloud, whose resignation of these offices we noted in our last issue. Mr. Taylor has been for the last eight years Mr. Cloud's assistant and "general right-hand man" and is thus especially well qualified to assume the duties of secretary of the two associations. It will be of interest at this time to briefly review Mr. Taylor's previous career. He began railroading in 1876 as clerk in the freight office at Saltsburg, on the West Pennsylvania division of the Pennsylvania Railroad, and was later transferred to Johnstown, Pa., on the main line of the Pennsylvania Railroad. In July, 1880, he entered the office of Mr. F. M. Wilder, superintendent of motive power of the New York, Lake Erie & Western Ry. and served in various capacities under Mr. Wilder and under the latter's successor, Mr. R. H. Soule, during their respective terms of office. In 1887 Mr. Taylor was selected as chief clerk in the office of Mr. R. H. Soule, who was then the general manager of the New York, Lake Erie & Western R. R. Upon Mr. Soule's resignation Mr. Taylor accepted a position in the office of Mr. S. M. Felton, first vice-president of the New York, Lake Erie & Western. He was later secretary to Mr. A. Hegewisch, president of the United States Rolling Stock Co. at New York City. Mr. Taylor occupied this position for a short time, when he resigned to accept the position of secretary of the Chicago & Calumet Terminal Ry. Co. at Chicago, now a part of the Chicago Terminal Transfer R. R. Co. On January 15, 1891, he took service with Mr. John W. Cloud, the Western representative of the Westinghouse Air Brake Co., and secretary of the Master Car Builders' Association, and later also secretary of the Master Mechanics' Association. Mr. Taylor remained continuously in this service until his election to the secretaryship of the two associations to fill the vacancy occasioned by Mr. Cloud's resignation, to go abroad. Mr. Taylor is thus thoroughly familiar with all the intricacies of the inner workings of the Master Car Builders' Association, particularly with the details of the arbitration



MR. JOSEPH W. TAYLOR.

committee's delicate work, and the members of the association accordingly feel content in the assurance that its clerical work is to be continued with the same fidelity to detail that has characterized that work for so many years past. Both associations are to be congratulated upon securing the continued services of Mr. Taylor, and the latter is to be congratulated upon his succession to a post so responsible and so honorable.

Mr. Mord Roberts, master mechanic of the St. Louis, Iron Mountain & Southern, has resigned. Mr. J. T. Stafford, hitherto assistant master mechanic of that road at Argenta, has been appointed acting master mechanic at that point.

Mr. H. K. Bates, master mechanic of the Fort Scott and Springfield divisions of the Kansas City, Fort Scott & Memphis, has resigned that position on account of ill health, after a service of twenty-nine years with the road named.

Mr. W. J. Miller has resigned as master mechanic of the southern division of the Kansas City, Pittsburg & Gulf at Shreveport, La., and Mr. C. A. DeHaven has been appointed to succeed him.

Mr. Thomas Fielden has been appointed assistant master mechanic of the Missouri Pacific, with headquarters at Cypress, Kan., vice Mr. W. T. New, resigned.

Mr. D. C. Courtney, formerly master mechanic of the Baltimore & Ohio at Cumberland, Md., has accepted the position of superintendent of motive power of the West Virginia Central & Pittsburg, with headquarters at Elkins, W. Va., vice Mr. R. O. Cumback, resigned to accept a position elsewhere.

Mr. J. W. Stokes has been appointed master mechanic of the Omaha, Kansas City & Eastern and Omaha &St. Louis, with headquarters at Stanberry, Mo., vice Mr. C. A. DeHaven, resigned to take service with the Kansas City, Pittsburg & Gulf.

Mr. George A. Kingsley has been appointed road foreman of engines of the Chicago & West Michigan and Detroit, Grand Rapids & Western, with headquarters at Grand Rapids, Mich.

Mr. C. H. Quereau, master mechanic of the first division of the Denver & Rio Grande, has been appointed assistant superintendent of machinery and acting master mechanic of the first division, with headquarters at Denver, Colo.

EXHIBITS AT THE CONVENTIONS.

The exhibits at the June conventions were fully up to the high standard established at the last three or four conventions. There has been a steady decline in the number of useless and absurd devices ever since the M. C. B. standard for car couplers began to be adopted by the roads, and this year such exhibits were almost entirely absent. All the devices shown were worthy of examination, and we believe that the railroad men present paid more general and careful attention to the exhibits than ever before. The following inventions, improvements, etc., shown are worthy of special mention, and will probably "live long and prosper":

The exhibit of the Chicago Pneumatic Tool Co. was, perhaps, the most complete and interesting ever made at the June conventions. Its location was the best on the grounds, and it was equipped with conveniences and comforts which made it a welcome resting place for the weary sight-seer, while it was a veritable college of information and instruction to those interested in the devices shown. Abundant space was provided for the exhibition of each tool, and for the crowds of interested spectators which were never lacking. It was hard to believe that such an entirely new line of labor-saving tools could have been developed and brought into general use in four or five years; and when it is remembered that these tools are now in general use not only at home but in Great Britain and on the continent the wonder increases. The tools themselves have done much to make this wonderful record, but the men behind the tools--Mr. J. W. Duntley, Mr. Joseph Boyer and the men whom they have selected as assistants—should have the chief credit. When the development of pneumatic tools began other manufacturers had an equal chance to attain such an immense and almost unparalleled success, but they failed to seize the opportunity. Future historians of mechanical progress will give the credit of introducing pneumatic tools to Mr. Duntley and Mr. Boyer.

The emergency knuckle, shown by the Railway Appliances Co., of Chicago, is a new device and of undoubted valne. The office of the company is in the Old Colony Building, Chicago.

An entirely new and most interesting exhibit was that of the Waterbury Tool Co. which showed a ratchet drill, the actuating handle of which can be used at any angle. For work in corners and other difficult places this drill meets all requirements. It is operated by a new mechanical motion, and should be widely demanded in the railway field.

The Peerless car coupler was shown at Saratoga last year, but it is now in new hands and will be made, hereafter, to conform to M. C. B. rules. The distinguishing feature of this coupler is a lock to the knuckle lock and the device would seem to render creeping of the knuckle lock, and the consequent parting of trains, impossible.

The automatically adjustable journal bearings made by the Atlantic Brass Co., New York, are a decided departure from the ordinary bearing in some particulars but they are making such notable records and are being pushed with such energy and faith that they cannot be ignored by progressive railway men. The exhibit of these bearings attracted much attention.

In addition to the well known Woods platform gate the R. Bliss Mfg. Co., Providence, R. I., exhibited a platform gate operated by air from the locomotive. This gate was invented by Mr. S. A. Crone, recently assistant superintendent of rolling stock of the New York Central & Hudson River Railroad, and will probably meet with favor and be adopted by many roads.

The exhibit of the Carborundum Co., Niagara Falls, N. Y., was extensive and of unusual interest. Large masses of carborundum were shown, attracting attention by their rich coloring; and the examples of the uses to which the material is put were numerous and varied. As an example of what scientific knowledge can accomplish in creating new and very useful products this exhibit was of compelling interest and those in charge of it were kept busy by crowds of visitors.

A new draft rigging exhibited by the Dayton Malleable Iron Co. received general approval. It seems to combine simplicity and strength to a degree not heretofore attained.

The Goodwin car, designed for dumping coal, ballast, etc., is, without doubt, the most complete and efficient car of the class ever built and the patents held by the Goodwin company make it impossible for any other equally effective car to be built for many years to come. Several full-sized cars were on exhibition at the conventions and a very complete working model was operated on the exhibition grounds. It is satisfactory to learn that the railroads are coming to realize the economy as well as the efficiency of these cars and are ordering them liberally. A train of Goodwin cars, hauling ballast, will do the work of from 300 to 500 men, and in handling coal the economy of the cars is proportionately large.

The unquestionable success of the Hale & Kilburn Co. in the car seat field is well deserved, because the company has never rested on its laurels but has constantly studied to improve what seemed good enough. Its latest improvement is a car seat frame made of pressed steel. This seems to bring the car seat to perfection; but this company is always trying to go a step beyond perfection and therefore one cannot tell what improvement it will show next year.

Canaday's improved throttle lever, shown by O H. Jackson, of Prescott, Arizona, is worthy of investigation. The lever is held by a cam and can be placed and held in any position, so that the cut-off can be by hair lines instead of by notches.

The magnetic holder for incandescent lamps shown by Jenkins Brothers is a most convenient device for shop use. The lamp can be placed on any part of a machine or boiler and it sticks there.

The fact that four new car doors were shown at Old Point indicates that the ideal door is still being sought for. The Jones door was illustrated in the June number of this journal. It retains the best features of the Moore door but has improvements which add much to its value. It was generally remarked that this door was as fine a piece of workmanship in its line as the convention ever saw. But what particularly attracted the interested attention of the members was the simplicity and merit of the construction of the hangers. The address of the manufacturers, the Jones Car Door Co., is 234 Lasalle street, Chicago. The Royal Flush car door, shown by the American Grain and Car Door Co., Philadelphia, was exhibited at Saratoga last year but has been much improved since that time. A very simple door and one worthy of attention was shown by J. M. Smith, car foreman Cincinnati Northern Railway, at Marshall, Mich., its inventor. The Universal Railway Supply Co. showed the Barr door, which also has the merit of simplicity.

An exhibit of the Buhoup three-stem car coupler was made on the government tracks near the Hygeia hotel. The couplers were on 80,000 pound cars and the curves on which they were tested were unusually sharp. The test was entirely successful, the couplers coupling and uncoupling under circumstances where the ordinary M. C. B. coupler would be inoperative.

A "king-bolt clamp" was shown by the Pearson Jack Co. and received general approval. It is designed to grip the projecting lower end of the king-bolt and thus keep the truck from falling down when wrecked cars are lifted to the track. It obviates the necessity of chaining trucks to the car and is a device that should soon be found on every wrecking train.

Whoever it was who secured the government tracks at Fortress Monroe for the exhibition of the Schoen pressed steel cars during the conventions did an excellent piece of work. The location was the very best available and a far greater number of railroad men inspected the cars than would have visited them if they had been on the C. & O. tracks. The days were pretty hot down there and railroad men were justified in refusing to make long trips to examine exhibits. Indeed, it was dangerous to go far in that heat, and the nearness of the Schoen car exhibit may have saved many valuable lives. The cars themselves were very interesting as showing the advances which are being made along a line of progress which is to have unlimited development, and in which the Pressed Steel Car Company is probably to be the chief factor.

While the exhibit of the great Q. & C. company had no noticeably new device it is worthy of mention because of its location. It was on the edge of the water; the spray of the sweet, salt surf occasionally cooled and refreshed those who lingered to enjoy its pleasantness, and from under the sheltering awning one could see the commerce of that part of the coast passing in and out to and from the ocean. The efficiency of the pneumatic tools in this exhibit was especially noticeable. Those of the Standard Pneumatic Tool Co. were shown in connection with the Q. & C. exhibit and the combination was effective.

An improved unlocking device for car couplers, the invention of T. L. McKeen, was exhibited by the Acme Railway Equipment Co., of Easton, Pa. Instead of being attached to the lifting lever the lifting chain passes over it and is fastened to the car. The part of the lifting lever over which the chain passes is bent into a square yoke which projects outwardly. With this device the unlocking of the knuckles in the case of a broken drawbar is made positive and certain.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

Vol. XXIII. CHICAGO, AUGUST, 1899. No. 3

UNFINISHED CONVENTION WORK is the theme of a valued correspondent, who, in a recent letter to us puts his criticism in about these words: "When the work of the late M. C. B. convention is considered as a whole, it will be found that much of the important work on the programme remains undone. The committee appointed to test triple valves reported that no tests had been made, as no triples had been submitted for test. The committee on Wheel and Track Gauges reported that their conference with the American Railway association produced barren results; and the subject was considered as a 'dead letter.' Although the Pennsylvania railroad had offered the use of a piece of track and a fifty car train for test purposes more than a year ago, no tests had been made. The committee on Brake Shoe Tests reported that the testing machine had been installed at the laboratory of Purdue University and was ready for use. It also stated that there were several new composite brake shoes on the market which ought to be tested; but *no tests had been made*. The manner in which important test work has been neglected and delayed is certainly one good argument in favor of a research laboratory, in charge of a director, as outlined by the report of the committee on that subject." We presume that our correspondent will admit that a part, at least, of these failures are "explainable," while, perhaps, remaining "inexcusable." It is, however, we think, doubtful that a research laboratory would have done much better than the committees, in the cases cited, in view of all the circumstances. Moreover, we may expect that the air brake and brake shoe investigations will be seriously taken up this coming year.

COUPLERS of the M. C. B. type received thoroughly adequate treatment at the Car Builders' convention, as we have before stated. The committee appointed to consider the contour lines of the M. C. B. coupler, and to present specifications for it, presented a very comprehensive report, the investigations having been carried even farther than the association requested. The point we wish to make now is that one who reads the report can draw only one conclusion concerning the justness of the recent attacks on this coupler. In a word, it has generally been considered that manufacturers furnished couplers true to the M. C. B. contour lines—in fact, perfect couplers. Whereas, it turns out that couplers with other than the M. C. B. lines, and twisted in the stem and head, and with innumerable other defects, have been offered to the railways and accepted and applied; and then, because they failed at intervals, the general design of the vertical plane coupler has been rather savagely criticised. It would be much better if every one concerned should, in lieu of indulging in carping criticism without offering an adequate substitute, bend his efforts toward making the vertical plane coupler a success. Then there would be *no* question about its success.

IT HAS been customary, when speculating on the final limit of speed of railway trains—if ever a final limit is to be obtained—to consider only the possibilities of the locomotive, it being very certain that the cars will withstand any speed at which the locomotives haul them. The question as to whether men will be found who will dare to run the locomotives at much greater speed than the present maximum is very generally disregarded. Some railway officials have awakened to the fact that it will be difficult to find men who will be able to withstand for any length of time the severe strain to which a material increase in speed will subject them. If the limit of speed possibility of the locomotive is not yet in sight, it is quite certain that the limit of endurance of the men is; and unless there are developed men who can withstand the mental and physical strain which will be incident to any marked increase in the present maximum speed, it is doubtful whether the possibilities of the locomotive will limit the maximum regular and continuous speed of trains. It is easy enough to make what are now considered extremely high speeds, when these are attempted only in favorable places and at infrequent intervals, but men do not take so kindly to it for daily requirement over distances of from one hundred to two hundred, or more, miles. An engine man will, of course, not hesitate to make fast time over a stretch of track which is in favorable condition, when he knows that he will scarcely "get the proper swing" when he will have an opportunity to "steady" the train with the brakes. The condition of the track, alignment and protection against accidents are important factors in limiting the maximum speed, but the endurance of the engine man will also be a much more important factor than it is at present generally considered to be.

Legal Aspects of Convention Work.

There has at times been lacking, both in committee reports and in the proceedings in the annual conventions of both the M. C. B. and the Master Mechanics' associations a due regard of the effects the reports or convention proceedings may have on legal proceedings against the railways of the country; but it is important to note that there is a desirable change taking place. It is notorious that unbiased (?) juries decide against railways whenever a semblance of excuse presents itself, and it is desirable to remove as many "semblances of excuses" as possible.

It is important to show, in the defense of every case of accident, that the railway has taken every reasonable precaution to guard against the particular accident in litigation, and that the devices provided for doing the work, from the doing of which the accident occurred, were of the best obtainable. But what are "reasonable precautions" in one locality are not necessarily so in another; and the same is also true of "best devices," and it will be well for members of either association to bear this in mind and not unload, through the courts, their methods and devices onto unwilling, and frequently just as able, fellow laborers.

The proceedings of both associations are followed closely by lawyers who make a specialty of railway cases, and frequently the proceedings are offered in evidence and wrongfully interpreted by even an impartial, though improperly informed, judge or jury, when they should really have no weight as evidence in the case.

As an illustration of the point which it is desired to make, let us consider the question of the prevention of throwing sparks from the stack: It would be entirely wrong for a road running through the cotton belt, or through a country covered with dry prairie grass a large part of each year, and using a soft lignite coal which, unless means are provided to prevent, throws showers of sparks from the stack, to force through the medium of committee reports, or action in conventions, and with the assistance of adverse judicial and jury decisions, its spark arresting devices upon those roads which are, in the way of throwing sparks and the chances of setting fires, not so favorably situated.

There are those who appreciate the conditions outlined in the foregoing caution; but it is believed that its presentation here will bring about a more general understanding of the situation and, therefore, result in more good to the railways and take out of the hands of over-zealous lawyers evidence which is so easily misunderstood.

EXTENDED PISTON ROD SUPPORTS— A. T. & S. F. RAILWAY.

The advantages to be gained by the use of piston rods extended through the front cylinder head, were discussed at some length at the recent convention of the Master Mechanics, the sentiment developed concerning the value of such practice being varying. During the discussion (which we give elsewhere in this issue), one speaker referred

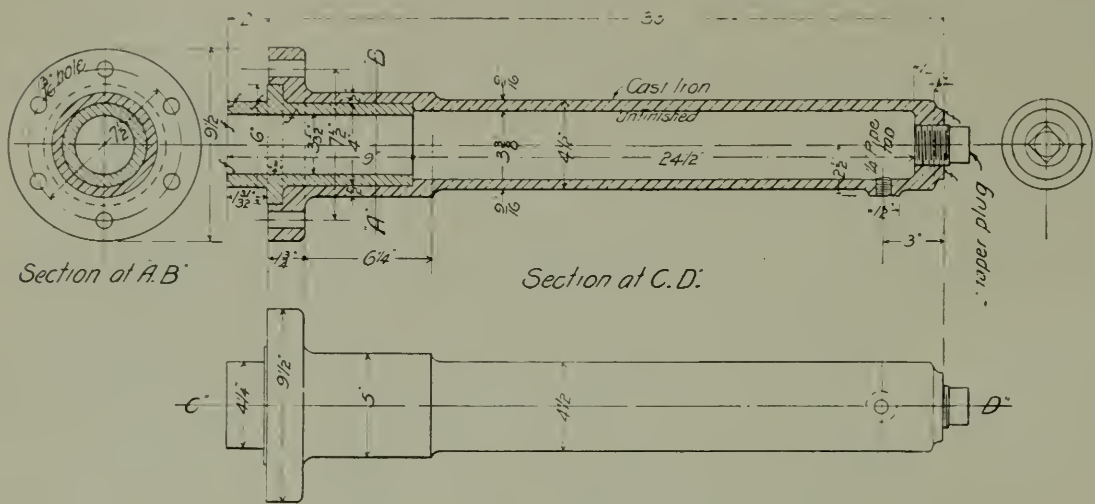


Fig. 1.—Piston Rod Support.

to the design followed on the Atchison, Topeka & Santa Fe as being the best he had seen. We have, in consequence, obtained prints of two arrangements used upon that road. Figure 1 shows the arrangement for

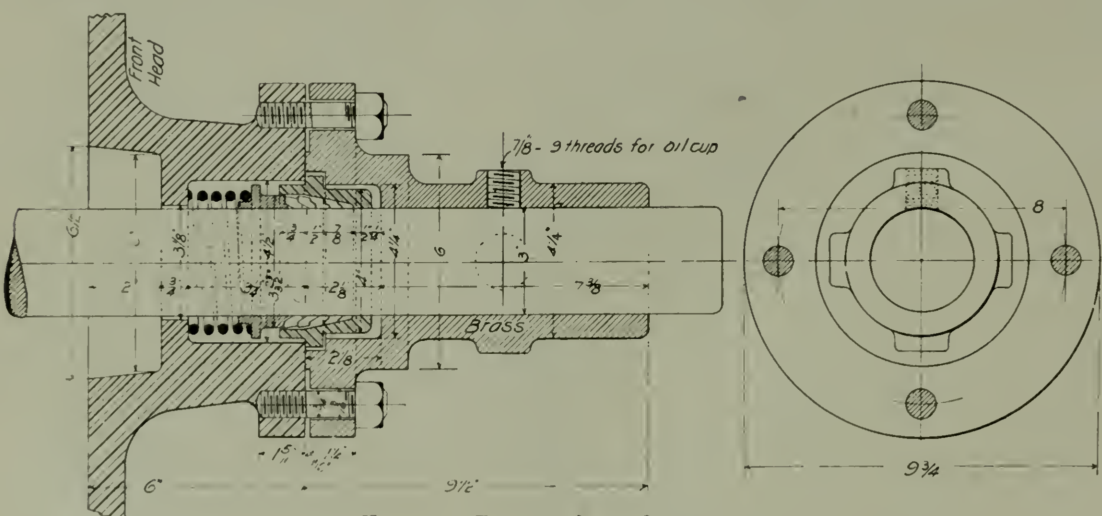


Fig. 2.—Piston Rod Support.

freight engines with cylinders 21x28 inches; and Figure 2, that used on engines of this class, and also upon a passenger locomotive on the Denver division, the latter having 19½x28-inch cylinders.

The first arrangement, it will be noted, includes a cast iron cover, or sheath, for the extended rod. This sheath is attached to the cylinder head in the manner shown. It carries a brass bushing piece 9 inches in length over all and 3½ inches in diameter, which carries the piston rod and the weight of the piston.

In the second arrangement, shown in Figure 2, the extended piston rod is not provided with a sheath, but is exposed. A metallic packing is employed, as shown. The brass bearing is 7⅜ inches, and has a running fit of 3 inches clear diameter.

Experience on the Santa Fe road fully warrants the favorable mention that was given these designs at the recent convention.

RAILWAY WATER TANK DESIGN.

RELATIVE MERITS OF STEEL AND WOOD CONSTRUCTION

BY T. W. SNOW.

In the Railway Master Mechanic of April, 1899, page 49, was given an article entitled "Steel Water Tank," with illustrations showing a stand-pipe as adapted to railway uses, which suggests a few thoughts that may be followed up with advantage.

The low price on steel plates previous to this year has led to many comparisons being made in the entire branch of water station service and I am glad to note an awakening all along the line in regard to this important adjunct to the service. In all reforms the tendency is to bear existing ills and evils too long and then institute a revolution instead of a reform. Certainly, the need of better water service on most of our railways is so apparent that no argument is needed to induce thinking men that it is time—high time—to turn over a "new leaf." The object of this article is to turn it over several times before abandoning present standards and then when right to go ahead.

The old type of wood tank and wood trestle can certainly be improved upon, first, because present standard sizes are too small in storage, and second, because the wood tank properly built will outlast the trestle. A good steel trestle can be built for small additional cost over wood, that will have sufficient life to outlast several wood or steel tanks. As to choice of wood or steel for this purpose, see comparison made hereafter in this article.

In constructing a water tower such as is shown in your journal and previously referred to (see Fig. 1), it should be remembered that one of the "evils" of the past has been retained, viz.: the tank fixtures and the resultant accumulation of ice in winter weather. This ice pile makes a dangerous footing for trainmen in switching, and requires watching to avoid interference with wheel flanges. The close proximity of tank or stand-pipe to track is to be avoided. The ground so occupied is usually valuable for other purposes, and such a structure is a continual menace to the safety of trains. A suitable water crane will convey the water to the tender as well, or better, and there would, moreover, be no danger of the valve rope freezing in the open tank during severe cold weather.

In making a comparison of the commercial value of steel and wood tanks there are many things to consider beside first cost. The recent rise in the price of steel plate has not only disturbed the ratio of tables prepared for this pur-

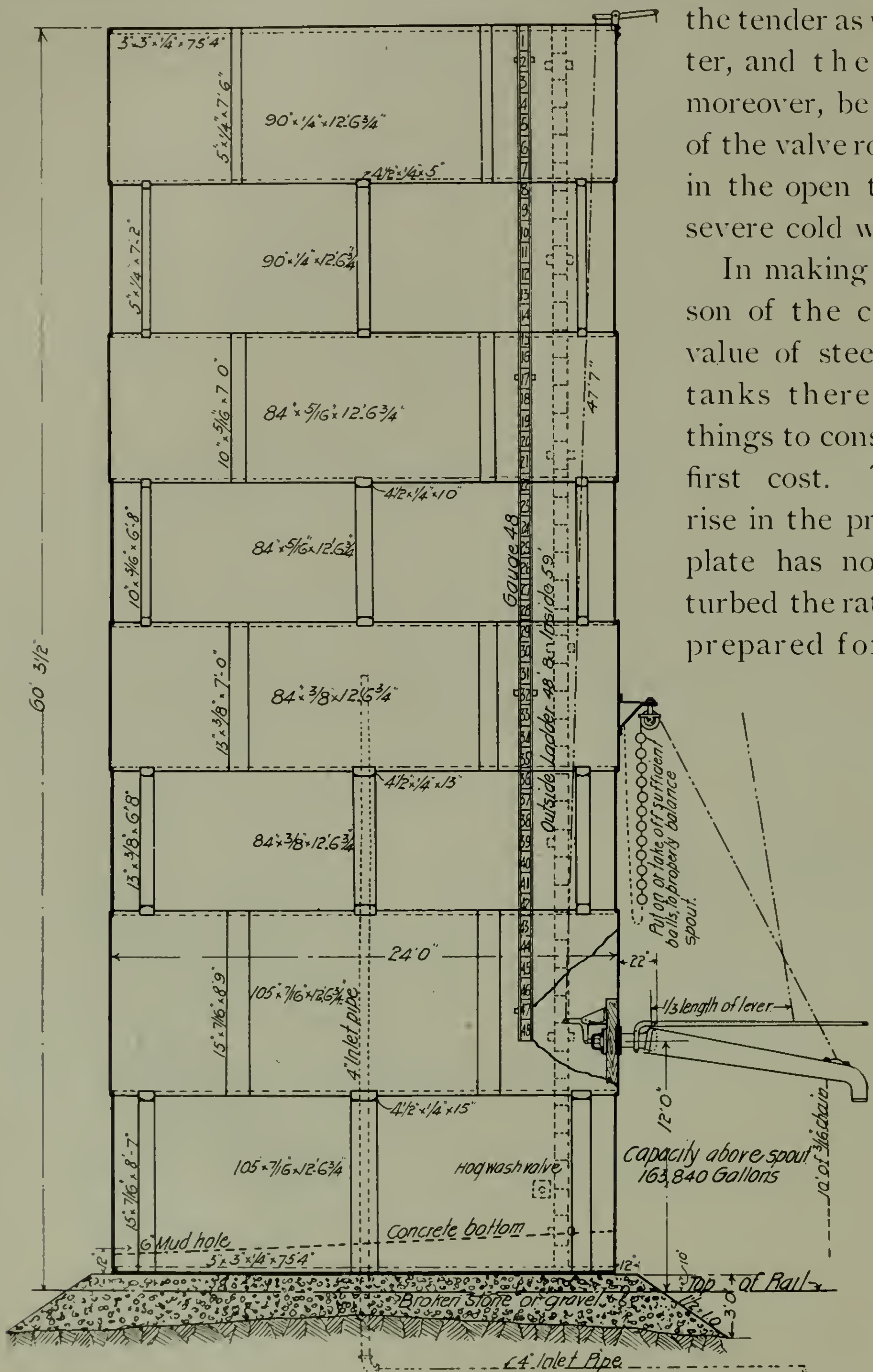


FIG. 1.

pose, but the delay in obtaining suitable stock for manufacturing steel tanks has upset the patience and equilibrium of many intending purchasers, and checked a movement that promised to be very general a few months since. There is, however, a day not far distant when these values will come closer together again—for a suitable lumber will be advancing in value, while the steel will decline in price as soon as normal conditions are reached.

It may be said of the steel tank that in places where the water consumption is in excess of 100,000 gallons during one night that the tank of wood is impracticable, and the use of steel therefore necessary. The limit as to quantity in wood construction may be placed at 100,000 gallons in one unit. The comparison of these tanks will therefore be made with units not to exceed this quantity. The size of tank in most general use is of 50,000 gallons' capacity, and specifications for such a tank are appended to this article. This size of unit has been the "standard" on most roads from the advent of the wooden tank until the present day, with a present tendency to increase the unit to 60,000, to 75,000, and even to 100,000 gallons.

In the early days of the railway, tanks were made of iron, quite often oval shape of bottom and with vertical sides. The tanks were enclosed in a brick or a stone building to prevent frost action and, usually, were heated by a stove. A year or two since the writer discovered some letters from Mr. Merrill, of the Milwaukee road, Mr. Chas. Paine, of the Lake Shore, and sundry other equally prominent railway men of their day, as to the "great discovery of keeping water in an unenclosed tank made of wood," and this discovery was subsequently patented and proved a very profitable patent during its life. These wooden tanks were made usually of clear, soft, white pine and the staves given a pitch, or inclination toward the top, of one-half inch to each foot in height, so that the hoops could be driven to make it water-tight. Thus several thousand dollars were saved on the total cost of each water station.

As our forests were depleted of suitable stock the grade of lumber in the tanks was gradually changed from "Clear" to "C" stock, and then to a selection made from First Common soft white pine. It was found that a hard knot in a white pine plank would last longer than the clear pine would hold it in place. Hence the lumber grade known on the market as "Tank," and now in most general use for this purpose. Other materials used for this purpose are as follows:

For convenience, I have placed the per cent mark opposite each to indicate the increased cost over First Common soft white pine.

	Per Cent.
Clear red swamp cypress	40
Clear California redwood	60
Clear Oregon or Douglas fir	50
Clear Oregon cedar	50
Common Eastern red cedar	20
Iron or steel	120

This ratio is made with common specifications for metal tank at normal prices.

The objections to each may be briefly enumerated as follows:

COMMON WHITE PINE—Difficulty in obtaining suitable inspection, available quantity growing rapidly less, and certainty of finding a substitute soon.

RED CYPRESS—Difficulty in detecting pin holes, shake, and length of time for proper seasoning. It will not stand first winter in this climate after cutting.

CALIFORNIA REDWOOD—Very difficult to handle on account of being "brash" and soft, necessitating greater care in handling.

OREGON FIR—Careful selection on account of "pitch pockets," necessitating rejection of approximately 50 per cent of mill run in clear stock for tank purposes.

OREGON CEDAR—Coarse grain. Careful selection necessary, with much waste.

EASTERN CEDAR—Small trees not avoidable east of Allegheny mountains. Most of this material comes from the State of Maine.

The objections to steel or iron tanks of 100,000 gallons or less are: First, liability of freezing: second, greater first cost.

The thin iron shell of the tank, or cylindrical tube as more frequently used, offers no protection in severe cold weather. All water is pumped in at the bottom and usually taken out through the same pipe. The ice formation begins at the top and extends downward in the shape of an inverted cone and usually keeps this shape all winter, except where but little used, and then it becomes solid in a protracted cold snap. That these tubes are dangerous is a pretty well established fact, and the numerous accidents to these structures from freezing has been carefully detailed by Prof. Wm. D. Pence, of the University of Illinois, in his work entitled "Stand-Pipe Accidents and Failures," and again in his "Action of Ice in Water-works Stand-Pipes," where some dozens of failures are recorded from frost troubles mainly. It is noteworthy that these failures are not confined to poorly-constructed work, but to the well-made equally.

Where the pumping plant is remote from the stand-pipe, and the pumper is careless or has other duties to perform that prevent his giving attention to the water control, there will be other "ice troubles," as Fig. 2 will indicate. The metal tank gives little if any protection against freezing, and freedom from frost troubles will depend solely upon the amount of water contained in the reservoir and the amount daily consumed.

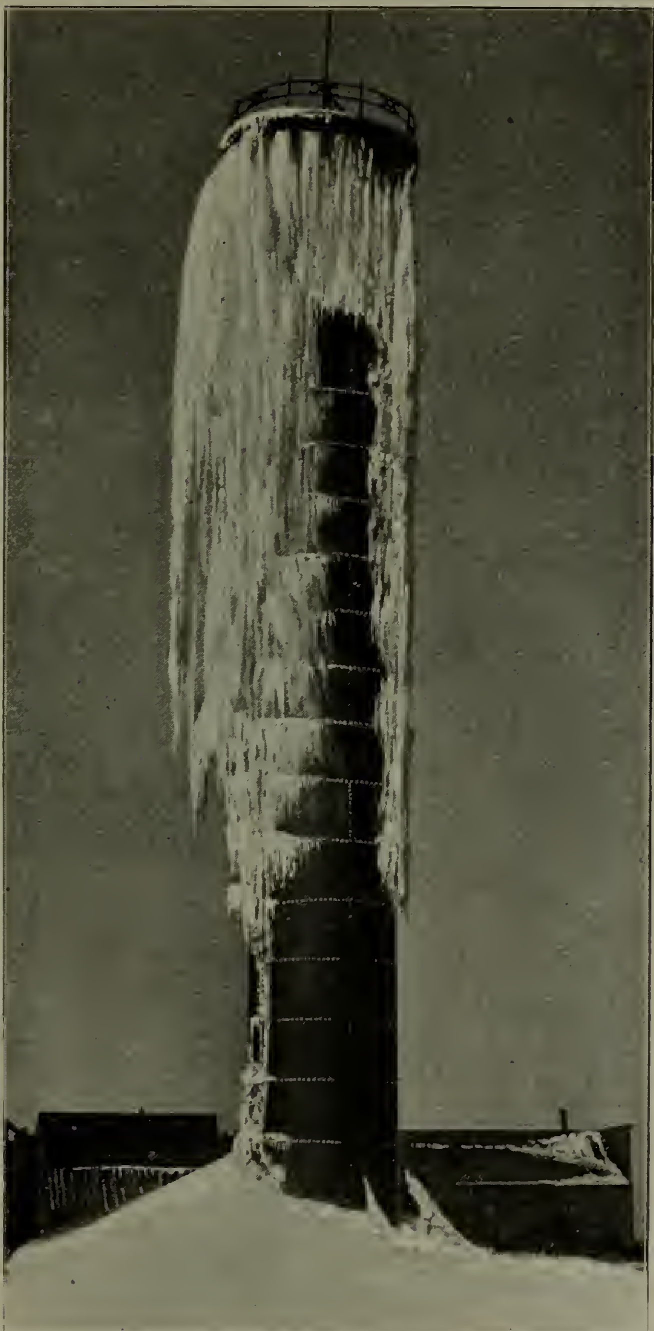


FIG. 2.

Water taken from wells at a temperature of 50 degrees to 55 degrees, in quantity equal to the reservoir capacity of the metal tank, will not chill to the freezing point in one day. Comparatively few stations will fulfill this condition. Surface water is usually preferred for boiler purposes, but surface water is usually near the freezing point, and is quickly converted into ice upon touching the cold metal. Here the wood has a decided advantage, for it is a fine non-conductor and will preserve the heat of well-water safely for a period of seven to ten days in a severe cold snap without danger.

If the metal tank is to be used it should be designed of greater diameter than height, to expose the least surface to the weather, also to keep down the pumping cost. Both of these items are important and will be referred to in the following tables. There is an impression abroad that in constructing a steel tube tank, a saving is effected over the steel tower construction. The experience of the writer is to the contrary. In regard to using the lower portion of the tube as a catch basin for mud, this is also a common practice in all tanks by raising the outlet valve a foot or more above the bottom, but it is a questionable practice for bad waters, and valueless for good waters. A settling basin or catch well can be built in most instances cheaper, and it is easier to remove the deposit that will accumulate. Fig. 3 will fairly well illustrate the steel tube tank, and Fig. 4 will represent the common tank, whether made of steel or wood. Let us first compare the two steel tanks.

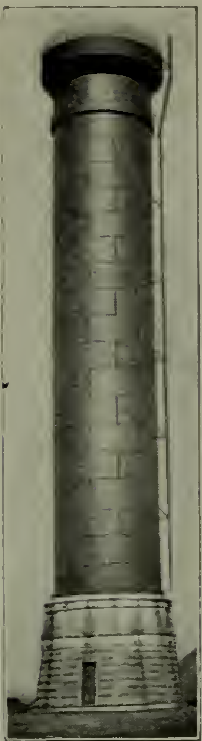


FIG. 3.

FIG. 4.

Let Fig. 3 be 12 feet in diameter and 100 feet high, and we have 67,800 gallons of available water above the twentieth foot mark. The approximate cost of such a tank, including foundations, erected complete, may be stated at $3,300 at the present time. The five top plates should be, with due regard for oxidation for a durable tank, 4-16 inch in thickness. The next five plates should be 5-16 inch in thickness. The next five plates should be 6-16 inch in thickness. The next five plates should be 7-16 inch in thickness. The bottom plates should be 8-16 inch in thickness.

Changing the form of the tank to 20 feet in height and 24 feet in diameter will give about the same quantity of water, and if you erect it upon a steel trestle, as shown in Fig. 4, we will have a total cost of.:

Foundations	$ 350
20-foot trestle	750
20x24-foot steel tank	800
Labor	700
Frost box and roof	200
Total cost	$2,800

The two top courses should be 4-16 inch thick. The two bottom courses should be 5-16 inch thick, and the bottom plates courses should be 5-16 inch thick. All plates are figured five feet in width in each instance.

The lower tank should have a tight roof to help preserve the latent heat in winter, and this will, with ordinary use, prevent its being capped with ice.

It is customary to provide a false bottom or air space, by laying a flooring between the main and chime joist. Ice will adhere to the sides in either instance more or less, according to the amount of water used daily, but it is far less important in the low tank than in the high one, if the bottom and top are protected.

If we take the average daily consumption of water at 100,000 gallons and assume the fuel cost of pumping at 1 cent per 1,000 gallons for 100 feet lift, we have a yearly cost of $365 with the high tank, against two-fifths of this amount, or $145.60, for fuel expenses in pumping this amount into the low tank.

This difference—$219.40—represents at 5 per cent a capital of nearly $4,500, and this multiplied by all of the water stations on a large trunk line would represent a sum of money that, to say the least, would be respectable. There should be, however, one deduction from this amount made, as larger water fixtures will be necessary to make up in volume what is lost in the velocity. At most stations using two water-cranes a train length apart, or 800 feet, will have an additional outlay on this account of approximately $600 to obtain a discharge of 4,000 gallons per minute.

If in place of a steel tank, as in Fig. 4, we substitute a wooden tank, with "standard" hooping specifications, we will reduce the cost by from $300 to $600, according to the material used, and have the following items to consider:

First—A fairly good insulation against cold weather, particularly when not pumping from wells.

Second—The life of the wood when saturated with water is equal to that of the metal tank herein described. When properly made the hoops fit throughout their length with an air-tight contact against the wood and no oxidation will be found on the inner side. When not properly made this argument does not apply. A good wooden tank should outlast two sets of hoops.

Third—A wooden tank is easier to handle and easier to repair or replace with ordinary railroad labor. No special mechanics or foreign labor will be necessary.

Fourth—The saving in first cost of the wooden tank at 5 per cent will nearly, if not quite, perpetuate it.

In closing, it may be well to state that most waters attack iron and steel, and hence the metal finds an enemy without and within. This is true to a limited extent of the wood only—most of the ravages of the elements are from the outside. With either tank, care and attention are necessary to obtain full life. The wood can better withstand neglect than the iron.

I have prepared the following specifications for a common white pine tank:

SPECIFICATIONS.

All pieces shall be of full length, without splicing, and made from 3-inch first selected soft white pine plank, free from coarse or loose knots, sap, shake, or any imperfections that can cause leak. All joints shall be machine sawed, with a fine 90 per cent scarf mark, with dowel pins at four feet intervals.

The outside of the stave shall be surfaced convex to coincide with the circle of the tank. No stave shall be wider than 8 inches, and no bottom plank wider than 12 inches. The crozing at the chime shall be cut with due allowance for the pitch of the staves, and ¾-inch deep. All black heart knots not extending clear through the plank shall be bored and carefully plugged with white pine. All plank must exclude the heart. (See Figure 5.)

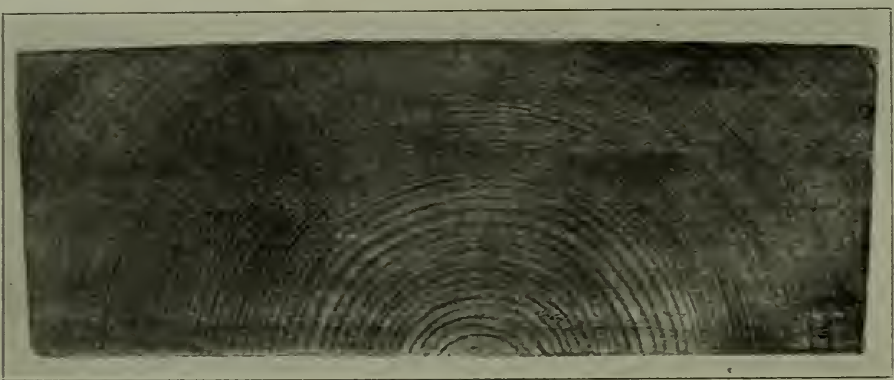


Fig. 5.

No sap allowed upon the inner edge and upon the outer edges not extending inwardly more than ½-inch, and not more than ¾-inch across the plank.

HOOPING.

1 hoop 5x3-16 inches.
2 hoops 4½x2-16 inches.
4 hoops 4x3-16 inches.
2 hoops 3½x3-16 inches.
2 hoops 3x3-16 inches.
2 hoops 2½x3-16 inches.

Total hoops, 13, fastened with three sets of lugs and bolts at each bend. These lug fastenings to be of superior tensile strength to the band, and riveted securely thereto (avoid all friction grip lugs.)

The thickness of the band should not be increased, though for a greater factor of safety it may be made wider, unless more lugs are used, rendering doubling or "folds" in shipping unnecessary. This hooping will allow, with a safe factor, for the swell of "season" or air-dried lumber, although kiln-dried pine tightly drawn up would burst them.

Such a tank will last when made thoroughly of air dried lumber an average of 20 years, with usual care in erecting and maintaining. There was recently a tank removed, made of such lumber, on the Sixteenth street crossing of the Ft. Wayne road in Chicago, that had been in service for 32 years, having been erected by George C. Morgan, then master mechanic of that road. Lumber that will comply with these specifications, improperly seasoned or kiln-dried, may not last ten years.

Fig. 5 will illustrate the end grain of carefully selected tank plank, as well as the convex outer surface to allow for a perfect hoop fit. The stave edges show radial machine cut for any width of plank up to ten inches. The tank plank should be so selected in relation to the heart of the tree as to present the concentric rings as shown. It will be readily seen that this arrangement will make the wood more impervious to the water where, if the rings presented the opposite position, a leaky stave would be had.

COMPOUND LOCOMOTIVES OF THE LONDON & NORTHWESTERN.

Mr. F. W. Webb, chief mechanical engineer of the London & Northwestern, read a paper at the June meeting of the Engineering Conference of the Institution of Civil Engineers, in which he reviewed the history of the compound locomotive on that road. In view of the unfavorable reports concerning compounds from other English roads, it is interesting to first note Mr. Webb's concluding sentence: "As regards economy of fuel, from careful and exhaustive experiments made by the author, the saving due to compounding is about 19 to 20 per cent, and this is confirmed by observations made in the United States." The claim has often been made, that in England simple engines are worked so near their maximum efficiency that nothing is gained by compounding.

The first compound used on the London & Northwestern was in 1878, when a simple engine was converted into a compound on the Mallet system, and this engine was worked for five years on the Ashby and Nuneaton branch. The results were so satisfactory that what has become known as the Webb system of compounding, two high and one low pressure cylinder, driving separate axles, was designed, and in 1881-82 the first engine, the "Experiment," was built on this plan. The cylinders were 11½ and 26-in. by 24-in., and the driving wheels 78 in. in diameter. Between April, 1882, and February 28, 1899, this class of engines has made 15,093,758 miles, which gives an average of 33,387 miles per engine per year; the average coal consumption, including 1.2 pounds for lighting up, and all coal used while the engines were standing, was 34.2 pounds per engine per mile.

In 1884, to meet the requirements of the heavy traffic between Euston and Carlisle, a more powerful class of compound locomotives, the "Dreadnaught," was built, These had 14 and 30-in. by 24-in. cylinders, 75-in. driving wheels, and 175 pounds steam pressure. Forty engines of this class, up to February 28, 1899, made 18,681,936 miles, which gives an average of 37,206 miles per engine per year, and an average coal, consumption, calculated as above, of 39.4 pounds per mile per engine.

To meet the increasing speed of trains, the "Teutonic" class was built in 1889. This class was in most respects similar to the "Dreadnaught" class, having the same size cylinders, but the driving wheels were increased to 85 in., and a simplified valve gear was used. Ten engines of this class are now running, and the total mileage made up to February 28, 1899, was 5,193,126 miles, or an average of 58,241 miles per engine per year; the average coal consumption was 37.9 pounds per engine per mile.

In 1891 the "Greater Britain" class was built, which was especially designed for working the heavy, fast passenger traffic over the west-coast route between Euston and Carlisle. The cylinders were arranged as before, but they were made 15 and 30-in. by 24-in.; the drivers were the same as in the "Teutonic" class, 85-in., but the boiler was made larger. Ten of these engines, up to February, 1899, made 2,704,537 miles, an average of 54,454 miles per engine per year, while the average coal consumption was 38.7 pounds per engine per mile. One of this class, the "Queen-Empress," was exhibited at the World's Fair, Chicago, in 1893.

It being desired to increase the number of cars of freight trains passing over steep grades on some portions of the line, a 3-cylinder compound freight engine was designed in 1893. This class had eight-coupled driving wheels, 51 in. in diameter, and all the cylinders were placed in a row under the smoke box; the high-pressure cylinders were without the frames, and the low pressure cylinder within, all driving on the same axle, the second from the front. Eighty-one of these engines are now running, and by their use many helping engines have been dispensed with, and the number of trains reduced. The total mileage up to February 28, 1899, was 3,628,727 miles, or an average of 28,331 miles per engine per year. The average coal consumption was 53.4

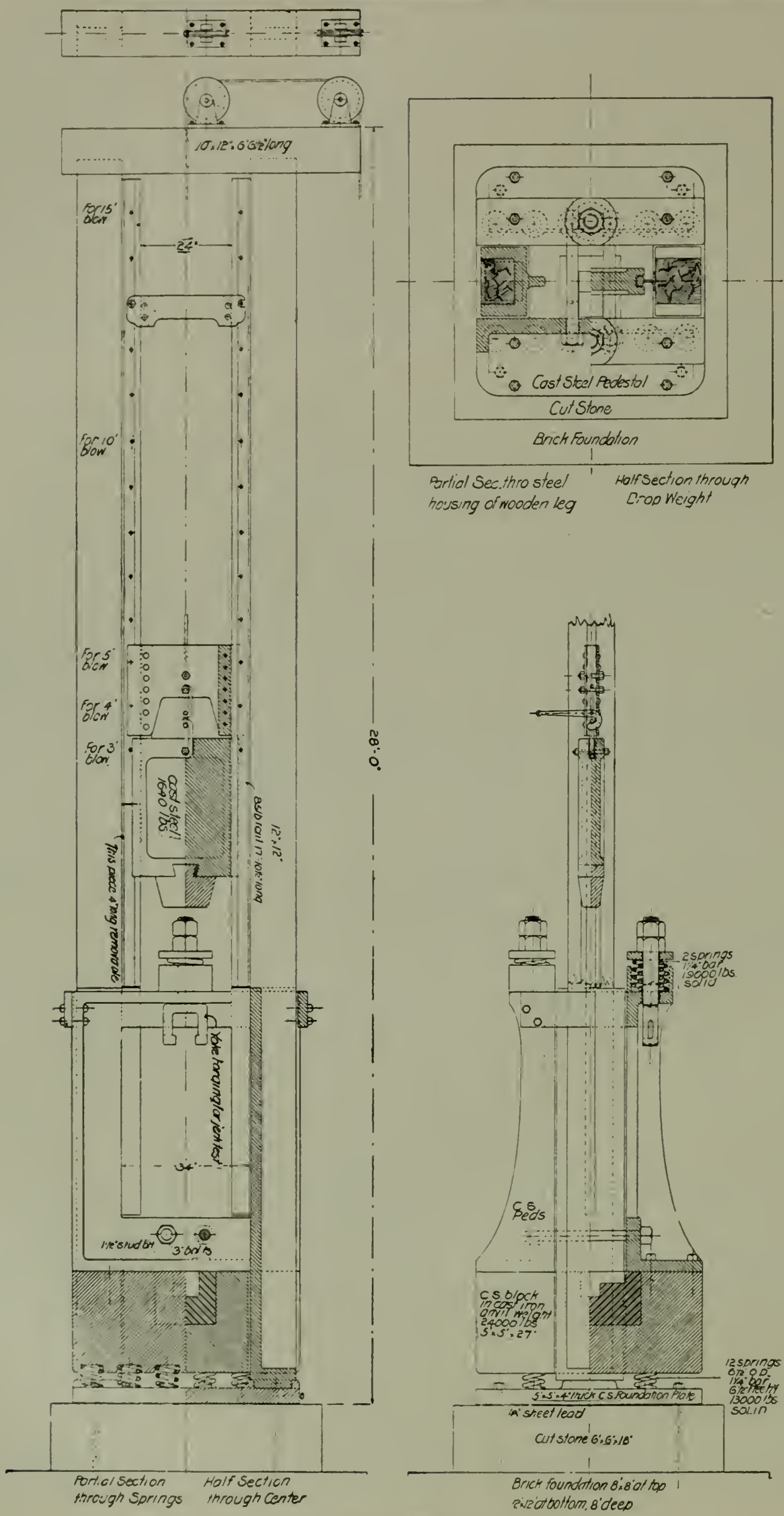
pounds per mile per engine, which, as before, includes 1.2 pounds for lighting up, and all coal used while switching or standing.

In 1894 the "John Hicks" class was designed for working the heavy passenger trains over the steep inclines on the northern division of the road. These engines were in all respects similar to the "Greater Britain" class, except the driving wheels were 75 in. instead of 85 in. in diameter. Ten of these have been built, and up to February 28, 1899, have run a total distance of 629,180 miles, an average of 48,868 miles per engine per year, with an average coal consumption of 44.8 pounds per engine per mile.

Further increases in the weight of passenger cars and the speed of such trains made necessary still more powerful locomotives, and in 1897 the "Black Prince" class was built. These engines, unlike the other compounds previously built, had two high and two low-pressure cylinders, with a boiler pressure of 200 pounds. The cylinders, 15-in. and 20½-in. by 24-in., were placed in a row, and all connected to the same axle, while the arrangement of the valve gear was modified. Two engines of this class are now running, and eighteen more are building. The total mileage for the two up to February 28, 1899, was 190,324 miles, or an average of 57,820 miles per engine per year, the average coal consumption being 40.3 pounds per engine per mile.

A PROPOSED DROP TEST MACHINE FOR COUPLERS.

In its report to the late Master Car Builders convention, the committee on M. C. B. couplers took occasion to present a design for a standard drop testing machine. The committee, in submitting this design (which we show herewith), stated that, in the first place, the machine must be reproducible; that a machine built on rock foundation should give just the same results as one built on soft soil, and that to this end it has seemed indispensable that the anvil should be spring supported. The committee in further comment on its design, said: "As strong and rigid a foundation as can be built must be put down, and the capstone covered with a cast-steel bed plate, having recesses cored in it to receive the steel housings for the legs of the machine. The 15-foot blows will be abandoned, as all the testing necessary can be done with the 10-foot blows, and the 15-foot blows have been found to be too destructive to the auxiliary apparatus in jerk tests, yoke forgings and equalizer bars breaking when submitted to these severe shocks. Besides



A PROPOSED DROP TEST MACHINE FOR COUPLERS that, it seems to be difficult to get couplers to stand even 10-foot blows, so that 15-foot blows may be left out of the question entirely. The anvil is made heavy enough to absorb in itself all blows and is supported on springs which are wound on definite sizes of mandrels, and from steel to fulfill definite specifications. The uprights to support the brackets carrying the yoke attachment for jerk tests are bolted down to the anvil, and leave plenty of room for the latter to rise and fall easily. The machine is accessible in the highest degree, and couplers can be easily and quickly put in and taken out in all tests. By the use of steel blocking and wedges, all couplers are held firmly in drop tests, and all are put on the same basis. It is believed that this machine can be built anywhere, and couplers tested on it are sure of receiving the same treatment as others tested in a different place." Further details of the proposed machine are revealed by our engraving.

IRON AXLE TEST SPECIFICATIONS.

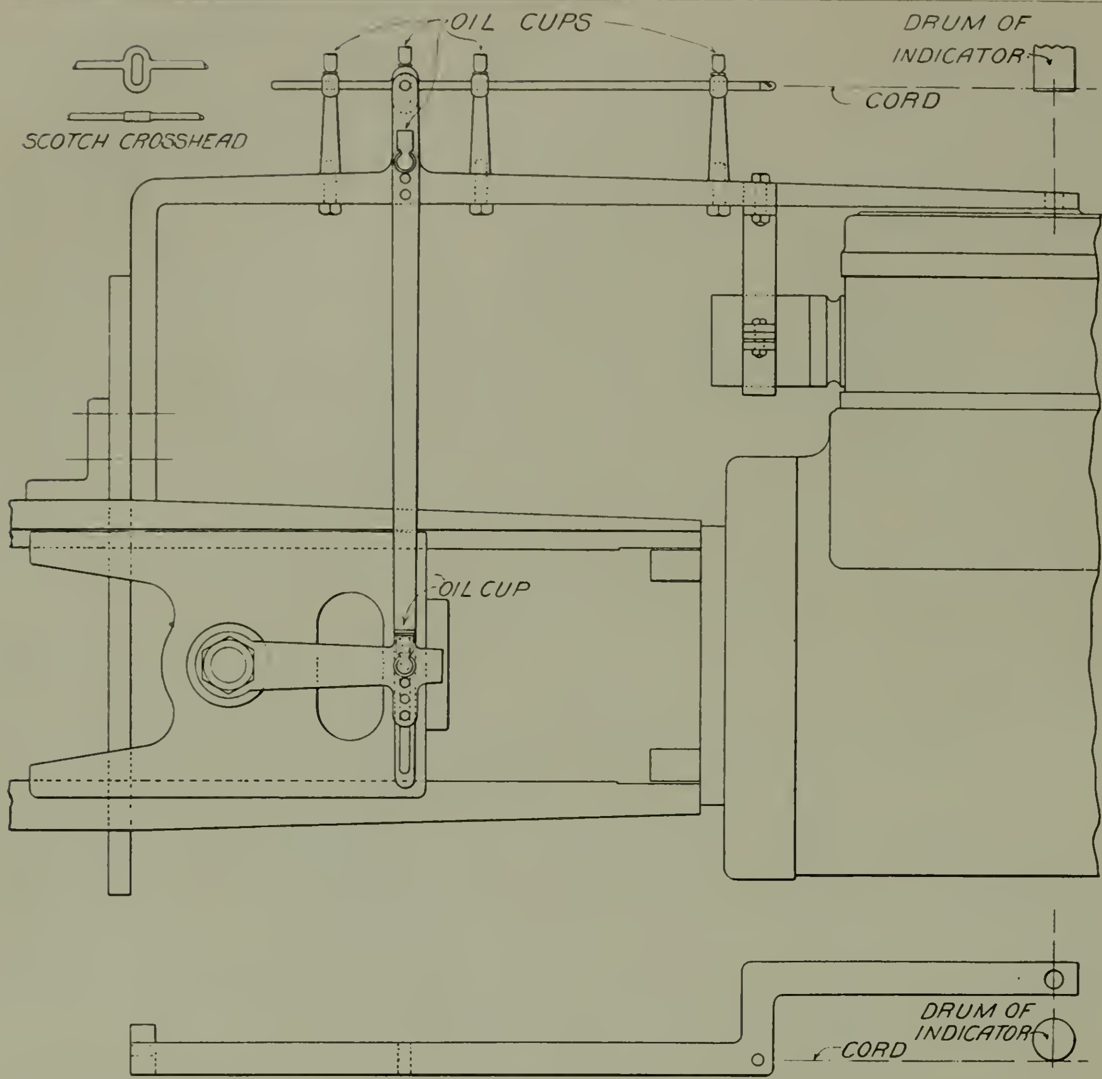
The abstract which we gave last month of the Master Car Builders' committee report on specifications for wheels and axles was incomplete, the committee not having up to date of publication given the figures for the drop test for iron axles. The committee has since supplied these figures, and we append the missing clauses, as follows:

6. It is desired that the axles when tested as specified above shall stand the number of blows at the heights specified in the following table without rupture, and without exceeding, as the result of the first blow, the deflections given:

Axle.	No. Blows.	Height of Drop.	Deflection.
M. C. B. 4¼ by 8-inch journals for 60,000-pound cars	5	21½ ft.	7⅛ in.
M. C. B. 5 by 9-inch journals for 80,000-pound cars	5	29 ft.	6 1/16 in.
M. C. B. 5½ by 10-inch journals for 100,000-pound cars	5	36 ft.	5 7/16 in.

7. Axles will be considered as having failed on drop test and will be rejected if they rupture or fracture in any way, or if the deflection resulting from the first blow exceeds the following:

M. C. B axle, 4¼ by 8-inch journals . . . . 8⅛ inches.
M. C. B. axle, 5 by 9-inch journals . . . . 8 1/16 "
M. C. B. axle, 5½ by 10-inch journals . . . . 6 1/16 "



REDUCING MOTION FOR INDICATORS.

The reducing motion for indicators, of which we give a sketch, was designed by Mr. W. E. Symons, superintendent of motive power of the Plant System, its details being worked out by Mr. George W. Wildin, mechanical engineer of that system. Mr. Symons, who has long been an extensive user of the indicator, formerly employed, with considerable success, a Bumbo pulley. This required the use of from four to six feet of cord to reach from the pulley to the instrument, and in operating it without using the detent arrangement it required an additional cord to reach from the pulley to the operator, making some ten or twelve feet altogether. It not infrequently happens that this cord becomes entangled, or caught in some of the working parts of the mechanism, and either broken or disabled at a time when most needed. In attempting to improve on these conditions, Mr. Symons applied one of the recently made reducing motion wheels made of aluminum. This device is a very good one, and Mr. Symons considers it very accurate up to a certain speed, beyond which, however, he contends, the cord is injured, and frequently becomes broken. He found that in locomotive work when the engine was making over 200 revolutions per minute that this string would soon fail, and at extremely high rates of speed, he thinks that the trembling or vibratory motion of the cord contributes somewhat to an irregular line on the indicator card. At all events, he abandoned this device and made in its stead the all metal device, an illustration of which we give herewith, employing the straight link, or what is most commonly called Scotch crosshead, as a means of reducing motion. With this arrangement only eight or ten inches of cord is required, including the cord that is wrapped around the drum. The device is positive and accurate in its movement at all points of the stroke and at all speeds; in fact, it is a very easy matter to manipulate it when the engine is running at seventy to seventy-five miles per hour. There is no patent on this motion.

"SUGGESTIONS FROM THE CHAIR."

EXTRACTS FROM THE PRESIDENTIAL ADDRESSES AT OLD POINT COMFORT.

BY PRESIDENT QUAYLE.

As chiefs of motive power departments, we have many problems before us, and it may not be unprofitable to note the direction toward which the solution of some of them are drifting.

POWERFUL LOCOMOTIVES AS MONEY SAVERS.

Since our last convention we have seen a very marked advance in the weight and power of locomotives, both passenger and freight, and this is most important. The problem of freight service is how to meet the reducing rates with economies that will secure the maximum net earnings. To do this, more powerful locomotives are necessary, and yet the track must not be made to suffer; and this, I believe, may be accomplished. We may need to increase wheel loads somewhat, but by using larger driving wheels the counterbalance weights may be made even less destructive than small wheels with lighter loads. We ought to build engines that will haul at least 2,000 tons on grades of from 6-10 to 7-10 of 1 per cent, and instead of driving wheels of 55 inches for road engines, on lines with ruling grades less than 1 per cent, we ought to use 60 inches. On such roads, by increasing train loads from 1,500 to

2,100 tons, we ought to save not less than half the cost of the heavier engine per year.

The greatest possibilities in saving, by the use of more powerful engines, are in the wages of engine and train crews. The expense of running a freight train for trips of about 100 miles at 10 miles per hour, which is uniform regardless of weight of train and the grades, is about $22.00. The cost of coal will be less per ton mile for heavier trains, but it is this constant charge for crews which effects the saving when their number is reduced. The labor cost at the round-house will be somewhat greater per engine miles, but when compared on the basis of ton miles it must be less, even when the labor of wiping is included. The wages of engine dispatchers are the same for heavy as for light engines, but since a smaller number are required for a given amount of work, this expense should be less with those engines that are more powerful.

The saving in coal is next to that of labor, and within the proper limits of the capacity of the engine and of speed, the heavier the train the less coal is required per ton mile. This argument applies to the loading of engines, whether heavy or light, but its force is greatest in connection with very powerful locomotives. This may be demonstrated by coal reports kept for relatively long periods. It takes more oil to lubricate a heavy engine than a light one; but this, too, should be referred to the ton mile, when it appears as a saving in spite of the great increase in steam pressure and the dimensions of journals. The same holds true in regard to the cost of repairs. They also will increase, but not in proportion to the additional work done. With two engines operating on the same grades, one built to haul 600 tons and the other 900 tons, the relative total cost of operation per 1,000 ton miles may be taken as the ratio of about 47 to 36, or a difference of about 25 per cent, or more than is usually expected from compounding. We are more fortunate than our English cousins in having comparatively large limits for the size of our engines, and comparatively few of us have reached our limits yet.

COMPOUND LOCOMOTIVES.

At our last meeting in this place, the compound locomotive was pronounced "in the balance." It has, however, gained many friends, as experience has demonstrated that the strictly "compound features" have given but very little trouble, and it is not now doubtful that this type of engine is advantageous. It needs, however, to be more carefully designed, even more than the simple engine, as regards the details which give trouble by breaking, because the strains are greater at times and less uniform. The tendency toward heavier loading has been favorable to compounds, because of the possibilities of greatly increasing their pulling power at critical points on summits by use of live steam in the low-pressure cylinder.

POSSIBLE IMPROVEMENTS IN LOCOMOTIVE DESIGN.

The possibilities of lightening parts by the use of improved material, whereby capacity may be increased without increasing weight, should be utilized to the utmost. Larger boilers may be built without increase of total weight, and we may be encouraged in this by the great improvement of recent years in marine work.

It would take too long to do more than partially enumerate the directions in which we may improve locomotives. The following need our attention: The reduction of waste power of the cylinder by reducing back pressure and condensation; piston valves; feed water purification; the forms of fire boxes and other factors tending to reduce staybolt strains and failures; more thorough lagging of the boilers at the sides and front of the fire-box; the further use of cheap fuels and care in the matter of details which will prevent engine failures on the road. All of these subjects are before us, and all of them give promise of good returns for the time and money spent upon them.

SHOP DESIGN.

In our shops we have too often a lot of buildings which have received additions from time to time without a definite plan, until we have many unsatisfactory conditions unfavorable to economical work. We permit our shop plants to run down, until some day we find they will no longer serve and they must be replaced with a complete new plant. It is better to plan carefully in the first place, providing for extensions, and then figure on a fair depreciation, and by spending a specified sum each year no renewal or general house cleaning of the entire plant need ever be necessary. It is our duty to properly impress this upon our superiors. Although it may be difficult to carry out the plan, business policy demands it.

POWER FOR SHOPS.

The distribution of power in shops needs thought. We have electricity, compressed air and also the gas engine to aid us, and I predict that after ten years we shall look back with surprise at the prevailing shop power methods of the present. We need more power cranes and more modern and powerful tools. We must give more attention to the cost of work and to those commercial methods that make success or failure in manufacturing establishments.

CARE OF EMPLOYES.

The welfare and comfort and the surroundings of our men, both on and off duty, interest us now, but much more ought to be done in these matters in the lines of reading rooms, places of recreation and in providing lectures, instruction and entertainment. We should use the technical papers intelligently. It is a good plan for the head of the motive power department to mark articles and send them to their master mechanics and such other employes as they would deem wise, asking for comments and suggestions. Will not a little work in this direction pay well?

ENGLISH VS. AMERICAN LOCOMOTIVES.

Not many years ago, acrimonious discussions were printed in technical papers, tending to show that English vs. American locomotive practice had two sides, and I believe that our English brothers would be the gainers were they to look to us in some of the things that we are doing in this country, and it would not be amiss if we were to study more closely some of their methods. It is by studying the best methods adopted by the other fellow that we can expect to improve our own conditions and lay aside some of our old-time practices.

BY PRESIDENT SCHROYER.

A third of a century has come and gone since the first meeting was called, of what is now the Master Car Builders' association of America.

GROWTH OF THE M. C. B. ASSOCIATION.

The body of men in attendance here to-day, the interests that are represented, have developed and expanded until, from a small beginning thirty-three years ago, we have here now a membership of 458 persons, representing 3,348,131 cars, or about $500,000,000 in money. These figures are such that they should cause us to consider seriously all questions that are brought before this association, either in the adoption of a standard of construction, or in the rules governing the interchange of cars in traffic.

A POETIC THOUGHT.

Since our last meeting at Saratoga was held a year ago, the ravages of war have almost passed away, and peace, with its attendant prosperity has again dawned upon our land; so that, to-day, we are almost in a position to cast our cannon, used in deadly strife, into car wheels, on which to carry the products of farm and factory from the interior to the seaboard, and from coast to coast, where they should be carried in American boats, built by American citizens, to the farthest nations of the earth.

CHEAP TRAFFIC MOVEMENT.

I presume that there has been no prolonged period in our history when the general business of our roads has been conducted on so extensive a scale as it has been during the past year; and it is also fair to assume that there has been no year in the history of the world when a ton of freight has been transported so cheaply, safely and quickly from one side of our continent to the other, as has been the case during the year just passed. To what extent we, as the heads of our representative mechanical departments of the railroads, have added to these conditions, must be left for wiser heads than mine to determine; but as a mechanical man, at the head of the mechanical department of a railroad, I can see in all directions the advances that have been made by us, both in enabling us to carry loads larger and safer and faster, and transporting passengers under higher speeds with a greater degree of safety, comfort and elegance than has ever been known before.

WORK OF THE ARBITRATION COMMITTEE.

Your arbitration committee has, during the year, passed upon thirty-five cases in dispute. This is the least in number that have been acted on for years, and speaks volumes of praise for the good feeling and honesty of purpose existing between the respective mechanical departments, and for the rules of interchange as they exist to-day, and the harmonious manner in which the railroads are interchanging the vast volume of business under which our diversified interests are transported from one section of the country to another. This committee has justly come to be looked upon as a sort of governing power in our interchange rules.

TRAINS PARTING.

Personally, I am not hopeful that very much improvement will be made in the direction of preventing trains parting, until we have entirely eliminated the use of the link and pin drawbar.

THE HEIGHT OF COUPLERS.

The recommendations, as made in the report by the committee on height of couplers may not, in the opinion of many, be the most desirable, as the opinion prevails strongly in many quarters that the limit in the height of couplers should be increased. Personally, I am of the same opinion, but think with the committee that the time for the increase of this limit has not yet arrived, and will not, until the automatic coupler has come into use. That day, I am glad to say, is not far distant, as the progress which has been made during the past year in the applying of this device, is such that I am hopeful that all roads in the country will have their cars properly equipped by the time the law goes into effect in January next. I am of the opinion that this association should take some action as regards this matter, and do all in its power to have the new couplers applied by the time the law goes into effect.

If I might be permitted to mention a few of the conditions which would make necessary the increase of these limits, I would state that the amount of wear we have on our wheels—which will probably reach as much as three-eighths of an inch—one-half to five-eighths' inch wear on our brasses, the amount of compression there is in the springs, the necessary wear on the carrying iron, and the dropping of the draft apparatus, are such that the limit of three inches between the maximum and minimum height is not enough in general service.

THE M. C. B. COUPLER.

Your special attention is directed to the much-discussed question of the Master Car Builders' drawbar. You are all familiar with the amount of adverse criticism which has been passed recently on the use of this bar. I think if we will look honestly into the question, we cannot help but come to the conclusion that much of the difficulty in its use is due to the great variety of makes that are now on the market, the inferior quality of material that is being used in their construction, and difficulty of handling them with the link and pin bar. Failures of bars are multiplied to-day, because of the increased work required of them. I believe, however, that the roads using the greater number of bars of the better makes are so entirely satisfied with the results of the service obtained that they have no complaints whatever to make as regards the merits of the M. C. B. coupler.

REPRESENTATIVE MEMBERSHIP.

The question of representation in this association has been called to my attention by one of the members, and I am led to believe that many are of the opinion that representation should be changed from its present wheelage basis, where eight wheels represent a car, to a tonnage basis, as the claim is now made that railroads represented heretofore having a large number of four-wheeled cars of eight or ten thousand pounds capacity, are having these replaced by eight-wheel cars having sixty, eighty and one hundred thousand pounds capacity. The result is that their tonnage is very largely increased, while their representation in this association is very materially decreased. These conditions prevail on most of the roads in this country. The question presents a field of inquiry that merits your attention and is presented to you as food for thought, as I have no recommendation to make in this direction.

BEST METHOD OF PREVENTING TROUBLE IN BOILERS FROM WATER IMPURITIES.*

The first effort in preventing trouble in boilers from water impurities should be in searching out sources of supply furnishing the best obtainable feed waters.

1. In building a water station where, by a larger first outlay, water of a better quality (that is, costing less for purification) may be obtained, the question should be carefully considered before accepting the poorer water in order to save first cost of plant The treatment of water is expensive, and the cost will pay the interest on a large investment. For example, in a station furnishing 100,000 gallons of water in twenty-four hours, which costs 4½ cents per 1,000 gallons for purification, were it possible to substitute a supply costing but 2¼ cents per 1,000 gallons for treatment, an outlay of $16,425 would be warranted in order to bring about the change. The annual cost for purifying the 4½-cent water would be $1,642.50; for the 2¼-cent, $821.25; the difference in the cost for the two treatments being $821.25, which equals 5 per cent on an investment of $16,425.

2. Where necessity compels the use of troublesome water there are few cases where by treatment, either mechanically or chemically, fairly good waters for boilers may not be obtained, the important consideration being the method employed.

There are in the market numerous so-called water purifiers, purges, oils and boiler cleaners, many of them absolutely worthless, others dangerous. It should be a rule never to allow the use of any compound for this purpose until its effects and dangers are fully understood.

3. The cost of purifying waters will always be cheap when compared with the use of waters which cause trouble in the boiler. The best methods to be employed can only be determined when the conditions are fully understood. The cost for water purification depends on the character of the water and the methods and reagents employed. Lime and soda ash are the cheapest of the effective and harmless reagents for this purpose, and direct treatment in the tender is the least costly method.

Waters carrying twenty-five grains of incrusting matter per gallon, five of which are sulphates, may be successfully treated with soda ash at a cost of about 40 cents per 1,000 miles of engine mileage, or about 6.12 mills per 1,000 gallons of water.

With engines equipped with blow-off cocks of sufficient number and correctly located, and with 4 per cent of the water taken blown out, in keeping boiler free from sludge, the engine may be safely and satisfactorily run from 2,000 to 3,000 miles between washouts.

Assuming the cost for untreated water to be 10 cents per 1,000 gallons, the 4 per cent wasted in blowing out would represent a value of 4 mills per 1,000 gallons, or a total for treatment and waste of 10.12 mills. In this calculation no account is taken of the heat losses in the water blown out, and if the blowing out be done at the end of the trip, when the engine goes into the roundhouse for a lay over, it should not be. But if on the road, a further cost equal to the value of the heat in the water wasted should be added to the other expenses for water purification.

In waters of the character and treated by the methods just referred to, the result that may be expected from engines in freight service is that 100,000 to 200,000 miles may be made between changes of flues, and that the life of fire boxes will be from eight to fifteen years.

Water with forty grains of incrusting matter, seven or eight of which are sulphates, may be treated in the same manner with fairly good results, but with an additional cost

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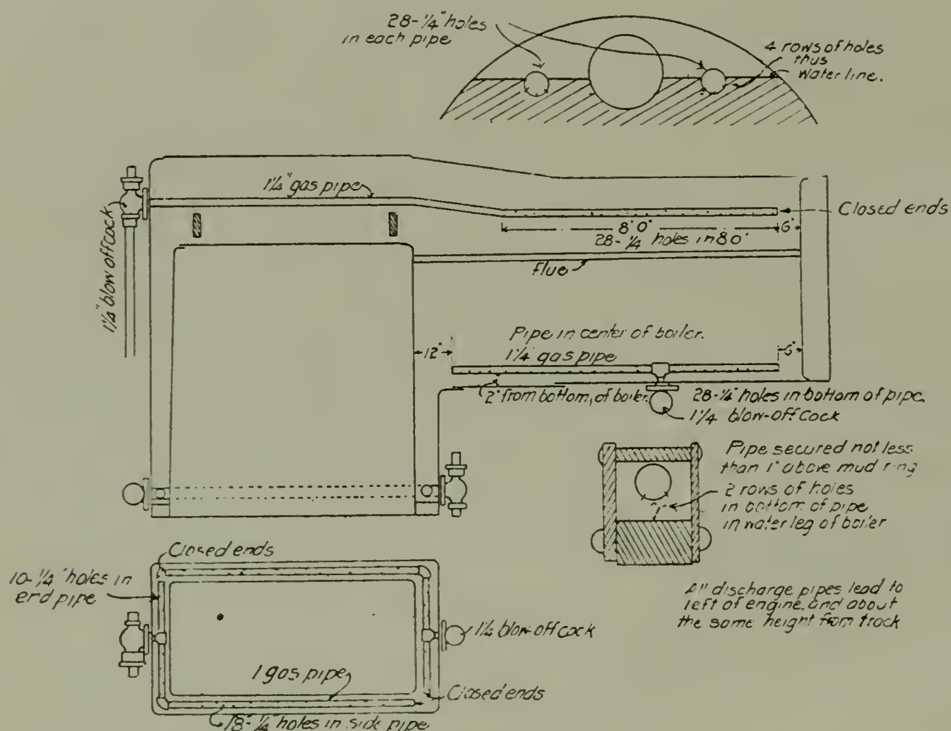
* Recommendations made by the Master Mechanics committee at the Old Point Comfort convention, June, 1899. Committee: A. E. Manchester, chairman, J. H. Manning, S. P. Bush, H. Bartlett, R. M. Galbraith.

for reagents and blowing out in proportion to the increase in incrusting matter and sulphate.

Treatment of water in the station tank, as represented by the several cases already alluded to, costs for reagents from 2¼ to 4½ cents per 1,000 gallons, and we estimate the loss of water in cleaning the settling tank, and in blowing out to keep the concentration of alkali to a safe limit, to be as great as by the direct method. The first cost for the water station is greater and will be further increased by the introduction of automatic devices for delivering the reagents. On the other hand, the special advantages are that the treatment may be varied to suit each particular condition of water; also that the water freed from sludge will carry a greater concentration of alkali without trouble from foaming.

The cost for treatment of water by mechanical purifiers or cleaners is for the water and heat lost in blowing out. The blow-off cock is the active agent for purification in all mechanical cleaners; the part performed by the remainder of the devices is to assist in bringing mud within its reach.



BLOW-OFF PIPING ARRANGEMENT—N. Y. C. & ST. L. RY.

An engine fitted with blow-off cocks, as shown in the accompanying drawing, which is the standard on the N. Y. C. & St. L. R'y, is, we believe, fully equipped with a good purifier.

When waters contain little or no sulphates, or where alkali is troublesome or earthy matter is in suspension, they may be successfully handled by mechanical devices.

We do not consider it safe practice, where sulphates are to be dealt with, to depend upon mechanical devices, except they be reinforced by chemical reagents for neutralizing the incrusting matter.

The cost for clarification of water by filtering or settling is for first cost of plant, the interest and maintenance of same. By the unaided method, the only other expense should be for attendant, and water used in cleaning.

With the mechanical filter, the water used for this purpose should not exceed 5 per cent of the amount pumped, and the time consumed in cleaning should be about fifteen to twenty minutes every five to ten hours. Where coagulants are used, there will be an additional cost for chemicals of 1 to 2 cents per 1,000 gallons of water clarified.

Water purification by evaporation, as already explained, represents the most effective practice of the day. The price given will be varied in proportion as the cost of labor and fuel be greater or less than the figures used in the case cited.

4. There should be on the staff of the superintendent of motive power, where the size of the system will warrant, and boiler feed waters are troublesome, two specialists; one a boiler washing inspector, who has charge of the boiler washing. In the performance of his duties, he should, as often as possible, visit the different round-houses and shops to see that they are equipped with and using the tools intended for this purpose; that the boiler washers understand how, and are doing good boiler washing; where soda ash put in the tender is the reagent and method employed for purification, to see that the correct amount is properly put in, observe the manner in which the blowing off is done, and to stay at each point until a personal inspection has been made of all boilers cared for by them.

The other specialist should be an assistant to the chemist, and should have a knowledge of the chemistry of water, and a good understanding of geology; the water supply of the system, so far as relates to quality, to be directed by him. Among his duties to be the searching for, and locating, the best sources of water, looking after the condition of water in existing stations, and where any falling off in quality develops, to determine cause. The analysis records, and reports in relation to water purification and supply, and its performance in the boilers, to be under his charge. He should spend a part of his time on the road, personally inspecting pumping and purifying plants and methods, and should keep in close touch with the boiler washing inspector, round-houses and shops.

A man of this character, with a correct understanding and well directed efforts, would make himself useful in the department, and be the means of materially lessening trouble in boilers from water impurities.

BEST METHOD OF APPLYING STAY BOLTS TO LOCOMOTIVE BOILERS.*

Your committee on "Best Method of Applying Stay Bolts to Locomotive Boilers, Including Making the Bolts and Preparing the Holes," respectfully submits the following report:

Through the medium usually employed—the circular of inquiry—the committee has obtained the experience of many of the members, and for which it wishes to express its thanks. The replies to the questions show that they were carefully prepared with a view of furnishing the committee all information required.

To "begin with the beginning," it has been thought best to submit the report showing, first, the process of manufacture of stay bolts, and to that end the subject will be considered under the several headings to indicate the same.

CUTTING STAY BOLTS FROM THE BARS.

The general practice is to cut stay bolts off to the required length by a concave cutter in a shearing machine. The Pennsylvania Company cuts them off in a turret lathe. The

* Report presented to Master Mechanics' convention at Old Point Comfort, June, 1899, by T. A. Lawes, Geo. F. Wilson and S. M. Vauclain.

C. C. C. & St. L. R'y uses the device shown in Fig. 1. The advantage in the use of this device is that the bolt is held more firmly, while being sheared, than in the ordinary concave shears, and it cuts the ends off squarely. When the concave cutter is used there is more or less tendency for the stay bolt to raise up while shear is cutting, and the result is the end is not cut off squarely.

There is no patent on this device.

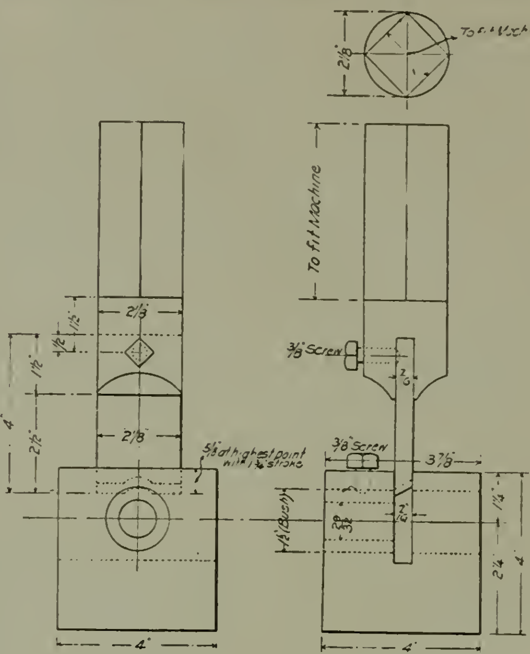


FIG. 1.

MAKING SQUARE ENDS ON STAY BOLTS.

The usual method of making square heads is by the use of a bolt header. The Buffalo & Susquehanna R. R. makes them with dies under a steam hammer; the Chicago, Burlington & Quincy R. R. mills off square at end of stay bolt; the Chicago & North-Western R'y makes the square with a punch under shears; the C. C. C. & St. L. R'y does the same with the device shown in Fig. 2. Heads can be put on with this device by one man at the rate of 300 per hour. An ordinary bolt header can do this work at the rate of 300 per hour, requiring, however, one man and a helper to operate it.

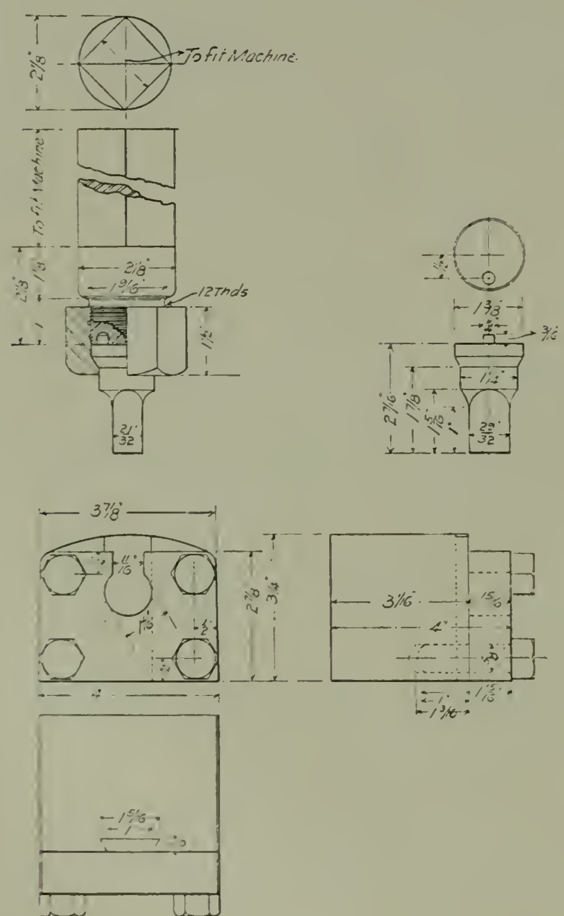


FIG. 2.

HEADLESS BOLTS.

Several members report that they do not square ends. The stay bolts are screwed into boiler by the aid of various devices. The Chicago, Burlington & Quincy R'y uses a patent eccentric die, and the Chicago & West Michigan R'y uses a chuck for this purpose. The Northern Pacific R'y reports the use of a device for screwing bolts into firebox.

The device used by the Atchison, Topeka & Santa Fe is shown in Fig. 3. It is not patented.

The Chicago & Eastern Illinois R. R. has tried headless bolts, but has abandoned their use, for the reason that after screwing them in with an air motor, an adjustment must be made by the use of an alligator wrench in order to move the bolt just far enough to properly rivet it. The time used in adjusting and removing the alligator wrench more than balances the cost of forging the square ends on bolts.

CUTTING THREADS.

The Chicago, Milwaukee & St. Paul Railway report the use of a six-spindle cutting machine — running the bolts through twice ; the first time roughing them down very nearly to size and the second time with dies that are in perfect condition—only requiring to straighten up, and cutting but little additional thread.

The Delaware & Hudson Canal Company also take two cuts on stay bolts—the second cut being a very light one to finish. A better thread can be obtained by this method, though the usual practice is to take but one cut over a stay bolt.

A number of roads report the use of a lead screw attachment an essential to produce stay bolts with threads of accurate pitch, viz : Erie ; Lehigh Valley ; Baltimore & Ohio ; Grand Rapids & Indiana ; Chicago Great Western ; Delaware, Lackawanna & Western ; Chesapeake & Ohio ; Penna. Lines west of Pittsburg ; Philadelphia, Reading & New England ; Minneapolis, St. Paul & Sault Ste Marie ; Northern Pacific ; Rio Grande Western ; Chicago, Rock Island & Pacific ; Buffalo & Susquehanna and Chicago & Eastern Illinois.

The lubricant reported as giving the best results in cutting stay bolts is lard oil. Summer cottonseed oil is as good, and dies will remain sharp as long with it as with lard oil, but after bolts are cut it is more liable to gum over the threads. This, however, has not been considered objectionable, except when bolts are prepared and stored for

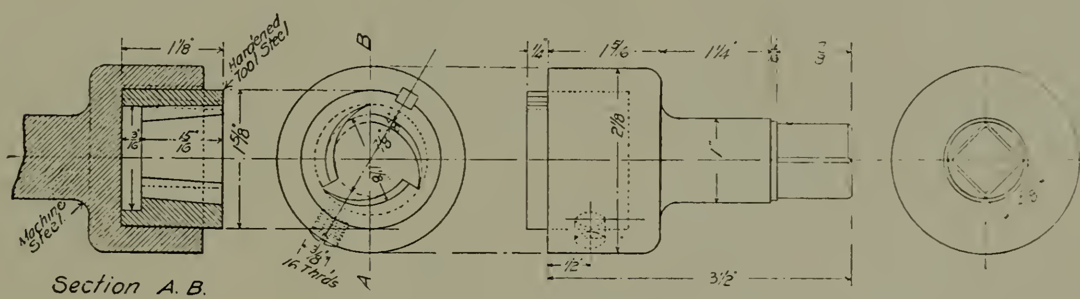


Fig. 3.

some time before they are used. The Lehigh Valley R. R. reports that the best lubricant they have found is two-thirds raw linseed oil and one-third signal oil. The Chicago, Milwaukee & St. Paul R'y uses bolt-cutting oil which consists of 60 per cent Natural West Virginia oil, 15 per cent fish oil and 25 per cent No. 1 lard oil. This was found entirely satisfactory.

SPECIAL FORMS OF STAY BOLTS.

The Erie R. R. uses upset ends on radial stays ; the Chicago, Burlington & Quincy R'y turns stay bolts down in center with a Niles screw machine ; the Boston & Maine R. R. swages them down in the middle instead of upsetting the ends ; the Rio Grande Western R'y cuts them down in center below bottom of threads in a bolt cutter, with blind dies, working with a lead screw ; the Chicago Great Western R'y reports the use of crown sheet stay bolts with threads turned off in the middle—the work being done in a turret lathe ; the standard practice of the Lehigh Valley R. R. is to upset both ends for about one inch, on which threads are cut, the center of bolt being left blank ; the Northern Pacific R'y reports that all long stay bolts are turned smaller in diameter at center than at ends, the work being done on a "Gisholt" machine ; the Union Pacific R'y turns stay bolts down in center in a lathe.

PREPARING STAY-BOLT HOLES.

The following roads report preparing stay-bolt holes in fire-boxes by first punching them smaller than required size and then reaming them to size—thus removing disturbed metal, viz : Delaware & Hudson Canal Company ; Chicago & North-Western ; Lake Shore & Michigan Southern ; Missouri Pacific ; Minneapolis, St. Paul & Sault Ste.

Marie ; Delaware, Lackawanna & Western ; Chicago Great Western ; Lehigh Valley ; Norfolk & Western ; Chicago, Milwaukee & St. Paul ; Northern Pacific ; St. Louis & San Francisco.

The following roads report drilling stay-bolt holes in fire-boxes, viz.: Chicago & North-Western ; Cleveland, Lorain & Wheeling ; Erie ; Chicago, Burlington & Quincy ; Duluth, South Shore & Atlantic ; Southern ; New York, Ontario & Western ; Buffalo & Susquehanna ; Chicago, Rock Island & Pacific ; Penn. Lines west of Pittsburg, and Grand Rapids & Indiana.

A large number of roads report the use of ordinary stay-bolt taps. A number, however, claim advantages in the use of the "Echols" patent stay-bolt tap made by Pratt & Whitney. The principle of this tap is the omission of each alternate tooth ; each cutting tooth is followed by a space which gives a freedom of action to the cutting teeth, impossible in the old style, thus decreasing the resistance from 30 to 50 per cent.

"DETECTOR" HOLES IN SOLID STAY BOLTS.

The general practice is to drill stay bolts after they are in position. A few members report punching these holes by means of a steel-wire punch in a bolt-heading machine. The Chicago & Eastern Illinois R. R. uses an air motor attached to a framework allowing the drill to be set at any angle. This device is illustrated in Fig. 4.

In making and applying stay bolts to locomotive boilers, two important factors must be carefully considered : The stay-bolt tap and the hob tap which cuts the dies in bolt-cutting machine must be true to pitch, and then the machine must have some special device for making the threads true to pitch. Cutting stay bolts true to pitch is a subject that deserves more investigation, we think, than any other detail connected with making and applying them properly. The weak point in a great many shops is in cutting stay bolts untrue to pitch. It has been found that accurately pitched dies will not produce true-pitched bolts.

Pratt & Whitney write the committee that "the problem of making a tap with long thread and keeping that thread to approximately correct lead has been a very annoying one to us, and doubtless to others, and is still annoying, for the very reason that we cannot rely upon the extent to which steel will change and the manner in which the change will take place. We overcome this very largely, however, by having carefully annealed steel to begin with ; having the annealing as uniform as possible, and threading the tap with a screw which is made expressly for the work, and which has an error approximately the error which takes place in the tap in the hardening operation ; i. e., long experience teaches us that steel will change in a certain direction. In the great majority of cases this direction is toward the shortening rather than the lengthening. We accordingly make the lead screw of our lathe long, as stated above, to compensate for the shrinkage or shortening that will take place in the steel when hardening. We very often have to give the tool a double shrinkage in very special cases. What we mean by double shrinkage is hardening the tool and reannealing before the final finish, threading on all important taps that have any special length of thread. We confine the error to .0015 per inch or .18 inch per foot."

Correctly cut dies alone will not cut true-pitch stay bolts ; to insure stay bolts being cut true to pitch, two methods have been employed : A lead screw attached to the carriage of a bolt-cutter is one way to accomplish this, and the lead-controlling feature employed by the Jones & Lamson Machine Company in the dies used in flat-turret lathe made by them the other.

The Acme Machinery Company writes the committee as follows :

"All dies that we have any knowledge of, gain threads and lose pitch when cutting threads Some of our expert diemakers can grind a set of dies so that they can be made to do 'most anything,' but that does not help the 'rank and file,' into whose hands such

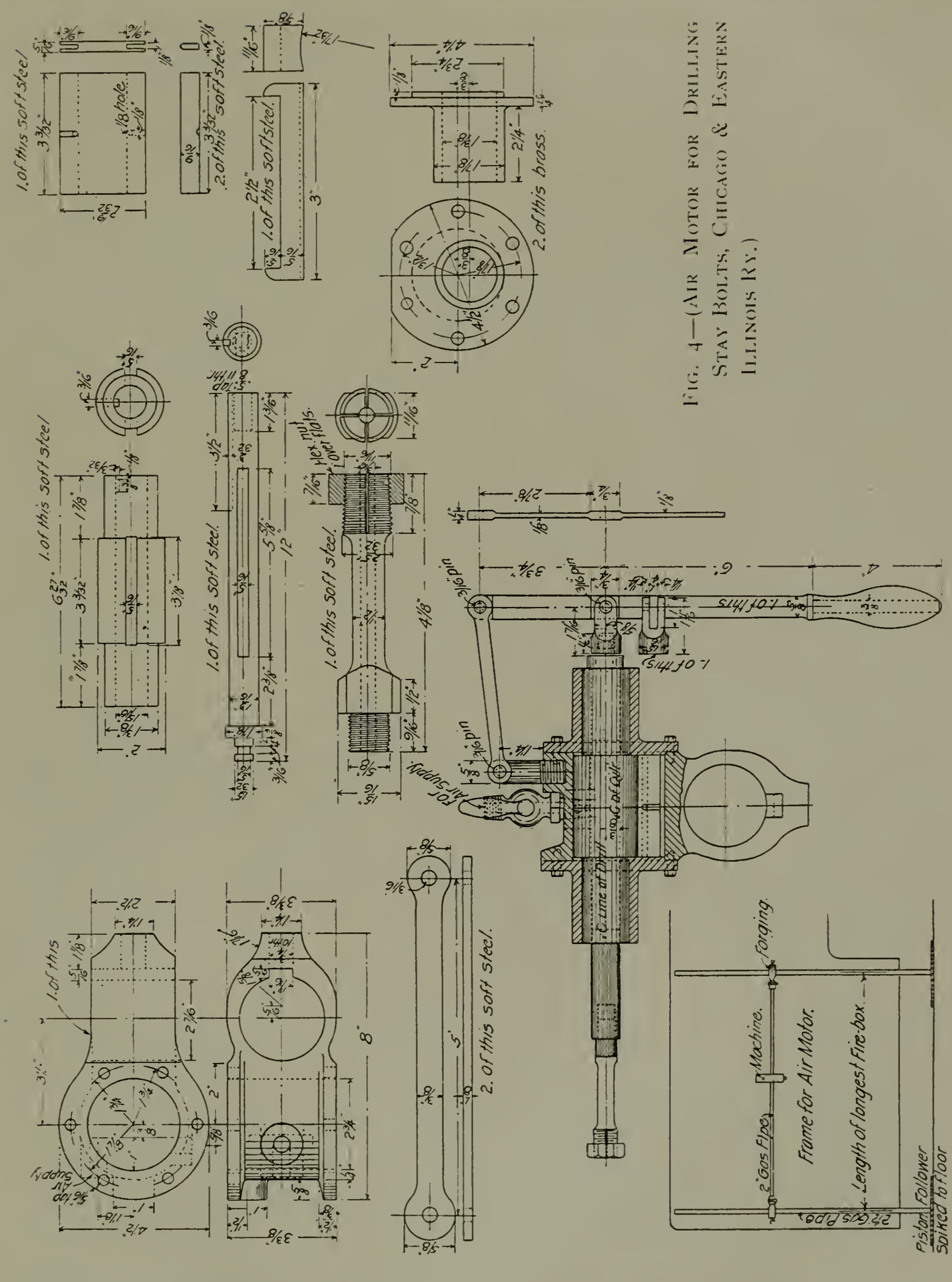


FIG. 4—(AIR MOTOR FOR DRILLING STAY BOLTS, CHICAGO & EASTERN ILLINOIS RY.)

a machine falls. All kinds of schemes and contrivances have been made and used in trying to correct the disposition of a set of dies to cut out of pitch. Supposing, for instance, the rear teeth of a set of dies would act as a nut ; they would certainly begin with an error, because the leading teeth are apt to begin with more or less error, as they 'nibble' at the end of a bolt."

At the New York meeting of the American Society of Mechanical Engineers, in December, 1897, Mr. James Hartness, of Jones & Lamson Co., read a paper on a stay-bolt threading device which has some valuable features, especially for radial stays, where there are threads on both ends of stay bolts and long blank spaces between.

We quote from the paper: The scheme may be briefly and perhaps completely described as 'Tandem' dies for simultaneously threading both ends of a stay bolt to insure correspondence in lead. These tandem dies are designed for use in a turret lathe, and cannot be applied to a bolt cutter." Mr. Hartness further states that: "Stay bolts are mostly cut by dies permitted to control their own lead; occasionally, however, a lead screw is used to govern the pitch of the die. The lead-screw scheme seldom controls the lead of the die at the beginning of its cut, on account of the slackness of the slides and intermediate connections; hence the die usually has a chance to cut a very incorrect lead before the screw has taken up the 'slack' and 'spring' of intermediate parts." The dies are described as follows: "The teeth at the front of the die have a cutting clearance, while the teeth at the back of the die have no clearance, but instead, ride on the thread and control the lead. So accurate is the lead-controlling feature that regular dies for market seldom have an error in lead greater than $\frac{1}{64}$ inch in 18 inches, which is less than one-fourth the average error in standard taps."

The committee has samples of screw-cutting done by the use of a lead screw on a bolt cutter, and also by the use of a Hartness die. Both methods give equally good results, so far as can be judged by the samples.

The investigations of the committee lead it to believe that the best method of making and applying stay bolts is as follows: Cut the stay bolts from the bars by means of a shearing machine; make square ends by the use of a bolt-heading machine, or punching the metal from the bar to form a head; cut threads in a bolt cutter having a lead screw, or on a turret machine having special dies that will cut true to pitch.

For a cutting lubricant, lard oil is the best, with yellow cottonseed oil a close second.

In preparing the stay-bolt holes, we recommend that: In the fire box, they should be drilled; in the shell of boiler, punched ⅛-inch smaller than required size, and the remainder reamed out with a reamer on end of stay-bolt tap. Holes should be tapped with some form of air or electric motor, and stay bolts screwed in with same device.

We also recommend that stay-bolt taps, and hob taps for cutting stay-bolt dies, be purchased from some reputable maker in preference to making them at a railroad shop. Stay-bolt and hob-tap making requires special skill and most accurate tools, which are not always available at railroad shops.

For cutting off stay bolts, no device appears to answer for all bolts. The best practice seems to be as follows: Where bolts are of uniform length, and are at right angles with sheets, as in vertical water space surrounding fire box, it is best to "nick" the bolts in a lathe to the right length; after being screwed into place a slight tap on the end is sufficient to break them off. For bolts that require to be cut off at an angle, an electric saw can be used to advantage; as in cutting off radial stay bolts, outside of boiler. A pneumatic cutting machine can be used to advantage for cutting off bolts of variable lengths after they have been screwed into place, where it would not pay to handle them singly in a lathe or cutting machine.

The committee knows of no better way of riveting stay bolts than the well-known method with the common hammer, and a holding-on hammer at the other end of the stay bolt. It is the committee's opinion that some form of air motor for drilling the "detector" holes in stay bolts is preferable to punching them. The objections to punching detector holes is that while stay bolts are being riveted the holes close up and require to be opened with a drift. When the bolt is drilled, after it has been riveted, there is no further work to be done.

LOCOMOTIVE EXPORTS from this country have grown remarkably heavy. All classes of our manufactures of iron and steel have shared in the growth of popularity abroad, but this is especially marked in the higher grades of manufactures, such as steel rails, railway locomotives, builders' hardware, machinery of all sorts, and especially those machines used in manufacturing. The number of railway engines exported during the year was 517, against 468 in 1898, 338 in 1897, 261 in 1896, 252 in 1895, and 142 in 1894, while the value of the exports of locomotives in 1899 was $4,728,748, against $1,028,236 in 1894. Of the 517 railway locomotives exported during the year, 99 went to Russia, 69 went to Japan, 61 to China, 59 to Mexico, 50 to Canada, 36 to British East Indies, 25 to England, 23 to Sweden and Norway, 20 to Brazil, 14 to the West Indies, and 11 to Africa. One interesting feature of this large exportation of locomotives in 1899 is that 211 of the 517 exported went to Asiatic countries.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

JULY MEETING.

The regular meeting of the Car Foremen's Association of Chicago, was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, July 13.

President Morris called the meeting to order at 8 p. m. Among those present were:

Anderson, A.	Dair, Wm.	Holtz, Chris	Reinhard, F. B.
Ashcroft, Norman.	Earle, Ralph.	Jones, A. A.	Stewart, H.
Bassert, Chas.	Guthenberg, Bruno.	Jones, R. R.	Smith, E. B.
Blohm, Theo.	Gardner, Lewis S.	Johannes, A.	Stuckie, E. J.
Bond, L. E.	Gruhlke, E.	Kehm, H. C.	Schultz, A.
Cardwell, T. R.	Green, C. E.	Kuhlman, H. V.	Shearman, Chas. S.
Cather, C. C.	Grieb, T. C.	LaRue, H.	Shaw, Mark.
Coleman, T.	Hatch, H. D.	Morris, T. R.	Wentsel, Geo.
Cook, W. C.	Hansen, A. P.	McAlpine, A. R.	Williams, Thos.
Depue, Jas.	Hultman, Chas.	Olsen, Louis.	Wensley, W. H.
Davies, W. O., Jr.			

MISCELLANEOUS BUSINESS.

The question of the matter of the annual celebration was taken up, and the chairman was instructed to appoint a committee of five to provide for same.

The chairman was also instructed to appoint a committee to revise the constitution and by-laws of the association, the present articles having been outgrown.

Secretary Cook announced the names of H. D. Hatch of the I. C. R'y, and Chas. S. Shearman of the Burton Stock Car Co., as approved applicants for membership.

RESPONSIBILITY FOR BROKEN SIDE DOOR.

The association then entered upon the discussion of a case in dispute between two railroad companies, a synopsis of which follows:

"A" delivers one of his cars to "B" with side doors in apparent good order. Two days later "B" returns the car to "A" with one side door inside the car all broken up. "A" demands defect card for the broken door. "B" declines to issue card, claiming that from what can be learned the door fell off the car while in his yard, and was run over by another car. "A" claims had the door been removed from the track and properly taken care of after it fell from the car, the damage would not have occurred, therefore it is a case of unfair usage and "B" is responsible. Which position is correct?

Mr. Wensley: I think this is a case of owner's defect. If the side door fitted properly it would not have fallen off. I had a case a short time ago, of a side door falling off in the yard and the corner being cut off. The Rock Island man asked for a card. I told him we did not ask anybody for cards.

President Morris: This question hinges on the claim that the owner has made, that the door should have been taken care of after it fell off. The owner acknowledges responsibility for a door lost from a car, and he also acknowledges responsibility for a door broken in falling off; but he says he thinks, where the door had fallen off and was run over by a car on an adjoining track, that the delivering company is responsible.

A Member: We had a case ten days ago of a side door falling off. The car was being inspected at the time and there was a train moving on the next track. It would take seventy men in our yard to watch the tracks and keep the doors off.

Mr. Jones: I should consider that this was a case of owner's defect. Rule 3, Section 24, fully covers it. It is impossible to be running around picking up doors off the track. If the door had fitted properly, no doubt it would not have fallen off.

Mr. La Rue: I hardly agree with this view. This car was offered in interchange with the door off. There is a decision of the arbitration committee, if I remember rightly, in regard to a drawbar that was placed in a car, and after the car got to its destination the drawbar was missing. They claimed that it was in the car when it left them. The Master Car Builders' rules do not contemplate sending anything home not billed as freight. This car seems to have been offered in interchange without the door, the door being inside as freight. If the car had been repaired this would have been an owner's defect.

President Morris: The owners acknowledge responsibility for a broken door.

Mr. LaRue: They ask for a defect card.

President Morris: If the broken door had been put inside the car and then removed by some one before it got home to the owner, that would place a different phase on the case.

Mr. Grieb: I do not see any difference between this case and a door lost in fair usage—I fail to see why the fact that the door was cut in two alters the case. The rules place the responsibility on the owners if the door is lost, and it seems to me that it does not make any difference what happens to the door afterward—whether it be cut in two or recovered—as long as it is not applied to the car it is lost, and the responsibility remains with the car owner.

Mr. Reinhard: The company that received that car with the door in good condition, and after handling it through their yard knocked the door off, or it fell off, and allowed it to remain on the ground to be cut in two by some engine or cars, should be held responsible. It is a case of unfair usage. That company might have availed itself of the privilege of the rules by putting the door back on the car and billing against owners. It seems to me, it is the same as delivering a car with material missing. The company had no business knocking the door off the car and virtually destroying it.

Mr. Grieb: I would like to ask the gentleman what reason he has for supposing this door was carelessly left lying on the adjoining track, or what interval of time elapsed between the time the door fell off and the time it was cut in two. It might have been done simultaneously, and if so, what power on earth could have saved that door? What evidence is there to show that there was any lapse of time; that any effort could be made, and that no effort was made?

Mr. La Rue: Cars are supposed to be handled with fair usage. Now we all know, as a rule, that doors don't fall off when cars are standing. But doors will be left half way hung, and in passing through the yard fall off, because some one is too careless to hang them up. There is nothing to show, that I know of, that this door was not knocked off ; it is possible it fell off, but the chances are it was knocked off. The chances are it would be considered cornered.

President Morris : There is no question but that the door fell off in the yard. The owners do not make claim on account of the door being knocked off, or of the fact that it might have been knocked off ; they simply say that the railroad company that handled the car showed negligence in not picking up the door before it was run over.

Mr. La Rue : Rule 2 says that cars offered in interchange must be accepted if in serviceable condition. If a car has a door broken, it is not in serviceable condition.

Mr. Kehm : I do not think that settles the question as to who is responsible for that door. If my neighbor rejects the car I would repair it and bill him for it, and he would pay the bill. I would say that the owner of the car is responsible.

Mr. La Rue : Under certain conditions.

Mr. Jones : Rule 3, Section 24, says, "missing or damaged under fair usage of any part of the body." Now it appears to me, that that door probably was not secured to the body of the car sufficiently and had fallen off in transit and got run over, and I consider that the owners are responsible.

Mr. Davies, Jr.: I am of the opinion that the owner is responsible for the door, since the door was put inside of the car and the car delivered home to owners. The delivering line is not responsible for the door.

Mr. Coleman : There is a doubt as to where the door fell off, and whether proper precaution was taken to preserve the door. The door might have fallen off on a switch, or it might have fallen off on the main line, where there was nobody to pick it up. There are many reasons why the door might fall off and still the owners be responsible. There is some doubt, and the Master Car Builders make no provision for a doubt. I cannot see but that the owner of the car is responsible,

Mr. Depue : I think in this case the owner would be responsible. I think if the door had been properly fastened to the car, or properly hung, that in fair handling the door would not have fallen off. If it fell off, it was evidence that the door was not properly fastened.

Mr. Oleson : Why was not this door taken care of before it fell off — the hangers tightened up, or something else done to it — to protect the owners ? I do not think it is fair to charge the owners for it. We have seven feet between rail and rail ; a side door covers six feet. If it fell off the car in the yard it would fall between the rails ; it would not fall on the rails. I have seen hundreds fall off, and they never fall on the rails. When they fall on the rails it is on a switch or on the frogs. I do not think it would be an owner's defect.

Mr. Davies, Jr.: I have seen doors fall off cars, and I have never seen one that would fall between the tracks and keep in the clear. They fall across the next track every time.

Mr. Bond : I have never seen a car door that would fall off and not fall on the track. A car door when it falls down will bounce ; it will not fall flat. If this car door was properly fastened and the car was handled with fair usage, that door would not fall off. There is no door that fits properly that with fair usage is liable to fall off.

Mr. Cardwell : It appears to me that as the owner in this case made no claim that the door was knocked off, it must not have been fastened on the car properly, because it would not have fallen off if it had been fastened properly. As to the matter of whether it was run over or not, I do not think the delivering road should be held responsible for it, because it cannot figure on where the door is going to fall.

Mr. Kehm : The position assumed by Mr. Cardwell, I think, brings out another phase in this controversy, and that is negligence on the part of the delivering company. As long as the arbitration committee has placed a penalty on negligence, if the door was improperly hung or insecurely fastened, the delivering company should certainly pay the penalty by assuming responsibility for the door. But it doesn't seem, from the wording of the case in question, that the door was insecurely fastened or that it was knocked off by any obstruction placed alongside of the track. For that reason I should say the owners were responsible; and I move that the association so decide in this particular case.

This motion was carried.

BROKEN DOOR POSTS ON REFRIGERATOR CARS.

"A" bills "B" for repairs to side door and post, the damage being on a refrigerator car belonging to "B." "B" asks for further information, and is told that the door was found swinging open, having been struck by something, breaking the door post and door stile. "A" claims it occurred in fair usage; "B" claims it was on account of the failure of "A" to properly close the door. Which position is correct?

Mr. Davies, Jr.: I should say that the company handling the car is responsible for the door. They should have closed it.

Mr. La Rue: Decision 421 decides that damage to door post and door stile is not a proper charge. It was not shown that they damaged it by fair usage.

Mr. Stuckie: Is there anything to show that there were hooks on, to hook the door back?

President Morris: No other information than what you have heard. The Secretary will please read a synopsis of decision 421. (Secretary reads case.)

Mr. Kehm: The question of broken door posts on refrigerator cars has been a subject of great annoyance to our company, and it is a question on which I am undecided — whether it is fair or unfair usage. We get empty refrigerator cars from connecting lines with the doors closed — sealed at times — and it is utterly impossible for an inspector to inspect the interior parts of a car to see whether a door has had a knock of the kind described, or whether the door post is broken, and there is nothing on the outside to indicate that the door post is broken. I have a case now with the N. C. & St. L., wherein we got a car with end post split — nothing on the outside to indicate such to be the case — and the door closed — still the owners desire to be reimbursed by our company for the broken door post, claiming it could not be damaged in fair usage. We are unable to determine how that post was damaged, and I am inclined to believe that unless it can be located, that the party handling the car is directly responsible; that it comes under the section in the rules quoted as the interior parts of the car at owner's risk.

Mr. Grieb: It seems to me that some of the remarks Mr. Kehm has made do not apply to the particular case at issue this evening. One party acknowledges that the damage was done by reason of the door being open, and it seems to me that we ought to take the position that it is wrong to run refrigerator cars that are provided with means for holding a door in a closed or open position — run a car in any manner without the fastenings properly applied, either open or closed; and that any damage resulting from running a car in such improper condition rests with the company handling the car.

Mr. Kehm: While I agree with Mr. Grieb, so far as this particular case is concerned, this association cannot afford to take the position on one case alone. When we take a position on a case of door posts being damaged on refrigerator cars, it is usually followed by the inspectors in all cases. While this particular case may have come about by unfair usage, we have got to provide for others that may come up where there is no evidence that it was done in this manner, or take the position that all damage done to cars in this manner is unfair usage.

Mr. Grieb: Mr. Kehm raises a very interesting point in regard to the decisions passed by this association upon certain cases. It seems to me it is very proper, if it is necessary, that this association ought to have an understanding amongst its members that the decisions rendered apply only to the case at issue; that we decide upon the actual evidence presented and not upon any hypothetical case. Therefore, one decision could not apply to all cases, unless the circumstances attending the different cases were alike. A decision rendered in this particular case this evening regarding refrigerator doors being opened, could hardly apply to box car doors being open. I thought, until Mr. Kehm spoke, that we were simply debating the case at issue.

President Morris : It seems to be pretty well understood that in this case the damage occurred on account of the door not being securely fastened. " A " doesn't say that it was so fastened ; he doesn't deny that it was swinging open ; and I think we ought to decide in that way, figuring that the door was open, swinging open—not securely fastened. It might have been struck by another car on account of its being open and taking up so much more room.

Mr. Jones : I think that " A " is responsible for the damage and should be billed.

Mr. Reinhard : I think that a door post and door stile broken on a refrigerator car is simply unfair usage. I know our experience has taught us so. We handle a great many refrigerator cars, and we find that people don't fix back the doors. A refrigerator door swinging back and forth is liable to be knocked off. I think the company handling the car should be responsible—on the ground of unfair usage.

Mr. Stuckie : How would this apply when fruit inspectors open a door and leave it open and a switch engine comes in, not knowing the door was open, and handles that car? Who would be liable then ? The owners open the car and it is on a railroad company's ground. I have had an experience of that kind, where a fruit inspector came along and opened a fruit car on the opposite side from where the switchmen were working, and the switchmen came in and pulled car out and pulled the door off. Who would be responsible for that? The owners left it there.

President Morris : Who did you hold responsible?

Mr. Stuckie : I guess the car went east. I do not know that anybody was held responsible down there. I don't know how it came out. Perhaps we had to pay for it. But such has been the case, nevertheless.

Mr. LaRue : I think if the door was left open the switchmen would soon find it out.

Mr. Wensley : The practice in our yard is that when a fruit inspector comes in to inspect a car we send a man along with a pinch bar to open and close the door for him.

Mr. LaRue : I move that in this particular case it is unfair usage.

President Morris : It is moved that in this particular case the owners are not responsible ; in other words, it is a case of unfair usage.

The motion was carried.

THE USE OF SECOND-HAND PARTS IN REPAIRING COUPLERS.

Mr. Grieb : There is one point I would like a little information on, that I think can be discussed here possibly with benefit, to me, at least, if not to all. Possibly the other members do not have such trouble. We find that some people in renewing M. C. B. couplers for defects of the body only, will, in applying the same kind of coupler, discard the knuckle and the other good parts and charge us for an entire new coupler. I would like to be advised if this is the general practice among the roads represented in the Car Foremen's Association. Of course we acknowledge responsibility for new body. But is it proper to throw away similar parts of the same make that are in good condition and fit for further use—discard them and replace them by new material of the same kind? The same make of coupler identically.

Mr. Smith : Our superintendent of motive power asked that I should take up a similar case for discussion here to-night. He said he had a case with another road where they had removed one of our couplers and discarded the parts that were supposed to be good and charged him for an entire new coupler, giving him credit for only second-hand material. There are many who do not think this is fair. If parts are good they ought to be used. At the same time it is hardly right to put old parts in new couplers.

Mr. Wensley: I had a similar case a few months ago. A Gould coupler had the guard arm broken off. I removed the coupler and applied a new one. When I removed the knuckle I found that the pin was worn down one-eighth of an inch in thickness.

Mr. Grieb: I would like to state that in the case that I mentioned we wish it understood that the knuckle is good for further service. If the stub shows any defect, we would be willing to pay for it. In fact, we would not think they were protecting our interests if they used material which was not fit for further use, as the knuckle pin you discarded was. But in the case we describe, the knuckle and the other parts, with the exception of the body, were good for further service, and instead of using those parts, they put in a new coupler of the same kind and charged us for the whole thing.

A Member: When I put in the old material I give credit for it.

Mr. Davis, Jr.: They way I handle such cases, if I have the same kind of a coupler, I put in the body and replace all the old parts, provided they are good; such as the knuckle, locking block and knuckle pin.

Mr. Bostwick: In my opinion the good parts are to be replaced. When the body alone is broken and the locking block, knuckle pin and knuckle are good, they ought to be replaced and charge for the body only.

Mr. Coleman: When we put in a coupler we put in the knuckle if it is serviceable, also the locking block and knuckle pin. I move that it is the sense of this meeting that second-hand parts should be used in all cases when serviceable.

Mr. Kehm: There is nothing in the M. C. B. rules which demands the replacement of second-hand parts in couplers. They provide that in changing couplers you can put in another make if necessary, and bill the owner by giving him second-hand credit for all the good parts; but there is not a word in the rules that says you must do it, even though you replace the same kind of a coupler. Our company would much prefer to have all new parts put in its cars and pay the difference between the second-hand price and the new. I think the owner derives the benefit from it and he is nothing out.

Mr. LaRue: I am like Mr. Kehm; that has always been my practice; and I always thought it was a benefit to the owner of the car. There are lots of times when we could put a knuckle back in a car when it was half worn out, but we read the rules the other way.

Mr. Cather: The rules say there is a difference between new and second-hand couplers—between new and second-hand parts. The gentleman who preceded me has stated that if new parts are put on, the car on which they are placed gets the benefit. The owner does not lose anything. The road making the changes allows him the value prescribed by the rules for parts removed. The rules do not say a second-hand knuckle is as good as new, but say they are worth only three-fourths as much as new. This is as a matter of equity. When a road changes couplers and puts in a new one, it is a benefit to all concerned. We always make it a point to investigate and are particular to apply the same kind of coupler. If the head is broken off, the men will apply a new coupler complete, claiming it is not good practice to mix partly worn and new parts, and if questioned they will always come back and say it was for this reason. If we take out second-hand parts and apply them to a new coupler it is a "botched" coupler, and the parts won't work like a new coupler complete.

Mr. Bond: I think in making repairs to couplers where there are any parts that will do, they should be put back, if they fit properly. Then when you make out your card, mention on it what parts of the coupler were O. K.

Mr. Jones: In replacing broken couplers we generally use the parts that are good. For instance, suppose a coupler has been applied, say, not over two months, and the knuckle, apparently, is almost as good as new. I don't think it would be just to throw that knuckle away and replace it with a new one, when it has only been used a short time.

Mr. Cather: The gentleman assumes that the coupler was two months old. It is just as fair to assume that it was two years old. There is nothing to show how old a coupler is, and a man is not supposed to have an idea of the wear and tear on a coupler. Still, it may be a good knuckle—serviceable, not entirely worn out. That is not the point. If we put in a new one it is worth one-fourth more than that old one. The road that gets that knuckle gets one-fourth more value; therefore why not stand for it? The same principle should apply as to couplers, when they are of different value. One coupler is worth $10.00 and the other $9.00. If we put in a coupler that is worth $10.00 we charge $10.00, or if an $8.00 coupler, charge $8.00; if we put in a knuckle that is worth $1.50, we charge $1.50. We don't throw removed ones away, but give them three-fourths value. We are not depriving them of any value. We are charging them a dollar for what we give them, and giving them credit for seventy-five cents.

Mr. Jones: What will they do with the old parts?

Mr. Kehm: We apply them to other couplers where the knuckle is lost or broken. We don't have a surplus of them; we don't have a sufficient number to supply the demand. It don't seem to me that this association can go contrary to the M. C. B. rules by advocating the use of second-hand parts exclusively.

Mr. Stuckie: There is nothing in the rules that demand it; therefore we cannot assume such a position.

Mr. Reinhard: I believe our practice is to apply new couplers and retain the old parts removed that are not broken, and give second-hand credit for the second-hand parts. There is always a chance that they can be used up somewhere.

Mr. McAlpine: We had a case just opposite from the case cited here to-night. The knuckle was broken and they threw the whole coupler away. If you make a ruling to use all second-hand parts, that would help us in such cases.

Mr. Kehm: If the gentleman paid for a new coupler in that case, and only secured scrap credit for the good parts, he was doing an injustice to himself.

Mr. McAlpine: Second-hand credit was allowed for the body.

Mr. Kehm: Then he got the benefit of the coupler that was applied.

A rising vote resulted 21 to 13 in favor of Mr. Coleman's motion.

Mr. Kehm: I would like to ask where you get authority for making such a decision.

Mr. Smith: I think we are going contrary to the M. C. B. rules. What are the rules for, if we are to come here and tear them to pieces? That is just what we are doing.

President Morris: I think it was decided your way, Mr. Smith.

Mr. Stuckie: This looks to me too much like boys' play. We have a Master Car Builders' association to formulate rules and we come here and tear them to pieces. I do not see where we have authority to do it.

President Morris: I think this is merely a question of practice; it does not affect the rules.

Mr. Stuckie: This decision does affect the rules. It is quite contrary to the rules I think it is a poor showing for this association to thus put itself on record. I do not consider that it is justice, nor does it show good talent in our behalf.

Mr. McAlpine: Is there anything in the rules prohibiting us from using second-hand material?

Several Members: No, sir.

Mr. McAlpine: Then I do not see wherein this decision is contrary to the rules.

Mr. LaRue: There is nothing in the rules to prohibit it, but I do not think it is good practice to put half worn-out knuckles in new heads. While it is legitimate and all right, I don't think it is good practice, especially when they are investigating the parting of trains as closely as they are now. They are going to place the blame somewhere.

Mr. Davies, Jr.: This decision does not say you should use worn-out knuckles; you should use only serviceable knuckles. If a knuckle is worn-out, take it out and bill the owner.

Mr. Cather: There is a difference between second-hand and new knuckles, or else there is not a difference. A coupler may run a year and be just as good as new; but the rules don't say so. I do not care if you apply a coupler and it has been in only a day. It has been in use. At that time it may be as good as new; it may be said to be better than new; because it has had service and it has been tried. But there certainly must be a difference or there would not be a distinction in the rules. If we put in a new knuckle, why not charge the new price? If we use the knuckle we took out, we must bill it at a second-hand figure. The rules say so. You may say it is as good as new. Perhaps it is. If there is any difference at all, why not be consistent? If we remove a Gould and put in a Little Giant, new and complete, or if we remove a Little Giant and put in a Little Giant, new and complete, then it is the same identical thing. Then we must have full value in either case for complete coupler. Then again, it saves time; it is quicker to put in a complete new coupler.

Mr. Kehm: As long as this association has gone on record as advocating second-hand parts in preference to new, I would like to have all the members use and bill the Illinois Central for new material. We will pay the difference in price. We do not want second-hand parts in a new head and we are going to apply new material, if necessary, and bill the members accordingly. But I don't think this association can afford to go on record as advocating any such thing,

A Member: I would like to have the motion reconsidered.

Mr. Kehm: I second the motion.

The motion to reconsider was lost by a rising vote of 21 to 11.

Mr. Stuckie: There is one subject I would like to have brought up—the actual practice of the various railroad companies as to the care they give air brakes—as to oiling the triple valve—whether they actually do the work, or whether they put the date on, intending to do the work.

Mr. Jones: I would like to have this question come up at the next meeting.

Mr. Smith: How are the members who have voted for this coupler decision going to maintain the contour lines of the coupler? That is going to be a feature that is worth considering.

President Morris: In regard to questions for discussion at subsequent meetings, we would like to have them in writing. Anything that the members have for discussion should be sent to the Secretary.

The meeting here adjourned.

RESPONSIBILITY FOR BURST AIR HOSE.

[The following case was discussed at the June meeting, but we were forced to lay it over from our July issue.—Ed.]

"A" loads one of his own new cars on its initial trip, equipped with two new 1¼-inch air brake hose and delivers it to "B." "B" hauls and delivers the car to its destination, and thirteen days later delivers the car back to "A," at the original receiving point, equipped with one of the original, and one worn-out and burst hose, and declines to make good the defective hose, on the ground that the owners are responsible for burst hose. He offers a joint evidence card which "A" refuses to accept, as he has traced the car to its destination and return, and the railway companies hauling the car claim to have made no repairs. Should "A" be entitled to card for hose? If not, why? Air hose submitted for inspection.

Mr. Stuckie: I can give you a very good pointer as to how this thing comes about. The engineer will burst his air hose and he will go over to the nearest track and unscrew a hose and put his burst one on, and he has a good one on his engine. A case of that kind happened the other day. This is one way new cars get old hose and old cars new ones. We have a good many furniture cars on our line and they are used mostly to fill orders. They go east, and when they come back they have one original hose and one spliced hose. In many cases they come back with one burst hose—similar to the one you have here for inspection. The trainmen have a burst hose and go over to the nearest side track and take off a new one and put on the old one. That is the way it is done, and until that dishonesty can be overcome just so long you will find old hose on new cars. The Santa Fe furnishes each train crew with a supply of hose, both 1 inch and 1¼ inch, and their engineers also carry an extra hose; consequently, they have no occasion to do this kind of work. But a great many roads do not furnish hose in this way, and the trainmen have to resort to dishonest means in order to get new hose.

President Morris: What is your opinion, Mr. Stuckie, as to issuing cards?

Mr. Stuckie: My opinion is that railroad companies delivering a car in that condition should card for the burst hose.

Mr. Smith: Three years ago we put 300 new cars in service between Chicago and the coke fields. Inside of three months we had one hundred old hose; no redress. I am clearly of the opinion that the delivering company is responsible for old hose on new cars. If you deliver a brand new car with an old hose you know very well it is "wrong repairs," and your inspector knows it, and you are not giving our cars the same attention you do your own if you allow it to run.

Mr. Davis: I do not think it is a question of dishonesty with the roads in question. I think it is a matter of trainmen getting a hose, and they take the nearest one, the same as Mr. Stuckie has stated; it is not a question of dishonesty of trainmen or inspectors. I do not think that the thing should be carded for.

President Morris: You think "A" has no redress in the matter?

Mr. Cardwell: I do not think he has; you would have to trace it all down, and when you did trace it down there would be no redress any way. They would say: We cannot tell who made repairs or took it off, or anything else; we have no record of it.

Mr. Grieb: It seems to me that a strict interpretation of section 20 of rule 3 exacts a card from delivering line for offering a hose in that condition—whether it be to the owner or anybody else. That hose is worn out and burst, according to the notice. It is therefore in an unsafe condition for service, and nobody has a right to offer a hose in that condition to his neighbor.

Mr. Gehrke: I do not think the delivering road should be held responsible for burst and worn-out hose. I will say that I have received cars with two new hose, delivered them to some of our connections, and they have come back with one original and one worn-out hose. I do not think it is customary, and I do not think it would be right, to hold delivering lines responsible for any burst hose. There is nothing in the rules saying that car must be new, in order to hold anybody for a worn-out hose; and it would not be necessary for "A" to make repairs before delivering car home. I do not think there is any rule to cover the case.

Mr. Cardwell: Should it not be customary under section 20 of rule 3? The delivering road should apply new hose and then it can render bill on it. If the owner of the car wants to accept bill, it is all right; if not, he can fight it out and the matter stops there, and it is unnecessary to do any tracing, which is usually more expensive than the hose.

Mr. Stuckie: Would it not be an injustice to the owner to take off the new hose and put on a burst one and charge the owner?

A Member: The owner knew that there was a new hose on that car when it went out, and if there was, the road that renders bill may have a little trouble in collecting it.

Mr. Hunt: Of course, so far as the case in hand is concerned, there is no doubt, according to rule 3, section 20, that the delivering company is responsible for this hose, as it is a burst hose, and the rules say that if you deliver a car with defective brakes the delivering party is responsible.

Mr. Wensley: I received recently a new furniture car from the C. & E. I., with two new hose, and when the car got over to West Chicago to the Wisconsin Central it had one burst hose. I issued an M. C. B. card for one air hose missing, and told them to return the old hose.

Mr. Hanson: I believe they ought to card for that hose; the delivering road ought to pay for it.

Mr. Showers: I see no reason why the delivering road is not responsible for the hose. It has been said here a number of times that section 20 of rule 3 covers the case very explicitly, and the hose in question shows for itself that it was not fit for service, and the car was offered in interchange. That makes it very plain that the delivering road is responsible. But what gets the best of me is that they could have torn hose off and billed it, and then say their bill was according to the rules.

President Morris: There is no evidence to show that that was done.

Mr. Showers: There was no repair card on car, but we have plain evidence that the car was delivered thirteen days prior, with two new hose on, and it is very plain that the owners are entitled to card because it was attempted to deliver car back with a burst hose. But had they delivered car at the time repairs were made, then, under the rules, they would have had authority to render bill.

Mr. Hunt: We have been told what should have been done in the case, and what was done, and some more things. A whole lot of different opinions have been expressed. But there is nothing peculiar about the hose being applied to the car. There are many conditions that would necessitate applying a hose. A car might be turned out of the shop to-day, new, and it might be necessary to put a hose on this evening. A coupler might be pulled out and the hose pulled in two, or the hose damaged by being struck, or the gasket might be damaged and the fellow working in the yard having no gasket applied new hose. There are many different things that would necessitate applying a hose, so far as that part of it goes, even though the car was new.

Mr. Showers: I would like to ask Mr. Hunt if he would consider as fair, the application of that hose to the car and the rendering of bill to the owners. It seems to me that the hose in evidence is sufficient to show that no bill was intended. The case as presented says there were no repairs made by the party handling the car. Now, if you are going to make repairs to an owner's defect, it is generally supposed that you are going to use material that is new, or as good as new.

Mr. Hunt: I said nothing about billing at all. I said it was not strange that there should be a hose applied to the car. The argument seems to run that there should have been no hose applied to the car, and my argument was on that point. Billing is another thing.

Mr. Grieb: I move that under section 20 of rule 3, the delivering line is responsible and should card for this hose.

President Morris: Based on rule 3, section 20, "A" is entitled to card for the burst hose.

The motion was carried.

EXTENDED PISTON RODS.

The advantages to be gained by the use of piston rods extended through the front cylinder head, were discussed at some length at the Master Mechanics' convention, during one of the "noon hour talks."

Mr. R. H. Soule, of the Baldwin Locomotive works, said that the question of the benefits, if any, following the introduction of extended piston rods, is now coming to the front as one of the natural sequences of the great increase in the size of our locomotives; the diameter and stroke of the cylinder having been increased greatly within recent years, and the boiler pressure as well. He had found that there was little fixed opinion on the subject among the railroad men, and no unanimity of opinion among the locomotive builders. He knew of one road, the New York Central, which makes it a rule that all cylinders, 19 inches and upwards in diameter, shall have their piston rods carried through the front ends. He had heard from a locomotive builder that in their own family they did not consider it necessary to apply the piston rod extension unless the cylinder is 28 inches or upwards in diameter. As regards the mechanism by which the piston rod extension shall be supported, there is no settled practice. It seems to be difficult to get a bushing or support more than five inches in length, if it be insisted that the piston rod extension shall be in the bushing at all times. If users are willing to have the piston rod extension draw nearly out of the bushing on the back stroke, the bushing can be increased to nine inches. When these extensions were first introduced into service, they did not carry a good service record, because in the early cases they were not lubricated. The question of lubrication comes up, and one locomotive builder states it to be his practice, where he applies extensions, to always apply a triple sight feed lubricator—one sight feed lubricator being devoted to the usual purposes, and the two branches of the third going to the bushing for the lubrication of the piston rod extension. Another locomotive builder states this to be unnecessary, and that the successful lubrication of this piston rod extension only requires some nice work in the arrangement of lubricating grooves in the bushing, so that the steam which is supposed to be supplied with its own lubricant can reach the bearings in question. Among the locomotive builders it is felt that the piston rod extension in some approved form, when the practice has reached a final stage, where it commends itself to the railroads, will be a neçessary feature in all powerful locomotives.

Mr. C. H. Quereau, of the Denver & Rio Grande, followed Mr. Soule, and stated that his road had a number of locomotives with the extended piston rods, but that his engines were drifting half the time. He agreed with what Mr. Soule had said, but believed that a perfected device for the extended piston rod is nearer at hand than Mr. Soule had indicated. In the first design the Denver & Rio Grande had, the bearing of the piston rod was only three inches. It now had in service a design in which the bearing is 8½ inches and adjusted perpendicularly, so that as the piston rod wears the piston can be raised to the center of the cylinder. He considered the best device of this class was that used on the Atchison, Topeka & Santa Fe. [This we present elsewhere in this issue.—Ed.] One difficulty that had been found with the Denver & Rio Grande device, which was simply a brass bearing and a sleeve over the extension piston rod, was in the matter of lubrication. The Rio Grande had on most of its engines a lubricating cup, a cup in which the oil is placed the same as on the lubricator itself, except that there is no sight feed. It will hold possibly a quarter of a pint; and the first time the locomotive throttle is closed the oil is drained out of this lubricator cup. With the device used by the Santa Fe road there was a perfect means of lubrication as much as is had on the piston rods at the back ends of the piston. In the circumstances under which his road was operating, he believed the extended piston rod would be a valuable feature, and with the packing on the extended rod, the same as on the piston rod, he could see no reason why piston wear could not be reduced, both on the piston rod and on the bearing.

Mr. Frank Slater, of the Chicago and North-Western, stated that he had some experience with the extended piston rod and failed to find any value in it. His opinion was that it was built to prevent the wear of the cylinder, and after looking further into the matter he found that the cylinder does not wear on the bottom. Nine-tenths of the wear is on the top, he stated, and he could not see why the piston should be so held up when there is no wear. A construction, to do this, adds cost to the first construction, and the piston rod wears badly on account of a lack of lubrication. If metallic packing is supplied there is added one more place for a leak.

Mr. Gaines, of the Lehigh Valley, said he could see no need for the extended rod. He had had engines on his road running for five or six years with 30-inch cylinders which had never had any support, and which had not shown any excess of wear.

Mr. Soule, speaking again, said: "One of the legitimate questions in connection with this problem of extended piston rods is whether the increased clearance which necessarily follows its use is not detrimental to the economy of the engine. We will take it for granted that extension piston rods are operated in closed tubes or pockets attached to the cylinder head, although it is entirely possible to make an arrangement by which the extension rod shall pass through a stuffing box; but under the present conditions the usual practice is to use the pockets for the rods to work in, and that necessarily increases the clearance at the front end of the cylinder. Will that increased clearance impair the efficiency of the locomotive?"

Mr. Cockfield, of the Chicago and North-Western, stated that he had had some experience in the use of extension piston rods on a 10-wheel engine with 18x24 cylinders, and carrying 170 pounds steam. The experience demonstrated that the cylinder wear was reduced. The extension was covered with asbestos and jacketed to prevent condensation, and the bearing on the rods was four inches, bushed and secured permanently. The means of lubrication was from the cylinder through the usual method.

Mr. Browne, of the Pennsylvania railroad, said that he did not think it necessary to have the extended rod on an ordinary sized cylinder. He had an engine with 24-inch cylinders, solid heads, with a lining of block tin around the head. After a while they wore away and the crosshead began to show trouble. The crosshead also had block tin on top and bottom of the wearing surfaces between the guides and the front end of the crosshead, and it would wear on the bottom of the back and on the top of the front end, and after the engine was running a little while it looked as if the guides were out of line. The piston wore at the bottom and the crosshead went down with it. The crosshead was taken out occasionally and relined, and the piston was turned around to let it wear on the other side, but the same trouble would take place. Finally, an extension rod was put on, and after that there was no further trouble. It was demonstrated on the 24-inch piston that the extended rod was a benefit. It was a low-pressure cylinder and consequently a gland could be put on the front of the cylinder head. A piece of gas pipe was slipped over the gland to prevent any dirt getting in.

Mr. Humphrey, of the Colorado Midland, said that he considered extended piston rods on engines that drift a great deal to be beyond experiment. On his road, with large engines with 20 and 21-inch cylinders, where they drift at times 100 miles at a stretch, it is necessary to have the extended rods in order to keep the cylinders from wearing. He had had locomotives, especially some 21x26, which required the re-boring of the cylinders every six or eight months, regardless of the amount of lubricant used. By applying extended front ends and having a 10-inch bearing made of the hardest bronze, a calipered cylinder that had been running for thirteen months, did not show quite 1-32 of an inch wear.

Mr. Sague, of the Schenectady Locomotive Works, reported that he had had some experience with extended piston rods, as applied to compound locomotives. He first used a brass bushing five inches in length. That did not seem to be enough, and the wear of the bushing was excessive. The length of the bushing was now nine or ten inches. His company put an auxiliary sight feed in the cup where the extended piston rod is used, although it does not feel by any means that it is an absolute necessity. It may be of advantage where the engines do a great deal of drifting. His company applies the extended piston rods to all compound locomotives, and is now applying the auxiliary indicators to such engines as do a great deal of drifting.

THE AVERAGE LIFE OF A LOCOMOTIVE.*

SOME FIGURES AS TO REPAIRS AND RENEWALS.

BY R. PRICE WILLIAMS.

With the valuable and very complete data placed at his disposal by Mr. Webb in 1869, with full details of the actual weight, cost of labor, materials, and average life (as measured by wear and tear) of each particular part of a standard type of a London & North-Western Railway Company's locomotive, the writer was enabled to calculate the average ultimate life of the entire structure, and the amounts which would require to be spent upon it to maintain it in a thoroughly efficient and normal condition during that period.

The results of these calculations, which are recorded in the proceedings of the Institution of Civil Engineers, show that, with the periods of life of the different parts, varying as they do from six months in the case of the tender brake blocks, india-rubber pipes, etc., to thirty years in the case of the side frames and other parts not subject to appreciable wear, the mean life of the engine and tender, when measured by the amount of its original net cost, would be about eleven years (engine, 10.80 years; tender, 11.90 years), and that during its ultimate life period of thirty years (1869 to 1898 inclusive) £4,890 10s. would have to be expended upon it to maintain it in a thoroughly efficient condition.

As that ultimate life period has now been reached, the company's reports afford the means of ascertaining how far this calculated expenditure per engine during this period agrees with the actual figures in the reports, particulars of which are given in the accompanying tabular statement, which has been submitted to Mr. Webb, who has been at the

*From London Engineering.

trouble of having the figures examined, and with a few minor corrections, verified.

The aggregate expenditure on the entire locomotive stock during the period in question has amounted to the enormous sum of over 11⅓ million sterling (£11,374,734), an amount exceeding the capital outlay on the entire working stock of the company (£10,056,225). Large, however, as this expenditure appears to be in the aggregate, it will only be found to amount, on an average, to £4,897, 7s. 2½d. per engine, and £163 5s. per engine per annum during the whole of that period—almost the exact calculated results based on Mr. Webb's data already alluded to, viz., £4,890 10s. and £163 respectively (*vide* "Molesworth," page 265).

LONDON AND NORTH-WESTERN RAILWAY: LOCOMOTIVE REPAIRS AND RENEWALS DURING A PERIOD OF THIRTY YEARS (1869 TO 1898 INCLUSIVE).

Year.	Number of Engines.	Wages.	Per Engine.	Material.	Per Engine.	Total Wages and Material.	Per Engine.	Total Train-Miles.	Total Miles per Engine.	Total Expenses per Train-Mile.
		£	£	£	£	£	£	number	number	d.
1869	1,539	168,706	109.62	176,956	114.98	345,662	224.60	23,279,660	15,127	3.5635
1870	1,559	171,143	100 78	155,608	99.81	326,751	209.59	25,037,527	16,060	3.1321
1871	1,619	156,443	96.63	154,430	95.38	310,873	192.01	26,507,002	16,372	2.8147
1872	1,791	168,207	93.92	158,452	88.47	326,659	182.39	28,835,916	16,101	2.7188
1873	2,032	189,712	93.36	211,517	104 10	401,229	197.46	30,123,750	14,825	3.1966
1874	2,085	189,917	91.09	202,925	97.33	392,842	188.42	30,474,401	14,616	3.0939
1875	2,157	189,506	87.86	203,367	94.28	392,873	182.14	31,748,603	14,719	2.9693
1876	2,196	173,934	79.20	196,986	89.70	370,920	168.90	32,323,759	14,719	2.7540
1877	2,233	181,009	81.46	180,348	80.77	362,257	162.23	32,701,680	14,645	2.6586
1878	2,247	186,099	82.82	164,858	73.37	350,957	156.19	32,498,113	14,463	2.5918
1879	2,246	174,047	77.49	150,270	66.91	324,317	144.40	32,517,933	14,478	2.3936
1880	2,266	188,770	83.30	143,608	63.38	332,378	146.68	34,911,787	15,406	2.3850
1881	2,315	189,822	82.00	146,644	63.35	336,466	145.35	36,188,478	15,632	2.2315
1882	2,377	170,547	71.75	162,535	68 38	333,082	140.13	36,780,484	15,473	2.1735
1883	2,419	180,480	74.61	187,372	77.46	367,852	152.07	38,096,778	15,749	2.3173
1884	2,462	178,602	72.55	201,871	81.99	380,473	154.54	37,948,865	15,414	2.4062
1885	2,490	170,339	63.41	196,342	78.85	366,681	147.26	37,974,227	15,251	2.3174
1886	2,523	173,629	68.82	201,409	79.83	375,038	148.65	37,625,328	14,913	2.3923
1887	2,543	190,068	74.74	212,244	83.46	402,312	158.20	38,087,184	14,977	2.5351
1888	2,547	189,189	74.28	203,208	79.79	392,397	154.07	38,641,005	15,171	2.4373
1889	2,551	196,085	76.87	218,214	85.54	414,299	162.41	40,543,883	15,894	2.4536
1890	2,592	198,161	76.45	204,159	78.77	402,320	155.22	41,899,410	16,165	2.3045
1891	2,621	192,411	73 41	209,496	79.93	401,907	153.34	42,494,389	16,213	2.2699
1892	2,671	193.488	72.44	213,448	79.92	406,936	152.36	43,236,699	16,188	2.2589
1893	2,717	184,335	67.85	217,553	80.07	401,888	147.92	41,131,988	15,138	2.3450
1894	2,741	188,903	68.92	209,485	76.43	398,388	145.35	41,466,847	15,128	2.3058
1895	2,761	194,544	70.46	216,033	78.25	410,577	148.71	41,655,965	15,087	2.3655
1896	2,780	205,611	73.96	228,537	82.21	434,148	156 17	43,303,238	15,577	2.4062
1897	2,812	203,315	72.31	240,320	85.46	443,635	157.77	45,486,774	16,176	2.3407
1898	2,878	218,649	75.97	249,965	86.86	468,614	162.83	47,548,652	16,521	2.3653
	70,770	5,556,571	2402.33	5,818,160	2495.03	11,374,731	4,897.36	1,091,070,333	462,198	76.4984

Averages $\left\{ \frac{2402.33l.}{30 \text{ years}} = 80.08l. \quad \frac{2495.03l.}{30 \text{ years}} = 88.17l. \quad \frac{4897.36l.}{30 \text{ years}} = 163.25l. \quad \frac{462{,}198}{30 \text{ years}} = \right.$ average number 15,407

Having regard to the great changes which have occurred during this long period of thirty years, the increased size, weight and power of the engines of the present day, the higher rate of wages paid for labor, and, on the other hand, to the very large reductions in the price of the steel material, it is somewhat difficult to explain the remarkably close agreement of the calculated and actual figures. There is, however, one very noticeable fact in the statement which goes a long way to explain it, and that is the remarkable equation which has been maintained in the amounts of wages and materials, respectively, throughout that long period.

It will also be observed that although the number of engines has in the meantime nearly doubled (88 per cent increase), the amount expended in wages on their maintenance and renewal has only increased about 30 per cent, while the wages per engine have actually decreased nearly 31 per cent (30.70 per cent), which would balance an increase of as much as 44 per cent. What makes this decrease all the more striking is that it should have occurred at a time when the price of labor had advanced, and large additions made to the weight and quantity of material used in the construction of the larger and more powerful engines now in use, which might have been expected rather to have added to the cost of labor per engine.

It is, unquestionably, to these large and continuous reductions in the item of wages, which have nearly kept pace with the reductions in the price of the steel material, that this close agreement between the calculated and actual cost of the maintenance and renewals per engine must be ascribed.

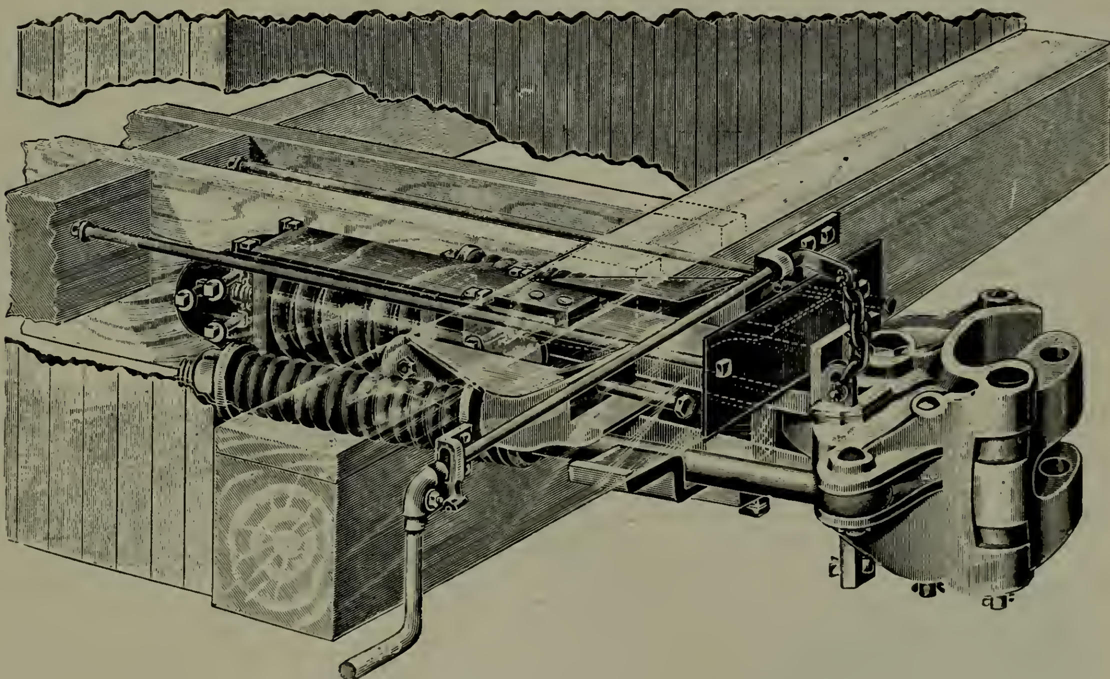
As regards the reduced cost of the materials per engine, it should be observed that, although the price of the material has fallen during the period in question, over 60 per cent, the actual reduction in its cost per engine has only been 20½ per cent, the difference being accounted for by the additional cost of the much larger quantity of material used, as it is obvious that had the engines continued to be constructed of the same size and type of those of 1869, the reduction in the cost of the material per engine would have been commensurate with the reduction in its price. This addition to the cost per engine in respect of the increased quantity of material, still further contributes to preserve the equilibrium between the wages and materials, which has been maintained during the last thirty years, and, as the records of the company prove, had previously existed for a number of years.

That the London & North-Western Railway Company has largely benefited by these great reductions in the price of the material, as well as by the equally remarkable continuous reductions in the cost of the labor is unquestionable, and so far as these economies relate to the cost of labor, they are entirely due to improvements in construction, workmanship, labor-saving appliances, and, more especially, to the conspicuous ability, skill and resource of the company's chief mechanical engineer, Mr. Webb, during whose period of office all this has been accomplished.

As an illustration of the economy effected in the item of labor, it may be mentioned that the reduction in 1898 amounted to 31 per cent below what it was thirty years ago, a saving of £31 per engine per annum in the case of the 2,878 locomotives now owned by the company, which would represent an annual reduction in the working expenses of nearly £100,000 (£96,892). The total saving to the company resulting from these reductions in the cost of labor alone during the last thirty years has amounted to over two million sterling (£2,110,013).

THE BUHOUP THREE-STEM FREIGHT COUPLER.

Some years ago (March, 1896,) we published an account of the Buhoup three-stem coupler as applied to passenger equipment. In this service this coupler had then proved its worth, and has since met with a very favorable reception, and is in quite extended use. It has, also, in suitably modified form, proved satisfactory in freight service ; and it was shown as applied to a freight car, and tested, at the recent conventions at Old Point Comfort, as we have already noted.



THE BUHOUP THREE-STEM FREIGHT COUPLER.

The principle of this coupler, and quite full details of its construction, are given in our engraving. In describing it, we necessarily repeat the points, to some extent, that are made in describing the passenger coupler. It will be readily seen that this coupler will adjust itself to curves so as to reduce strains and wear on the coupler and on the flanges of the wheel, and will yield to and deflect buffing blows which might otherwise injure or destroy the coupling head. It is well understood that couplers, particularly of the M. C. B. type, while especially designed as draft devices, are also called upon to perform the function of buffers, and in performing this latter function are subject to severe blows, which tend to their destruction. The three-stem coupler is so constructed that it will always yield in line of force so as to relieve the lugs, or the guard arm, as the case may be, from the crushing force. In addition to this, the three stems add a greater degree of safety against couplers breaking off or pulling out and dropping on the track, as it would be apparently impossible to break the entire three stems at the same time. An additional draft spring capacity is also given to the cars, which has become a desirable feature at this time, for the reason that of late years much larger trains and heavier loads are being hauled without any benefit of additional spring compression between the cars. The rotating of the head also allows cars to travel around curves with freedom, thus reducing the draft on the engine. In cases of damage to the head at any time, it is as easily replaced as a knuckle, without disturbing the draft attachments in any way.

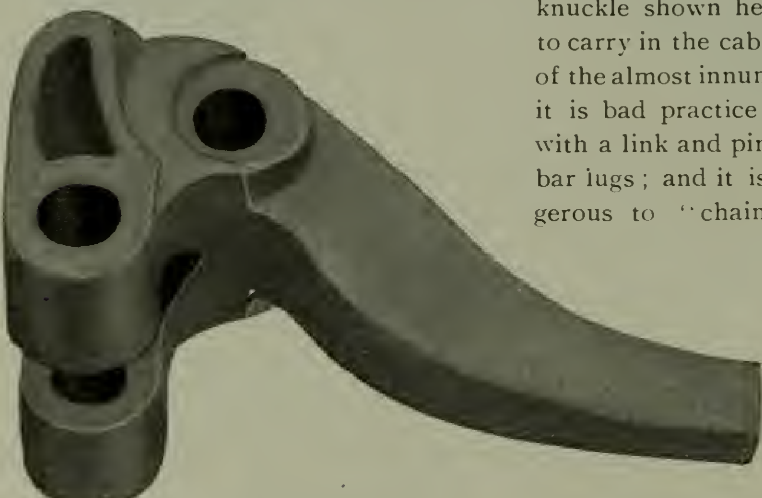
Another feature that is claimed for this style of coupler, is that all of the lost motion between the faces of the M. C. B. coupler, which is absolutely necessary in a single stem to permit of curving, can be dispensed with, and thereby the knuckle is always held more closely in contact with its constructed lines, thus reducing very materially the wear of the knuckle. The reasons why this feature can be employed in the three-stem and not in the single-stem coupler are, as stated by the inventor, that "the contour lines of the single-stem coupler must provide for the curving within the head of the coupler itself, but with the three-stem coupler, the rotating of the head itself is four times greater than the allowance made in the contour lines of the single-stem, and provides for four times greater curving feature than the single-stem, without any strain whatever to the platform."

On the theory that more cars can be started with a close M. C. B. coupling than with the link and pin, and that more cars coupled with link and pin can be drawn around curves with less draft on the engine than with the single-stem M. C. B. coupler, is based the claim that the three-stem coupler has another advantage, in that the rotating of its head produces the benefits of the close coupler in starting trains, and the benefit of free movement of link and pin cars around curves.

This coupler couples and uncouples on curves upon which a single-stem M. C. B. coupler simply cannot be operated. This fact was conclusively shown to many interested observers at Old Point Comfort last June, during repeated tests on the government tracks, where the coupler was coupled and uncoupled on 58 and 76 degree curves. This coupler, the invention of Mr. H. C. Buhoup, is sold by the McConway & Torley Company, of Pittsburgh, Pa.

THE GILMAN-BROWN EMERGENCY KNUCKLE.

The expensive and vexatious delays following the breaking or disabling of coupler knuckles while on the road could be in large part avoided by the use of the emergency knuckle shown herewith. It is impracticable to carry in the caboose a line of spare knuckles of the almost innumerable patterns now in use; it is bad practice and dangerous to couple up with a link and pin connection with the draw-bar lugs; and it is also bad practice and dangerous to "chain up" a connection. The Gilman-Brown emergency knuckle fits into the necessities of the case as neatly as it does into over 90 per cent of the couplers now in use.



GILMAN-BROWN EMERGENCY KNUCKLE.

It should be understood that it is intended for emergency use only. But it gives a strong, close and safe coupling, amply efficient, in all its functions, to bring a train safely into its division point, where the proper knuckle replacement can be made. This knuckle is offered by the Railway Appliances Company, Old Colony Bldg., Chicago, and it is offered only after the manager of that company, Mr. George H. Sargent, has satisfied himself by several months of experiment and trial that it is not only practical, but that it will fit most of the couplers now in use. As above intimated, it has been found that it will fit over 90 per cent of the couplers now used, and that those couplers that it will not fit are not commonly met with in present practice.

PERSONAL MENTION.

Mr. W. O. Davies, Jr., formerly foreman of freight repairs on the Chicago, Milwaukee & St. Paul, at Chicago, is now connected with the Chicago Railway Equipment Co.

Mr. Edward Hiserodt, who was for many years connected with the old Indiana, Bloomington & Western as master mechanic, and later as foreman of a wrecking crew on the Lake Erie & Western, died recently at Tipton, Ind.

Mr. George W. Taylor, until recently master mechanic of the Wisconsin & Michigan Railway, has been appointed master mechanic of the Copper Range Railroad, with headquarters at Houghton, Mich.

Mr. Richard Meade has been appointed assistant division master mechanic of the Santa Fe, with headquarters at Wellington, Kan.

Mr. George Reichel, of Horton, Kan., has been appointed foreman in the shops of the Delaware, Lackawanna & Western at Scranton, Pa.

Mr. David Van Alstine, heretofore division master mechanic of the Chicago Great Western at St. Paul, Minn., has been appointed master mechanic to succeed Mr. Tracy Lyon, promoted to be general superintendent of that road.

Mr. William H. Stearns, who from 1872 to 1895 was master mechanic of the Connecticut River Railroad, which is now a part of the Boston & Maine, died at his home in Springfield, Mass., on July 14. Mr. Stearns was engaged in railroad work for over fifty-seven years, being seventy-seven years of age when he died. He began when fourteen years old to learn the machinist's trade, and he completed his apprenticeship with Wilson Eddy in the machine shops in Lowell. He was afterward foreman in the Boston & Albany machine shops under Mr. Eddy. He went to Springfield when nineteen years old and began work at once in the Boston & Albany shops, or as they then were, the Western road shops. In 1842 the Springfield car and engine shop was started. Mr. Stearns took pride in the fact that he helped put in the machinery and set it up, and that he was put in charge of the second engine, the "Hingham," that was turned out of the shop. A large share of this engine he made himself. It was the custom in those early days to put the machinists in charge of the engines which they had a hand in constructing. He left this work after a few years service, and next began running on the Old Colony road between Boston and Cohasset, where he was employed for several years, and after this was for several years engineer on the Boston & Albany. In 1862 he was made foreman in the Boston & Albany shops, where he remained until 1872, having worked nearly twenty-two years with that railroad. In 1872 he became master mechanic of the Connecticut River Railroad, and continued in this position until 1895. The Connecticut River road was then absorbed by the Boston & Maine, and Mr. Stearns was retired from his position to that of foreman of the round-house, where until his death he had charge of sending out the engines and assigning the engineers to run them.—*Railway Review*.

Mr. W. L. Harrison has been appointed superintendent of the West Superior shops of the Eastern Railway of Minnesota, vice Mr. H. A. Bayfield, resigned. Mr. Harrison has for several years past been general foreman of the Great Northern shops at Barnesville, Minn.

Mr. H. F. Ball has been appointed mechanical engineer of the Lake Shore & Michigan Southern, the appointment dating from July 15. Mr. Ball has hitherto been general car inspector of this road. The position that he relinquishes to accept his promotion has been abolished. Those who have watched Mr. Ball's bright and progressive work in past years well realize how thoroughly deserving he is of the recognition of his talents that has now come to him.

Mr. Tracy Lyon, hitherto master mechanic of the Chicago Great Western, has been appointed general superintendent of that road. Mr. Lyon is a graduate of the Massachusetts Institute of Technology, and has been master mechanic of the Chicago Great Western for some time. Mr. Lyon was a comparatively newcomer in the railway mechanical world, but he had rapidly made himself welcome and influential, and his passing into the operating field causes regret among his associates of recent years.

Mr. L. B. Paxson has resigned as superintendent of motive power and rolling equipment of the Philadelphia & Reading, and has been appointed consulting mechanical engineer of that road, a position recently created. Mr. Paxson has been in the service of the Philadelphia & Reading during all his business life. He commenced with the road as a brakeman on a coal train, and later served as master mechanic, engineer of machinery, and superintendent of motive power and rolling equipment. He is now seventy-two years old.

Mr. J. McGie, heretofore master mechanic of the Montana division of the Great Northern, has been appointed master mechanic of the Montana Central Railway, a proprietory line of the Great Northern.

Mr. Theo. H. Curtis, mechanical engineer of the New York, Chicago & St. Louis, has resigned to accept the position of mechanical engineer of the Erie, with office at Susquehanna, Pa. Mr. Curtis will assume his duties on August 10. Mr. Curtis first commenced railroad work in the office of superintendent of motive power of the Terre Haute & Indianapolis at Terre Haute, and after a period of two years in the drawing room entered the shop, taking up all branches of the care and maintenance of locomotives and cars. He next went to the Big Four as chief draftsman at Cleveland. To further learn railway engineering he, later, entered the service of the Brooks Locomotive Works, and still later went to the Pittsburg Locomotive Works. Some ten years ago he left the latter concern to become chief draftsman of the New York, Chicago & St. Louis, later becoming mechanical engineer of that road. Mr. Curtis will be remembered as an occasional contributor to our columns. He has a wide circle of friends in the west who will dislike to lose him, but they will be gratified that he has been given such an important post.

Mr. W. H. S. Wright, purchasing agent of the Chicago, St. Paul, Minneapolis & Omaha, has resigned to become northwestern sales agent for the Illinois Steel Co. He will be succeeded by Isaac Seddon, who has for a long time been Mr. Wright's chief clerk.

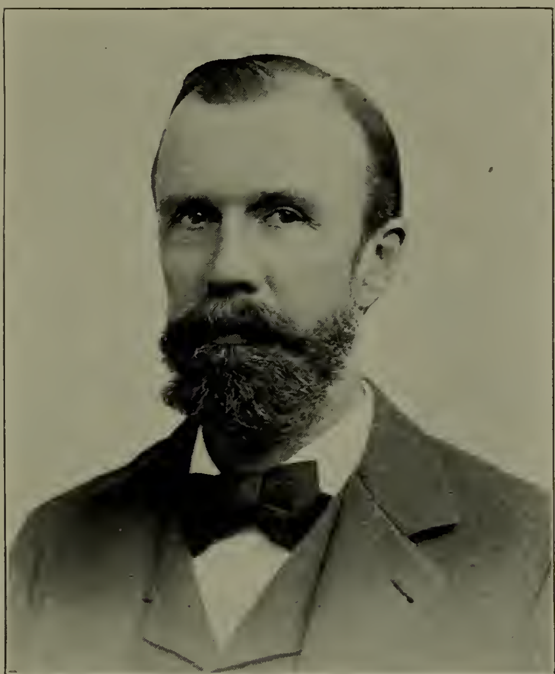
Mr. S. N. Crawford, for several years with the Peoria & Eastern, has been appointed general foreman of the Ohio Southern shops, vice H. K. Schorer, who has resigned to go to the Pittsburg, Fort Wayne & Chicago.

Mr. W. C. Pennock, until recently master mechanic of the Pennsylvania Lines, southwest system, at Logansport, Ind., was drowned July 17, at Hudson Lake, Ind., while endeavoring to rescue two companions who went overboard. Mr. Pennock was born at Cardington, Ohio, in 1862, and received an excellent technical education. In 1880 he entered the service of the Pennsylvania Lines as a fireman on the Ft. Wayne division, and three years later was appointed road foreman of engines on the Richmond division, later holding similar positions on the Indianapolis and Cincinnati divisions. In 1893, Mr. Pennock was made master mechanic of the Chicago division, at Logansport.

Mr. Frank Cain, master mechanic of the Texarkana & Fort Smith, has resigned

Mr. F. M. Dean, for the last twelve years foreman of the Huron (S. D.) shops of the Chicago & North-Western R'y, has resigned to accept a responsible and lucrative position with the Baldwin Locomotive Co., at Philadelphia. Mr. Dean has been in the employ of the North-Western R'y for a quarter of a century. He is the inventor and patentee of Dean's locomotive track sander, now being used in all parts of the country, and which has brought him into wide prominence.

Mr. J. G. Tomlinson, superintendent of motive power of the New Orleans & Northeastern, Alabama & Vicksburg, and Vicksburg, Shreveport & Pacific Roads, whose headquarters are at Meridian, Miss., was killed at Meridian July 25. He was run over by an engine while attempting to cross the track.



Mr. Geo. W. Morris.

Mr. Geo. W. Morris, formerly General Manager of the A. French Spring Co., of Pittsburg, Pa., died at his summer home in Virginia, on July 8, 1899, age fifty-three years. The funeral was held from the Church of the Ascension, of which he was a member. The services were conducted by the Tancred Commandery No. 48 K. T. of Pittsburg. He is survived by his wife and one son. It is hard to realize that "George" Morris has passed away, and that neither at the June conventions nor anywhere else in all the world shall we see him again. The suddenness of his death adds greatly to the shock of it. Only a few weeks before it occurred he was at the conventions at Old Point, apparently in good health and, as ever, full of friendliness and good fellowship. His acquaintance with all the older members of the associations was intimate, and he had the respect and hearty liking of them all. He had attended these conventions for the past thirty years. No one in the railway supply field was more widely known nor better liked. He was a successful business man, a good citizen, a loving husband and a loyal friend.

Mr. R. E. McCuen, heretofore general foreman of the Lexington & Eastern Railroad, has been appointed master mechanic of that road, with office at Lexington, Ky.

Mr. J. M. Burford has been appointed master mechanic of the East Louisiana, with headquarters at New Orleans, La.

Mr. A. Hendee has been appointed master mechanic of the Panama Railway, with headquarters at Colon, Colombia, vice Percy Webb, resigned.

Mr. P. L. Cochrane, formerly master mechanic of the Central of Georgia, at Columbus, Ga., and afterward master mechanic of the Seaboard Air Line, died at Atlanta, Ga., on July 4, at the age of seventy-one years.

Mr. A. Fenwick has been appointed master mechanic of the Wisconsin & Michigan, vice Geo. W. Taylor, resigned.

Mr. N. W. Best has been appointed superintendent of motive power and machinery of the Los Angeles Terminal Railway.

Mr. S. S. Smedley, formerly division master mechanic on the Missouri Pacific, died at Jackson, Mich., on July 4, at the age of fifty-seven years.

Mr. David N. Pasho, formerly master mechanic and traveling engineer of the Erie died at Dunkirk, N. Y., on July 6, aged seventy years.

Mr. G. T. Sanderson has been appointed master mechanic of the Great Northern at Havre, Mont., vice T. McGie, who has been made master mechanic of the Montana, Central.

Mr. W. Barcley has been appointed master mechanic of the Mexico, Cuernevaca & Pacific Railway, with headquarters at Cuernevaca, Mex.

Mr. Samuel F. Prince, Jr., has resigned as superintendent of motive power and equipment of the Long Island Railroad, to accept the position of superintendent of motive power and rolling equipment of the Philadelphia & Reading, with headquarters at Philadelphia, Pa., vice Mr. L. B. Paxson resigned. Mr. Prince was formerly mechanical engineer of the road to which he now returns as head of the mechanical department.

Mr. Philip Wallis has been appointed superintendent of motive power and equipment of the Long Island, and New York & Rockaway Beach railways, vice Mr. S. F. Prince, Jr., resigned to take charge of the mechanical department of the Philadelphia & Reading. Mr. Wallis has been for some years master mechanic of the Lehigh Valley at Easton, Pa. He is well remembered in the west as one of the coterie of bright young men who have graduated from the mechanical department of the Chicago, Burlington & Quincy.

As previously noted, Mr. A. M. Waitt, superintendent of motive power and rolling stock of the Lake Shore & Michigan Southern, has appointed Mr. F. W. Brazier as assistant superintendent of rolling stock and Mr. E. E. Davis as assistant superintendent of motive power, both with headquarters at New York. The full reorganization of the mechanical department is outlined in the following extracts from official circulars : The motive power department will be operated under five grand divisions : (1.) Hudson division, including all points on the New York Central & Hudson River Railroad proper, south of Rensselaer, and including the Harlem and New York & Putnam divisions ; also all points on the West Shore south of Ravena, and including the Wallkill Valley Railroad. (2.) Middle division, including all points on the New York Central & Hudson River Railroad proper, north of and including Rensselaer, and east of DeWitt ; also all points on the West Shore east of Syracuse to and including Ravena ; also all points on the Mohawk & Malone Railway, and St. Lawrence & Adirondack Railroad. (3.) Western division, including all points on line of the New York Central & Hudson River Railroad proper, west of and including DeWitt, and all points on the West Shore west of and including Syracuse ; also including all points on the Dunkirk, Allegheny Valley & Pittsburgh Railroad. (4.) R., W & O. division, including all points on the Rome, Watertown & Ogdensburg Railroad, Carthage & Adirondack Railroad and Gouverneur & Oswegatchie Railroad, except Suspension Bridge, Rochester, Syracuse, Rome and Utica. (5.) Pennsylvania division, including all points on the Pennsylvania division of the road, except Lyons and Geneva. Mr. E. E. Davis, assistant superintendent of motive power, with headquarters at the Grand Central Station, New York, will have supervision of the locomotive shops and the repairs, maintenance and distribution of the motive power of the road. All reports and correspondence connected with the locomotive department should be addressed to the superintendent of motive power and rolling stock. Such communications should have the words "Loco. Dep't" stamped or written in the lower left hand corner of the envelope. Mr. F. W. Brazier, assistant superintendent of rolling stock, with headquarters at Grand Central Station, New York, will have supervision of the car shops and the care and maintenance of the car equipment of the road.

All reports and correspondence connected with the car department should be addressed to the superintendent of motive power and rolling stock, but in the lower left hand corner the words "Car Dep't" stamped or written. Mr. H. M. Butts is appointed supervisor of the passenger equipment, and will have supervision of the cleaning of passenger equipment, when not at the shops ; and such other duties as may be assigned to him from time to time. The headquarters of Mr. George Thompson, division superintendent of motive power of the Pennsylvania division, are transferred from Jersey Shore, Pa., to Corning, N. Y. The title of Mr. James Buchanan, heretofore assistant superintendent of motive power, will be division superintendent of motive power, with jurisdiction over locomotive department business on the Middle and Hudson divisions. The title of Mr. G. H. Haselton, heretofore assistant superintendent of motive power, will be division superintendent of motive power, with jurisdiction over locomotive department business on the Western division. The title of Mr. P. T. Lonergan, heretofore master mechanic, will be division superintendent of motive power, with jurisdiction over locomotive department and car department business on the R.. W. & O. division. The jurisdiction of Mr. James Macbeth, master car builder at East Buffalo, is extended over the entire Western division in car department business. The position of master car builder at East Rochester is abolished, and Mr. J. Westervelt, formerly master oar builder, will have the title of general foreman, reporting to the master car builder of the Western division, The jurisdiction of Mr. F. W. Chaffee, master car builder at West Albany, will extend over the Middle division in car department business. The jurisdiction of Mr. S. T. Case, master car builder at Mott Haven, is extended over all points on the Hudson division in car department business.

Mr. F. von Schlegell, superintendent of the St. Cloud shops of the Great Northern, has been made assistant superintendent of the Fergus Falls division of that road, with office at Melrose, Minn. Mr. Charles H. Putnam succeeds Mr. von Schlegell as superintendent of the St. Cloud shops.

SUPPLY TRADE NOTES.

We are in receipt of a little book called "The Imprisonment of the Heat Unit," by Wallace W. Johnson. If the members of the engineering class of Sibley College, Cornell University, are not convinced of the immense superiority of magnesia lagging over all other forms of lagging used for heat insulation it is not the fault of Mr. Wallace Johnson, or of the bright little lecture which he gave to them, and which is published under the above title. Those who have heard Mr. Johnson expatiate upon the excellencies of the Keasbey & Mattison product, or tell stories of happenings in the army during the civil war, know that he is a convincing and picturesque talker, and in this address he has maintained his own high standard. The title given it is a happy one, and the little booklet will be read through by many people.

Mr. G. E. Macklin, until recently special agent of the Pressed Steel Car Company has been made assistant general sales agent, with headquarters in the Empire Building, No. 71 Broadway, New York City. Mr. R. L. Gordon, for a long time with the Fox Pressed Steel Equipment Company, and more recently in the Chicago office of the Pressed Steel Car Company, has been transferred to the Wood's Run (Allegheny) plant of the Pressed Steel Car Company, where he will confine himself largely to engineering work.

The importance and volume of the business of the Pressed Steel Car Company, entirely apart from the manufacture of pressed steel cars, is not generally understood. The pressed steel car is of comparatively recent development, that is, such cars have only been in use about three years. But the manufacture of pressed steel bolsters, truck frames and center plates by the old Fox Pressed Steel Equipment Company, and the Schoen Pressed Steel

Company, which two, combined, make the Pressed Steel Car Company, has a history of more than ten years. In the manufacture of parts referred to, the company has plenty of competition, a large number of concerns offering competing products; but despite this, it is doing at an outside estimate more than 75 per cent of the business of the country in this line. Figures at hand for the past five weeks show a volume of business during that period above $575,000, apart from car deliveries. The profits of the business are not given out, but its volume would seem to indicate the truth of the company's assertion that it is not far from 40 per cent of the total business done, and sufficient to alone pay much more than the 7 per cent required for the annual dividends on its preferred stock of $12,500,000.

Mr. Edward N. Hurley, president of the Standard Pneumatic Tool Company, has gone to Europe to perfect arrangements relative to the appointment of agents for the disposition of his company's "Little Giant" pneumatic tools on the other side of the Atlantic, and establishing of works in England. The company's foreign business has increased remarkably during the past year, especially in Great Britain and Germany, and it is now making shipments of machinery to all parts of the civilized world.

The business done by the Chicago Pneumatic Tool Company during the month of June was the largest in its history, over five hundred orders for pneumatic tools of various kinds being booked. The company's shipments included a large number of tools for Europe, one large order to South African Republic, and one to Australia. The factory of the National Pneumatic Tool Company, of Philadelphia, the control of which has recently been acquired by this company, is running to its fullest capacity both day and night, as is also the case with the St. Louis factory, it being necessary to do this to keep pace with the orders.

The new illustrated catalogue of The Egan Co., Cincinnati, Ohio, is very elaborate. It measures 12½ inches long by 9½ inches wide and contains 340 pages. It is printed on very fine enameled book paper, handsomely bound in cloth, and lettered in gold. The introduction is not only in English, but is printed in Russian, French, German and Spanish. This company has been endeavoring for several years past to perfect and improve their line, so as to make it far superior and in advance to any other machinery in the world, and they have brought out quite a number of new and advanced types of machines, which are certainly triumphs of mechanical ingenuity and skill. This new catalogue shows all of these new machines and many more besides, so that no factory or superintendent, who wishes to keep in touch with the latest devices for turning out work, can afford to be without one of these new books. They are sending out these new catalogues free of charge, express prepaid, and if any reader has not received one he should write at once, referring to the RAILWAY MASTER MECHANIC, and they will be pleased to send one.

Chicago rabbeted grain doors will be used on the 500 Illinois Central box cars, recently let to the American Car & Foundry Co. The 500 cars about to be built by the C., M. & St. P. R'y will also be equipped with the Chicago grain door.

Pressed Steel Car Co.'s pressed steel bolsters have been specified for 500 Illinois Central coal cars and 200 Swift & Co. refrigerator cars, recently ordered.

The Pressed Steel Car Co. informed us, under date of July 11, that since December 13, last year, 12,598 steel cars have been ordered of that company for delivery this year, of which nearly half has been delivered. The Penn'a R. R., B. & O., B. & O. S. W., Lehigh Valley, Phila. & Reading, P. B. & L. E., Oregon Short Line, Union Pacific, L. S. & M. S., P. & L. E., L. S. & I., Great Northern and Egyptian State Railways are roads which have ordered heavily. Cars were ordered the first six months at the rate of $25,000,000 per year. Schoen patent truck bolsters and miscellaneous pressed steel parts ordered make up a magnificent volume of business for the year.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

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The International Association for Testing Materials.

The recent meeting in Pittsburg of the American section of the International Association for Testing Materials, was the second in its history, the first meeting having been held in Philadelphia, August, 1898. The membership now numbers 125, and the society is successfully launched and bids fair to have a permanent and honorable career in the history of technical and scientific societies.

The enormous amount of material used by railways—especially iron and steel—and the importance of the highest intelligence in regard to its economical application, renders the subject of testing materials of peculiar interest to the engineering departments of railroads. We will, therefore, give a brief account of the rise and progress of testing materials of construction, and of the International Association, which deals with this department of human knowledge.

The measurement of the strength of materials for industrial application was not taken up until the present century. During the first half of the century some progress was made in the knowledge of elastic resistance. The necessity for safe construction in railroad bridges rapidly developed investigation of the strength of iron and steel, in order that the greatest strength could be obtained with proper economy in amounts of material used.

After the year 1850 practical testing machines were built with provisions for measuring elongation, and the work of testing rapidly progressed until, in 1870, it was generally recognized by manufacturers that the physical tests of metals were necessary in order to secure uniformity of product. It seems remarkable now, when iron and steel have such extensive application in all kinds of construction, that it is only within the last *thirty* years that the measurements have been made which are necessary to insure its scientific and economical use.

After numerous tests of iron and steel had been made, and the results were studied by experimenters at different stations and the information exchanged and compared, it was soon found that the strength depended upon the size of the specimen and the manner in which the load was applied. It then began to dawn on the engineer of tests that, in order to obtain results which were comparable, there must be uniformity in the manner of testing. The struggle to obtain this uniformity throughout the world finally resulted in the organization of the International Association for Testing Materials. The subject was discussed by numerous engineering societies without definite conclusions.

In 1882 that great genius who seems to have been raised up for the purpose—John Bauschinger, of Munich—organized conferences which met in the cities of Germany and Austria, and in 1895, as a result of the conference held in Zurich, the International Association for Testing Materials was formally organized. In 1897 the second congress of this association was held in Stockholm, there being present 361 members, representing 18 different countries. It was now arranged that in order to facilitate the progress of the work in different countries, that the members in each country should meet and form a national section of the International Association. The machinery for conducting the work is thus similar to that of the various railway clubs in this country, which now largely do the preliminary work of the national railway mechanical conventions.

The second meeting of the American section of the association for testing materials, recently held in Pittsburg, brought together representatives of the largest steel works, and of the principal testing laboratories, in the country. The presidential address by Prof. Mansfield Merriman, of Lehigh University, gave a history of the movement, outlines of which we have given above. Prof. Hatt, of Purdue, read a paper on "Comparison of Steel Plates under Flexure and Tension," and the discussion soon brought out the fact that commercial testing and scientific testing are two very different things, and that accurate results for comparative purposes can only be obtained by very careful measurements with the aid of micrometers, and autographic recorders, and other such reliable auxiliaries to the testing machine proper.

An interesting investigation which will be of especial value to railways is that made by Prof. Hatt on "Impact Tests," wherein he shows that European practice has demonstrated the practicability of impact tests in a remarkable degree. The development of this method of testing will throw new light on the necessary resistance of M. C. B. couplers, rails, and other railway structures subject to blows. Reports of progress were made by chairmen of committees on "Standard Specifications for Testing Iron and Steel," and on the collection of data for establishing standard rules for test pieces, with special reference to axles, tires, springs, etc.

We must not close this article without a brief reference to the early history of railway testing rooms, which belongs to the present generation. The first railway testing laboratory was established in Altoona, Pa., by the Pennsylvania railroad in 1874, and in 1876 the chemical laboratory was equipped. The operation of this test room was the first systematic application of science to the mechanics of railroading in this country. The results of its work soon made their appearance in specifications for material, which were then first made; and the practice thus commenced, of buying railway material to specification, is now quite general. The credit of all the advantages which come from specifications should therefore be given to the testing laboratory.

The Special Apprentice.

The above headline hardly conveys a full idea of the subject which is to be briefly treated in the following lines; but because the special apprentice has received so much attention at the hands of the associations, and the clubs, and by the press and in conversation, and because every writer is sufficiently conceited to appreciate a fair consideration of his writings by a large number of readers, the particular headline is used as, to be frank, a "catch."

The term "special apprentice" is very generally misapplied; generally those who use it accept it as synonymous with "technical graduate"; but under the broad meaning of the term, either a graduate of a technical college or of a manual training school, or a person particularly apt in some special line of business and with only the rudiments of an education, may make an equally good special apprentice. The misconception of the meaning of the term is due largely to the too general impression that a technical graduate is necessarily a very good journeyman, both in the shop and in the drawing room, and too frequently the graduates have assisted in the spreading of such impression. It is the intention of this article to point out the fact that it is only in the drawing room that a man can get the experience that will make him a draftsman, and only the experience in the shop that will make him a machinist, a boilermaker, a blacksmith or what not. It is intended to confine our remarks to the technically educated man and to present some ideas which may be of value to such a man and to his prospective employer, and on this account the headline is somewhat misleading. The general remarks will apply to other than the railroad business, but it is this line of work to which particular reference is made.

It is fitting to address, first, the young man and to impress upon him the value of the education which either he has obtained or which he is about to obtain. First, he should understand that the ideally educated man is he who has had the practical experience and has obtained the theoretical learning; then if he appreciates the proper relation of one to the other, and is guided in his work by such appreciation, he is quite sure to meet with success. It may be remarked that the demand is ever growing greater for the men who can so combine both branches of learning; and although the theoretical man may express disdain of the practical man and the practical man look similarly upon the man of theoretical attainments, each appreciates his own want.

Mr. C. P. Huntington has taken the position that the time spent in attending college is as good as lost, and while some might say, at first thought, that the idea was not a correct one, further consideration may possibly indicate differently. Assuming that the practical and theoretical should be combined for the best results, it naturally follows that, for proper appreciation of either, they should be associated as closely together as possible. Then it follows that a man should enter the practical side and carry the theoretical along with it. Some young men would be sufficiently farseeing to carry both along with an even pace, but with a majority the experience would be obtained at the expense of theory. Perhaps this applies more particularly to technical work than to financial affairs, with which Mr. Huntington is more closely associated.

The colleges produce just the opposite condition, although it is their continual effort to bring the practical and theoretical as closely together as possible. A young man has the choice of three courses; viz: getting the practical and theoretical together, (and for some this may be best); getting the theoretical and then the practical, with a college education first; or he may get the practical and then the theoretical. There have been successes secured from every one of these courses, but it is believed that the second has furnished the greatest number and that it is the one to be preferred at present for the average young man. The strong objection to the last is that by the time a man has obtained some idea of the practical, he feels that his age or other incumbrance prohibits him obtaining the theoretical.

Having obtained the college education, it is desirable that the young man get the practical education as quickly as possible, and to do this he should make compensation, and everything else, secondary to gaining experience; too frequently, the young man feels that he "knows it all" and bears himself accordingly and his advancement awaits his learning the contrary. It should be appreciated also that even in the theoretical, the college course merely starts the education and a most important part of the teaching is where to find certain information when it is wanted.

It is safe to say that the more desirable class of technical graduates are gradually placing a fairer and truer estimate of value on their education. As evidence of this, there are young men with the title of civil engineer working with section men, and mechanical and electrical engineers taking correspondingly low places in the shops; they may start too low, but their education assures that they will rise above their fellows—how far above being dependent upon themselves.

The employer has made the same error of overestimating the graduate, as the graduate has made, but the employer, also, so far as shop work is concerned, at least, now appreciates more and more that the graduate, generally, is only in a condition to learn the practical more rapidly than others do, and is treating him accordingly. There is a very general opinion, however, that a graduate is necessarily a draftsman—but his training in a technical school does not make him so; he should be treated in the drawing room just as he is in the shop—as a beginner who should be capable of rising rapidly; and the opportunity should be given him to rise, instead of starting him at the top only to fall.

A Summer's Half-hour with Definitions.

The term Mechanic is defined by Webster as "one employed in shaping materials into any structure," and was primarily applied to the individual who worked with hand tools. The artisan who shaped metals by the use of tools, the wood carver, and the mason who is skilled in the art of building, are mechanics in the strict sense of the term; but the common acceptance of the word mechanic refers to the metal worker, who, as he began to devise appliances to assist in his work, became known as a machinist, then as he expanded into a constructor of tools and machinery, and skilled in the theory of mechanism, he grew to be a master workman, which term became master mechanic, when he was placed in charge of other workmen or machinists. The master mechanic is, therefore, the title given to one who is in responsible charge of other mechanics in control of the machine shop.

In railroad work the title of master mechanic refers to the official in charge of the repairs to locomotives and cars, and the machine shops in which these repairs are made, and who directs and controls the workmen engaged therein. This work is often divided under two heads; that of master mechanic and master car builder, but each official is a mechanic in the strict sense of the word, as the duties of each are along similar lines; that of directing the operation of mechanics in shaping materials into the various structures desired.

The title of superintendent of motive power or machinery is to designate a still higher grade of the mechanic, and denotes the individual who is the directing head of the various mechanical departments of the railroad, as relates to the care of the rolling stock. He is a mechanic in the fullest sense of the word, and is expected to be skilled in the theory, construction and use of the machinery of the shops and the motive power and cars of his road. He is the general in charge of an army of mechanics, who do his bidding in the same manner as the officers in the army execute the orders of the commander-in-chief.

The old-time superintendents of machinery (if one may use the term), are men who have grown up from the ranks, having started as apprentices in the shop, and worked their way up to the top of the ladder through sheer force of will and character, gaining each step by diligence in their work, being promoted by reason of their marked intelligence in the construction and operation of machinery, and special fitness to command men; having won the successive titles of machinist, master workman, master mechanic and superintendent by hard work, and the display of high ability in the performance of duty.

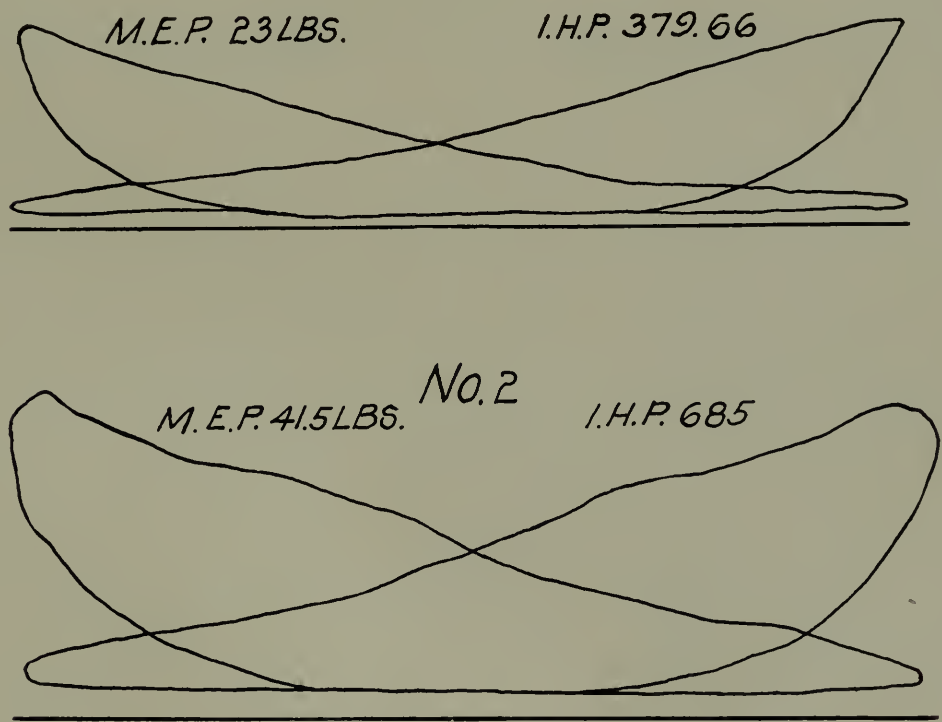
The development of railroads has been so rapid that the title of superintendent of motive power and machinery is only of recent origin, growing out of the necessity of having a central governing head to control the many departments and divisions into which the railroad systems are divided; each division has its machine shop and its master mechanic in charge, who must take care of his particular division, reporting to the superintendent of motive power, who is the referee, and from whom he receives his general instructions.

The superintendent of motive power must, therefore, be a broad-minded and experienced mechanic, as his duties are to direct and govern the mechanical operations of his road. He must be liberal and just, but he is no longer a mechanic in the sense of looking after the details of shop management, which he must leave to his master mechanics. His experience must enable him to decide, when they cannot agree, but his province is to deal with the larger problems of management, such as the selection of equipment, government of employes, and the carrying out of the policy dictated by the management of his road. He must keep in sympathy and close touch with his assistants, but his success depends upon his close application to the general problems of management, rather than looking after the details of operation, which should be left to his subordinates.

ADVANTAGES OF THE INDICATOR ON A STEAM ENGINE.

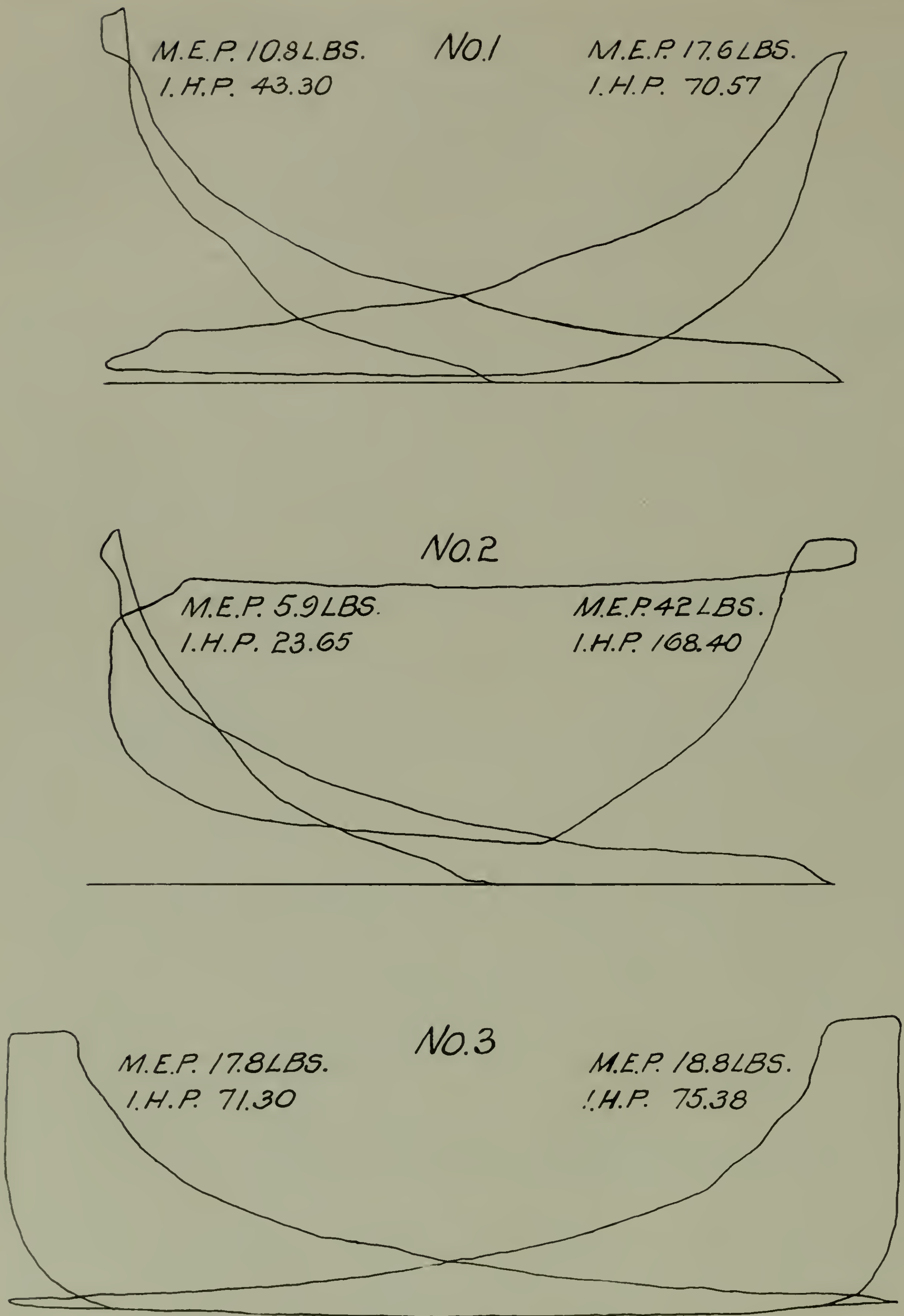
BY W. E. SYMONS.

Some years ago the writer was connected with a western road on which there was a 17 x 24-inch eight-wheel engine that seemed to baffle the skill of all enginemen and mechanics who endeavored to



CARDS FROM A LOCOMOTIVE.

locate and remedy an apparent difficulty in the valve gear. The engine's valves were repeatedly gone over and accurately adjusted with the trams by the best talent in the mechanical department. The sound of the exhaust was apparently even and square until the engine attained some rate of speed, when the exhaust gradually became weaker on one side, until at a high rate of speed it was quite feeble and almost indistinct, thus reducing, in a remarkable degree, the efficiency of the machine.



CARDS FROM A CORLISS ENGINE

Numerous attempts were made to locate and remedy the trouble, with but one result; that of failure. Finally, the indicator was resorted to. A series of cards were taken from the right-hand cylinder, which proved to be all right at the different speeds attained; card No. 2 having been taken from this cylinder at a speed of fifty-six miles per hour.

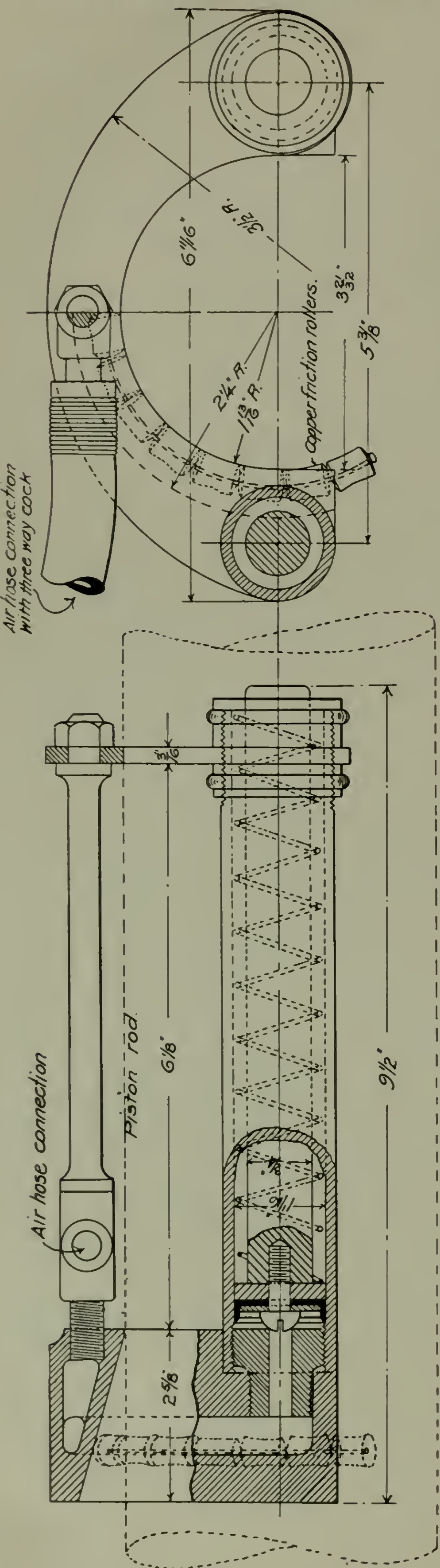
The left-hand cylinder was then piped, the instrument applied, and from zero to a speed of eight or ten miles per hour there was no perceptible falling off of the initial pressure line. From this speed, however, up to the high speed attained, the line gradually fell off, producing a card similar to one secured from an engine that is being closely throttled, showing clearly that there were some obstructions in the steam passage on that side; card No. 1 being taken at a speed of about fifty-six miles per hour.

The engine was taken into the shops, the steam chest and valves removed, and steam pipes taken out; the steam channels were filled with water, and on removing the water it was both measured and weighed, and showed that the steam passages were of the proper area of opening. Next, the steam pipes were taken in hand, and on examination it was found the steam pipe to the left cylinder held about one gallon less water than the one leading to the right. Probing with a wire located an apparent obstruction near the center of same, and on putting the pipe on a planer and cutting it in two, it was found that a large lump, obstructing about two-thirds of the opening or area of the steam passage, was the cause of the mischief. A large sized piece of the steam pipe core had evidently fallen out in arranging the mould in the foundry, and this error on the part of the foundryman had been the cause of the whole trouble. A new pipe was applied to the engine, and the engine from that time on rendered creditable service, and a great weight was taken from the minds of a number of employes of the mechanical department, whose skill had been baffled in their vain attempts to locate the trouble by the old-time orthodox methods.

The Corliss engine cards shown herewith were taken from an engine driving a large sawmill in Arizona. About twelve cords of wood per day were being consumed in a vain attempt to cut eleven to twelve thousand feet of lumber per day with the engine in the condition shown by cards Nos. 1 and 2. The valve motion was overhauled, properly adjusted and put in condition, as shown by card No. 3, after which, with a consumption of about five cords of wood per day, forty-eight to fifty thousand feet of lumber was cut with ease.

Both of these I consider very good practical lessons in indicator practice.

PNEUMATIC RAM FOR METALLIC PACKING.



One of the neatest of late applications of compressed air is that shown in our engraving, which gives quite full details of a pneumatic ram for compressing the spring in metallic packing to get the gland in place. We are permitted to illustrate this device through the courtesy of Mr. Herbert Roberts, superintendent of motive power of the Norfolk & Southern, the general foreman of whose shops at Berkley, Va.,—Mr. R. P. Schilling—designed it.

The device consists of a frame which, in operation, is laid upon the piston rod. This frame carries in its two lower longitudinal members two plungers, which, upon the admission of air through the ports shown, emerge from their casings quickly and strongly. They carry the gland to its place squarely, as may be readily understood from a study of the engraving. In operation this device does not get soft rings out of shape, as is so often done with a bar, because it is impossible to get a central purchase on a gland with a bar to prevent cocking. As is well known, soft rings are very often made defective in this way, causing them to blow and leak steam the first time put in service.

An important feature of this ram is that it does not disfigure or mar the piston rod or valve stem. The purchase against the rod is obtained by the use of the copper friction rollers shown. These rollers, loosely strung, are laid over the rod and, engaging with the beveled inside face of the rear portion of the ram, effect a firm grip, providing ample resistance against the back thrust when the plungers are forced forward.

This device has shown itself in actual work to be not only simple and cheap, but durable, and an important time and labor saver. With it, one man can easily get a gland to its place. In cases where air plants are not used, the ram can be coupled to the train line of the engine being worked on, or with any engine within reach, for the air hose attached to it has the standard Westinghouse coupling. It is thus very convenient for working on hot engines in round-houses or in the yards.

This device is also readily used in putting in hemp or other soft packing, for it will compress such packing in the stuffing-box as hard as may be desired, thus saving screwing nuts up several times. This ram has gained such favorable attention that it has, we understand, been recently taken up by the Chicago Pneumatic Tool Co., which will shortly add it to its line of pneumatic tools.

NICKEL STEEL IN LOCOMOTIVE CONSTRUCTION.

At the recent convention of the Master Mechanics Association, a report upon the use of nickel steel in locomotive construction was presented by a committee consisting of Mr. Tracy Lyon, chairman, Mr. Pulaski Leeds and Mr. A. E. Mitchell. This report is of especial value, just at this time, when nickel steel is meeting with growing favor for the purposes indicated. There is very little exact knowledge of the nature and behavior of nickel steel—very little, that is, that has been generally distributed among railway men, at least in this country. In fact, here, this material has really been only experimentally used in locomotive work, and so used for but a very few years. Accordingly, the information now compactly presented by the committee merits presentation in practically its complete form. It will be remembered that in a recent issue (July, 1899, page 90) we criticised the specifications for nickel steel for locomotive parts, given in the report as supplied by a "prominent American manufacturer;" and that we, at the same time, questioned the conclusiveness of the tests referred to at the close of the report. This should be borne in mind in reading the report, which, however, because of its value as introducing the subject, we append nearly in its entirety. The report is as follows:

It is only fair to state that this report was not undertaken until late in April and that no more was proposed than to lay the foundation for the work of a future committee on "Nickel Steel."

This material was first brought into practical prominence at the time of the armor plate tests of the Government at Annapolis in 1890. It also came to be used by the Government for deck plates and stay bolts, but it was not until about 1896 that its use in this country began for locomotive construction; first in piston rods, crank pins, axles, and later in fire-box plates, side rods and stay bolts.

Up to this time, however, nickel steel has only been used in locomotive construction in an experimental way, judging from the answers received to the circular to members from this committee. Out of thirty replies, some twenty-five confessed to no experience at all with this metal, and most of the others stated that their experience had been too limited to enable them to give any information on the subject.

There follows some general information regarding nickel steel which has been gathered from the best authorities within reach, both at home and abroad. It is not attempted to give a general history of the use and development of nickel steel, but rather to bring out the features of this alloy which are of practical interest to the members of this association.

Nickel steel is stated to be not a difficult alloy to manufacture, requiring no special furnaces, tools or thermal conditions. The cost of the nickel itself was, until 1875, $6.00 to $7.00 a pound, so high as to make its use for such a purpose impossible, but the opening in Canada of the most extensive nickel mines yet discovered has reduced the price to from 30 to 40 cents a pound.

Although nickel has been alloyed with steel in almost every proportion, what may now be called commercial nickel steel contains from 2 to 5 per cent of nickel. Such a material possesses great uniformity, the nickel being uniformly distributed throughout the ingot and not subject to segregation like other ingredients of steel, although some of the earlier experiments seemed to indicate a tendency, with more than 2½ per cent of nickel present, toward the formation in the heart of the ingot of long needle-shape crystals, which forging, hardening or annealing would not cause to disappear

The addition of the nickel to steel adds particularly the qualities of toughness, durability and resistance to corrosion. Commercial nickel steel may possess the same elongation as ordinary steel with a tensile strength 30 per cent higher and an elastic limit at least 75 per cent higher (Wiggin, *Jour. I. & S. Institute*). This greater strength, and particularly the higher elastic limit, would appear to make its use for structural material, boilers and machinery, far more advantageous than ordinary steel, especially where a saving in weight is desired and the parts are subjected to alternating stresses.

With increased steam pressures, boiler plates two inches and more in thickness are demanded, bringing with them serious difficulties in handling and construction which it may be possible to obviate by using nickel steel plates 25 or 30 per cent thinner.

Most of the nickel steel made in this country contains about 3 per cent of nickel, and it is stated that such material can be worked without difficulty; rolled, forged, pressed in dies without cracking, flanged, punched, welded and machined. There seems to be no doubt, however, but that nickel steel cannot be machined as easily as low carbon steel. It takes the edge off tools very rapidly and the finishing cut is apt to sliver. The best of machinery and tools are required to cut a clean thread on stay bolts. One authority says that an alloy containing 1 per cent of nickel can be easily welded, but that with more nickel the difficulty of this operation increases. With more than 5 per cent of nickel, all of these operations become considerably more difficult. A French authority states that it requires ten times more time to corrode a 5 per cent nickel steel when dipped in dilute muriatic acid than an ordinary soft steel containing 0.18 carbon. Other experiments, made by leaving planed plates exposed to the action of sea water for a year, showed a loss

TABLE I.

	C.	Mn.	S.	P.	Ni.
Nickel steel........	0.24	0.78	0.027	0.027	3.25
Hard-forged steel...	0.30 to 0.35	0.60 to 1.00	0.03 to 0.05	0.03 to 0.05	. . .
Forging steel......	0.25 to 0.30	0.60 to 0.80	0.03 to 0.07	0.03 to 0.06	.....

TABLE II.

Shape.		Kind.	Ultimate strength. Lbs. per sq. in.	Elas Limit.	Elastic Ratio. Per cent.	Elong. 8 in. per cent.	Elong. 2 in. per cent.	Red. Area.
Rounds	a......	Nickel	86,015	63,575	73.9	20.19	34.00	46.3
	b.....	Hard forging .	87,663	58,055	66.2	16.70	24.44	30.3
	c......	Forging......	78,066	51,793	66.3	23.94	24.44	52.0
Angles.........		a....	86,960	58,553	67.3	21.75	39.66	50.5
		b...........	87,820	54,153	61.7	19.25	34.83	43.3
		c	76,970	49,544	64.4	19.25	34.83	49.6
Universal plates Longitudinal...		a	85,773	58,410	68.1	21.08	39 25	52.0
		b.	82,773	50,163	60.6	20.50	37.67	47.0
		c...........	78,996	46,654	59.1	26.78	37.67	52 1
Universal plates Transverse		a	86,417	58,203	67.4	16.50	28.92	36.1
		b...........	85,173	50,000	58.7	18.83	23.17	27 4
		c....	85,173	50,000	58.7	18.83	23.17	27.4
Sheared plates. Longitudinal...		a....	85,337	58,169	68.1	19.00	35.50	48.3
		b...........	85,012	50,000	58.8	22.10	39.40	48.4
		c...........	78,918	49,128	62.3	22.03	39.40	50.8
Sheared plates. Transverse ...		a	84,377	57,260	67.9	17.13	32 50	43.4
		b.	84,327	50,000	59.3	21.71	37.00	41 3
		c...........	84,327	50,000	59.3	21.71	37.00	41.3

The result of a recent comparative test of nickel steel stay bolts as compared with iron is also given below:

Diameter.	Tensile.	Elongation.	Per Cent Reduction.
.894	52250	Iron. 8 inches 20.5 4 " 30.0 2 " 40.0	47.1
.865	60560	Nickel Steel. 8 inches 27.0 4 " 38.0 2 " 52.0	69 2

by corrosion of nickel steel plates of 1.36 per cent; of mild steel 1.72 per cent; wrought iron 1.89 per cent. A nickel steel has been offered for use for locomotive tanks on account of its non-corrosive qualities.

The Government specifications for the nickel steel propeller shafts of the U. S. S. Brooklyn required a tensile strength of 85,000 pounds and 50,000 pounds elastic limit. The navy appears to be using nickel steel very extensively now, and provides the following general specifications covering its present use:

HIGH-GRADE MACHINERY FORGINGS.—To have a tensile strength of not less than 95,000 pounds, elastic limit not less than 65,000 pounds, elongation not less than 21 per cent in two inches. Oil-tempered and annealed. Used for main engine shafting, cross-head pins, connecting rods, piston rods, tie rods, valve stems, links, eccentric rods, etc., with their bolts, nuts, keys, feathers, etc.

CLASS A, NO. 1, MACHINERY FORGINGS.—To have a tensile strength of not less than 80,000 pounds, elastic limit not less than 50,000 pounds, elongation not less than 25 per cent in two inches. Oil-tempered and annealed or not, at option of manufacturer. Used for columns and other stationary parts of the main engines.

CLASS A, NO. 2, MACHINERY FORGINGS.—To have a tensile strength of not less than 80,000 pounds, elastic limit not less than 45,000 pounds, elongation not less than 26 per cent in two inches. Annealed only. Used for bolts or studs in flanges of steam cylinders, valve chests, steam and water pipes.

An ultimate resistance of 90,000 pounds can be obtained from 3 per cent nickel steel with very low carbon, say 0.175, when to obtain this strength in ordinary steel would require at least 0.50 carbon, sufficient to make the material so brittle as to be unreliable. It is claimed that with the right treatment an ultimate resistance of as much as 135,000 pounds can be obtained with steel containing about 3 per cent of nickel (J. B. Nau, *Annales des Mines*). In general, the elastic limit of nickel steel may be depended upon to be above 50 per cent of the ultimate resistance.

H. H. Campbell, in the *Journal of the Iron and Steel Institute*, gives the results of some tests of nickel steel as compared with other steels. The analyses are shown in Table I and the tests in Table II. [Se page 207.] Four tons of nickel steel were made, cast into two ingots and rolled to the various shapes mentioned.

A prominent American manufacturer gives the following specification as proper for nickel steel parts of locomotives:

SPECIFICATIONS.

3 per cent Nickel Steel.	Minimum Tensile Strength.	Maximum Tensile Strength.	Minimum Elongation.	Elastic Limit.	
Crank pins................	78,000	84,000	25% in 2 in.	½ of Ultimate	Oil-tempered.
Piston rods........	78,000	84,000	25% in 2 in.	" "	
Driving axles.........	74,000	80,000	30% in 2 in.	" "	
Side rods.................	60,000	68,000	25% in 2 in.	" "	
Fire-box plates...........	60,000	68,000	20% in 8 in.	" "	
Stay bolts....	58,000	66,000	20% in 8 in.	" "	

Maximum P. 0.03, S. 0.03, Mn. 0.40, C. 0.25, Si. 0.03.

From some experiments made in Belgium in 1894, comparing ferro-nickel steel containing carbon 0.06 and nickel 7.5, and a high carbon steel containing carbon 0.55. the following general deductions as to the comparative results of hardening and tempering may be made: In the natural state the carbon steel was considerable superior to the ferro-nickel in point of limit of elasticity and ultimate resistance, but showed a much less elongation and contraction. When hardened in water at 900° or in oil, the ferro-nickel showed itself to be the superior at every point, still retaining a silky fracture, while the fracture of the hardened carbon steel was dry and granular. When annealed at 500° after hardening, the difference was not so marked, the carbon steel showing a greater ultimate resistance, but an inferiority in other respects. These tests show an ultimate resistance of the ferro-nickel of from 76,788 pounds per square inch in its natural state (elastic ratio 75 per cent) to 177,750 pounds when hardened in water (e. r. 85 per cent), and 141,631 pounds when hardened in oil (e. r. 97 per cent). The carbon steel showing 122,292 pounds (60 per cent), 104,943 pounds (72 per cent), and 132,815 pounds (76 per cent), respectively.

The results of quite exhaustive tests of nickel steel made by the St. Jacques Steel Works in France, are of sufficient practical interest to be quoted here in full. These permit the classification of the metal into three different groups :

"1. Steels containing 2 to 5 per cent of nickel. Their resistance increases with the percentage of nickel, especially when the carbon content is low. When carbon reaches 0.50 per cent or more the presence of nickel has little influence. Steel of this class forges and rolls well. When hardened, the ratio of elastic limit to ultimate resistance becomes very great.

"2. Steels containing from 10 to 20 per cent nickel. The resistance increases again with the amount of nickel. An addition of 0.10 per cent of carbon increases the ultimate resistance from 42,660 pounds to 92,430 pounds. Such steel containing 20 per cent nickel has a resistance of 156,420 pounds. If at the same time the carbon increases up to a certain limit, a resistance of more than 284,000 pounds can be obtained. The upper carbon content, at which the resistance of a 10 per cent nickel steel begins to decrease again, is 0.50 per cent.

"Steels of the second class do not harden much, and do not harden at all when the carbon is higher than 0.10 per cent; 20 per cent nickel steel never hardens. All are very brittle. They forge and roll well, but when containing more than 0.10 per cent carbon they cannot be machined.

"3. Steels containing from 20 to 25 per cent of nickel. Their elastic limit, as well as ultimate resistance, is low. They have great elongation, and are nearly free from brittleness. When forged at a low temperature without annealing, their elastic limit increases notably, and has reached 78,000 pounds, with an ultimate resistance of 113,700 pounds, and an elongation of 25 per cent.

"With carbon content of less than 1 per cent, the steel can be easily forged and rolled. Steel with 1 per cent of carbon can be forged between 500 and 1,000 degrees with light blows. Machining is difficult, but not impossible.

"From these tests it results that only the steels of the first and third classes can be used for practical purposes, the steels of the second class being too brittle and too difficult to machine." (A. Abraham in *Iron Age*.)

The suitability of nickel steel for tires is particularly mentioned. "The usual test of a tire is that it should stand compressing one-sixth of its diameter without cracking, but one of nickel steel stood compression from a diameter of 39½ to 19 inches without signs of fracture. A crack appearing in the metal does not develop as in carbon steel, and this renders it peculiarly applicable for shafts and axles." (W. Beardmore in *Jour. I. & S. Inst.*)

The experience of one of this committee with two piston rods of commercial nickel steel would confirm in a way this latter statement. After having been in service for two years, transverse cracks appeared extending over about one-third of the circumference of the rods, and of a maximum depth of $\frac{3}{16}$ inches. When removed, however, the rods could not be broken with the heaviest sledges, one being finally fractured in a hydraulic press, while the other had to be drilled in two. These rods appeared to be soft, and the wearing surface did not glaze over, although no unusual wear of metallic packing was observable

A user of nickel steel locomotive crank pins states that there seemed to be quite a variation in the hardness of different pins in the same lot, as evidenced by the behavior of the metal under the tool, and that the reduction in diameter of the softer pins under the pressure of the burnishing roll was particularly noticeable.

Another reports the trial of nickel steel bolts in place of iron (where the latter were failing and could not be made larger), but with no benefit.

A few members reported the recent use by them of nickel steel crank pins for locomotives, piston rods and fire-boxes. Among the few comments made was one which referred to the rough appearance of nickel steel fire-box sheets, and another that it appeared, from a limited number of nickel steel piston rods in service, that they were more apt to break than those of ordinary steel. (No particulars given.)

It has not been attempted to touch on the use of nickel steel as a material for castings, but much may be looked for in that direction.

The committee performed a good service in giving in its report a list of references to the literature of the subject, and this list we append as follows:

"Alloys of Nickel and Steel," Jas. Riley.—*Journal Iron and Steel Institute*. Vol. I., 1889.

"Magnetic Properties of Alloys of Nickel and Iron."—*Proceedings Royal Society*. Vols. 47, 48, 50, 1890.

"Nikkel-forekomster og Nikkel-produktion," Kristiana, 1892.—*Journal Iron and Steel Institute*, Vol. II., 1892; Vol. I., 1893.

"Production in the United States of Heavy Steel Engine, Gun and Armor Plate Forgings."—*Transactions Naval Architects and Marine Engineers*, Vol. I., 1893.

"Nickel Steel."—*Industries and Iron*, November 2 and 23, 1894.

"British Armor and Ordnance."—*The Engineer*, March 23, 1894.

"The Armor Plate Question."—*Engineering Magazine*, December, 1894.

"The Present Status of Face-Hardened Armor."—*The Iron Age*, December 6, 1894

"Notes on the Metallurgy of Nickel in the United States."—*Transactions American Institute Mining Engineers*, Vol. XI.

"The Development of American Armor Plate."—*Transactions Franklin Institute*, Vol. CXXXIII.

Stahl und Eisen.—Nos. 4, 8, 10, 19, 1893; Nos. 11, 12, 1894; No. 1, 1895.

"Nickel and Nickel Steel," F. L. Sperry.—*Transactions American Institute Mining Engineers*, March, 1895.

"Nickel Steel and Its Advantages Over Ordinary Steel," H. A. Wiggin.—*Iron and Steel Institute*, Vol. II., 1895.

"High-Grade Steel," J. C. Danziger.—*Detroit Engineering Society*, June, 1896.

"Nickel Steel as an Improved Material for Boiler Shell Plates, Forgings and Other Purposes," W. Beardmore.—*Institute Naval Architects* (Br.), April, 1897.

Journal Iron and Steel Institute, Vol. II., 1897, W. Beardmore; C. E. Guillaume.

"Steel for Forgings," A. L. Colby.—*Engineers' Club*, Philadelphia.

"Nickel Steel for Crank Pins and Axles," H. K. Porter.—*Western Railway Club*, February, 1898.

"Tests of Nickel Steel Stay Bolts."—*Railway Gazette*, February, 1898.

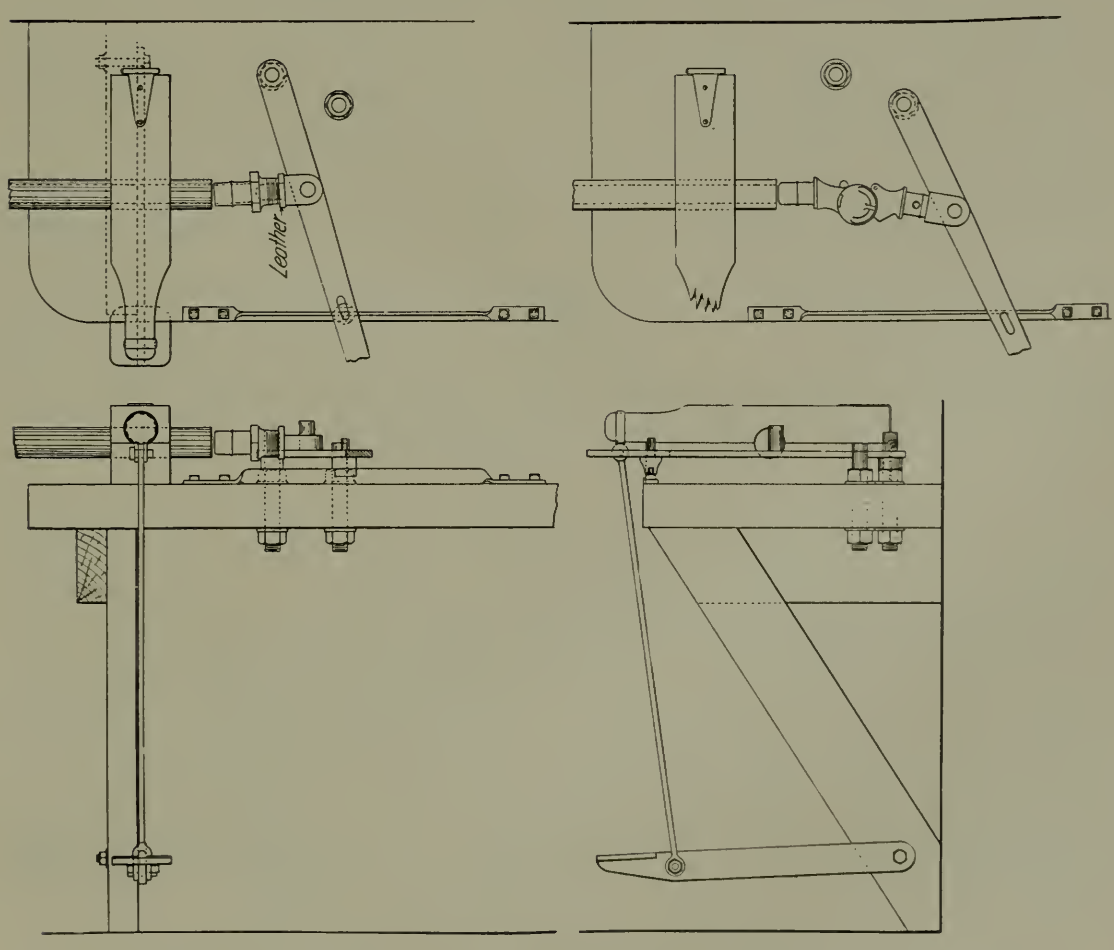
"Improvement in the Manufacture of High-Grade Boiler Materials."—*Railway and Engineering Review*, April 22, 1899.

"Special Nickel, Chromium and Silicon Steels" (*Annales des Mines*), A. Abraham.—*Iron Age*, February 2, 1899.

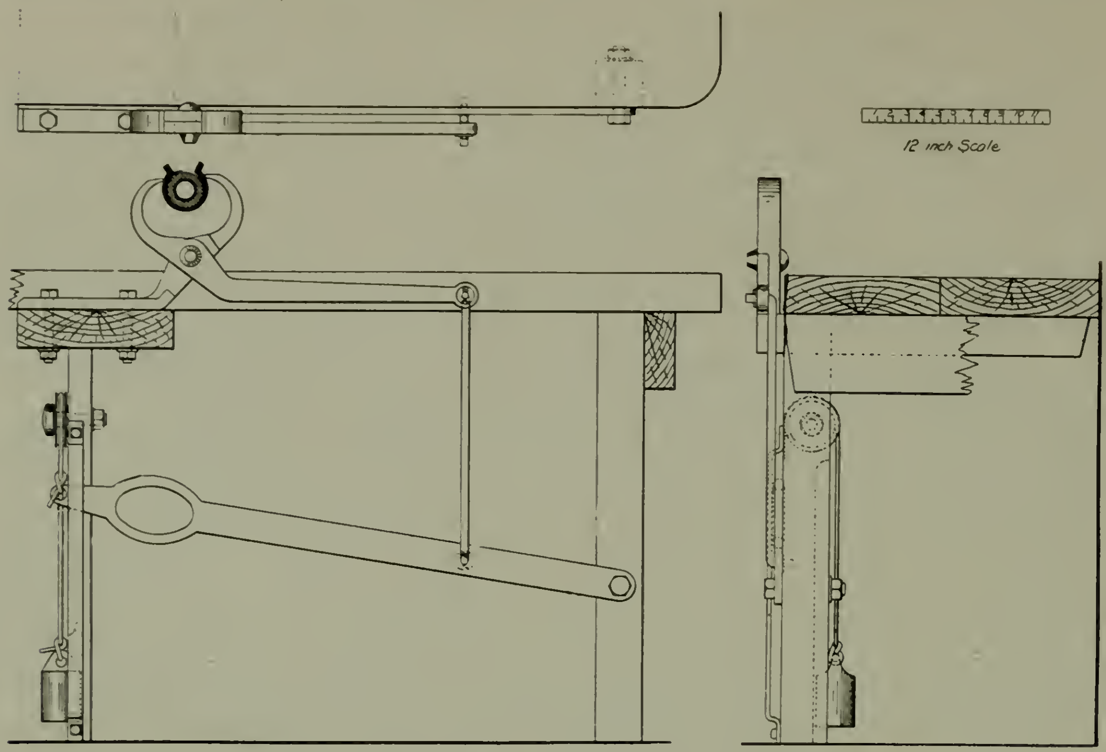
"Nickel Steel," H. K. Landis, A. I. Mg. E.—*Engineering Magazine*.

RIGS FOR FITTING UP AIR HOSE.

The fitting up of brake hose by compressed air appliances is followed in many different ways at different shops. Wherever there is an air supply, shop-men have exercised their ingenuity in devising clever ways and means of utilizing that power to aid them in rapid hose fitting. But there are many places where hose has to be fitted up, that are without air supply, and it was at one of such places that the devices here shown were built, in order that the old time bench methods might be improved upon. Our first engraving shows a rigging for fitting on the coupling and the nipple; and the second, a device for rapid clamping. The drawings are so complete that the operation of these riggings may be readily observed. In putting on nipples and couplings the hose is held, as shown, in a clamp, the foot treadle holding it firmly; the nipple, held in the lever, is then brought around and forced into the hose. A rod or tube may be placed in the hose to stiffen it if desired; but it is not necessary. The clamping is effected by the tong-shaped appliance shown,



Rig for Fitting up Air Hose—Nipples and Couplings.



RIG FOR FITTING UP AIR HOSE—Clamps.

operated by the counter-weighted lever, below and in front of the bench.

These devices were designed by Mr. H. Herwig, air brake inspector of the Chicago, Lake Shore & Eastern Ry., at Chicago, Ill. They are simple, but very effective. With them, one man can fit up fifty hose complete in two hours; whereas, by the old way, the same amount of work takes two men six hours.

STATION TREATMENT OF WATER—SOUTHERN PACIFIC RAILWAY.

It has long been considered by many, that the ideal way to purify water for use in locomotive boilers is to treat it before it reaches the engine tank; but the cost of the necessary plant has prevented the general following of this practice. The Southern Pacific Railway has, however, gone into this matter quite extensively, and with satisfactory results. In the report on "Best methods of preventing trouble in boilers from water impurities," presented at the June convention of the Master Mechanics' Association, an account of the practice on that road is given as furnished to the committee by Mr. Howard Stillman. The latter's description of the plant and its operation follows:

The Southern Pacific have introduced and have in operation at present, four plants for treatment of hard scaling waters. By introducing quicklime and soda ash in such proportion as required in water to neutralize carbonic acid and convert incrusting sulphates, allowing the precipitates to settle in ample tankage and drawing settled water from surface of tank, the method prevents corrosion, and eliminates about 80 per cent of the scale salts. The accompanying engraving shows the plant at Santa Paula, Cal. As shown, it was designed to be entirely automatic, but it has been found best to operate it for a required period

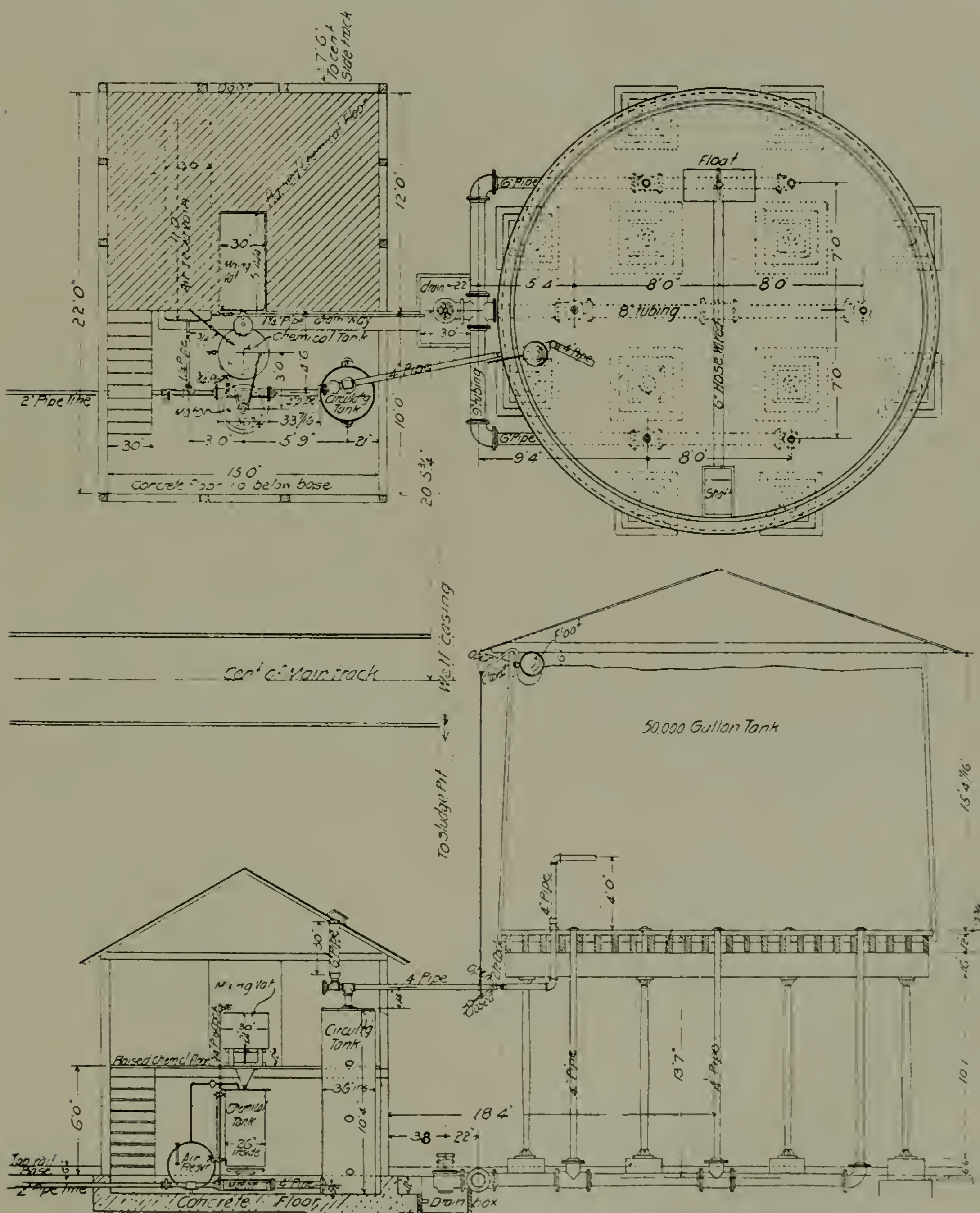
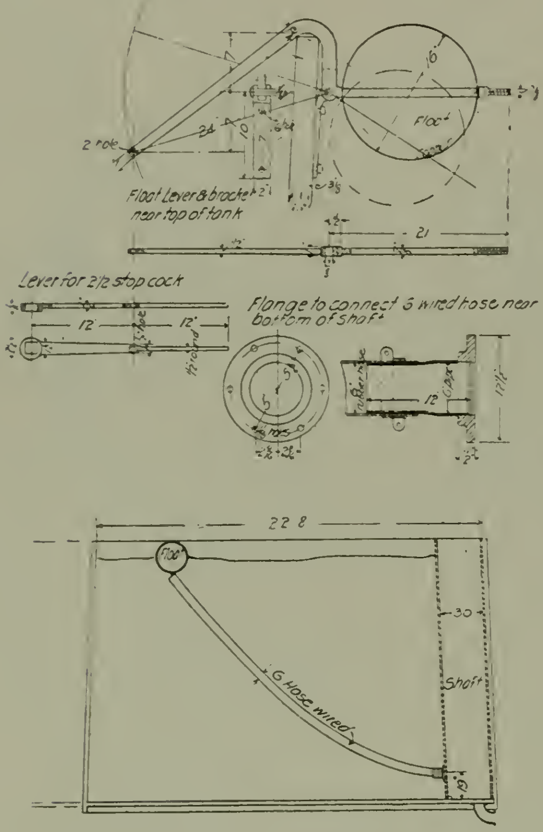


Fig. 6.

Water Purifying Plant, Santa Paula, Southern Pacific Ry.

at one time during the day, so as to allow more time for settlings. The float valve shown is, therefore, not in use, and the water is cut out at a valve in the main, just before entering the motor shown in the plan. This motor consists simply of a horizontal water wheel, enclosed in a casting, with a cover about as heavy as locomotive cylinder heads. The wheel has ample clearance within its case, and is driven from a nozzle at the entrance of the water main to the water casing. The shaft of the water wheel projects through a stuffing box and carries two small wheels. One of these wheels is a gear, engaging in a larger gear driving a regulating valve for the purpose of controlling the chemical feed from the upright chemical tank, on the lower floor; the flow from the chemical tank, through the regulating valve, is controlled by air pressure to suit the conditions under which the apparatus works, and gauged to be proportioned to the average hourly rate of flow through water main.



DETAILS OF TANK FIXTURE.

The second wheel on the motor shaft is a sprocket, and drives a central shaft and paddles, within the upright chemical tank. When in operation, this paddle churns up the chemical mixtures while feeding out.

The chemical solution, after passing the regulating valve, flows on through a ¾-inch pipe which taps into the water main at a point just before entering the large or circulating tank on the ground plane. This upright tank contains alternate baffle plates, to effect mixture of the chemical solution with the water in its upward flow through the circulating tank.

The water discharges into the service tank about four feet from the bottom through a horizontal nipple, giving a slowly rotating motion to the treated water. A wired 6-inch hose connects with the tank valve, the upper end of the hose being attached to a float, and by this means, the upper (open) end of the hose draws water about a foot from the surface, rising and falling with the level. The discharge from the gravity supply at Santa Paula is at a constant rate of 6,200 gallons per hour, and the amount of water used per day is about 24,000 gallons.

Precipitated matter in the service tank is removed by the spider-drain system of tank bottom outlets, discharging at the 9-inch mud valve, shown just between the chemical house and tank foundation on the ground level. The water still contains about one-fifth the incrusting matter, but some falls in the boiler as sludge, and does not stick to the boiler inside.

The plant at San Luis Obispo is similar in principle to the one described, but circumstances are somewhat different, and the water is also of a different character. There are engines at San Luis Obispo using the treated water almost entirely, and it is now possible to let them go with boiler washing once a week, where formerly they were washed every night. Hard scale does not form with washing once a week, where formerly the washing daily did not remove the hard scale. It should be understood that the treating plants referred to are each on a different division of the road, and waters are poor on either side of points at which the plants are established. It is, therefore, difficult to state a figure for locomotive service that is reliable as to amount saved for boiler washing, etc.

The cost of water treatment at treatment plants is:

Santa Monica	4.00 cents per 1,000 gallons.
Santa Paula	2.25 " " " "
San Luis Obispo	2.30 " " " "
El Paso	2.50 " " " "

The analysis of the water from the Santa Paula plant before and after treatment, shows it to contain:

	Treated.	Untreated.
Carbonate lime	1.98	10.85
Sulphate lime	Trace	4.36
Carbonate magnesium	2.68	1.05
Sulphate magnesium	.70	7.00
Silica	.41	1.05
Alkali carbonates	1.28	....
Alkali sulphate	20.53	8.51
Alkali chlorides	4.20	4.20
Total matter	31.78	36 92
Total incrusting	5 67	24.21
Total non-incrustings	26.11	12.71

Reagents for treating 1,000 gallons: Lime, ¼ pound; soda ash, 1¼ pound.

Directions for care and management of water-treating plants at Santa Paula and San Luis Obispo.

The treatment is effected by injecting into the water main, by air pressure through the feed regulator attached to the motor shaft a chemical mixture from the upright chemical tank on the lower floor.

The chemical tank is filled, as the mixture is required, from the mixing vat on the upper floor.

The open vat contains the stated amount of chemicals, with water, for 10 inches depth of liquid when mixed and ready for use.

Directions for mixing chemicals in the open vats.

Weigh out the required amount of lime and place in the vat, covering with water. Allow to stand about half an hour, by which time the lime should be thoroughly slacked. Now put in water until nearly the required 12-inch depth, and stir thoroughly, adding the soda ash by sprinkling into the mixture from end of a shovel, and continue stirring with the hoe to dissolve the soda.

Note.—If the soda ash is dumped into the vat in a mass, it will form the equivalent of sal soda, and not dissolve easily.

Now fill the vat to the 12-inch depth with more water and additional stirring.

The above mixture may be made up in one-half or other proportional quantities and kept on tap as required for the upright chemical tank on the lower floor. Care should be taken to stir up the solution while being run off from the vat.

Any accumulation of sand or rock remaining in the vat when drained, should be shoveled out and thrown away.

When held in the open vat, the chemical mixture will keep its full strength for a week or more.

When run off into the chemical tank, with all cocks closed, the mixture will keep indefinitely.

All chemicals should be kept dry before use.

Care of settling tanks.

No rule can be established for the disposal of sludge. The valve outlet to the spider-drain attachment to the tank will require attention about once a month, probably, and should be opened at a time (as near as possible) longest since the treating plant has been in operation.

The valve should be wide open only long enough to draw off the heavy sludge.

THE ENGLISH have been quite stirred up over the recent sales of American locomotives for their railways; but it is not the first time that they have been so worried. In 1839 they had a little scare, occasioned by some bidding by the Baldwin works. A paragraph appearing in the

"Railway Magazine" for November 9, 1839, has been resurrected. It bore the title of "A Pill for Locomotive Makers of England." It must have been a bitter pill, judging from the comment made. The paragraph reads as follows:

"We have just seen a sort of prospectus of Messrs. Baldwin, Vail & Hufty, of Philadelphia, offering to supply England, Germany, etc., with locomotives of 12½-inch cylinders for £1,646; 12-inch for £1,543, and 10½-inch for £1,337½; an additional sum of $1,710 will purchase duplicate driving wheels, axle and eccentrics, tenders and truck wheels and axles, a set of brasses and twenty copper tubes. If five engines are ordered at once, these gentlemen promise to leave in the hands of the purchaser, for twelve months, £100 for every engine, as a guarantee that the expenses of repairs for the first year, if the engines do not run above twenty miles per hour and over 100 miles per day, shall not exceed $500. To these promises a long list of testimonies is added. We have before us drawings of these engines, and smutty-looking things they are. Their cylinders are placed outside near the front of the engine, and the connecting rod is attached to the driving wheels near the end of the cylinder. We should be sorry to condemn any man's wares untried but, in our opinion, from the appearance of the machines, Messrs. Baldwin & Co. are either beings of some years past, or have actually mistaken a retrograde for a direct motion in the march of improvement. We should not hesitate to say that one of these engines is not to be compared with one of our best of an equal power in economy of working."

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

AUGUST MEETING.

The regular meeting of the Car Foremen's Association of Chicago, was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, August 10.

MISCELLANEOUS BUSINESS.

President Morris called the meeting to order at 8 p. m. Among those present were:

Bond, L. E.	Gruhlke, E.	Kramer, Wm.	Showers, G. W.
Blohm, T.	Guthenberg, Bruno	Kroff, F. C.	Smith, R. G.
Bates, Geo. M.	Gardner, L. S.	Manthey, H. H.	Spohnholtz, J. C.
Callahan, John	Grieb, J. C.	Mattes, J.	Stocks, Jas.
Coleman, T.	Green, C. E.	Miner, W. H.	Stuckie, E. J.
Cook, W. C.	Hultman, Chas.	Morris, T. R.	Swoboda, J.
Constant, E. T.	Hansen, A. P.	McAlpine, A. R.	Thinerge, J. C.

Cather, C. C.	Helwig, H.	Nightengale, H.	Van Vleit, J.
Davies, W. O., Jr.	Hensel, Fred	Olsen, L.	Wensley, W. H.
Etten, L.	Kehm, H. C.	Reinhard, F. B.	Weschler, Henry
Gehrke, Wm.	Konze, Wm.	Saum, Geo.	Wentsel, Geo.
Groobey, Geo.			

Secretary Cook: We have applications from L. E. Thomas, of the Illinois Central Railway at Centralia, Ill., and G. M. Bates, of the C., B. & Q. R. R., at Chicago. They have been approved by the executive committee and will be enrolled as members.

President Morris: The names of the committees that were provided for at the last meeting are as follows: Committee on Revision of the Constitution and By-Laws: J. C. Grieb, chairman; G. W. Showers, C. C. Cather. Committee on Annual Entertainment: W. H. Wensley, chairman; H. C. Kehm, T. B. Hunt, John Thrall, William Miller, George Groobey and H. V. Kuhlman.

THE INTERCHANGE RULES.

The first question for to-night's work is discussion of the changes made in the M. C. B. rules, effective September 1, 1899. The Secretary will please read the changes, section by section, and they can be taken up and discussed.

[The Secretary read, section by section, the changes that had been made in the rules. The following only were the subject of discussion]:

Secretary Cook: Rule 3, Section 19a. A new section is added, following Section 19, as follows:

"Journal bearings which require renewal by reason of change of wheels or axles, for which the delivering company is responsible. (Delivering company responsible.)"

Mr. Reinhard: Suppose we receive a car with a cut journal and a defect card for it from connecting line; would that cover the brass, or would you have to ask for another defect card?

President Morris: The defect card would have to cover everything you billed for.

Mr. Reinhard: That would be my understanding, but my question is, whether it would go or not.

Mr. Kramer: I think that is all right. If the journal is cut badly enough to come through the journal box, and the journal box is cut, the journal box should be carded too.

President Morris: Mr. Reinhard's question was, whether journal bearings would have to be mentioned on the defect card.

Mr. Kramer: I think that is all right; they should be; the delivering road should be responsible for them.

Mr. Kroff: Suppose brasses are worn out, would you ask delivering company for a defect card in case of cut journal or bent axle? I think the rule is good enough the old way.

Mr. Kramer: I think if the brass has been worn out before it was delivered, the delivering road was privileged to renew the brass before the journal got hot on account of the brass being too thin; therefore, I think the delivering road should be responsible for the cut journal and cut brass.

Mr. Grieb: I wish to ask another question regarding what would be done in a case of slid flat wheels interchanged. If you had a pair of flat wheels under a car, and there was a card on it, and you had to apply new journal bearings, would you ask for another card for the journal bearings, or how would you dispose of the charge for the bearings?

Mr. Kramer: In my opinion, I should say that the delivering road should be responsible for the renewal of the brasses, if they should be renewed.

President Morris: We would like to have a few opinions on this subject. It is one that is interesting, and it is bound to bring out more or less discussion at one time or another. We had better have an understanding in regard to it now.

Mr. Gradl: Section 21, of Rule 3, says delivering company is responsible for journal bearings. (Reads the rule.)

Mr. Stuckie: For instance, if the Chicago, Milwaukee & St. Paul carded for a cut journal or a slid wheel, and the Belt delivered the car home—who would be responsible for the brass then? The Belt is the last delivering road.

President Morris: The delivering company is responsible. That seems to be clear. The Belt would be the delivering company, and they would be responsible, but they might shift the responsibility, if their records showed some one else in for it.

Mr. Stuckie: The St. Paul cards for the slid wheels.

Mr. Grieb: It seems to me that the responsibility for the whole deal, both for journals and slid wheels, as well as the brasses, must rest with the party that cards for it, under these rules.

Mr. Oleson: My opinion is, that where there is a pair of wheels changed, which is chargeable to the delivering road, such as slid wheels and cut journals, it should be charged to the delivering road if they remove the brass; but where a pair of wheels is changed on account of being slid flat, the owner should be charged, because he is getting the benefit of it.

Mr. Wensley: I think if I was taking out a pair of wheels with cut journals, and the bearings were damaged on account of those journals, I should expect a card for the bearings as well as the journals. If bearings are worn out, I should certainly charge owners for them.

Mr. Reinhard: I don't believe the gentleman sees into what I am trying to get at. The question is, suppose a car is delivered with cut journals, would the card covering the cut journals be authority for the brasses, or would you have to get an additional card, or would it have to be enumerated on this defect card, "one cut journal and so many brasses?" For instance: In renewing end posts you can remove two boards of siding and bill for it; but the question in my mind is whether this one card will cover two brasses which you will have to put in, in case the journals you apply in replacing those cut journals have to have two new brasses—whether this one card will be authority to make bill for the two brasses and the cut journals.

Mr. Stocks: This rule, so far as I can see, don't say anything about defect cards, whatsoever; it simply says that the road making repairs—that is, replacing a pair of wheels—is responsible. If they renew the brass, they will do it at their own expense. If you take a car with a cut journal, it is unfair usage. If the brass is destroyed and the journal is cut, of course you would have to card for both; but this rule, I believe, just means—we will say, for instance, bent axle, and you change the wheels on your road and the old brasses will not fit the new journals, being a different size. Well, then, it would be necessary to put in new brasses. You have to put them in at your own expense. Of course you can use the old brasses. That is the way I look at the rules, and I believe it is correct.

Mr. Grieb: In order to settle this question, I would make a motion that, according to the understanding of this association, in renewing journal bearings on account of defects to either wheels or axles, for which the owner is not responsible, the responsibility for the bearings will rest upon the party who accepts responsibility for the renewal of the wheels or axle; whether one bearing is renewed at that time, or two. The very fact that you have treated a car unfairly to the extent of cutting the journal, sliding a pair of wheels or bending an axle, et cetera, places the responsibility for the one or two journal bearings which are interested in the transaction, upon you; but I do not think we ought to make bills on defect cards for any more items than the defect card especially mentions; and in case we receive a car with a cut journal and we find it necessary to renew one or both of the journal bearings, we ought to get another defect card authorizing charge for the bearings, before we put the bill through.

Mr. Stocks: I would object to that, for these reasons: If we get a car with a bent axle, and the other road is willing to take that car on that card, if they change the wheels we can't go beyond the rules as they are written down. The rules state very plainly that the company making the repairs to any car—that is, when they are responsible for the defect—should do it at their own expense. Slid wheel, bent axle, or broken wheel, is unfair usage. But in issuing a defect card, I do not believe I would be in favor of charging them for everything afterwards; it should be stated on the defect card.

Mr. Davies, Jr.: I don't see why we should make a motion to live up to these rules.

President Morris: The motion is, that "It is the understanding of this Association, that according to the section, delivering company is responsible for all brasses removed with wheels having defects for which the delivering company is responsible." It is a question of proper understanding of the rules.

Mr. Showers: The gentleman on the other side of the house refers to responsibility for brasses wherein wheels or axles have been removed on account of defects the owner is not responsible for. I believe we have a decision prior to the issuance of these rules, which has made the owner of the car responsible for brasses. This rule, in my judgment, or this part of a rule, was affixed to overcome that part, wherein journals are cut, axles are bent, wheels are chipped or slid flat. It is more to the company's interest in making repairs to apply a different axle; that is, they can make the change of axle to better advantage than to press off the wheels and apply the same axle. Consequently, an axle may be larger or smaller, and the journal bearings will not fit. Now, to begin with, the owner of the car is not responsible for the wheels, neither is he responsible for the journals; neither is he responsible if the party saw fit to apply a different axle. If it is to their interest to apply a different axle, they should stand for the journal bearings.

Mr. Kramer: That is what I was getting at. It is just like this: if I should deliver a car to another road, with a bent axle, and they should demand of me a defect card for the bent axle, if they haven't got an axle to fit that car, that would not be our road's fault. If the brass should be carded for, it should so state on the card.

Mr. Showers: I believe I misunderstood him a moment ago. I don't mean the party that makes the repairs; I mean the party that is responsible in the beginning, should stand responsible for the brass.

President Morris: That is Mr. Grieb's motion.

Mr. Bates: Mr. Kramer is all right. The Arbitration Committee have decided, time and again, that if you put work onto some other road, you can't dictate how they shall make repairs. Whatever they do, the carding road must pay for. If any road bends an axle and puts the work onto its neighbor, it certainly is responsible for the brass as well as the bent axle.

Mr. Grieb's motion was here put and carried.

Secretary Cook: Rule 5, Section 3c. This section is changed to read as follows: "The joint evidence card shall not be used as authority for rendering a bill, but shall be sent to the company against which evidence is presented, and it shall furnish defect card covering the wrong repairs if it made them. The joint evidence card, accompanied by a proper repair card upon which a bill has been made, shall be used as authority for rendering bills, but if accompanied by such repair card the joint evidence card shall be sent to the company against which the evidence has been presented, and it shall furnish a defect card covering the wrong repairs if it made them."

Mr. Showers: Does this association understand that joint evidence cards are to be signed without, being accompanied by a repair card, where there is no proof that the repairs are wrong?

Mr. Grieb: I would like, for my personal information, to ask Mr. Showers why they should not be signed.

Mr. Showers: I have no reason at all, except it has been refused to us.

Mr. Grieb: It seems to me that any one understanding the use and purpose of the joint evidence cannot object to signing it. It is simply a statement of facts and conditions as they find them—whether repairs are proper or not. I do not see what the absence or presence of a repair card has to do with signing it.

Mr. Showers: The only reason I had was, perhaps, to get some information from the inspectors as to whether in a given case they would refuse to sign joint evidence.

Mr. Wensley: I want the repair card sent along when I sign it, if I don't see the repairs myself. I know one or two men not over fifteen miles away, who, never having seen a car or never having seen the repairs, sign a joint evidence card and fire it back. Last spring we received a request from a party on the West side for wrong repairs to a deadwood 4x10. Two feet four inches was the length of the deadwood. I went down to see the gentleman and asked him to show me his car. He was not present; his foreman was there, but he couldn't find a deadwood any larger than 4x10. They claimed deadwood should be 4½. I took one of my inspectors and went back two or three days afterward and saw the gentleman himself. I asked him to show me his stock on hand. We went through all the stock he had in his yard and he didn't find a deadwood 4x10. If the second man had seen that, he never would sign a joint evidence card. The actual facts in the case are, his deadwoods are 4½x9, and he hasn't any larger. Now, I claim any man who signs a joint evidence card without seeing the repairs is doing wrong.

Mr. Showers: That is not the question. It is a matter of repair card. Would you ask anybody to sign a joint evidence card without seeing the repairs? I must say that if it keeps on, I will have to have more time waiting for men to come and look at repairs, and will also have to enlarge the yard.

President Morris: I don't think it is possible for a railroad to do business in Chicago and hold a car for an inspector to come five to fifteen miles to look at it.

A Member: We keep a man for that purpose.

President Morris: I will say for the St. Paul, that if we get a car with wrong repairs from a foreign road we are not going to hold it over a single train to have a man come to look at the repairs. We can't do it. We will tell them nothing but the truth, and we expect they are equally honest. We hold material fifteen days for inspection. I think it is the practice to hold material, if anyone expresses a wish to see it. As a rule, inspectors don't go from one road to the other, looking for wrong material. They think the other road is honest, and take their word for it. I don't see how else it can be done in Chicago.

A Member: I don't think Mr. Showers is talking on the same argument at all. The question that Mr. Showers is getting at is, if you ask an inspector to come look at a car he will say, Where is the card for that car? he will also say, I won't sign it, unless I can see who made repairs. It is not whether they see it or not.

President Morris: There is nothing in the rules that justifies a person in refusing to sign a joint evidence card merely because there is no repair card on the card showing when these repairs were made.

Mr. Showers: We will admit there is nothing in the rules, but in general practice there is something.

Mr. Miller: I make a motion to the effect, that it is the sense of this meeting that no inspector should refuse to sign a joint evidence card where wrong repairs are made, regardless of whether there is a card on car to show who made the wrong repairs or not.

A rising vote resulted, 42 to 3, in favor of the motion.

President Morris: This winds up the subject, with the statement that there is no change made in the golden rule, which is that everybody should do as he wishes to be done by.

WORN AXLE FILLETS.

We will now take up the next question, which is as follows:

"To what extent are axles found with fillets entirely worn away; what is the general practice in turning up new fillets; what is the customary charge for such work?"

Mr. Kroff, of the Pennsylvania Company, has promised to open the discussion; we would like to hear from him.

Mr. Kroff: I do not know that I can say to what extent the fillets are worn away, but I do know that there are axles with fillets entirely worn away; some are almost entirely worn away. Our practice over on the Pennsylvania line is that axles must be removed from service when the journals have any one or all of the following defects:

1. When the collar has been worn down to 3-16 in. thick.

2. When the journal has been found ½-in. longer than the standard length.

3. When the inside fillet has been worn down to a radius of 1-16 in.

We do not condemn axles simply because the fillet is entirely worn off; that is, if we have a chance to turn up fillets. But in no case will we allow journals to run ½-in. from the standard size. Say, for instance, a journal is 7-in.; if we turn on a fillet that would make it 7½-in., and we condemn the axle; otherwise, we turn a fillet on the other axle. But I do not know to what extent axles do run out of fillets entirely. We have only been practicing that for the last two or three months now. As to the charge, I do not know what the practice is, but I think that 10 cents for turning on a fillet is sufficient pay.

Mr. Grieb: In case you condemn an axle, by reason of not having sufficient metal left without making it more than ½-in. longer than the original size—in case you have such an axle, do you charge the owners for replacing it?

Mr. Kroff: We certainly would.

Mr. Showers: Is it the practice, generally, for railroads to turn up fillets where they are worn on the inside next to the collar?

Mr. Kroff: We do not pay any attention to the fillets on the collar. If the collar is worn 3-16 in. thick we condemn it. The inside fillet is turned, if we have sufficient metal there to turn the fillet up.

President Morris: Do you have the front, as well as the back fillet?

Mr. Kroff: We only have the back fillet.

Mr. Reinhard: This seems to be something new to me. I don't know that I have seen a great many axles that have had fillets entirely worn away or badly worn. When we catch an axle so badly worn as 3-16 in. on the collar, and fillet worn, it is condemned.

Mr. McAlpine: It has not been our custom yet to pay any attention to the fillets. It is a new subject with us. But this week we had a bill sent us for repairing fillet on a new axle on account of fillets worn. I would rather have them make a new bill and charge us for removing the axle.

Mr. Miller: It has been our practice when we find a fillet worn away, to turn it up if the size of the journal permits it. But I would like to ask what would be done in a case of an axle having no fillet on, and the size of the journal only large enough for, say, turning up a fillet 1-16 in. in radius, which cannot be condemned under the rules. If the size of the journal is large enough, so it will permit the turning up of a fillet 1-16 in. in radius,—¼-in. or 3-16 in.,—can such an axle be scrapped if the party saw fit to turn up the journal?

President Morris: Can you answer that, Mr. Grieb?

Mr. Grieb: No, sir; I can not.

President Morris: Can any gentleman answer it by telling what his practice is?

Mr. Kroff: When fillet is worn down to 1-16 in. radius, axle is removed.

President Morris: On foreign cars?

Mr. Kroff: On our own cars.

President Morris: Mr. Miller's question refers to foreign cars.

Mr. Kroff: Well, 1-16 in. radius is not much of a fillet, although I think a man could turn a fillet on there with ⅜-in. radius; ¼-in. radius would leave that axle running for a good many months.

Mr. Gradl: I would like to ask if such charges are being made? I suppose it is a private arrangement, and that each company has its own practice. It seems to me, we run axles as long as we think they are fit to run.

Mr. McAlpine: We have been charged for removing axles on account of sharp fillet, and while the rules do not say anything, yet the Arbitration Committee have decided in case 362 of September, '96, that, "It is believed that axles become dangerous and liable to fail when the journal fillets are worn sharp, and that it is good practice to condemn axles that have no journal fillets."

President Morris: Mr. Kehm, will you state what your practice is?

Mr. Kehm: We have never made such a charge to my knowledge.

President Morris: Have you ever been charged for the work?

Mr. Kehm: Never have; no, sir.

CREDIT FOR REMOVED WRONG BRASSES.

President Morris: We will now take up the next question, in regard to wrong brasses:

"In the case of a wrong brass removed by car owner upon authority of a defect card, what is the proper credit to be allowed as regards weight? Is it an arbitrary credit of one-half the weight of the standard brass applied, or should it be actual weight removed, in accordance with third paragraph, on page 28, of the M. C. B. code of rules?"

Mr. Kehm: We have always allowed an arbitrary credit of 5 or 6½ pounds, as the case may be, and no charge for labor. That has been our practice.

Mr. Showers: As regards credits, I think the practice generally in effect is an arbitrary credit of one-half the weight of the bearing. Possibly, it may be less than a half.

Mr. Weschler: If a defect card is issued for a wrong brass applied and we remove that brass, we allow the owner credit for the actual weight removed. That is the way we understand that section, which says: "Material applied on defect card, in which case the weight and kind of metal removed shall be credited."

Mr. Grieb: I cannot see that the rules provide for any credit other than the arbitrary one-half, which is the rule governing the removal of brasses in general. I do not see that brasses removed on defect cärds should be treated any differently. That portion of Rule 5, recited by the gentleman who spoke previously, also contains a provision which reads, "except as otherwise provided in the rules." Now there is a definite provision made otherwise in these rules for journal bearings.

Mr. Bates: I do not think there is any argument to make on this question, for the reason that the Arbitration Committee has decided that an arbitrary scrap credit is the proper thing to allow on a defect card, in case No. 533.

President Morris: Before adjourning I would like to state that one of the members has suggested for discussion at the next meeting, the comparative efficiency of M. C. B. couplers now in use on freight cars. This is an interesting subject, and will bring out a good many very interesting facts, if the members will give their experience. I believe the intention is to call a spade a spade, and not to try to cover up any particular makes of couplers by any name that would tend to hide their identity. It is something that ought to be very interesting, and we would like to have a full and free discussion.

The meeting here adjourned.

DEVELOPMENT OF GAUGES FOR WORN COUPLERS.

A part of the duties of the committee on M. C. B. couplers, reporting at the last convention of the Master Car Builders' Association, was to define the contour lines more fully when worn. The committee found that this assignment took it into the field of gauges for worn couplers, and it accordingly prepared a brief history of the development of such gauges, from the time that the late Mr. D. L. Barnes designed such a gauge up to the designing of the gauge shown later in this article, which gauge is now before the association for letter ballot as recommended practice. We append this history, quoting literally from the report, as follows:

In taking up this matter of gauges for worn couplers it was found that the first effort to meet the new conditions was made by Mr. D. L.

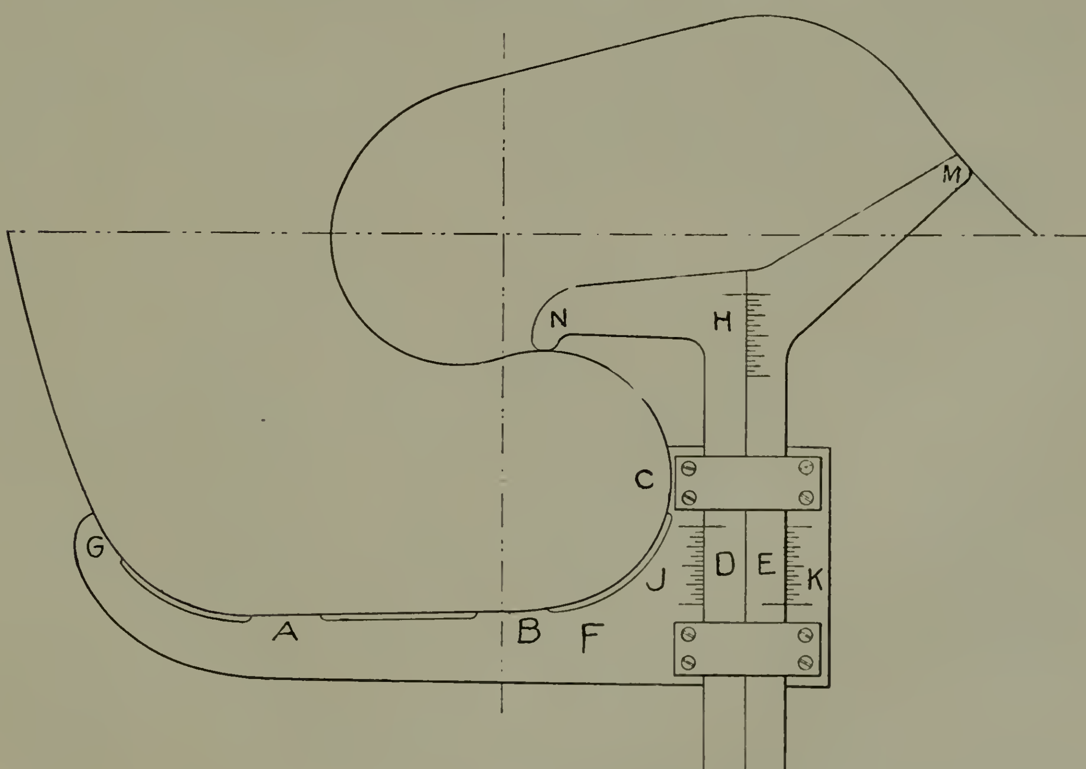


Fig. 1.—Barnes' Gauge.

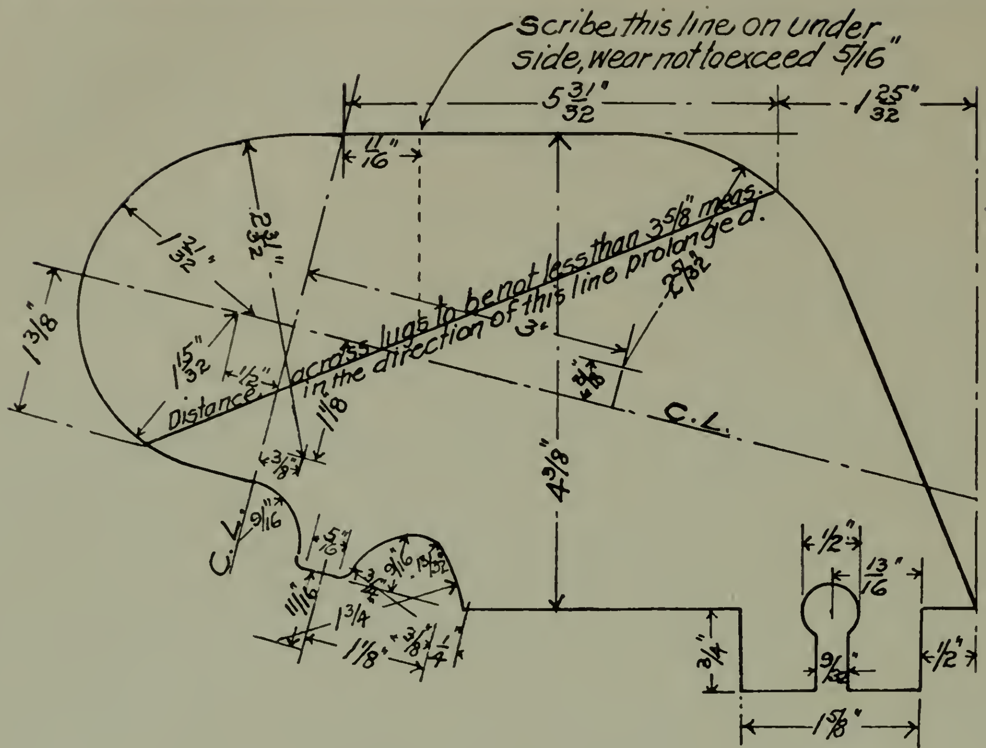


FIG. 2.—B. & O. GAUGE.

Barnes in 1890. His gauge is shown in Fig. 1. His analysis of the effects of wear is quite correct and the gauge is a very ingenious one.

The objections are, first, that it is assumed that the front face of the knuckle is a plane, and permanent in location, which is not by any means correct. Some couplers, unfortunately, even when new, do not have the front face plane, but crowned. This would at once throw slide H D out

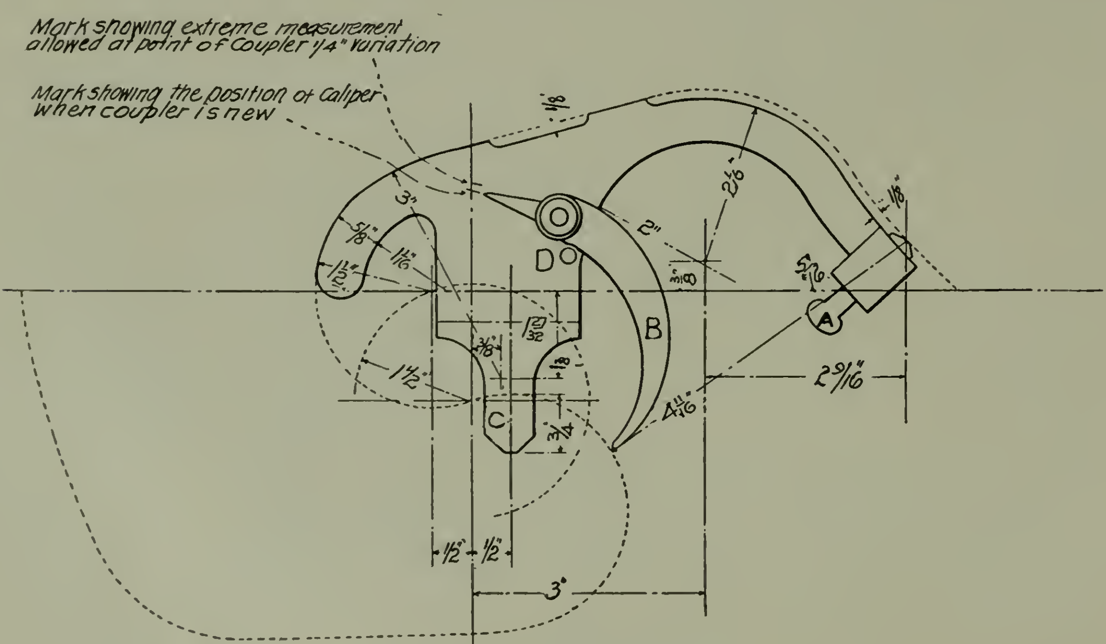


FIG. 3.—FILDES' GAUGE.

of register with scale J. Another objection is that the bearing point of scale L E is not at the end of the guard arm, though that could be easily remedied, but the more fatal defect is that in case of a worn guard arm the point gets still further away from the end, instead of moving in the direction of the length L M of the arm of the slide. The result of this combination of defects is that inspectors would have to be provided with a sliding scale of condemning points to go with the gauge. It is also rather awkward to handle and carry around.

The next attempt is the B. & O. gauge shown in Fig. 2. The objection to this gauge is that it requires the use of a rule by the inspector, together with other defects which will be considered later.

We next come to the gauge in Fig. 3, designed by Mr. Thomas Fildes and shown by Mr. Waitt at the last convention. This was by far the best attempt to solve the gauge problem that had then been made. The trouble with this gauge seems to be that on account of the solid point for wear of inside face of knuckle, it is difficult to drop the gauge into the coupler if the knuckle is not worn ¾ of an inch. It is, therefore, awkward to measure guard arm wear or bending, and wear of pivot pins, lock, etc., in the combinations in which they sometimes occur.

The first step, therefore, in the improvement of this gauge was to arrange to drop it fully down into the contour, and this was accomplished by making the solid point for knuckle wear a slide. It could then be pushed back to the position it should occupy in a new contour, and the gauge would drop into the coupler below the top of the knuckle. For the curved caliper point a slide was substituted. The slide in the guard arm end of the gauge was moved out to the end of the contour, increased in size, strength and accessibility, and the gauge shown in Fig. 4 was thus evolved.

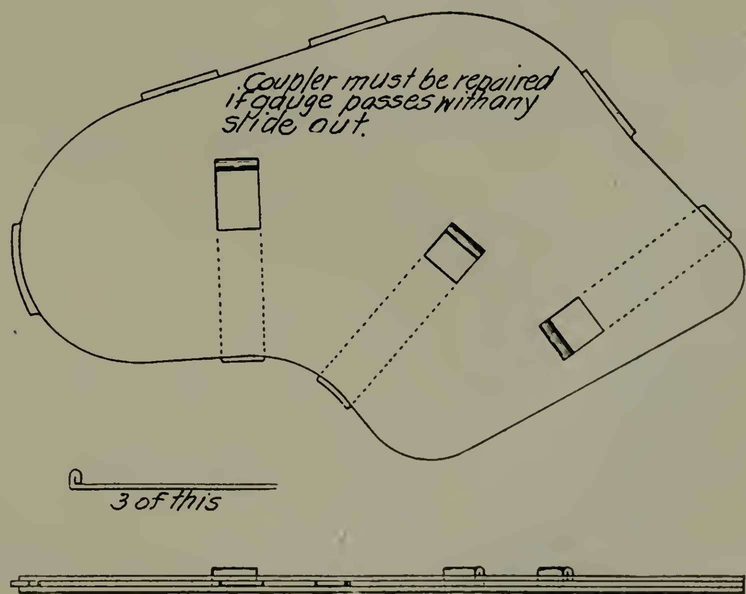


Fig. 4.—First Form of Proposed Gauge.

It will readily be seen from its construction that if the guard arm is in good shape a considerable wear of pivot pin and lock may be allowed

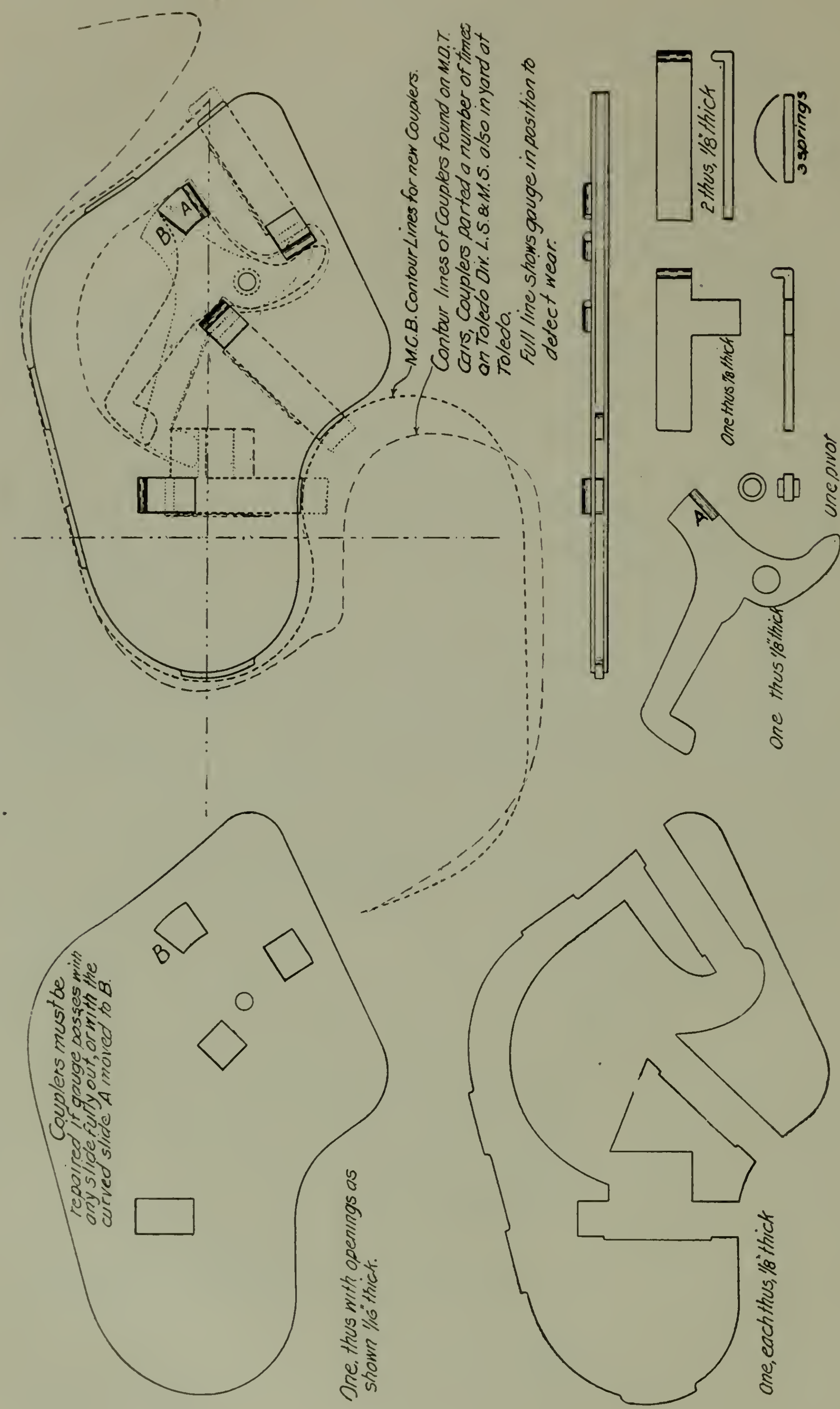


FIG. 5.—FINAL FORM OF PROPOSED GAUGE (WITH DETAILS)

to take place without rendering the coupler dangerous. Likewise, if the knuckle is in good shape, the guard arm may be much worn or distorted without allowing the couplers to part. In using this gauge, however, it was soon demonstrated that although the gauge might not pass through with any one slide fully out, yet a combination of wear might exist which would make the couplers dangerous. To cover this point the gauge shown in Fig. 5 was designed. The gauge is almost self-explanatory, but it may be said in addition that it provides for allowing more wear to take place in long guard arm couplers than in short ones, which is as it should be.

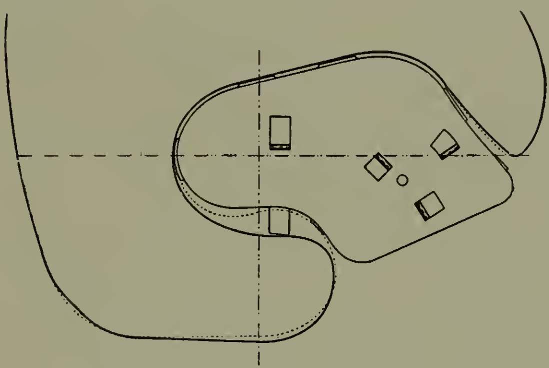


FIG. 6.—CONDEMNED BY FIRST POINT.

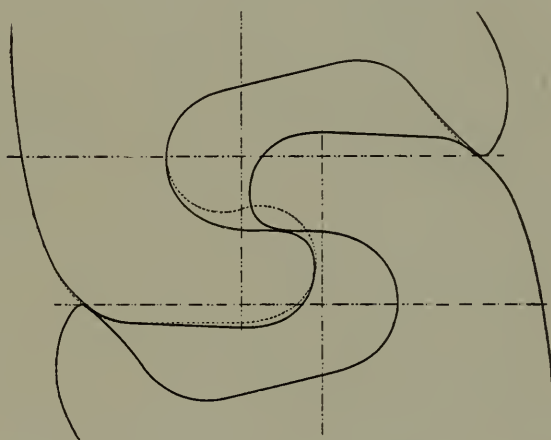


FIG. 7.—COUPLERS THUS CONDEMNED.

The application of this gauge in the condemnation of couplers is shown in the following figures. It must always be remembered that if a coupler has been in service long enough to allow one part to become badly worn, all the other parts are pretty sure to be partly worn also. Thus, in Fig. 6, where a coupler is shown to be condemned for wear of inside face of knuckle, it is also seen that the heel of the knuckle is somewhat worn; the pivot pin and lock have worn so as to allow the whole knuckle to move over sidewise, and the guard arm is a little back

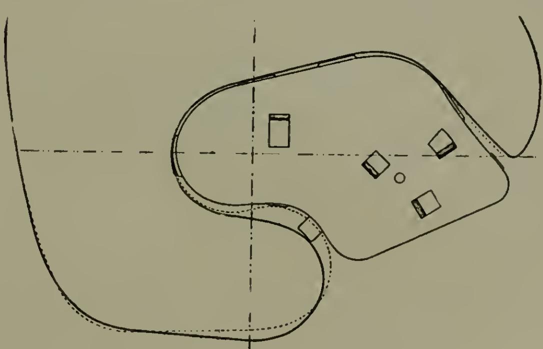


FIG. 8.—CONDEMNED BY SECOND POINT.

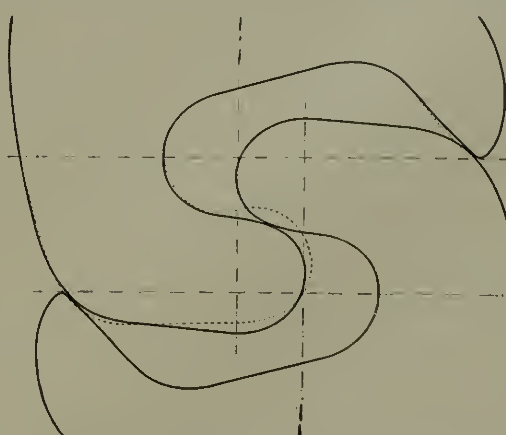


FIG. 9.—COUPLERS THUS CONDEMNED

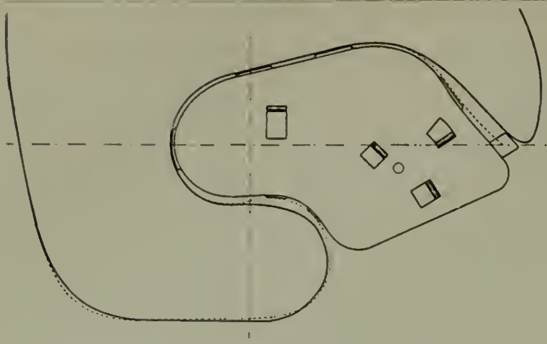


FIG. 10.—CONDEMNED BY THIRD POINT.

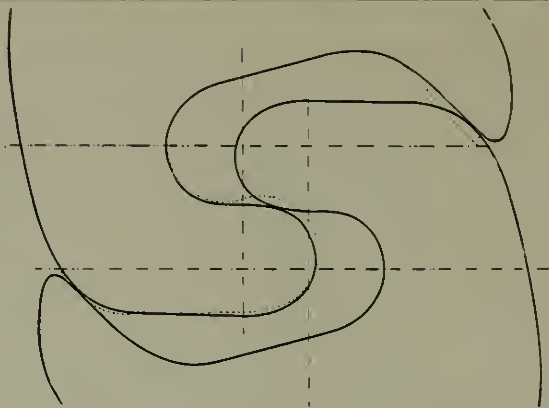


FIG. 11.—COUPLERS THUS CONDEMNED.

of the original contour as shown by the dotted line. It must also be remembered that this badly worn coupler may at some time be coupled with another as badly worn as itself, and therein lies the danger. If it should always be coupled to a new contour there would be no liability to parting, though in that case one guard arm would be doing all the work; but when it meets with another as badly worn as itself, as shown in Fig. 7, it is then high time to renew the knuckle. It can be seen that it would not take a very severe jerk to allow spring enough in these parts to permit the couplers to slide past each other without unlocking.

Fig. 8 shows a coupler condemned because the gauge passes with the second point fully out. When knuckles are pivoted far back, this condition is the more noticeable, and arises from wear of pivot pins and locks—1-16 of an inch wear in either of these parts is magnified to ⅛ of an inch displacement of the point of the knuckle. Fig. 9 shows a pair of such worn couplers running together, and proves that they ought to have been condemned. Fig. 10 shows a coupler which is worn too far on the guard arm. This condition may arise due to legitimate wear, though it is more likely to appear as the result of blows which have sprung and distorted the guard arm to the shape shown. Two couplers in this condition are shown in Fig. 11.

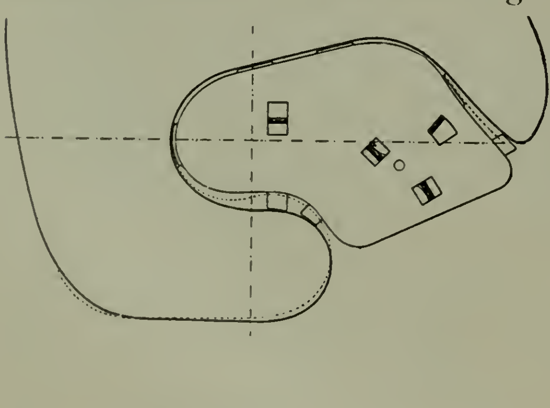


FIG. 12—CONDEMNED BY COMBINATION.

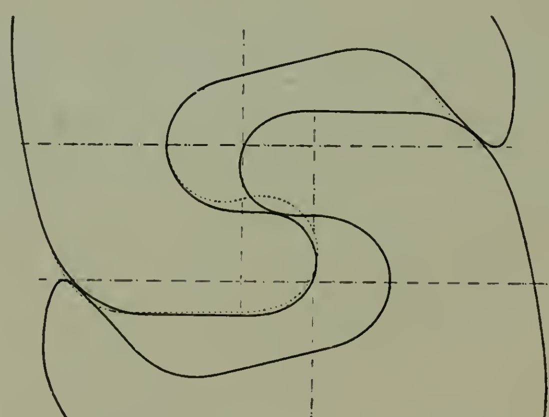


FIG. 13.—COUPLERS THUS CONDEMNED.

The conditions shown in Fig. 12 are submitted as embodying the distinguishing features of this perfected gauge, namely, to provide for a combination of wear taking place all around the coupler. It must be remembered that there are a good many points where wear can take place, and a list of these points is herewith added:

1. Heel of knuckle, where the coupler comes in contact with the guard arm of the opposing coupler.
2. Inside of guard arm.
3. Inside face of knuckle where pulling stress is greatest.
4. Rear side of pivot pin hole in knuckle.
5. Front side of pivot pin hole in lugs of drawbar.
6. Pivot pin.
7. Locking surface of tail of knuckle.
8. Surface of lock in contact with knuckle.
9. Surface of lock in contact with drawbar.
10. Drawbar where lock comes in contact with it.

The common and final result of all this wear is to so diminish the effective width of the knuckle, and to so increase the space between the guard arm and the point of the knuckle of the opposing coupler that the couplers can slip past each other. This the gauge is designed to prevent by the action of the cam-shaped lever A. When this is pushed over to the end of its curved slot it throws all the slides part way out. Experience seems to indicate that the distance from guard arm to point of knuckle should not be greater than 5¼ inches and this is the dimension used in the gauge. It is easily seen that the gauge would not pass through with any one slide fully out, and yet that the couplers are dangerous may be seen by an inspection of Fig. 13. What comparatively small amounts of wear are permissible at the various points, when this wear occurs simultaneously, may be seen by observing this drawing. A departure from the original contour of 7-16 inch on the inside of the knuckle, ¼-inch on the point of the knuckle, 3-16 inch on the guard arm, and with the heel of the knuckle worn off 3-16 inch, allows the couplers to take the position shown in Fig. 13, and the merest glance at these couplers shows that they are in a dangerous condition. When couplers are found in this condition the proper thing to do is to renew the knuckle, pivot pin or lock so as to restore the knuckle to its original contour. Couplers found as in Fig. 10 should have the coupler body scrapped, for it is worn out. The other parts may be retained for future use.

It is easy to see from what precedes, that members, for their own interests, should see that all couplers purchased should conform fully to the provisions in regard to gauging new couplers. If the gauge passes with any movable point out, the coupler should be rejected. A coupler which is ⅛-inch slack to gauge is just the same as one that has been in service long enough to be worn off ⅛-inch, so that by allowing slackness in the gauge, one is practically applying worn couplers. If a wear of ¾-inch on the inside face of knuckle is permissible, and is called 100 per cent., then ⅛-inch slackness of the gauge at that point represents 16 per cent of the life of the coupler thrown away.

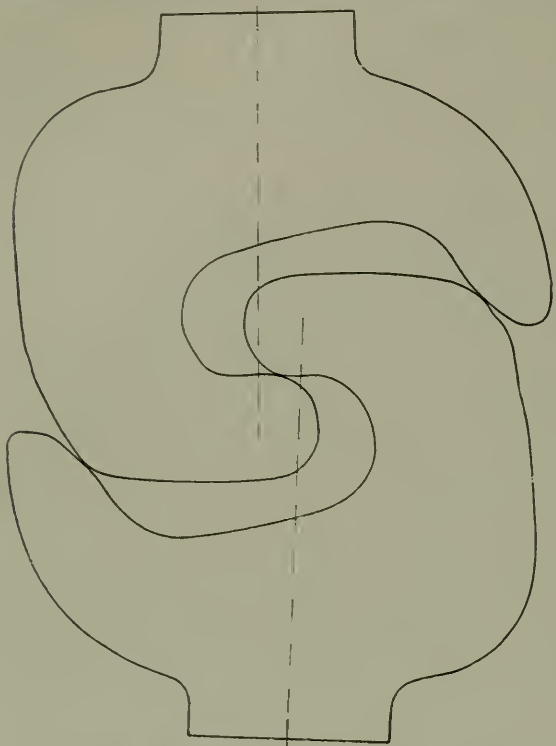


FIG. 14.—WORN COUPLERS THAT PARTED.

A resolution recently adopted by the Chicago Association of General Superintendents calls attention to the matter of trains parting without couplers unlocking, and asks that the Master Car Builders' Association take some steps to remedy the trouble.

Fig. 14 shows a pair of worn couplers which were found to be condemned by the gauge shown in Fig. 5. In order to prove that the gauge was correctly proportioned, the two cars on which these worn couplers were found were put in the middle of a train, and on starting up the drill engine the cars parted without knuckles unlocking.

PENSION FUND FOR EMPLOYES OF PENNSYLVANIA RAILROAD COMPANY.

The recent announcement that the Pennsylvania Railroad company contemplated inaugurating a Pension Fund on behalf of its employes in the near future, has reliable confirmation in an extended statement sent to us by a prominent official of that road, who is in a position to speak authoritatively on the subject.

According to his statements, the pension feature is of long contemplation with the company. A number of years have passed since it was first officially suggested, during which time unremitting study and observation were devoted to the question in all its aspects.

During the early operation of the present Relief Fund, the pension adjunct was brought in view, provision for that end being made in the department regulations, wherein it is expressly stated that such surplus as should arise during specified triennial periods of the operation of the fund is to be set aside as a foundation for the Superannuation and Pension Fund. The plan then considered involved, however, restrictive action, being confined in its working to such employes only as were members of the Relief organization. The working fund was to be exclusively the Relief Fund surplus. The real labor which eventuated in the development of a feasible plan for the creation of a general Pension Fund was not commenced, however, until the amount available for such purposes, grew to proportions that warranted serious consideration of the subject.

A special committee on Superannuation and Pension Fund was appointed by the Advisory Committee of the Relief department. The committee examined into and reported upon the various systems of pensioning in operation on upwards of seventy of the leading railways of Europe, America, Asia, Africa and Australia. It prosecuted investigation along this line, with a view of securing data which could be used in constructing a preliminary basis. This necessarily involved the responsible and arduous task of collecting, analyzing and collating information for guidance in forming a plan suitable to the requirements of prevailing conditions in the United States. The information obtained from the various sources, however, while edifying and of much interest, did not enable the committee to reach any final conclusion as to the best plan to be adopted, and it became necessary to give the matter original thought, and work it out from that standpoint, rather than upon any basis that existed, the result being an exhaustive preparation of statistical information, embodying results of such a scheme from many different bases, and finally selecting one that would carry with it the assurance of success.

Such a plan was submitted to the President for action of the board, when the whole matter was referred to a special committee of that body. The plan named only embodied the care of superannuated employes, members of the Relief Fund, and the allowances were to be made from that fund. It was subsequently, however, thought advisable and more liberal to make general provision for all old employes, by the company assuming the obligation of providing them with a pension allowance, in addition to what the Relief Fund could afford to grant to its members who might be retired by the company. Subsequently, the characteristics inevitably allied to a question of such magnitude were narrowed down and crystalized into a purely pension basis for all employes, and the result laid before the directorate's special committee in a revised plan for pensioning employes, whether members of the Relief Fund or not.

The Pension Fund, as practically agreed upon, is to be established as of January 1, 1900, the company is to contribute the money necessary for its operation, and will be relieved from any further payments of amounts heretofore made by it on account of what is known as "Company Relief," *i. e.*, carriage with its own money of Relief Fund members, the length of whose sickness exceeds the regulation maximum benefit period of 52 weeks, and who are, in consequence, entitled to no further relief fund benefits on account of such sickness.

A board of officers has been created and invested with full power to make and enforce the rules and regulations incident to the care and conduct of the fund, and adopt such means as may be necessary to determine the eligibility of employes to receive benefits therefrom, and fix the amount of allowance that shall be paid in each case.

This board consists of: First Vice-President, John P. Green; Second Vice-President, Charles E. Pugh; Third Vice-President, Sutherland M. Prevost; Fourth Vice-President, Samuel Rea; General Manager, Joseph B. Hutchinson; and Assistant Comptroller, Max Riebenack. They are officers of the highest standing in their several departments, each commanding the fullest public and company confidence in the fields of railway statistics, financing, accounting and general ability. Better selections could not have been made for an undertaking at once so comprehensive and important, their appointment being, in fact, tantamount to its speedy, thorough and eminently satisfactory consummation.

Retirements will be voluntary and involuntary; that is, all employes seventy years of age and over, will be considered as having attained the maximum age limit for active service, and will be retired and placed upon the Pension Fund roll, while those whose ages range from sixty-five to sixty-nine years, and who, in the opinion of the fund administrators, have become physically disqualified, or otherwise permanently incapacitated after thirty or more years of service, may be either voluntarily or arbitrarily retired and pensioned.

The pension allowance to such retired employes will be determined on the following basis: For each year of service, a fixed per centum of the average regular pay for a specific period immediately preceding retirement, with a minimum monthly allowance. It will thus be seen the bases of retirement are age and service, with allowance proportioned to pay received during a designated period preceding retirement.

For such employes, members of the Relief Fund, as may be retired by the company, it is proposed to grant to them from the interest on the Relief Fund surplus an additional allowance on a fixed basis in proportion to the amount they contributed while a member of the Relief Fund, so that each member retired by the company will receive this additional allowance because of his membership in the Relief Fund, and it will be paid from the interest on the surplus from the operations of that fund.

In addition to this, the Relief Fund, through its Advisory Committee, proposes to amend the regulations of the Relief Fund in order to make general provision for all its members, so that, in case of sickness or disability, benefits on account thereof will be continued at one-half rates, irrespective of the duration.

From the above, it will be seen that the idea involved in the establishment of the Pension Fund is far reaching, and covers a much wider and broader field than is conceivable upon first thought. The principle involved in the proposed action of the company, and that of the Advisory Committee of the Relief Fund, the membership of the latter being partly composed of employes of the company, members of the Relief Fund, and elected by the contributing members of the Relief Fund, will make provision for every employe, a member of the Relief Fund, in case of sickness, disability, or total incapacity, from the time he enters the service of the company until the relations are severed.

The Relief Fund, the expenses of the operation of which, together with any deficiency arising therefrom, are met by the company, affords every employe physically qualified, and within the proper age limit, an opportunity to make such provision as will insure for himself benefits in case of sickness or disability, during the entire duration thereof, and, in case of retirement by the company, a superannuated allowance in addition to the pension of the company, and to his beneficiaries benefits in case of death.

The object that has been attained, or rather, endeavored to be, is to grant every employe an opportunity to provide for himself in case of sickness, disability, or death, through the medium of the Relief Fund—which is co-operative and supported jointly by the employes, members thereof, and the company—and when the retirement age is reached the company to reward by granting a pension allowance, in addition to what he will receive from the Relief Fund, to which he has contributed, in the shape of a superannuation allowance on a fixed basis in proportion to the amount he contributed while a member of the Relief Fund.

A very important feature is the protection afforded the Pension Fund, through the purpose of the company to fix an age limit for admission to the company's service, provision in this respect being that from and after January 1st, next, no person shall be employed who is over thirty-five years of age, or who cannot pass the required physical examination, except that former employes desiring reinstatement may be permitted to re-enter the service at the discretion of the Board of Officers, provided, however, they meet the requirements of physical examination, and possess other necessary qualifications; also, that the temporary employment of men, regardless of age limit and physical condition, shall be permitted for a period not exceeding six months, subject to requisite extension, when engaged upon temporary work.

The necessity for action of this character is requisite, for the reason that the company will then have in its service only men who, if they desire, may become members of the Relief Fund, and in this manner make preparation for any illness to which they might be subjected in the future, or accident that might befall them. In this way every member is afforded an opportunity to make provision for himself during his early service with the company, when it has not yet received from such employe service, both in length and quality, that would entitle him to special consideration at the hands of the company in case of inability to perform his daily labor.

A series of conferences between the Pension Board and the Advisory Committee of the Relief department in the near future will, no doubt, result in completing the necessary changes in the Relief department regulations, and securing such other information as may be required to finally establish the Superannuation Fund in connection with that department, and thus place the Board of Officers in position to place before the Special Committee of the Board of Directors, in the fall of this year, a report giving details respecting final arrangement for the company's Pension Fund, and the Relief Department Superannuation Fund, and so insure final action by the directorate preparatory to putting same in effect by the first of January.

While the Pension Fund is a distinct and separate provision by the company, from its own funds, for the benefit of its employes, and will be operated from a distinctive company standpoint, its relation to the Relief organization will be unavoidably so intimate as to make it appear as an auxiliary feature thereof. By the addition of the superannuation and pension features to the benefits afforded by the Relief Fund, the company has virtually established for its employes a relief and pension institution, which will be more apparent when it is remarked that the aims and results of the two features are inseparably interwoven in one fundamental principle—humanization.

The new fund will affect the entire force of employes, on the lines of its system east of Pittsburg and Erie, and scattered along a trackage of over 4,100 miles, located in the states of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia, and the District of Columbia.

In response to the query, as to what are the main objects of the consolidated fund, it was said: First, the manifestly humane purpose to protect the immediate interests of active, and preserve the future welfare of aged and infirm, employes; and second, to increase and improve the effectiveness of the company's service. The interests of active employes are guarded by a fixed responsibility voluntarily assumed by the company toward the fund, which insures them, during their period of efficient service, fair wages, and an adequate allowance in the event of sickness, accident or death; while their future welfare is amply protected by the same assumption of company responsibility, which guarantees them, upon incapacitation by age or infirmities, a fixed life annuity. The company's benefits consist, for the most part, in the efficiency of service naturally consequent upon the employment of younger and more robust men in the stead of those whose incapacitation has rendered their retirement beneficial, both to themselves and the service, also in welding more firmly the mutual interests of employer and employe, thereby the better enabling that concentration of effort and uniformity of action so essential in the management and conduct of corporate affairs.

No other railway company in the world, whether under state or private control, possesses a joint fund whose direct and general beneficial features present the admirable system and thoroughness that are so manifest in the one under consideration.

The employes eligible to retirement will not receive the pension allowance as a favor, nor as a charitable act on the part of the company extending it. They will be in position to consider themselves the recipients of a permanent annuity, earned by and merited through years of faithful, efficient and loyal service; for it is, above all else, a mark of regard shown by a great corporation, through its administrative representatives, toward each and every employe who has won it by conscientious and capable performance of assigned duties. With this view of the facts at hand, and conceding the company's representative rank among the world's greatest railways, it cannot be successfully denied that the most conspicuous, as well as most enduring, evidence of the company's greatness rests in this time-lasting humaneness toward its employes.

No act of the company's directorate, or the officers who have been prominently identified with the pension work, will redound so much to their individual credit, nor reflect so much honor and dignity upon their official accomplishments, as the part they have played in the establishment of this, one of the noblest and grandest of modern beneficent organizations, and one, too, which stands for one of the greatest strides toward sound advancement in moral ethics that has been taken in this greatest era of enlightenment and progress. It may, indeed, without fear of contradiction, be styled a triumph in modern philanthropy, involving in its execution an outlay on the part of the company estimated at considerably over the large sum of three hundred thousand dollars per annum.

COKE AGAIN FOR LOCOMOTIVE FUEL.

The Boston & Maine has been successfully following experiments with the use of coke as a locomotive fuel. It seems to have secured a fine article of coke at a low price. Mr. Lucius Tuttle, president of that road, is reported to have expressed himself as follows, concerning his experience with, and future plans for the use of this fuel:

"Coke, as produced by the New England Gas & Coke Company, is a perfect locomotive fuel, and we are changing over our locomotive equipment so as to adapt same to the burning of coke as rapidly as we can get engines into the shops. We expect to have 50 locomotives changed over this summer and 100 before next January, unless some new conditions arise which we do not anticipate. We already have about a dozen changed over, and are using most of them in our suburban service between Boston, Gloucester and Marblehead. We have one on our through Portland express and it is fulfilling all our expectations. It costs about $50.00 to change over an engine by placing in water grates, which we find best adapted for the purpose. The coke creates such an intense heat that cast-iron grates are not serviceable. By building up our engine tenders we are able to run our engines from 125 to 150 miles, without refueling, and we cannot do better than this with coal. Of course, the great advantage in the use of coke is that it is dustless and smokeless. On the run from Boston to Portland, there will hardly remain a handful of ashes, whereas in the burning of coal almost three bushels of ashes would remain. The cost of coke is just about the same as bituminous coal, while the advantages are innumerable. Through the oiling of our roadbed and the burning of coke we will be able to give a passenger service as clean as electric roads. We estimate that the Boston and Maine will effect a saving of at least $100,000 a year, that it now pays in damages by reason of fires from sparks. Coke, as a locomotive fuel, is only made possible through Mr. Whitney, for he sells coke as a by-product. If coal was turned into coke simply for the coke the cost would make its use prohibitive. The use of coke is just as economical for freight engines as for passenger, and when we can get to it, it will be used on both freight and passenger engines. The engineers and firemen much prefer it to coal and understand its use. Bituminous coal requires constant firing, whereas coke only requires re-firing about every twelve miles."

A NEW MECHANICAL MOVEMENT AND ITS APPLICATION TO A RATCHET DRILL.

In the ratchet drill shown herewith, the sleeve carrying the pawl, or, rather, in this case, the pawls, has formed upon it two trunnions the common axis of which is inclined at an acute angle with the axis of the drill; and the divided, or fork-shaped, handle is made so as to turn freely upon the two trunnions (see Fig. 1). This simple construction, all the bearings being cylindrical, makes possible a new movement.

Suppose that the drill is set in a vertical position. Now, if the handle is moved up and down in the vertical plane, the sleeve is caused to turn in one direction and then in the other direction on the spindle of the tool and so, through the medium of ratchet and pawls, to drive the drill held in the spindle. The idea is so elemental that it is strange that it has not been applied before. By the upward motion of the handle, the upper trunnion is caused to move around backward and the lower trunnion is caused to move around forward. That is, the sleeve turns in the left hand direction on the spindle and the pawls in the sleeve run back over the ratchet teeth, which have been milled into the spindle. Next, the handle is moved downward in the vertical plane and the reverse or right hand motion is imparted to the sleeve. The result is that the drill is driven in the work. The handle may be moved not only in the vertical plane but in any other direction and still drive the drill: up to the right and down to the left at any angle, or in the plane at right angles to the axis of the drill like the ordinary ratchet—in any direction except one.

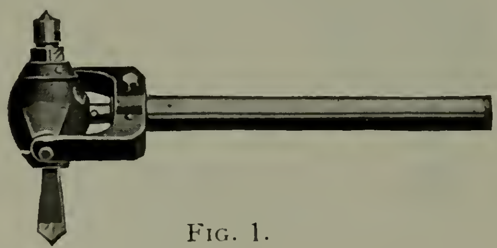


Fig. 1.

When the handle swings in the plane at right angles to the axis of the trunnions, that is, up to the left and down to the right (the parts being arranged as in Fig. 1) no motion of the sleeve or the drill is produced.

But even the motion of the handle up to the left and down to the right, may be made effective. First, remove the drill from the socket. Then swing the handle downward to the right, past the lower end of the spindle or socket, and up on the other side of the tool. Now turn the whole tool around, so that the handle points toward the operator, and it will be seen that the upper trunnion is now at the left of the axis of the drill and the lower trunnion is at the right (Fig. 3). When the parts are arranged in this manner the motion of the handle up to the left and down to the right drives the drill, for the handle pulls directly against its bearings instead of swinging upon them as before. Thus, taking into consideration the two arrangements of the parts, the effective motions of the handle are universal in direction, and the tool is properly called a universal ratchet.

This quality of the tool makes it available for work in close places, as in drilling out

FIG. 3.

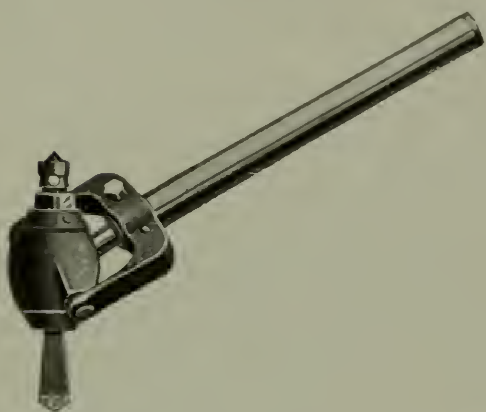


FIG. 4.

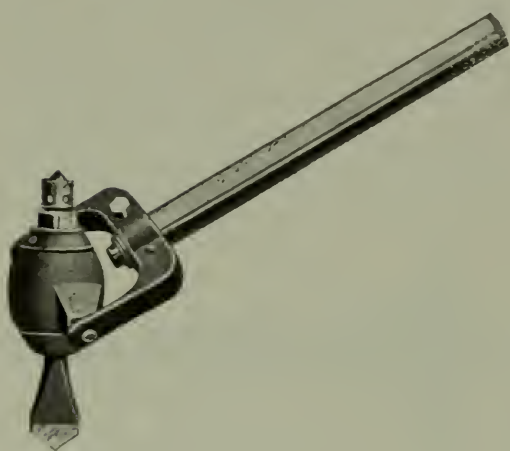


FIG. 6

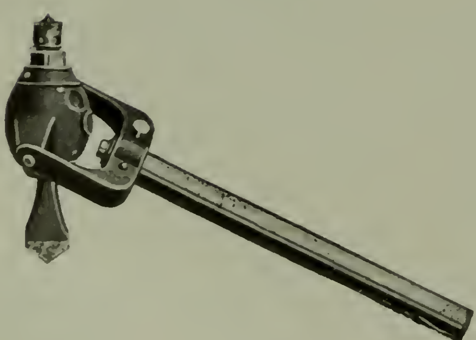


FIG. 7.

broken studs in steam pumps, and many kinds of erecting and repairing of machinery, where there is little or no room to move the handle in the ordinary direction, but where there is space in some other direction. But, unlike the bevel gear tool, devised many years ago to accomplish the same object, this tool is convenient for ordinary drilling. The difficulty with this present tool also, as at first designed, was that when the handle was moved in the ordinary direction it had a tendency to fly up, turning on the trunnions without driving the drill. To overcome this difficulty, a screw with a conical end (and pinholes for operating it) is contained in the handle in such position that the conical end can be set up into a countersink in the sleeve (Figs. 1 and 2.) Thus the handle can be held in a fixed position as related to the sleeve, and be just as rigid, and just as comfortable to operate, as any ratchet handle in ordinary work.

The up and down motion of the handle, first described, is not comfortable; a man must constrain his muscles and compel it to go as he desires. But he ought to be glad in that he can drill a hole at all in many places. If the parts are arranged as shown in Fig. 1, the motion up to the right and down to the left is very easy and effective; or, if the parts are arranged as in Fig. 3, the motion up to the left and down to the right is easy; for in both cases the handle pulls directly against the bearings.

There is one other adjustment which is very important: The handle may be elevated and the handle screw, mentioned above, may be set up into a different countersink (Fig. 4). The operator now has a rigid handle set at an angle with the main axis of the tool, so as to escape a valve stem or some other obstruction.

Fig. 1 is a vertical section, and Fig. 5 a cross section of the tool half way down the sleeve. There are five pawls so arranged as to engage only one at a time with the twelve teeth of the ratchet. The pawls are ⅞ in. long, and the teeth 1½ in. long. The diameter of the ratchet is 1¾ in. This multiple pawl arrangement, with the few large teeth, make possible a very strong tool with, at the same time, only about 2 inches of lost motion at the end of its 16-inch handle.

A feature of this ratchet, which will appeal to every practical man, is the feed stop. It is well known that the most frequent reason for throwing a ratchet aside for repairs is that the feed screw has been withdrawn too far, when under pressure, and the last thread or two spoiled. A left hand screw with a large head is screwed into the lower end of the feed screw before all the parts are assembled. The head comes up against the nut (Fig. 1) which is threaded left hand where it

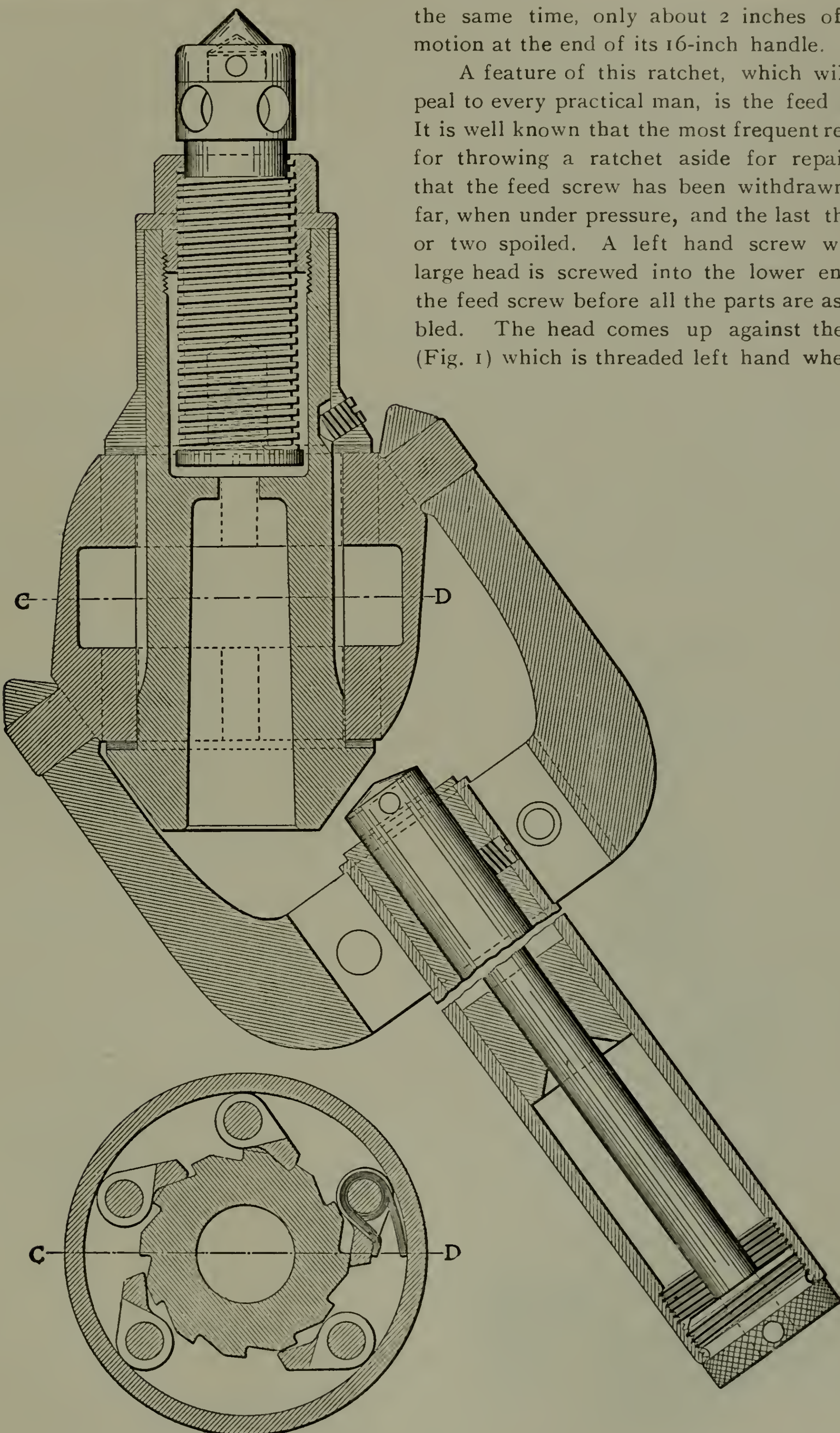


Fig. 5.

Fig. 1.

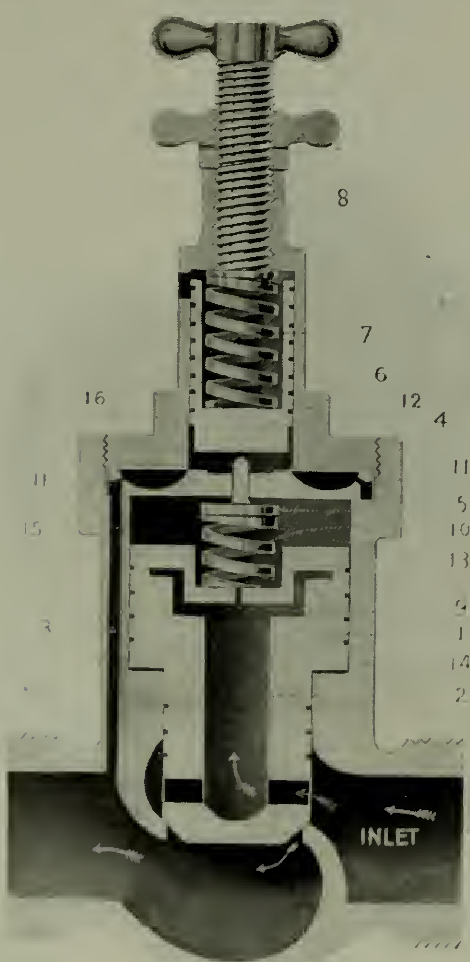
screws into the spindle. The feed screw is always engaged with the nut the whole depth of it, which is 1 inch. In Figs. 6 and 7 are shown, respectively, the beginning and ending of one of the many angular movements which the lever of this drill may be caused to effectively take, when not, for special purposes, fixed in the countersinks.

Harvey D. Williams, of Stamford, Conn., formerly assistant professor of machine design at Cornell University; Horace G. Hoadley, of Waterbury, Connecticut, and Everett C. Lewis of Woonsocket, R. I., are the patentees of this tool, which is called the Williams Universal Ratchet, No. 6. For several months it has been on the market, being manufactured by the Waterbury Tool Co., Waterbury, Conn.

THE "CLIMAX" REDUCING VALVE.

The "Climax" reducing valve possesses some features of merit that are commanding interested attention at the hands of railway men. It is claimed for it that it will actually control steam under all conditions, whether steam be flowing through it or not. Our illustration fully reveals its interior structure.

In operation the steam enters the valve from the side marked "inlet," and following the arrows passes around the main valve, 1, and through the small port, 9, into the controlling steam chamber, 13, passing thence through the auxiliary valve, 16, which is held open by the controlling spring, 7, until such time as the spring is compressed by the steam rising through the ports 3 and 11 to the point at which valve is set. Then the auxiliary valve, 16, closes, when the passage through port, 9, into the controlling chamber, 13, overcomes the pressure on the under side of the main valve, 1, when the valve closes sufficiently to allow the desired pressure to pass through to the low pressure side of the valve.



In cases where a throttle valve is desired, the valve stem should be screwed out, relieving all pressure on the auxiliary valve 16, which retains full steam pressure in the controlling chamber, 13. The area of this being greater than that on the under side of the main valve, 1, keeps the valve closed and allows no steam to pass through until such time as the auxiliary valve, 16, is again open.

The objectionable feature of a diaphragm which is continually breaking under high pressure is dispensed with in this valve entirely. The dash pot, 14, being above the flow of steam, is entirely free from sediment. The main valve, 1, is so loose that there is no danger whatever of the valve sticking from any sediment which might get around it.

This valve does very close work, not varying more than 3 pounds to 5 pounds on the outgoing system, with an increase of boiler pressure from 100 pounds to 225 pounds.

Every valve is made of the very best steam metal and is guaranteed to not steam-cut at 250 pounds steam pressure. It will work equally as well on air or steam, and is now in use on some of the largest roads in this country. This valve can be furnished with any size coupling desired and with either screwed ends or union, and one will be sent to any railway company in the United States on trial. This valve is offered by Mr. F. G. Street, 535 Temple Court Building, Chicago.

PERSONAL MENTION.

Mr. A. C. Hone has been appointed superintendent of motive power and rolling stock of the Evansville & Terre Haute, Evansville & Indianapolis, and Evansville Belt Rys., vice Mr. John Torrance deceased.

Prof. Robert Wilhelm Eberhard von Bunsen, the famous German chemist, died at Heidelberg on August 16. Prof. Bunsen was the inventor of the world famous Bunsen burner ; and his studies and discourses in blast furnace practice have greatly cheapened the production of iron. Bunsen, with Kirchoff, created the foundation of modern spectrum analysis which has revealed so much of value in chemistry, astronomy and optics.

Mr. E. B. Thompson has been appointed mechanical engineer of the Chicago & North-Western vice Mr. F. M. Whyte, resigned to go to the New York Central in a similar capacity. Mr. Thompson formerly for many years held this same position, resigning about two years ago to accept the position of mechanical engineer of the Northern Pacific. He resigned the latter position some months ago and has since been engaged on special detail work in the office of Mr. Chas. Schroyer, superintendent of car department of the North-Western. Mr. Thompson's friends are very much pleased to see him back at his old post.

Mr. James Buker has been appointed superintendent of the Consolidated Cattle Car Co., at Chicago, vice Mr. Joseph Buker, resigned to become assistant superintendent of machinery with the Illinois Central.

Mr. Isaac H. Congdon, formerly superintendent of motive power and car departments of the Union Pacific, and patentee of the Congdon brake-shoe, died at his home in Omaha, Neb., on August 21, at the age of sixty-six years. He was born at Granville, Mass., on June, 1, 1833, and entered railway service on July 11, 1851, as machinist with the Cleveland, Columbus & Cincinnati. He was afterward for one year, machinist with the Springfield, Hartford & New Haven, but on August 1, 1853, returned to the Cleveland, Columbus & Cincinnati as foreman of machine shops, which position he held until December 31, 1859. From 1860 to 1865 or 1866 he was master mechanic of the Great Western Railway at Springfield, Ill., and in 1865 or 1866 went to the Union Pacific as general master mechanic. In 1882 he was made superintendent of the motive power and car departments of that road, holding that position until 1885, when he resigned. Mr. Congdon was a leading man in his profession in his day. He was not only a man of strong administrative powers, but he was an excellent mechanic, with original ideas. His name has been perpetuated chiefly through his brake-shoe patent, but among many other details of practice original with him we may include the extended front end for locomotives.

Mr. Joseph Buker has been appointed assistant superintendent of machinery of the Illinois Central, with headquarters at Chicago. Mr. Buker is widely known as a private car line man, having since July, 1890, been superintendent of the Hicks Stock Car Co., (now Consolidated Cattle Car Co). But he had been previously for many years in railway service. He commenced railway work in January, 1876, with the Michigan Central

Ry., and remained with that road until July, 1888, putting in four years in the water service and building department and eight years in the freight and passenger car department. In 1888 he went to the Atchison, Topeka & Santa Fe, in the freight and passenger car service, remaining there until he was made superintendent of the Hicks Stock Car Co., in 1890. While Mr. Buker's railway service was distinctively in the car departments he nevertheless had every opportunity to become familiar with the locomotive and machinery departments, and he assiduously cultivated those opportunities. Mr Buker has a host of friends who are glad to see him assume his important position with the great Illinois Central system.

Mr. John Ebbert, who ran the first locomotive out of Chicago—the Pioneer, on the old Chicago & Galena Union, in 1847—is dead.

Mr. Daniel Whitman, an old railroad man, died at Philadelphia on August 11, at the age of eighty years. He served as an engineer on the Philadelphia & Reading Railway for a number of years, and was later on an inspector of locomotives for that company. In 1852 he entered the service of the Baldwin Locomotive Works and took several of the first engines to Cuba, where he instructed men how to operate them.—*Railway Age.*

Mr. F. M. Whyte, hitherto mechanical engineer of the Chicago & North-Western, was on August 16 appointed mechanical engineer of the New York Central & Hudson River, with headquarters at West Albany, N. Y. He will have charge of the drafting and designing, the testing department, and the inspection of new material. Mr. Whyte is a graduate of Cornell University. His first railway service was, we believe, on the Baltimore & Ohio, where he worked on drawing, designing and testing under the mechanical engineer and the engineer of tests. He was later in the motive power drawing room of the Lake Shore, and after that was on the staff of Mr. David L. Barnes, the famous consulting engineer, working on a wide range of testing and designing. Still later, after a brief period in which he was engaged as a consulting engineer on his own account, Mr. Whyte was, in 1897, appointed mechanical engineer of the Chicago & North-Western, which position he held continuously until his present engagement with the New York Central. Mr. Whyte takes east with him the congratulations of a wide circle of western friends who have interestedly watched his fine record in railway work, and his admirable discharge, for the past two years, of the duties of Secretary of the Western Railway Club.

Mr. L. B. Heers has been appointed master mechanic of the new Pittsburg, Shawmut & Northern Railroad Company, with office at Angelica, N. Y. Mr. Heers has hitherto been master mechanic of the Central New York & Western, one of the roads forming the new system.

Mr. Howard James has been appointed purchasing agent of the Great Northern, vice S. F. Forbes resigned. Mr. James has hitherto been purchasing agent of the Northern Steamship Line at Duluth.

Mr. Wm. P. Danforth has been appointed traveling engineer of the Missouri, Kansas & Texas in Texas, with headquarters at Denison, vice A. C. Loucks, who, as elsewhere noted, has been promoted to be master mechanic. Mr. Danforth has hitherto been a passenger engineer on the Choctaw division.

Mr. Charles Graham, Jr., master mechanic at the Kingston shops of the Delaware, Lackawanna & Western, has been transferred to Buffalo and placed in charge of the shops there, to succeed Mr. F. B. Griffith, resigned.

Mr. John Calvert, formerly engineer on the middle division of the Pennsylvania Railroad, has been appointed road foreman of engines on the Philadelphia & Erie.

The office of Mr. F. C. Gates, purchasing agent of the Wheeling & Lake Erie, has been moved from Toledo to the Arcade Building, Cleveland, Ohio.

Mr. Amos Turner has been appointed master mechanic of the Lehigh Valley at South Easton, Pa., vice Mr. Phillip Wallis, who, as previously noted, resigned to become superintendent of motive power and equipment of the Long Island.

Mr. James K. Brassill, assistant master mechanic of the Chicago, St. Paul, Minneapolis & Omaha at Sioux City, Iowa, has resigned to become master mechanic of the California Northwestern, vice Mr. John Bonner, resigned.

Mr. Samuel Potts has been appointed master mechanic of the Los Angeles & Redondo, vice Mr. W. N. Best, resigned.

Mr. Frederick B. Griffith, master mechanic of the Delaware, Lackawanna & Western at Buffalo, and for a long period in the service of the company, has resigned. Mr. Griffith served as an apprentice under Mr. Wm. Buchanan on the New York Central from 1865 to 1870, and had been with the Lackawanna since 1883.

Mr. L. L. Smith has been appointed division master mechanic of the Chicago Great Western, at St. Paul, vice Mr. D. Van Alstine promoted to be master mechanic of the entire system. Mr. Smith comes from the Chicago, Burlington & Quincy—a road famous for turning out bright young men from its mechanical department. He was for a long time detailed on special work on the Burlington, establishing the piece work system etc., and conducting its brass foundry at Aurora. Of late he has been round-house foreman for that road at Streator, Ill. His long upward step to his new post pleases a host of friends.

Mr. Joseph Longstreth, of Germantown, Pa., who was engaged in superintending the erection of a number of locomotives built for the Brazilian government by the Baldwin Locomotive Works, died at Para, Brazil, on July 28. Mr. Longstreth was thirty-five years of age, and after graduating from Harvard University entered the service of the Baldwin Locomotive Works.—*Railway Age.*

Mr. G. A. Gipple has been appointed general storekeeper of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul. Minn., vice Mr. George Herbert, who has been made chief clerk to the purchasing agent.

Mr. J. G. Laughlin has resigned as storekeeper of the Seattle & International, to accept a similar position with the Pacific Coast Company at Seattle, Wash., vice Mr. J. M. Gibbon, resigned.

Mr. F. M. O'Meara has been appointed storekeeper of the Seattle & International at Seattle, Wash., vice Mr. J. G. Laughlin, resigned.

Mr. J. M. Ward has been appointed master mechanic of the Galveston, Houston & Northern, with headquarters at Houston, Tex.

Mr. A. B. Quimby has been appointed foreman of the Dakota Central division of the Chicago & North-Western, vice Mr. F. M. Dean, who, as previously noted, resigned to enter the service of the Baldwin Locomotive Works.

Mr. J. A. Danks has been appointed master mechanic of the St. Louis, Kennett & Southern, vice Mr. F. Glover.

Mr. Oliver Galbraith has resigned as general foreman of the machine department of the St. Louis Southwestern shops at Pine Bluff, Ark., to accept a similar position with the Wabash at Springfield, Ill.

Mr. Robert Libby, who for so many years represented the New York Air Brake Company in the South, with office at Atlanta, Ga., died recently at the home of William Rutherford in Owensville, Ohio. Mr. Libby for the last year or two, by reason of blindness and physical suffering, has been incapacitated for business. While his death was not unexpected, it was a source of grief to the large circle of friends which Mr. Libby had among railway men and railway supply men.—*Railway Age.*

Mr. F. W. Williams has been appointed master mechanic of the S. B. & N. Y. and O. & S. divisions of the Delaware, Lackawanna & Western, with headquarters at Syracuse, N. Y., in place of Mr. L. Kistler, resigned.

Mr. John Torrance, superintendent of motive power and rolling stock of the Evansville & Terre Haute, died at Evansville, Ind., on August 2.

Mr. T. W. Demarest, round-house foreman of the Pennsylvania lines at Indianapolis, Ind., has been appointed master mechanic of the Logansport division, with headquarters at Logansport, Ind., vice Mr. W. C. Pennock, deceased.

Mr. Cornelius D. Wall, formerly at different periods master mechanic of the Central of Georgia at Macon, Ga., and Columbus, Ga., master mechanic of the Western of Alabama, at Montgomery, Ala., and master mechanic of the Atlanta & Charlotte Air Line at Atlanta, Ga., died at Columbus, Ga., on August 2, from a stroke of paralysis, at the age of seventy years. He retired from active work about five years ago.—*Railway Age.*

Mr. John O'Brien, master mechanic of the Richmond & Petersburg division of the Atlantic Coast Line at Richmond, Va., has been appointed general fuel clerk of the Atlantic Coast Line at Manchester, Va., and his son, Mr. Robert O'Brien is appointed master mechanic at Richmond to succeed him.

Mr. C. C. Harter has been appointed general storekeeper of the Mexican Central, with headquarters at the City of Mexico.

Mr. L. J. Guyon, road foreman of engines of the Northern Central and Philadelphia & Erie divisions of the Pennsylvania Railroad, died at Sunbury, Pa., some weeks ago, at the age of fifty-five years.

Mr. Alonzo Hendee, who, as previously noted, was recently appointed master mechanic of the Panama Railroad at Colon, Colombia, began his railroad career, says the *Railroad Gazette*, in 1868 as fireman on the old Cincinnati & Zanesville Railroad, and for over thirty years has been employed on various roads as locomotive runner, shopman and air brake inspector.

Mr. James P. Callahan has been appointed general foreman of the Baltimore & Ohio at South Chicago, Ill., vice Mr. J. A. Jones, resigned.

Mr. W. F. Dixon, formerly of Paterson, N. J., and now manager of the locomotive works of the Sormovo Company, at Nijni-Novgorod, Russia, sailed for Liverpool on August 16, after having spent about two weeks here. He was accompanied by his Russian wife, acquired since his sojourn in the land of the Tzar. Upon the completion of the one hundredth locomotive turned out from the works Mr. Dixon was given a vacation and all his traveling expenses paid, to visit England and America. Unfortunately, however, Mrs. Dixon was ill during her entire stay in this country, so that the pleasure of the visit was much marred.—*American Machinist.*

Mr. Cornelius Vanderbilt, Jr., received last month the degree of Mechanical Engineer from the Sheffield Scientific School, Yale University. In 1895 he received from Yale the Bachelor of Arts degree and after two years of practical railroad work took up the scientific course, receiving the Bachelor of Philosophy degree in 1898, and after taking the prescribed course received at the last commencement the degree of Mechanical Engineer. The past year Mr. Vanderbilt has been carrying on his engineering studies in addition to his duties in the motive power department of the New York Central & Hudson River Railroad, and credit was given at the Sheffield Scientific School for some of his engineering work on the railroad. He is about to take up work again in the civil engineering department of the road. Mr. Vanderbilt has shown actual mechanical ability and has had a good deal to do with the designs and details of the latest locomotives built for the New York Central. He has taken a serious interest in the work of the motive department and has been a conscientious employee of that department.—*Railroad Gazette.*

Mr. L. B. Rhodes, foreman of machine shops of the Georgia Southern & Florida, has been given the title of master mechanic.

Mr. Walter G. Nixon has been appointed purchasing agent of the Missouri Pacific, St. Louis, Iron Mountain & Southern and leased and operated lines of those systems, vice Mr. Abram Gould, deceased. Mr. Nixon has for a long time been Mr. Gould's chief clerk. Mr. George Snodgrass, in charge of stationery supplies, has been appointed assistant purchasing agent.

Mr. P. H. Hickey has been appointed assistant road foreman of engines on the Cleveland, Cincinnati, Chicago & St. Louis.

Mr. A. C. Loucks, of Dallas, has been appointed acting master mechanic of the Missouri, Kansas & Texas, of Texas, vice C. T. McElvaney, resigned to enter private business. Mr. Loucks has for many years been traveling engineer for the Missouri, Kansas & Texas.

Mr. Harry J. Hoar, of Altoona, has been appointed assistant foreman in the vise shop of the Pennsylvania railroad.

Mr. A. Sherwood has been appointed master mechanic at Wellington on the Santa Fe. He has hitherto been foreman of the company's round-house at that point.

Mr. C. T. McElvaney, master mechanic of the Missouri, Kansas & Texas, of Texas, who has been connected with that road as master mechanic for many years, has resigned his position to take charge of the mechanical department of the American Cotton Company. His territory will embrace all of the cotton states, and he will have charge of the mechanical department of all the plants operated by the above named company, which number in the neighborhood of two hundred. His headquarters will be in Denison.

The office of Mr. J. W. Taylor, secretary of the Master Car Builders' and Master Mechanics' associations, is now in room 667, Rookery Building, Chicago, Ill.

Mr. R. W. Morgan has been appointed purchasing agent of the Wagner Palace Car Company, vice Mr. D. O. Talbot, resigned.

Mr. James O'Connor has been appointed general storekeeper of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa.

Mr. J. E. Capps, foreman of car repairs of the Georgia Southern & Florida, has been given the title of master car builder.

SUPPLY TRADE NOTES.

The Sargent Company, the well known manufacturer of brake shoes and steel castings at Chicago, is to remove to Chicago Heights. Four buildings will be erected, 100x500 feet each, at a cost of $175,000. The present plant at 59th and Wallace streets, Chicago, will be torn down when the new works at Chicago Heights are completed, which will probably be in about two years. The company has taken up eighteen acres of land at Chicago Heights, and employment will be given to 700 men on the completion of the new plant.

The Atlantic Brass Co. has been incorporated at Trenton, N. J., with a capital stock of $1,000,000, to manufacture and deal in brass fittings and patented car axle bearings and railroad appliances. The incorporators are Scott Lanahan, Charles M. Reynolds, Henry Meyers and Charles H. Burke, of New York, and Robert L. Green, Elizabeth, N. J.

The Brown Hoisting & Conveying Machine Company, of Cleveland, Ohio, is installing for the Cramp Ship & Engine Building Company three electric traveling cranes, which will greatly facilitate their work.

The Buffalo Forge Company, of Buffalo, has secured the contract for the entire supply of the forges and blowers, for use in the temporary machine shops on the Port Arthur section of the Chinese Eastern Railroad. The order calls for 106 forges and 14 blowers. The Buffalo Forge Company, has also, after severe competition on the part of English and German manufacturers, been awarded a Hawaiian contract for the supply of four 50-horse power and two 75-horse power, high speed, vertical center, crank engines, which will run in oil. A direct connected pressure blower will also be supplied, and a 300-light generating set. This machinery is intended for the American Sugar Company's newly acquired plantation, which is situated on the island of Molokai, one of the Hawaiian group.

The Reliance Machine & Tool Company, Cleveland, Ohio, has recently shipped bolt cutters to the American Shipbuilding Company, of Lorain, Ohio; the Southern Missouri & Kansas Railroad Company, Point Girardeau, Mo., and the L. P. & J. A. Smith Company, Cleveland, Ohio.

The Niles-Bement-Pond Co. has been incorporated under the laws of New Jersey. The companies involved in this combination are the Pond Machine Tool Company, of Plainfield, N. J.; the Philadelphia Engineering Works, of Philadelphia; Bement, Miles & Co., of Philadelphia, and a control of the Niles Tool Works Company, of Hamilton, Ohio. The new company has the following staff of officers: Robert C. McKinney, of the Niles Tool Works Company, president; James K. Cullen, of the Niles Tool Works Company, first vice-president; A. C. Stebbins, of the Pond Machine Tool Company, second vice-president; Walter L. Clark, of the Niles Tool Works Company, third vice-president; Charles L. Cornell, of the Niles Tool Works Company, treasurer, and E. M. C. Davis, of the Niles Tool Works Company, secretary. Alexander Gordon, president of the Niles Tool Works Company, is chairman of the board of directors. The other directors are Charles A. Moore, of Manning, Maxwell & Moore, and the Pond Machine Tool Works; Clarence S. Bement and Frederick B. Miles, of Bement, Miles & Co.; Gordon Shillito, Thomas J. Gaff and Daniel H. Holmes, of Cincinnati; Frederick W. Gordon, of the Philadelphia Engineering Works; George T. Reiss and James K. Cullen, of the Niles Tool Works Company; E. C. Burke, of Cleveland, Ohio, Walter L. Clark, of the Niles Tool Works Company; A. C. Stebbins, of the Pond Machine Tool Company, W. S. McKinney, of Pittsburg, and Robert C. McKinney, president of the Niles Tool Works Company. Frederick B. Miles and George T. Reiss have been appointed engineers for the company. The capital of the new company is $8,000,000—$3,000,000 of 6 per cent cumulative preferred and $5,000,000 common stock. Of this is issued $2,000,000 in preferred and $5,000,000 common, $1,000,000 in preferred shares being retained in the treasury of the new company to acquire the minority interests in the Niles Tool Works Company. The main office of the new company will be at 136 Liberty street, New York.

New shops and additions thereto are reported by our exchanges during the past month, as follows: The Philadelphia & Reading will erect an addition to its present shops at Reading, Pa. The building will be 85 feet wide by 403 feet long, built of brick, with frame trusses and slag roof, and is intended for a general car repairing shop. A compressed air hoist, capable of lifting loaded freight cars, will be installed.—The Lehigh Valley will build a large locomotive coaling and ashes receiving station at South Plainfield, N. J., and the New York Central & Hudson River will build coaling stations at Kingston and Utica, N. Y., and Weehawken N. J.; the Link Belt Engineering Co., of Nicetown, Pa., has the contract for all these coaling plants.—The Southern Pacific Company is preparing plans for the enlargement of its car shops at West Oakland, Cal.—Work on the new Great Northern shops and round-house at Minot, N. D., has commenced.—The Pittsburg & Lake Erie Railroad Company has begun the preliminary work on the erection of a large air-compressing plant at the McKees Rocks shops, to furnish power to the shops. Every department of the building and repairing shops will be fully equipped with air-compressor machinery, and all the small machines will be operated in the same manner. Plans are now being prepared for the changes and improvements to be made in buildings and locations of various departments composing the Pittsburg & Lake Erie Railroad erecting and repairing shops and round-houses at McKees Rocks. Work on the new buildings is to begin this fall, as the present round-house is proving entirely inadequate for the business done.—The St. Louis Southwestern has acquired a body of land comprising five acres in East Waco, Tex., near the city limits, upon which, it is said, shops will be located.—Work has been begun at the machine shops of the Pecos Valley & Northeastern Railroad at Roswell, N. M.—The Rock Island Railroad intends to equip a machine shop at Council Bluffs, Iowa. It will occupy a building already erected, 40x80 feet.—The Chicago, Burlington & Quincy contemplates the erection of a round-house on property recently acquired at West Ninth street, Des Moines, Iowa.—The Louisville & Nashville will remove the shops at Bowling Green, Ky., to Paris, Tenn., on the Memphis branch, in the near future, the new shops at Paris being nearly completed.—Contracts have been awarded by the Chicago Great Western Railway Company to James T. Brady, St. Paul, Minn., for the erection of buildings valued at $90,000 along the St. Paul and Kansas City divisions. The principal improvements will be a 16-stall addition to the round-house at Oelwein and some smaller buildings for the storekeeper and the machine shops at that point, an 8-stall addition to the round-house in Des Moines and a new 8-stall round-house in St. Joe.—The Cleveland, Cincinnati, Chicago & St. Louis Railway is building new shops at Mount Carmel, Ill. The buildings will be of brick, with slate roofs, and will be composed of a 10-stall round-house, 60x200 feet, machine shop, 35x52 feet, storeroom and office, sand-houses, ashpits and coal platforms. The power plant will contain two 100-horse power boilers and one 14x36 Corliss engine. The buildings will be heated with steam and lighted by electricity.—Excavation work has been begun for the foundation of the new buildings of the Union Pacific plant at Rawlins, Wyo. The buildings are to be used as a boiler house and engine house. The dimensions will be 50x60 feet.—The Panhandle will shortly begin some extensive improvements in its shops at Logansport, Ind.—The Oregon Short Line will build brick and stone locomotive and repair shops at Pocatello, Idaho.—The Northern Pacific will build new shops at Mandan, N. D., to replace those which burned in May.—The Texas & Pacific Railway is rapidly pushing to completion a complete circle brick round-house, rearrangement of tracks and the building of round-house conveniences, such as sanding, watering, cinder-dumping and coaling arrangements at Fort Worth, Tex.—The Houston & Texas Central Company is putting in a new round-house and turntable at Fort Worth.—The Boston & Maine round-house at Lyndonville, Vt., was destroyed by fire recently, and of the eight locomotives in the house at the time, six were badly damaged by flames. The loss on the building is estimated at $15,000, on locomotives $15,000.—The Chicago & North-Western has taken out a permit for the construction of new buildings at its Chicago car shops. The buildings include an addition to the machine shop 100x150 feet, 34 feet high, and boiler shop 120x300 feet.—The C., B. & Q. road is planning for the construction of a machine shop at McCook, Neb.—The work on the new Hutchinson & Southern terminals and buildings at Hutchinson is being pushed ; the round-house will be located between Madison and Jefferson streets, and will be a large brick structure, accommodating twelve engines. The round-house will be 266 feet wide in the rear and 162 feet in the front. Just in front of the round-house will be a large 60-foot turntable, and farther west a 50,000-gallon water tank. The shops will be located east of the round-house between the river and Madison street.—A contract has been let by the Santa Fe for the building of a car shed 80x300 feet, a lumber shed 20x300, and another car shed 20x185 feet, at Cleburne, Tex.

Merchant & Co., of Philadelphia, New York and Chicago, have recently made a shipment of 35,000 pounds of seamless brass condenser tubes to Scotland. This company has long been well known in the brass and copper business, and the order above noted is an indication that it is pursuing its aggressive business methods, not only in this country, but generally in the world's markets, which are now becoming tributary to the United States.

Mr. George C. Dressel, president of the Dressel Railway Lamp Works, New York, died last month. He was born in Germany in 1828, and came to this country and entered the service of the New York & Harlem Railroad, where he remained for eighteen years, until he began the manufacture of railway signal lamps in 1881.

The American Locomotive Sander Company, of Philadelphia, has been organized to manufacture or control the following locomotive sanding devices: Leach, Houston, Dean, Curtis and "She" sanders. The general offices of the company are at Thirteenth and Willow streets, Philadelphia; the officers being C. Longstreth, president; John Reilly, vice-president and treasurer; Elliott Curtis, secretary, and Harry Vissering, superintendent.

The Gold Car Heating Co., and the Gold Street Car Heating Co., report that the number of orders which they have taken during the past few months are of such magnitude as to surpass all former records of the companies. It is a certainty that the improved Gold electric heaters have struck a popular chord among railway officials.

The Niles Tool Works Company, Hamilton, Ohio, have received a large order for machine tools for the temporary machine shops now being built in Manchuria, by the Chinese Eastern Railway. The order includes a large car lathe weighing about 42,000 pounds, double axle lathes of various sizes, large vertical boring mills, double steam hammers and hand and portable twist drills. This is the second order the Niles Tool Works Company have received from this company, the first order which they filled being entirely satisfactory and leading to the placing of the second. The Niles Tool Works Company have also a contract for furnishing a full complement of tools for the plant of the Alabama Steel & Ship Building Company, at Ensley, Ala.

The Westinghouse Electric Manufacturing Company, of Pittsburg, with its kindred interests, has been awarded the entire contract for the equipment of the numerous electrical plants which will be installed on the Chinese Eastern railroad. About $200,000 is involved in the contract. A Paris cable to the New York *Commercial* reports that the bulk of the contracts for the extensive equipments of the electric roads now under construction, and particularly for the lines to run to and in the exhibition grounds, are being executed at the Westinghouse Electric Company's works.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

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The Vanderbilt Boiler.

All master mechanics will be interested in the experiment now being made on the New York Central R. R. with the corrugated marine type locomotive fire box, designed by Cornelius Vanderbilt, Jr., for it now seems probable that this type of fire box has been so successfully adapted to locomotive practice that it will have more extended use than heretofore. It is another instance in which railroad engineering is following marine practice and there are good reasons why this should be so. The highest development of steam engineering is always found in the navy department, for the government spares no expense in the education of her engineers, or in the design and construction of the machinery of her war vessels. With the demand for higher speeds came increased boiler pressures and, as these pressures increased, steam could only be used economically by compound and triple expansion engines. Our railroad engineers have thus been fortunate in having the compound engine developed before it was necessary to adapt it to locomotive practice. The necessity of lightness combined with strength, for high pressures, led to the use of the corrugated tubes for marine fire boxes—and the trouble with broken stay bolts in high pressure locomotive boilers is now suggesting their use for locomotive fire boxes.

Coming now to the Vanderbilt design, the first marked feature to notice is the large size of the corrugated tube. It is 63⅜ inches external diameter, and 59 inches internal, and we believe it is the largest corrugated furnace which has ever been made. On account of this large diameter the sheet is made ¾-inch thick to resist external pressure, and it was subjected to a test pressure of 500 lbs. per square inch before being put into the boiler. The use of a fire box sheet ¾-inch thick, which is just twice the present general practice with flat plates, may be considered by some as a detriment on account of the supposed resistance to the transmission of heat through the sheet due to its extra thickness. It is well known, however, that within such limits, the resistance to the transmission of heat from hot gas, on one side, to the water on the other side of the sheet, is independent of its thickness and we should therefore expect as good evaporation from each square foot of this thick corrugated fire box as from a flat plate only ⅜-inch thick.

By the use of a tube so large in diameter, it is possible to get sufficient grate area for a medium sized locomotive with one tube. The area of the grate is 35 square feet, which is larger than the standard grates used on other New York Central engines of the same type. It will be remembered that in the Strong boiler with twin furnaces a grate area of 62 square feet was obtained, and this points to the fact that the grate area with a single corrugated tube is limited, and where ample grate area for very large locomotives is desirable it cannot be obtained in a single corrugated tube. The use of twin tubes leads to very expensive and complicated construction which was found objectionable with the Strong boiler. In considering the corrugated tube for large engines in the future it must be remembered, therefore, that the extent to which the grate area can be increased is quite limited. It is unfortunate that this is true because increased grate areas with flat surfaces can only be obtained by largely increasing the number of stay bolts, and one of the chief merits of the corrugated tube is that it dispenses with stay bolts.

The advantages of a fire box without stay bolts are numerous, the principal one being that it eliminates one of the most uncertain sources of weakness, it removes the necessity of constant inspection and renewal of stay bolts, and the fire box can be removed for boiler repairs and cleaning without the laborious and expensive task of cutting out and replacing hundreds of stay bolts. In examining a cross section of the fire box and boiler we have noted that the water space at the grate line is wider than the general practice with flat surfaces, and it increases so rapidly that it is 10 inches at the center line of the corrugated tube. This ample water space around the furnace and the freedom from stay bolts in the water space should secure much better circulation of the water than is obtained in the ordinary fire box, and it should contribute to improved evaporation. It is important that the corrugated surface should be kept clean and free from scale, and the conditions are favorable to ease in washing out, but if this fire box is used with water producing scale it will be necessary to use soda ash or other purgative to prevent the accumulation of scale which will have a tendency to form in pockets on the corrugations.

The report of preliminary tests of the Vanderbilt boiler in freight service show an evaporation of 8.6 lbs. water per lb. of coal, equated to

10.3 lbs. from and at 212° F. The engine is in regular freight service and doing satisfactory work, and trials will soon be made with the engine in passenger service.

The final measure of the success of this interesting experiment with a corrugated furnace will be shown when it is decided whether to build any large number of engines with that type of fire box or not.

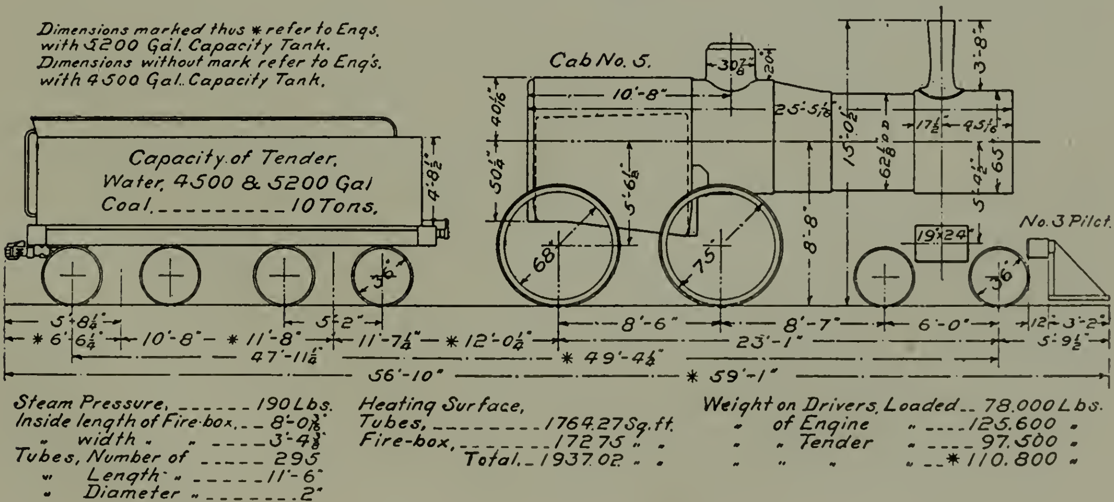
LOCOMOTIVE CLASSIFICATION BOOK—C. & N.-W. RY.

The Chicago & North-Western Railway recently got out a locomotive classification book that has proved to have been designed on a very satisfactory plan. The book is about 4¼ inches wide and 7 inches long, and comprises 104 pages. It is entitled "Dimensions and Classification of Locomotives of the Chicago & North-Western Railway Co." The first 23 pages are taken up with a list of the engines, beginning with "No. 1," and continuing on to the last, in sequence. The heading for these pages is as follows (we give also a sample line of entry beneath the heading):

Engine		Cylinder	Type	Diam. Driving Wheel Center	Weight on Drivers, Lbs.	Tank Capacity		Year Built	Description on Page
No.	Class					Gals. Water	Tons Coal		
3	A	19x24	8-Wheel	68	78,000	4300	8	1895	25

These tabulations give at a glance the main characteristics of any engine concerning which information is desired. Then comes a series

Class A.



of pages giving more detailed information concerning the engines, a left-hand page bearing the following heading and the oppo site page bearing a diagram of the engine:

CLASS A.—DIAGRAM ON PAGE 25.

Number	Date of Delivery	Builder	Number	Date of Delivery	Builder
3	Nov. '95	Schenectady	....	....	....

These latter tabulations do not take the engines up in sequence by their numbers, but present them grouped by classes. We give herewith a reproduction of the form of diagram used. This is a very thorough and satisfactory scheme of presentation of the complete story of every engine on the line. We are indebted to Mr. R. Quayle, superintendent of motive power and machinery of the Chicago & North-Western, for the privilege of presenting this brief account of the book.

BOILERS WITH CORRUGATED FIRE BOXES.

Various attempts have been made to use a corrugated fire box in boilers of the locomotive and marine types, and these attempts have met with varying degrees of success; the latest effort put forth in the direction of using such a fire box in locomotive work was instigated by Mr. Cornelius Vanderbilt, Jr., and there is in service now on the New York Central & Hudson River Railroad a locomotive the boiler of which was adapted to a Morison suspension furnace. This furnace is of the corrugated stayless type, and is illustrated in Fig. 1, which engraving shows the fire box end of the Vanderbilt boiler.

The desired goal in using the corrugated fire box is a construction which will not need stay bolts to prevent the collapse of the fire box, and it must be granted that the freedom from the annoyances of the stayed fire box is worthy a supreme effort. It will be seen that there are no stay bolts used in the design illustrated; there is, however, a sling stay shown at the top front end of the fire box; there is a row of these stays extending around the front end of the fire box and securing it to the outer shell. They are used only to secure the furnace in its proper relation to the outer shell, and any assistance available from them to prevent collapse of the furnace is merely incidental.

The center of the furnace is considerably below the center of the boiler, in order to give as much water space as possible above the furnace; one of the difficulties experienced in designing these boilers is to provide for sufficient depth of water above the furnace and, at the same time, leave sufficient steam space to insure dry steam in the dome, and to do these within allowable limits for the diameter of the enlarged portion of the outer shell. The location of the furnace made it impossible to support the tube sheets entirely with the tubes, and the spaces of both tube sheets which are unsupported by the tubes are secured to the outer shell by diagonal braces. The tubes are placed at an angle with the horizontal represented by a deviation of 5 7-16 inches in 12 feet 6 inches and the tube sheets are placed perpendicular to the tubes; setting the furnace so low in the boiler necessitated this construction.

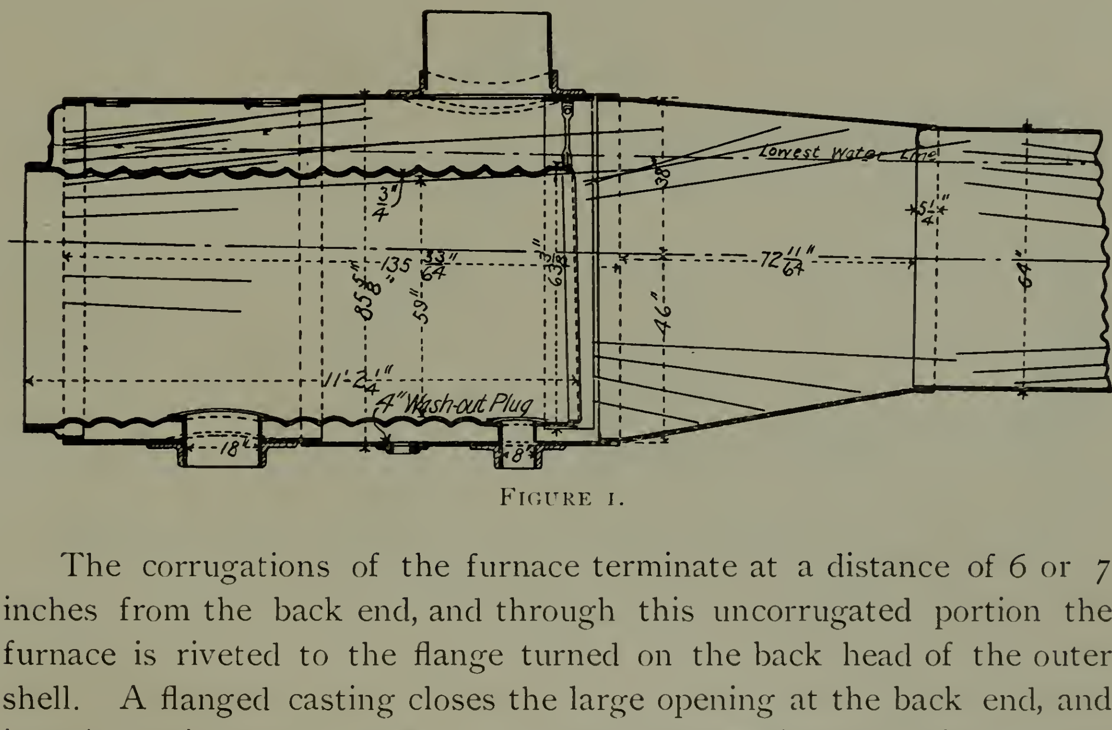


FIGURE 1.

The corrugations of the furnace terminate at a distance of 6 or 7 inches from the back end, and through this uncorrugated portion the furnace is riveted to the flange turned on the back head of the outer shell. A flanged casting closes the large opening at the back end, and in this casting are the two openings through which the firing is done and another, below these two, through which the ashes are handled. The grates are supported on side bars secured to the sides of the furnace and the ashes drop from the grates to the bottom of the furnace.

About two feet of the front end of the grate is cut off by a perpendicular bridge wall extending across the furnace. The refuse which collects between the bridge wall and the back tube sheet is disposed of through the 8-inch opening through the bottom of the furnace and shell. The 18-inch opening through the bottom of the furnace and shell provides a place through which the refuse of combustion may be dropped to the ash pan below; the capacity for ashes inside the furnace below the grates is limited, and the ashes must be hoed to this opening and dropped to the ash pan several times on a trip.

It is understood that the construction of this boiler was well under way before Mr. Vanderbilt was aware that boilers very similar in construction had been designed and built by others; had he been aware of the experience of others he probably would have changed, somewhat, his design so as to benefit by their experience.

Several boilers similar to the Vanderbilt boiler were constructed in Germany some years ago, and it is understood that they have not given entire satisfaction although experience has indicated changes which have improved the service rendered by the boilers. Fig. 2 shows these boil-

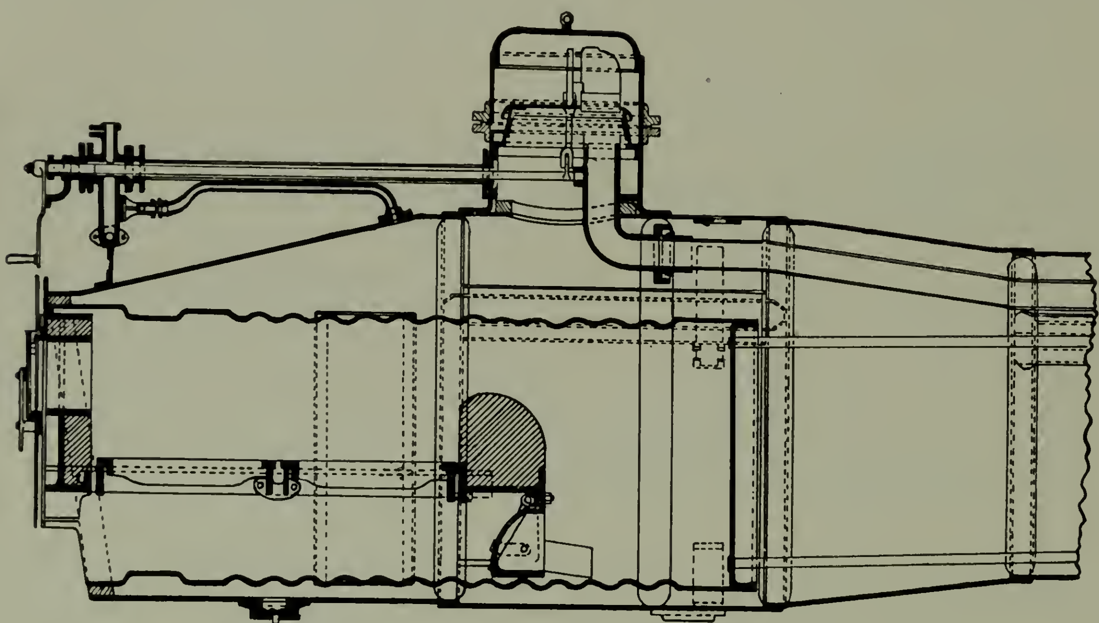


FIGURE 2.

ers after having undergone a short period of development; it was found that no air should be allowed to enter the combustion chamber between the bridge wall and the tube sheet from the grate immediately beneath, and rather, that the only communication with the combustion chamber should be over the bridge wall.

Some difficulty has been experienced with the corrugated furnace type of boiler to get circulation of water below the furnace; some boilers showing a temperature of water below the furnace of from 150° to 160° F., while the steam gauge showed nearly working pressure. This great difference in temperature between the top and bottom of the furnace causes unequal expansion of the furnace, and difficulty with the back tube sheet results. Difficulty with the back tube sheet in the boiler shown in

Fig. 2. has been experienced and it is doubtful if, in other respects, the design has proved a success.

The locomotive which has the boiler shown in Fig. 1 was built recently at the West Albany shops of the New York Central & Hudson River Railroad and has been put in freight service and it is understood is giving good satisfaction, although it is too soon yet to obtain anything very definite from the road as to its performance.

The early experiments with this type of fire box were made in Europe. In 1867 Maey of Zurich used a fire box with a semi-cylindric crown sheet, which, as well as the vertical side walls, was made of corrugated copper sheets. In 1875 Kaselowsky designed a boiler in which the vertical side walls of the fire box were abandoned, and the semi-cylindric furnace of Maey developed so as to embrace three-fourths of a circumference. In this form no stay bolts were used. In 1886 Crampton in England designed a boiler formed of two superimposed partial cylinders, the lower one being fitted with a corrugated furnace flue.

In 1889 a decided advance was made in European practice in this respect by the Prussian state railroad, which had built at Essen a boiler with a 4-foot corrugated fire box of the regular marine type. The design was made by Messrs Knaudt and Pohlmeyer. The construction at the back end of this boiler is somewhat similar to the Vanderbilt design, but the tube plate end of the furnace flue is attached to the shell by means of four gusset stays. The Knaudt and Pohlmeyer corrugated fire box is illustrated in *London Engineering*, October 4, 1889, and in the *Railroad Gazette*, November 15, 1889. Another design for a stayless boiler with a corrugated furnace was made for the Prussian state roads by Mr. Gustave Lentz in 1890, and illustrated in the *Railroad Gazette* for January 9, 1891. This boiler consists of two truncated cones with a cylindric portion in the middle, and the corrugated tube is bent longitudinally, a portion of it being horizontal near the tube sheet, and the back portion pitching downward. The steam space is thus located near the center of the boiler. The tubes are considered sufficient to stay the front end as they entirely fill the back tube sheet. In the Vanderbilt boiler the back tube sheet extends beyond the tubes, both top and bottom, and this portion is supported by stay rods. In the Knaudt and Pohlmeyer design and in the Lentz fire box the furnace is divided by a fire-brick bridge wall. The gases mix with the hot air as they pass the bridge and combustion is completed in the chamber beyond. It is supposed that the reduced speed of the gases after passing the bridge wall will permit of cinders and ashes dropping in the ash pit at the bottom of the combustion chambers.

In the United States, the only locomotive boiler with a corrugated fire box, built heretofore, is the Strong boiler which was designed by Mr. Geo. H. Strong in 1882 and first placed in service on the Lehigh Valley R. R. in 1886. In this design three corrugated tubes are used, two of them side by side in the twin furnaces and a third for the combustion chamber beyond, thus connecting the furnaces with the tubes. The corrugated tubes were 38¼ inches diameter inside, and the grate area 62 square feet. The heating surface of the fire boxes was 155 square feet, of the combustion chamber 93 square feet, and of tubes 1600 square feet, making a total of 1,848 square feet. Careful tests of the boiler under the direction of Mr. E. D. Leavitt showed an evaporation of 7.9 lbs. of water per lb. of anthracite egg coal, and 8.56 lbs. of water per lb. of bituminous coal. In changing from anthracite to bituminous coal no alteration in the grate or draft appliances was found necessary. The Strong boiler has not been generally approved, in spite of its good evaporative performance and all the benefits to be derived from a stayless fire box. The principal objection to it is its high first cost and great weight. A good illustration of the Strong boiler will be found in the RAILWAY MASTER MECHANIC, for April, 1887.

RAILWAY ACCIDENTS.

According to figures furnished by the Inter-State Commerce Commission the total number of casualties to persons on account of railway accidents during the year ending June 30, 1898, was 47,741. The aggregate number of persons killed as a result of railway accidents during the year was 6,859, and the number injured was 40,882. Of railway employees, 1,958 were killed and 31,761 were injured during the year. With respect to the three general classes of employees, these casualties were divided as follows: Trainmen, 1,141 killed, 15,645 injured; switchmen, flagmen and watchmen, 242 killed, 2,677 injured; other employees, 575 killed, 13,439 injured. The casualties to employees resulting from coupling and uncoupling cars were, persons killed, 279, injured, 6,988. The corresponding figures for the preceding year were, killed, 214; injured, 6,283. The casualties from coupling and uncoupling cars are assigned as follows: Trainmen, killed, 182, injured, 5,290; switchmen, flagmen and watchmen, killed, 90, injured, 1,486; other employees, killed, 7, injured, 212. Summaries show that, with reference to trainmen—including the term engineer, firemen, conductors, and other trainmen—1 was killed for every 150 employed and 1 injured for every 11 employed. One passenger was killed for every 2,267,270 carried and 1 injured for every 170,141 carried. Ratios based upon the number of miles traveled, however, show that 60,542,670 passenger-miles were accomplished for each passenger killed and 4,543,270 passenger-miles accomplished for each passenger injured.

MASTER MECHANICS' COMMITTEES.

Committees for the current year's work of the Master Mechanics' Association have been appointed as follows:

STANDING COMMITTEE.

The extent to which the recommendations of this association have been put into practice.—F. A. Delano, A. Sinclair, H. Middleton.

SUBJECTS FOR 1900 CONVENTION.

Relative merits of cast-iron and steel-tired wheels.—J. N. Barr, A. M. Waitt, H. S. Hayward, A. L. Humphrey, John Hickey.

Advantages of ton-mile basis for motive power statistics.—H. J. Small, C. H. Quereau, W. H. Marshall.

Flanged tire.—S. Higgins, W. H. Thomas, Wm. Garstang.

Compound locomotives.—A. E. Mitchell, J. F. Deems, John Player, J. E. Sague, J. H. Setchel.

Piston valves.—S. P. Bush, Henry Schlacks, Wm. McIntosh.

Valve oils and various bearing metals.—A. W. Gibbs, J. B. Barnes, Geo. F. Wilson.

Power transmission by shafting *versus* electricity.—Geo. Gibbs, F. Mertsheimer, Wm. Renshaw, W. A. Nettleton, R. A. Smart.

Best type of stationary boiler for shop purposes.—Frank Rearden, J. J. Ryan, J. F. Dunn.

What can the American Railway Master Mechanics' Association do to increase its usefulness?—T. R. Browne, G. M. Basford, L. R. Pomeroy.

Subjects.—Robert Quayle, G. W. Rhodes, F. D. Casanave.

PROPOSED BRAKE SHOE TESTS.

The Standing Committee of the Master Car Builders' Association on Brake Shoe Tests, has decided to make another series of tests at an early date, which will include only brake shoes of new kinds that have not already been tested by the committee, and which may properly be considered as being in the market, or having some considerable use on some railroads.

All brake shoe manufacturers who wish to avail themselves of this opportunity to have their shoes tested, should communicate at once with the chairman of the committee in reference to the details of the test, and should state in their communication to the chairman to what extent their shoes are in use.

Communications should be addressed to Mr. S. P. Bush, superintendent M. P., P. C. C. & St. L. Ry., Columbus, Ohio.

AIR BRAKE REPAIR AND INSTRUCTION ROOMS OF THE ST. PAUL & DULUTH RY.

BY G. R. PARKER, AIR BRAKE INSTRUCTOR, ST. P. & D. RY.

The additional number of freight cars that have been recently equipped with air brakes involves an increased responsibility on the part of railroad officials, to see that this important apparatus is operated and maintained in such a manner as to give the highest degree of safety. On nearly every hand it has been acknowledged, on the part of the officials, that the first requisite to accomplish the above mentioned results is to have a competent person in charge of all air brake work, including application to the different vehicles, and the manner in which it is operated in stopping or in controlling the speed of trains on grades. The best results can be obtained from any machine only by having it operated in harmony with the mechanical principles employed in its construction, and also by properly maintaining the apparatus, which includes cleaning and all necessary repairs. The accuracies demanded when making repairs to the different parts require each piece to be subjected to a severe test to insure a certain and satisfactory action in service.

In addition to the person in charge of air brakes, the majority of railroad officials have also considered the necessity of two additional adjuncts, namely, instruction, and repair and test plants. Without these three, air brake application on any railroad is like a ship at sea, without rudder, chart or compass.

The usual foresight exercised by the officials of the St. Paul & Duluth Railway Company enabled them to anticipate what would be required along these lines. This is amply shown by the fact that a building, as shown in our engraving (Fig. 1) was erected three years ago to be used especially for air brake instruction and repairs.

The building, which is located at the company's shops at Gladstone, a short distance out of St. Paul, has three compartments: two rooms on the ground floor, one for instruction, the other for repairs and tests, and a basement, which is utilized as a storage room for spare parts. The necessary piping and reservoirs for instruction, repair and test purposes are also located in the basement, as seen in Fig. 2; the train pipe for brakes being on the left, and the piping for the air signal toward the right.

Figs. 3 and 4 show part of two sides, respectively, of the repair room. Fig. 3 shows the lye tank, at the left, with an air hoist directly above it. This air hoist is hung upon a traveler that runs upon an

Train Pipe. Fig. 2, Basement. Signal Pipe.

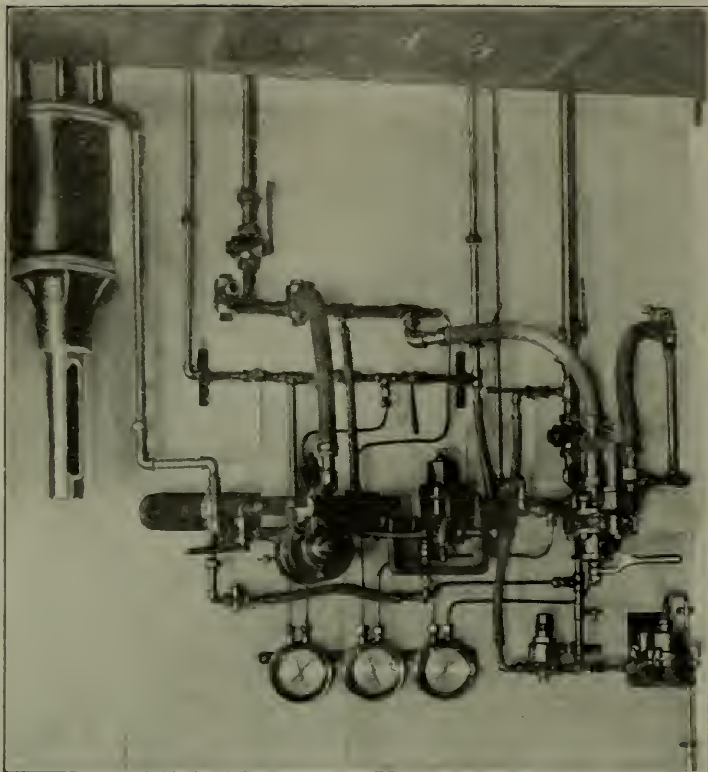


FIG. 4. TESTING RACK IN REPAIR ROOM.

overhead rail, enabling all heavy material to be readily transferred from one point to another in the room. The rack upon which all finished work is placed is also seen in Fig. 3, at the right.

Fig. 4 shows the necessary and indispensable test rack where all brake, triple, signal and reducing valves can be readily placed in position, joints made and thoroughly tested. The device designed by the St. Paul & Duluth

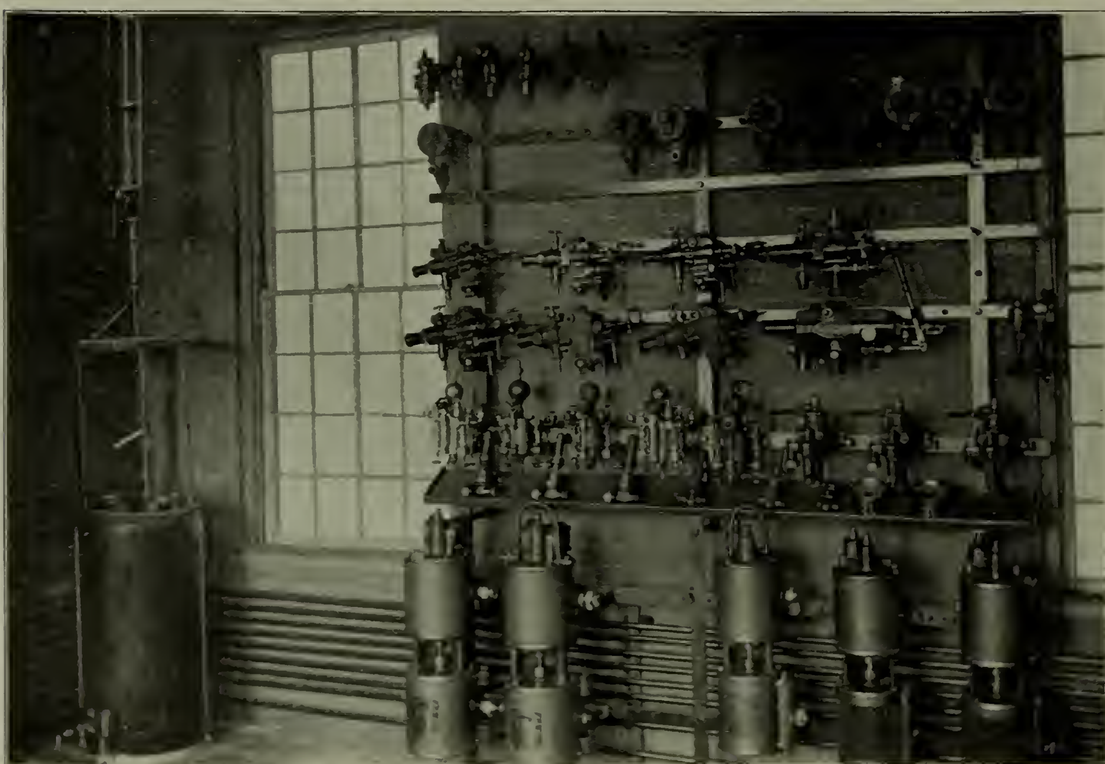


FIG. 3. STORAGE RACK IN REPAIR ROOM.

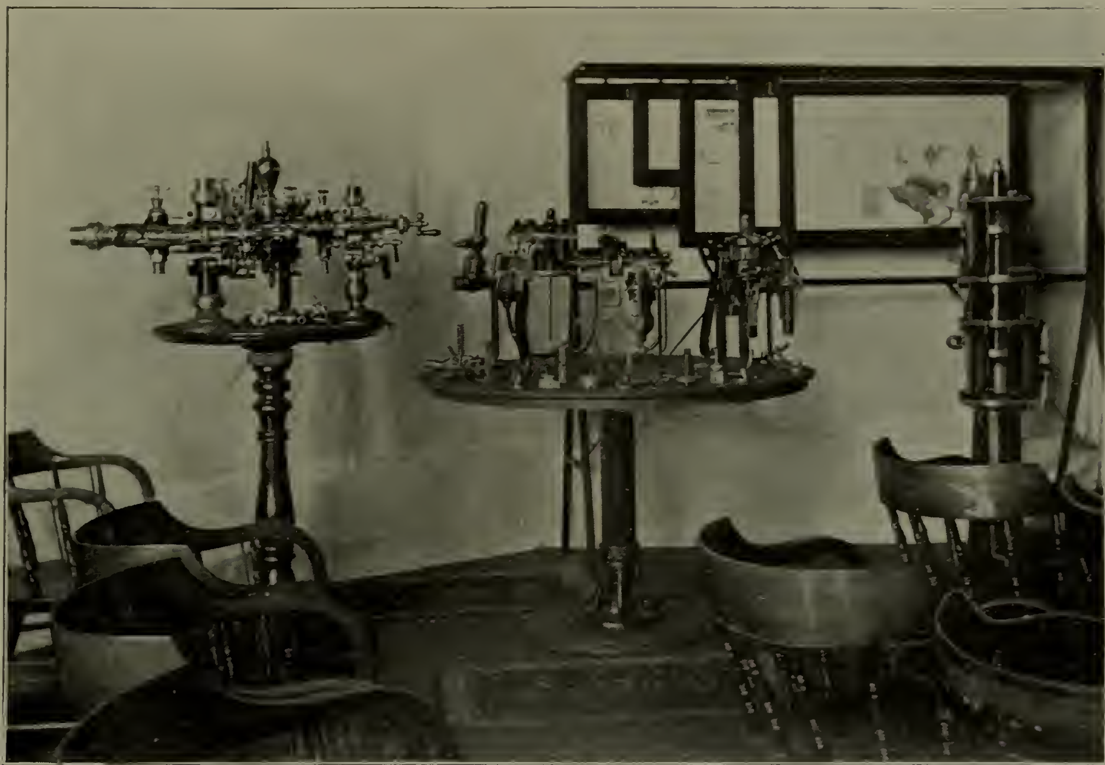


Fig. 5. Tables with Sectional Apparatus.

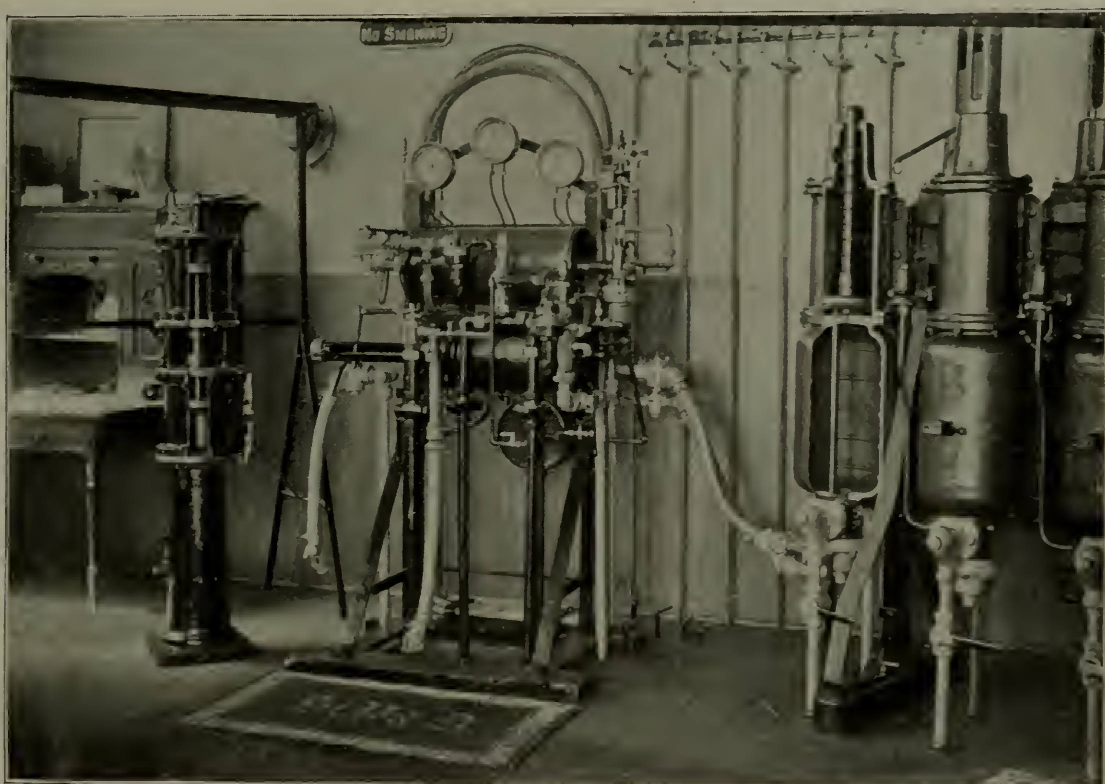


Fig. 6. The Engine Rack.

people for holding and jointing plain and special driver brake triple valves is worthy of notice.

A flanged bracket is employed where all quick action triple valves, including freight, passenger, and special passenger triples, can be readily placed and tested. As previously stated, the different reservoirs are placed in the basement, the necessary piping being employed; and, by means of stop cocks, any desired size of reservoir can be cut in, to accommodate the different triple valves.

When the pumps are being tested they are run by air pressure instead of steam. This practice has been found to be very satisfactory. The advantages are as follows: A higher pressure is obtained than would be the case were steam used, as the highest steam pressure carried on stationery boilers is 80 pounds, while air pressure for shop purposes is 125 pounds. At Gladstone the boiler room is situated at some distance from the air brake room, and if steam was used there would be considerable condensation. After a pump has been run and tested by means of steam, even supposing it is reasonably dry, there is always some water lodged in the steam end that will produce corrosion, which is detrimental, especially for new work when all parts are closely fitted.

FIG. 7. THE CYLINDER RACK.

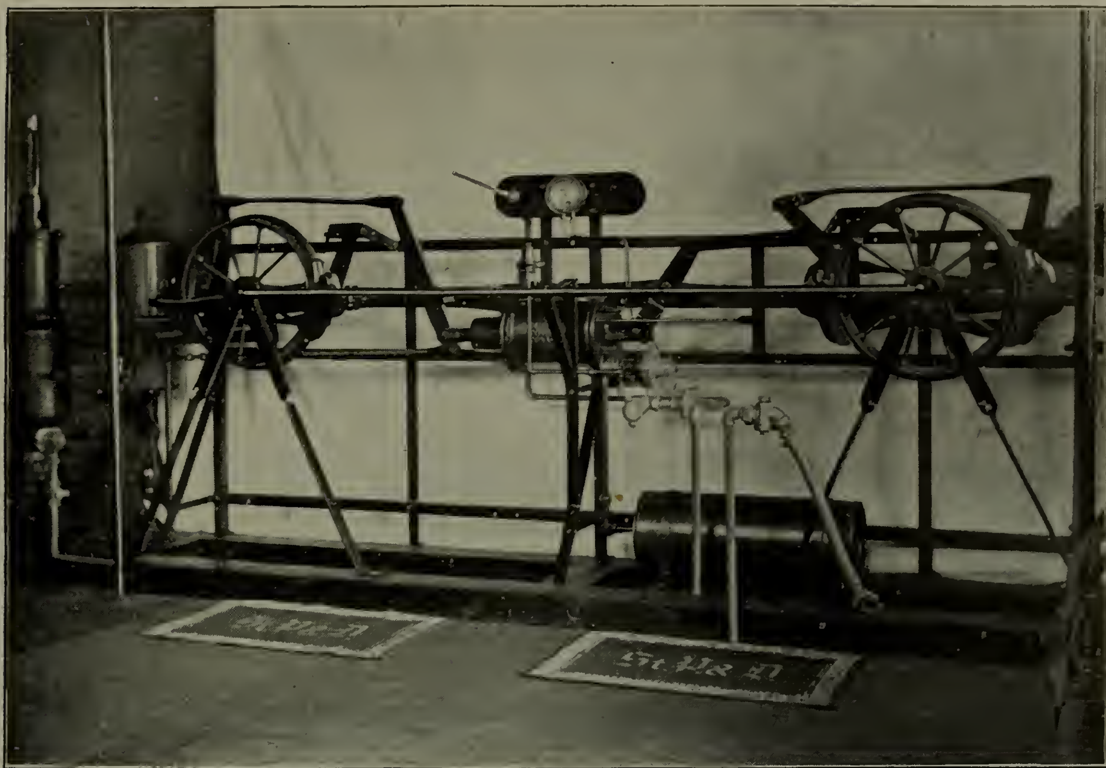


Fig. 8. The Foundation Brake Rack.

Then again, the absence of the heat that steam would give enables the pump or any part of same to be readily handled.

The five additional illustrations show the entire apparatus for instruction purposes. No expense has been spared to make the room comfortable, attractive and complete in every detail. Both tables for sectional parts of locomotive apparatus, as shown in Fig. 5, are free to revolve. This enables any sectional part to be brought to the front. The sectional air pump is mounted upon a carriage which enables it to be moved in front of the class, and it can also be elevated by means of air pressure, the post being a cylinder with piston and packing leathers. The pump can be revolved whether elevated or not, and this enables it to be placed in any position so that any part of it can be seen, giving all in the class an unobstructed view.

Fig. 6 is what is called the engine rack, where all the principal operative parts on an engine and tender are placed. This rack occupies a central position directly in front of the class.

Fig. 7 is the brake cylinder rack, with 12 brake cylinders, reservoirs and triple valves. It is fastened to a suitable framework with supports at both ends.

Fig. 8 is the foundation brake rack designed by the St. Paul &

Duluth. It occupies a floor space of 2½ by 14 feet. One end has the freight or Stevens system of brake levers, and the other the passenger or Hodge system, with their respective hand brake staffs. The brake or foundation rack represents the thirteenth or last car of the thirteen. By closing the head angle cock, which is seen in Fig. 6 on the right of the engine rack, and opening an additional stop cock, it is connected directly to the train line for engine and thereby becomes the head car, while car No. 1 becomes the rear car. This is equal to running the engine around the train and coupling the same on the rear.

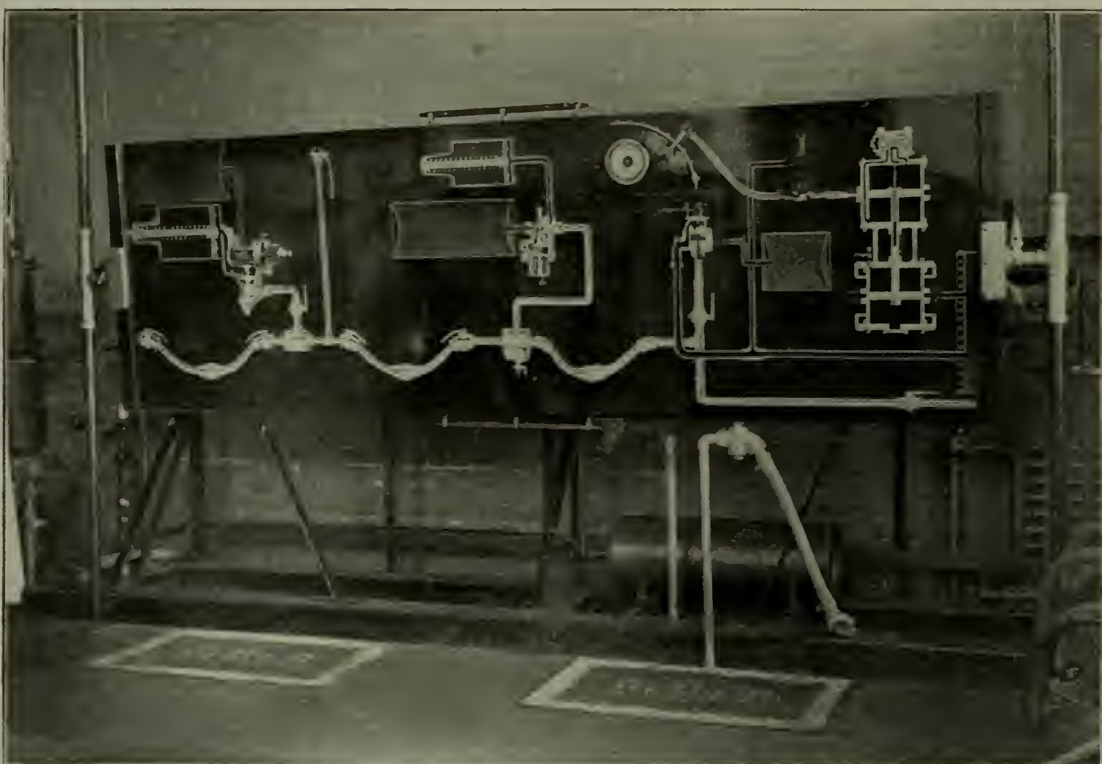


FIG. 9. INSTRUCTION BLACKBOARD.

As previously mentioned, the train pipes are situated in the basement, having forty-two feet of piping for each car. In addition to the thirteen train pipes, there is also sufficient storage to hold a volume of air, equal to thirty-seven train pipes. The additional volume is connected on the rear of the thirteenth car. When using the entire volume of air, equal to fifty cars, the brake or foundation rack, by suitable connections, can become the rear or fiftieth car in the train. Thus the foundation brake rack may be the first, thirteenth, or fiftieth car in the train. The value of this arrangement will suggest itself to all instructors n air brake work.

Fig. 9 shows the blackboard used in the instruction room, its dimensions being 3½x12 feet. It is suspended in front of the foundation brake rack, and it can be raised, lowered, or turned, so that either side can be used as the occasion requires. The slides are guided by two pipes that extend from the floor to the ceiling, the weight of the board being counterbalanced by two bars of iron that slide inside of the pipes. The triples shown on the board are real sectionals set into the board with all inner parts intact and free to operate as they would in service. All other parts as seen on the board are painted. Colors are employed to express the different parts. The same colors are used on the entire apparatus, showing the different parts and pressures. The other side of the board is blank, being used for crayon sketches or examples in figures.

All primary work and the greater part of descriptive instruction is given from the blackboard, being of a kindergarten character and it is attractive and simplifies preliminary work, both for the instructed and instructor.

TRIFLES AND TENDENCIES AS NOTED IN A BRIEF EUROPEAN TRIP.

BY WILLARD A. SMITH.

The opposition among foreign railway managers to the American passenger car system seems to be gradually giving way in practice, although they do not admit it in conversation. It is impossible to at once retire the inconvenient little compartment passenger coaches ; but new cars show the growth of American ideas. Most of these are now long corridor compartment cars, permitting circulation through the train. Many of the new ones are sixty feet long. Entire trains of cars of this length are now run between Paris and Brussels; and on some other routes. They are built like an American compartment sleeping car. The advantage of the privacy of a compartment can only be obtained by a party large enough to fill the compartment. It is sometimes much more unpleasant to occupy a small room with objectionable strangers, than it can possibly be to occupy a seat in the ordinary American coach. As an illustration, dogs are permitted to accompany their masters in the car, instead of being sent to the baggage van. I have a vivid remembrance of the discomfort and disgust occasioned in a compartment at close quarters with a mangy French poodle, who spent the time in scratching and shaking himself. The system of charging for baggage not carried by the passenger in the coach, leads most travelers to carry a number of hand bags, cases and bundles, which often cumber a compartment very disagreeably. One can smoke in his compartment if the other occupants do not object. He must notify the guard, who then pastes on the window looking into the corridor a label stating that smoking is permitted.

These long cars are provided with toilet rooms, and as circulation in the corridor is permitted, they are much more comfortable than the old style compartment coaches. The sleeping cars are, of course, on the corridor plan. The newest are sixty feet long and are a decided improvement over the older ones, the discomforts of which have so often been commented on. Folding seats are provided in the corridor for the use of the passenger while the compartment berths are being made up. Hardly as much attention is paid to cleanliness as in the best American service. The panels and all eligible places are occupied by advertisements, usually enameled on metal. The fact that they describe, for the most part, the advantages of certain hotels in which the sleeping car company is interested, does not make them any more ornamental.

Advertising in cars and at stations has reached the maximum in England, and is fast coming to that point on the continent. Soaps, teas, and pills seem to be the principal articles whose virtues are thus extolled. Our American railway stations are generally uninviting enough, but their careless ugliness is less disgusting than this everlasting vulgarity of circus poster advertising. The fields along the right of way bear a plentiful crop of the same stuff, and it is "rubbing it in" to have the interior of your compartment similarly decorated. In some cars, however, there are posted convenient maps of the road. Nor is the practice of using photographs of scenery for interior decoration particularly objectionable. The "tidies," or "antimacassars" which protect the backs of the seats frequently extol, in cotton thread, the virtues of "the shortest line," and even illustrate noted castles, etc., along the route. There are no double windows in the sleeping cars. Possibly they are not needed in that climate; but the single windows admit the dust so freely as to suggest the fact that the double variety has its advantages in summer as well as winter.

The worst thing about the sleeping cars is the price of accommodations. Four or five dollars per night is the regular charge for a berth; and when travel is large, engagements must be made days ahead in order to secure sleeping accommodations at all. It is no wonder that most people prefer sitting up in the ordinary coaches.

One of the railways in the south of England operates a service of Pullman parlor cars. It was the busy tourist season when we went over the road, and the solitary Pullman car could have been filled several times over. We found out why; the ordinary day coaches have an exceedingly lively lateral motion, which absolutely prevents reading, and greatly conduces to car sickness—an interesting prelude to the main play on the channel—making the easy riding Pullman car just so much more desirable.

Dining cars are coming more and more into use. Where they are run in the trains of ordinary cars, the passengers can only go to them and return to their compartments when the train is stopping at stations. The steamer trains from Paris to Cherbourg are ticketed by the steamship agents, and the passenger finds his seat reserved in the dining car for a certain hour and station. A good table d'hote luncheon is served. The coaches ride so roughly that reading is impossible, and the interval in the dining car is thus doubly agreeable. In other places, dining cars are run in complete trains of corridor cars. It is supposed that the passenger can then go to and from the "diner" at his leisure. But as trainmen are careless, and sometimes leave doors in the corridor locked, and as no one comes through the train when in motion, the promise of dinner is likely to prove illusory. We took a through train at Crewe for London early in the afternoon, after being assured by the guard that we could go right through to the dining car at any time. Alas, there was a door locked, and the occupants of one-third of the train went without their dinners until their arrival in London at 8:30 in the evening. On the Western railway of France we paid the "supplement" of one franc each for seats in the coupé cars, the especial advantage of which is the toilet room accommodation, accessible through the corridor. Another locked door in the corridor and no one to open it, caused us to mourn for the franc from which we so easily parted. It is easy to see why American conveniences of travel are not extravagantly popular in Europe. As there offered they have their drawbacks.

At some stations "first-class" toilet accommodations are offered, to which entrance is obtained by means of a "penny in the slot." Two half-pennies will not work it, so it is well to provide yourself with pennies before traveling, and not to give them all to the cabman and the porters.

On the Swiss railways the cars are divided into compartments, but have central aisles, on the American plan, and doors between the rooms. Each compartment is provided with a guide or time-table of the entire Swiss railway system, printed in four languages, German, French, English and Italian. As free time-table folders are unknown in Europe this plan is decidedly convenient. The complications of Bradshaw are too much of a maze for the ordinary traveler. It is a marvel of completeness and condensation and convenience, when one really understands it; but there should be special courses in the schools and colleges to fit people to interpret it. Such a course should be made obligatory, upon station agents at least.

Interlaken is one of the most popular resorts in Europe. It has its Casino, and has recently set up there a game very similar to the roulette of Monte Carlo and other places. This is, however, called the "railway game." A small train of cars runs around a circular track on which are stations marked "Paris," "London," "Berlin," "Vienna," etc. The long tables extend in each direction, divided into squares bearing the names of the stations. The player throws his coin on to the space he wishes to bet on. There is a great rush for these tables when the bell sounds, and the croupiers rake in great heaps of coin. To a looker-on it appears easy enough for the operator to stop the train where he chooses. The house, certainly, has a sure thing.

Things, perhaps, more worth noting than those I have written of above are the universal use of steel car framing, the increased use of 8-wheel freight cars with bogie trucks, the comparatively slow but sure progress of the air brake in freight train equipment, the wonderful increase of mountain railroads in Switzerland and other mountainous regions; and many similar subjects. But these are vacation sketch notes, and there is now so much of an international character to technical literature that your readers do not lack opportunity to learn regularly of the railway world's work everywhere.

WATT AND BOLTON.

Mr. Herman Fletcher, of Louisville, Ky., has in his possession two steel engravings, of James Watt and Matthew Bolton (or Boulton), respectively. These engravings, which we reproduce here, have been in Mr. Fletcher's family for over 100 years, they having been given personally by Messrs. Watt and Bolton to Mr. Fletcher's grandfather—Luke Punchon—at the time that the latter was employed by them. Mr.

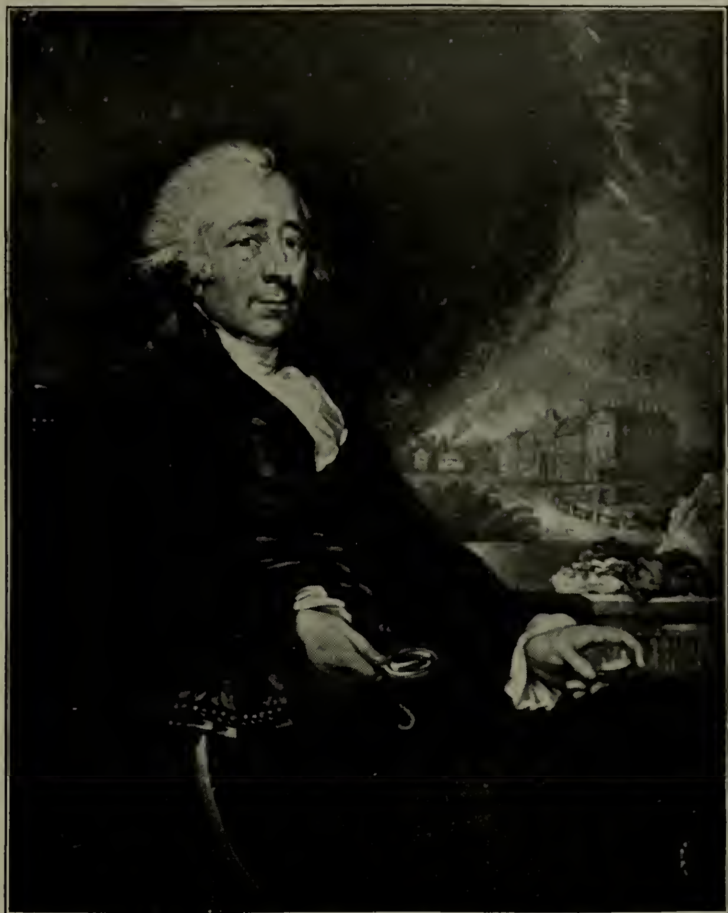
JAMES WATT.

Punchon started the first engine that came out of Bolton & Watt's shop. Mr. Fletcher, in the course of a recent letter to us says: "My grandfather's name was Luke Punchon, and he started the first mining engine at Cornwall, England. When the engine was set up ready to run, he told my father, the mine owners came from all parts of the country to see its operation, and their natural desire was to see it a failure. When the throttle was turned on and the engine started in successful motion, they dispersed faster than they arrived. They knew that in order to compete, they would have to follow suit and keep pace with the tide of progress. When the engine was in successful operation the fireman was an important adjunct. He was ordered to open or close the fire door an eighth of an inch, more or less, as dictated by the engineer, and was called out to open the fire door one eighth of an inch more."

Mr. Jas. Watt, whose portrait reveals a strikingly interesting face, was born in Scotland in 1736. He was a mechanical engineer and man of science, famous as the improver and almost the inventor of the steam engine. In early life he had hard struggles as a mathematical instrument maker, and as a surveyor. In about 1763 a Newcomen engine was placed in his hands for experiment. This engine was designed for pumping water in mines. In it, steam was admitted to a cylinder and then condensed by a jet of water, atmospheric pressure then forcing the piston down. He experimented with this crude affair until 1765, when he hit upon the idea of a separate condenser, which insured success with the Newcomen engine. But not content with that, Watt soon devised the prototype of the modern steam cylinder, closed at both ends, and the steam engine was then substantially invented. He had varied business experiences with his engine (which he patented in 1769), until finally he entered into partnership with Matthew Bolton, to make the new engine at the Soho Iron Works, near Birmingham. Watt perfected numerous inventions in the following years, the steam governor being the most important. Bolton, his partner, whose portrait we also reproduce, was born in 1728, his father being a steel manufacturer.

Under the title of "A Forgotten Steam Engine," *The Engineer*, of London, in a recent issue, tells interestingly of Watt's work on the steam engine in the following words:

"Those who have studied James Watt's life and works know that he left very little to be learned as to the principles on which a steam engine should be made. In his day the science of thermo-dynamics did not exist as we understand it. But for all practical purposes it may, for the steam engine, be summed up in a sentence—'Keep the cylinder hot.' All the science in the world cannot tell us more than that. Watt perfectly understood, moreover, what was to be had from expansion. It is difficult, indeed, to mention any factor likely to promote the economy of the steam engine, whose existence Watt did not recognize, and whose value he did not appraise. He invented and patented the steam jacket, and he did more than this. A defect of the jacket is that while the surface to be kept hot is of almost infinitesimal thickness, the heat derived from the steam in the jacket has to pass through the metal of the cylinder liner, and the result is that the incoming and expanding steam, as a rule, comes in contact with metal colder than itself, and so condensation takes place. To prevent this, it is necessary that the steam in the jacket should be at a temperature considerably higher than that of the steam in the cylinder, a condition which can only be secured by superheating the jacket steam, or using steam of a much greater pressure than that in the cylinder.



MATTHEW BOLTON

"Now, James Watt cut the Gordian knot and disposed of the whole difficulty by inventing an engine in which the cylinder is jacketed inside instead of out. Very soon after he had invented his first, or atmospheric, engine he saw that the cold air following up the piston must cool the cylinder. He shut up the cylinder in a little house of its own, which he kept filled with steam of high pressure, and he patented this steam engine in 1769, that is to say, 130 years ago, and he then gave the world the most perfect steam engine which, from the thermal efficiency point of view, it is possible to construct.

"A single-acting, open-topped vertical cylinder stands inside another. If we stand a small tumbler on a table, and turn a large tumbler upside down over it we have the whole arrangement. The inner cylinder is fitted with a piston, the rod of which passes through a stuffing-box in the top of the outer cylinder. A couple of valves put the inner cylinder alternately in communication with the space between the two cylinders and with a jet condenser. In working, the outer cylinder is always filled with boiler steam. It is, indeed, an extension of the boiler, in the same sense that the condenser is an extension of the inner cylinder. The piston rod is coupled by a chain and arc head to the working beam; at the other end of the beam are the spear rods and pumps. When at work, let us suppose the piston to be indoors, that is to say, at the bottom of the cylinder; the steam valve opens, steam passes under the piston, balancing the pressure above, and the engine goes out of doors by the weight of the spears, and the forcing stroke takes place. Then the steam valve is shut and the exhaust valve opened, and a vacuum is made under the piston, which comes indoors, and so on. The steam under the piston could be cut off at any point which would give suitable expansion. The range was fixed by the usual limits obtaining in the case of a Cornish engine. Because the piston is followed up on its descent by steam of full boiler pressure, the inside as well as the outside of the cylinder must be of the temperature proper to the pressure. The steam entering the cylinder under the piston will undergo no initial condensation after the steam valve is shut; and the expanding steam will continually meet with cylinder walls hotter and hotter than itself. The general result will be that condensation of the working steam—as we shall call it, although this distinction is not quite accurate—is out of the question. A certain amount of liquefaction due to the performance of work will take place, but no deposit of moisture on the sides of the cylinder can result. When the piston is descending, the boiler steam will probably find the temperature of the cylinder walls reduced, though even this is doubtful. It may be admitted that a certain quantity of water will be produced—although certain experiments which we have carried out go to show that no condensation which can be measured takes place—as the top of the piston always passes above the top edge of the inner cylinder, any water which would otherwise collect on the piston will be pushed over, and will fall down in the space between the two cylinders, from which it can be drained. It must not be forgotten that when expansion is used a certain volume of steam will always be pushed back again into the boiler during the up-stroke of the piston, but this is of no practical importance if the steam pipe is made large.

"We have here, then, an engine in which there is no initial condensation. The expanding steam starts dry in a dry, hot vessel, instead of beginning to expand with some 20 or 30 per cent of water mixed with it. No conditions more favorable can be found for expanding steam than those provided by Watt. We must seek for sources of waste in the boiler steam. We have repeatedly pointed out that no matter what the quality of an engine—good, bad, or indifferent—all the steam received from the boiler by the cylinder must leave the cylinder as steam, with the exception of that percentage which is liquefied by the performance of work, and that other portion which is condensed by radiation and conduction from the outside of the engine. This means, of course, that steam condensed initially or otherwise, during the steam stroke must be re-evaporated during the exhaust. To use the words of the veteran Isherwood, whose preface to the second volume of 'Experimental Researches in Steam Engineering' is the most masterly treatise on the thermo-dynamics of the real steam engine—not the ideal affair—ever written, we may say that it is the re-evaporation which is the cause of all the waste, because all the water of condensation, which may amount to 30 per cent or so, has to be evaporated twice—once in the boiler and once in the cylinder—and no mechanical return is obtained for the second evaporation, which is done by the coal on the grate just as much as though it were done in the boiler. Now in the Watt engine no re-evaporation can possibly take place. We have seen that condensation of the working steam is impossible; and any water resulting from the entrance of the boiler steam into the cylinder cannot re-evaporate, because the pressure at which it was condensed remains always the same throughout the whole cycle. The evaporation takes place in an ordinary cylinder only because of the fall of pressure during the exhaust.

"It is not quite clear why Watt did not build engines under his 1769 patent, or, rather, under the particular portion of it dealing with the engine we have described. Our readers will not, we think, be slow to see that this principle of construction admits of a wider range of application than Watt ever dreamed of; but with this we have nothing to do. Our work begins and ends with directing attention to an old and forgotten invention, whose beauty and excellence should suffice to rescue it from oblivion."

PASSENGER CAR LIGHTING.

At the last meeting of the Southern and Southwestern Railway Club, Mr. W. E. Symons, for a committee consisting of himself, R. H. Johnson and T. S. Lloyd, presented an extended report on the comparative value, efficiency, cost and practicability of the various types of artificial lights for passenger cars. The report is taken up with descriptions of storage battery, axle light, direct dynamo, combination dynamo and storage, and Pintsch gas systems. In summing up, the committee finds that the oil lamp, with its offensive odor, annoying heat in hot weather, damage from fire or explosion, either in train accident or otherwise, is fast becoming obsolete, except on some branch or local runs where it would be impossible to use the electric light, the cost prohibitive, or where, from the lack of storage stations, gas cannot be procured. While on all first-class trains in main line service, it would appear that either gas or electric lighting of some system was the standard.

Electricity has passed the experimental stage, says the committee, both as a power and as an artificial light, "and even if stopped in its development where it now is, it must be considered as one of, if not the, greatest invention of the age, and certainly one of positive and enduring utility. That the unknown capacity of the American inventive genius will doubtless cheapen the production to a degree that will practically make its adoption universal we all hope for, and feel assured will be realized at a not far distant day. Owing to the development of electric and other means of artificial lights, none of these figures as to the cost should be considered as permanent or fixed, for from the strides that have been made, particularly in the reducing of the cost of production, no doubt the cost of electric and other up-to-date improved methods of artificial light for trains will be still further materially reduced, until they will be equally as cheap, or cheaper than the oil lamp or tallow candle."

The committee gives the following memorandum as to cost of application and maintenance of mineral seal oil lighting on the Plant system: Cost of lamps, two chandeliers of two lamps each to a car, $172.50; oil consumed for lighting period of twelve hours, one gallon per car; average cost per light per hour (twelve hour period) .025.

It also gives the proportion of the various systems of lighting passenger cars in the United States (*Railroad Gazette* statistics):

Oil lamps	55 per cent
Gas	53 "
Electric light	02 "

The following average costs per light per hour are also given by the committee:

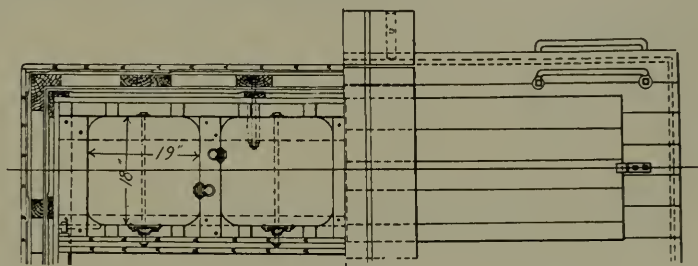
System.	Cost per light per hour.
Storage straight	.007
Axle light (Moskowitz)	
Dynamo straight	.083
Dynamo and storage	.043
Gas (Acetylene)	
Gas (Pintsch)	.02

Figures as to the axle light and the acetylene gas were not available.

REFRIGERATOR CAR TANKS.

The refrigerator car, the demand for which has grown to such vast proportions, has been but little discussed in railway papers; and it would seem fitting, at this time, when so many are being built at the different shops throughout the country, to discuss a few details of construction which are required to make a perfect refrigerator car.

In the first place, in beef cars, a temperature ranging from 34 to 40 degrees must be maintained in the hottest weather of the season,



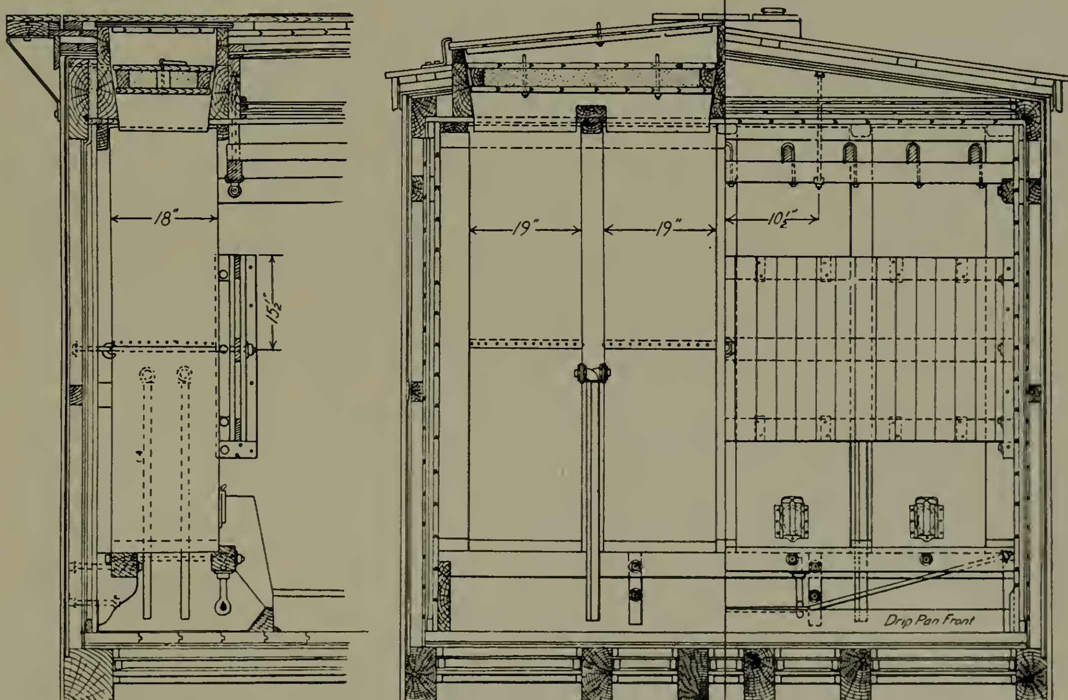


Fig. 1. Refrigerator Car Tanks.

for about 12 hours between icings; and one of the important items of their construction is therefore ice boxes and tank.

One of the best forms of ice tanks now in use is that shown in Fig. 1. This construction employs end tanks, four of which are placed in each end of the car, and filled through hatchways in the roof in the usual manner. Each tank holds about 500 pounds of ice, thus providing 4000 pounds per car, to which is added, in the hottest weather about 600 pounds of salt, to facilitate the melting of the ice, and thus increase the refrigeration. An overflow pipe is placed 30 inches from the bottom of the tank, which allows space for brine to be carried, this being one of the chief elements in car refrigeration.

By referring to Fig. 1, it will be seen that the tanks are so arranged as to allow a free circulation of air all around them; the air enters through an opening near the ceiling, and as it becomes cold it drops to the floor, and in this manner a circulation and the desired degree of temperature is obtained.

The tanks are made of No. 18 galvanized iron, riveted, soldered and tested, before being placed in position in the car, where they are raised about 12 inches from the floor, and are supported on an oak frame, which is fastened to cripple posts with lag screws.

A well pan, or bottom, which is made of No. 26 galvanized iron, is placed under the tanks, and nailed to the side and end of car, and the bevel well front, which latter is lag screwed to the floor. This well pan takes care of the drip from the sweating of the tanks; and also of the overflow of brine, after the desired height in the tanks has been obtained. In one corner of the well bottom, a pipe leads down through the bottom of the car, to a drip cup, which, in some cases is fastened to the bottom of the car, and, in others is made a part of the well pan. The arrangement is such that the overflow fills the cup, and as the drain-pipe leads to the bottom of it, it prevents any hot air from getting into the car through the pipe.

One advantage of this form of tank is, that it is possible to get a much lower temperature than with other forms, is always easy to repair, and is therefore economical in maintenance,—an item in car repairs which is always worthy of consideration.

In cars used for the transportation of fruit, the form of ice-boxes in use varies greatly; but the one which is most generally used is built on to the end of the car, with sub-framing, and extends from the roof to about one foot from the floor. It is about two feet wide, and is equipped with ice grates and hatch plugs, and also ventilators, which latter are attached to the hatchways. When in use the hatch plug and cover are removed and the ventilator placed over the hatchway. A space is left on the inside of the ice box near the ceiling, from 8 to 10 inches wide, and a wire screen placed over it, which allows free circulation of air in the car.

Another form of tank, or ice-box, one which is most used in provision cars, is one which does not extend down to the floor, so that the whole length of the car can be utilized for the loading of barrels, boxes,

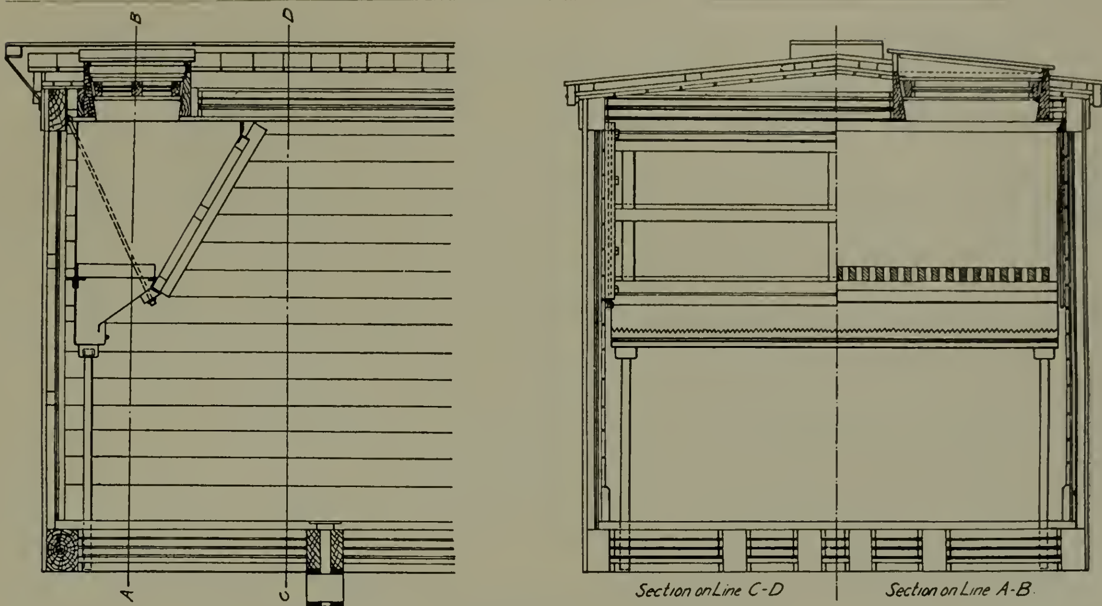


Fig. 2. Refrigerator Car Tanks.

etc. About the best ice-box of this form which has come to our notice, and which is the easiest and cheapest to repair, is the one shown in Fig. 2. This was invented by Mr. J. C. Kircher, foreman tinsmith for Swift & Co., Chicago. While the form does not vary materially from the old wooden ice-boxes of this style, now in use, the construction, and results obtained, are far superior. The tank being made of galvanized iron, does not produce a bad odor, as do the wooden boxes, by long usage. It will be noticed by referring to Fig. 2 that the front of the box slopes back at an angle of about 65 degrees, which slope is designed to force the ice to the bottom of the tanks, to the grates, and also allows better drainage of the tank; at the same time allowing more space in the car.

The novel feature about this tank is the manner in which it is supported. It will be noted that an eye bolt is fastened to the end plate, and that to this is forged a long eye rod, which passes along each end of the tank diagonally to the bottom front edge or corner, where it passes through an oak face piece, being fastened with nuts. An angle iron is riveted to the front and back of the tank. A cleat is lag-screwed to the end of the car, and on this the back angle iron rests; and the front angle rests on the oak face piece which is supported by the rods. It will thus be seen that in case of needed repairs, it is only necessary to remove the nuts and the tank is easily taken down. By again referring to Fig. 2, a row of teeth will be noticed extending across the tank. This feature is for utilizing the drip from the tank for further refrigeration; the air passes over the top of the tank, down through the ice and out between the teeth, and thus affords a better refrigeration by the circulation of the air passing through drip from melting ice. In this class of car no brine is used, and the temperature desired is seldom below 42 degrees.

LATE ARBITRATION CASES.

The work of the last (September) meeting of the Arbitration Committee of the Master Car Builders' Association is at hand. Sixteen cases were decided, and of these we give four as follows:

SCRAP CREDIT FOR BROKEN DRAWBAR REMOVED.

Case No. 556.—Canadian Pacific Railway Company *versus* New York & Ottawa Railroad.

New York & Ottawa Railroad car No. 3108, equipped with cast drawbar, 190 pounds, and wrought spindle, 36 pounds, while in possession of Canadian Pacific Railway, February 12, 1899, had bar and spindle broken.

The C. P. R'y applied cast drawbar, 200 pounds, and wrought spindle, 36 pounds, and rendered bill against owner for

200 lbs. cast, at 1½ cents	$3.00	
Cr. scrap (10 lbs.)	.05	
		$2.95
36 lbs. wrought, at 3 cents	1.08	
Cr. scrap (18 lbs. at ¾ cents)	.13	
		.95
2 hours' labor		.40
		$4.30

and claim this charge is in accordance with Rule 5, Section 10.

The N. Y. & O. R. R. claims bill should be rendered:

200 lbs. scrap, at 1.5c	$3.00	
Cr. 190 lbs. cast removed, at ½ cent	.95	
		$2.05
36 lbs. wrought, at 3 cents	1.08	
Cr. 36 lbs. wrought at ¾c	.27	
		.81
2 hours' labor		.40
		$3.26

The N. Y. & O. R. R. claims that Rule 5, Section 10, calls for full credit of kind of scrap removed from car, no matter at how many places it is removed. The C. P. R'y claims that credit should be allowed only for scrap removed at places where repairs are made.

DECISION.

The interpretation of the Arbitration Committee as to Section 10, of Rule 5, in the case of M. C. B. couplers and link-and-pin drawbars, where reference is made to "the weight and kind of metal removed should be credited," is that this means the original weight of the coupler or drawbar removed, and not the weight of the part remaining when a portion is broken off or missing.

In the opinion of the Committee, the bill of the Canadian Pacific Railway Company should be corrected accordingly.

WAGNER DOOR, SECONDHAND USED; PRICE CHARGED FOR.

Case No. 564.—Southern Pacific Company (Pacific System) *versus* Atchison, Topeka & Santa Fe Railway Company.

In November, 1898, the Southern Pacific Company (Pacific System) made repairs to Atchison, Topeka & Santa Fe Railway Company's car No. 17950, as follows: 1 Wagner door (secondhand) and 1 eccentric rod, missing. Bill was rendered for 1 Wagner side door, $3.50. The bill was returned by the A. T. & S. F. R'y Co., making objection to the price for a secondhand door, the claim being made that price should be at 25 per cent less than the price quoted in rules. The S. P. Co. replied that there is no authority under the rules for this claim, as the rules do not provide a different price for new and secondhand side doors. The A. T. & S. F. R'y returned the bill and declined to approve the charge for this door, stating that there is nothing in the rules which authorizes the application of a secondhand side door; that they mention certain circumstances under which secondhand material may be used, and that in those cases 75 per cent of the value of new material may be charged, and that the prices shown on pages 26 and 27 of the M. C. B. Rules are for new material. The S. P. Co. answers that the door applied was in perfect condition; that there is no reason why it was not as serviceable as a new door and why it should not last as long; that there is nothing prohibiting the use of secondhand material as far as it knows, and also that there is no special price for secondhand material of this description, and that it considers its charge a proper one.

DECISION.

There is no mention in the rules in regard to the use of secondhand material except in the case of M. C. B. coupler parts and metal brake beams. It is the practice to use in the repairs of cars secondhand material to a greater or less extent. The Atchison, Topeka & Santa Fe Railway Company does not dispute the Southern Pacific Company's statement that the door applied was in perfect condition, and that there is no reason why it was not as serviceable as a new door. Therefore, it is the opinion of the committee that the bill of the Southern Pacific Company is correct and should be paid.

COUPLER, COMPLETE, BILLED FOR, WHEN ONLY BODY USED.

Case No. 565.—Southern Pacific Company (Pacific System) *versus* Atchison, Topeka & Santa Fe Railway Company.

In November, 1898, the Southern Pacific Company (Pacific System) made repairs to Atchison, Topeka & Santa Fe Railway Company's car No. 12139, as follows: 1 new Janney coupler, account of broken; 1 brake shoe, worn out; 1 guide pin, missing.

Bill was rendered for:

1 new Janney coupler complete		$7.50
1 brake shoe		.33
1 guide pin, 3 lbs. wrought		.09
Labor, 2½ hours		.50
		$8.42
Credit.		
3 lbs. wrought iron	$ .02	
1 Janney coupler body broken	.67	
Good parts of coupler	1.55	
		$2.24
		$6.18

The bill was returned by the A. T. & S. F. R'y, objected to for the reason that a Janney coupler complete was used and billed for, when repair card stub shows the body only was used, and claim is made that only body should be charged.

The S. P. Co. claims the bill is correct as rendered; that it applied a new coupler complete, rather than hold the car until the old coupler could be taken apart and the good parts of the old coupler applied to the new body; that under the rules it is authorized to use new couplers in place of old, providing the proper credits are given for the good parts removed.

The A. T. & S. F. R'y replied that all that can be billed for under the present rules is the shank; that if it were allowable to charge for a coupler complete to every car in every case, the price for a coupler shank would never have been included in the rules, and the only reason the S. P. Co. charged for a coupler complete is because it can get from $1.00 to $3.00 more for a coupler shank in this way than it could if the bill were marked for shank only applied; that it has received two other S. P. Co.'s bills for couplers complete where the stub shows shank only broken, and says that charges are made for the sole purpose of getting an increased price for a coupler shank ; that if it were allowable to make a charge in this manner for shank broken, it would be allowable also in case of a knuckle being broken, thereby obtaining an increased price for a knuckle; that the only case where the rules allow a charge for a coupler complete with a credit for the secondhand parts removed is in case a different kind of coupler is used.

The S. P. Co. says it makes no reply to the insinuation that bill was rendered as it was, for the purpose of obtaining a little more for the coupler applied, but claims that it applied a new coupler complete as it would have required some extra delay in making repairs to the car ; that when it can be done as well as not, parts of couplers only are renewed, as is shown in other cases in the same bill with this car, and that there is nothing in the rules which prohibits the use of a coupler complete, whether the same kind is used or not; that there are times when the extra time it would take to remove the good parts from the broken coupler, and the corresponding parts from the new coupler, and then substituting the secondhand parts, would cause a delay in the movement of the car; that it is to the interest of the owner to have repairs made with as little delay as possible.

The A. T. & S. F. R'y states that, in the first place, the S. P. Co. shows the word "broken" instead of "applied" on line 13, of sheet No. 2, in giving its side of the controversy in the abstract.

The S. P. Co. answers that when the repair card stub shows that only a body was applied, there is no question but that the proper charge would be for a body only, but that in the case in dispute the card shows that there was a new Janney coupler applied on account of the body broken, and that if any of its bills have been rendered for a coupler complete when the card shows that only a body was applied, it was through an error, and that they are willing to make the necessary correction.

The A. T. & S. F. R'y, in addition to the argument shown, wishes to go on record as stating that it considers it unjust to a car owner to remove good material from its cars, and replace it with material of the same kind at an additional expense to it, when the company making the repairs has material which can be used with those parts ; that the argument stating couplers complete are applied to save delays to cars, and that owners are thereby benefited, should have no weight, because a car owner would not be aware of, nor would he care for, his car being delayed on another road fifteen or twenty minutes longer, in order that knuckle and pins might be removed from one shank and applied to another; that the fact that it takes but little time to exchange these parts is made evident by the M. C. B. Rules allowing no labor for exchanging them. The A. T. & S. F. R'y also wishes to state that if it is correct to make a charge of this kind, where a new coupler was applied, it would also be correct in case a secondhand coupler complete were used, thereby allowing the company making bill to collect from $4.00 to $5.00 for a secondhand shank instead of $3.38.

The S. P. Co. agrees that, when possible to do so, only the parts failing should be renewed, but that it is not always possible to do so; that in case it is not, and a new coupler complete is applied, as in the case in dispute, the company making the repairs should not be the loser, even though the same kind of coupler is applied as the one removed, as the rules do not prohibit such application. The owner receives what benefit there is in a new coupler. As most of the secondhand couplers are made up of different parts which have been removed from cars, the question might be raised as to whether the price of a secondhand coupler should be the price of the several parts as quoted, or 75 per cent of the price of a new coupler. If the rules allow 75 per cent of the price new in case a secondhand coupler of another make is applied, the same price should be used if the same kind is applied.

DECISION.

In Section 11 of Rule 5 is given a specific price for the coupler shank, namely, $4.50, and when a broken shank is replaced by one of the same make it is proper that the charge should be as mentioned above. In the opinion of the committee, the bill of the Southern Pacific Company should be corrected.

LINK-AND-PIN DRAWBAR ON CAR STENCILED FOR M. C. B. COUPLERS.

Case No. 566.—Southern Pacific Company (Pacific System) *versus* Norfolk & Western Railway Company.

Central Pacific car No. 18554 was received on the Norfolk & Western Railway with one automatic coupler and one common drawbar; the common drawbar was damaged and replaced by the N. & W. R'y, and bill rendered. Bill is disputed by the Southern Pacific Company on the ground that the car was equipped with automatic couplers and was so stenciled, which would make the Norfolk & Western Railway responsible for receiving the car with common drawbar in place of coupler without protecting itself, and makes the bill for the common drawbar against the owners improper.

The N. & W. R'y inspector claims positively that the car was not stenciled "Automatic Couplers"; that the unlocking arrangement was not on the end sill, and that under the rules he was, therefore, justified in receiving the car with common drawbar in one end, and in replacing common drawbar with another of the same kind when broken.

The S. P. Co. claims that the car was stenciled to show that it was intended to be equipped with couplers, and after looking the car up produces evidence that the car was marked "California Drawbar Stem," as shown by diagram attached, and contends that this fulfills the requirements of Section 31, Rule 3.

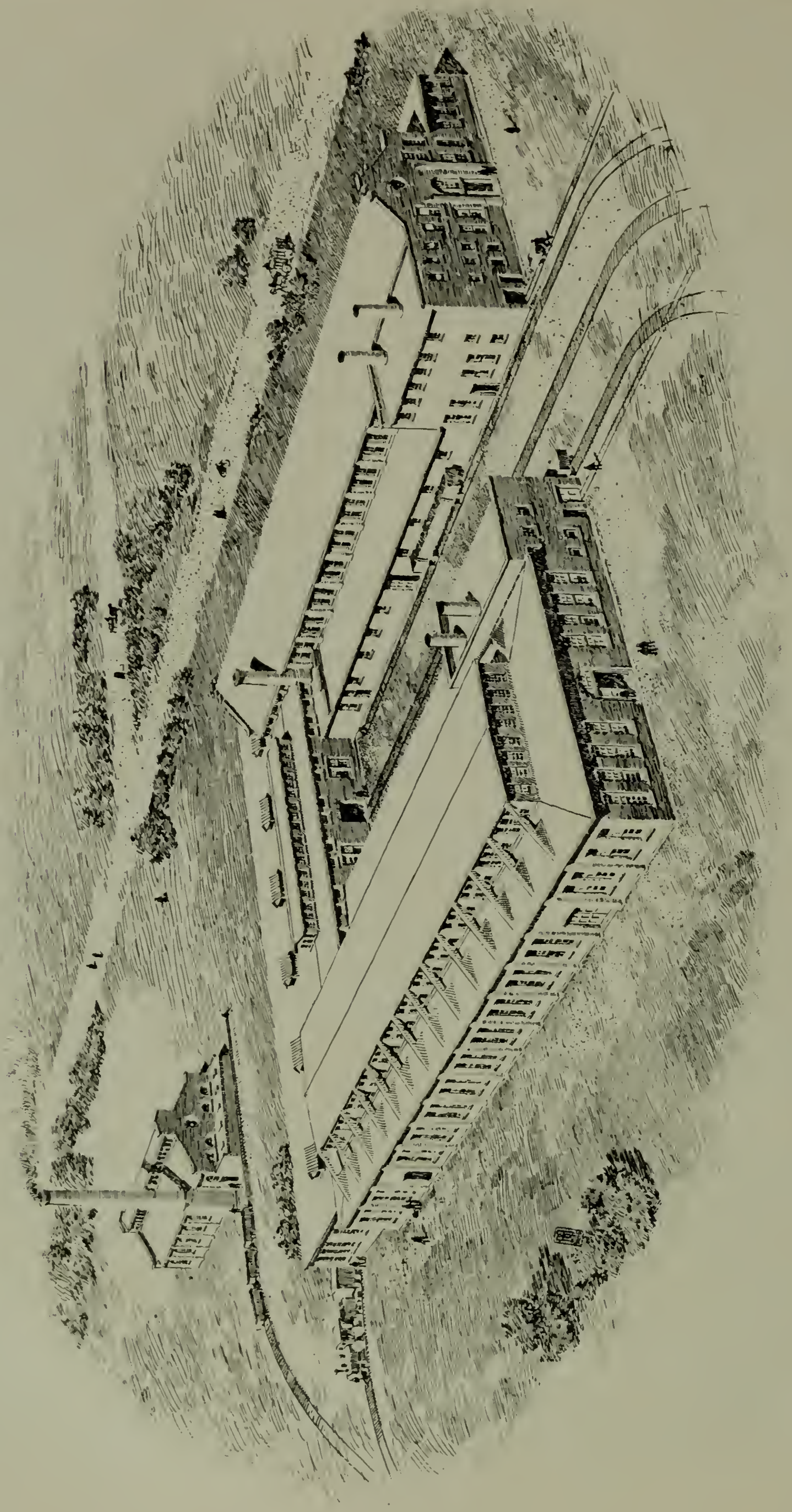
The N. & W. R'y contends that even granting such stenciling to have been on the car (which it does not, however, here admit), that such stenciling does not cover the requirements of Section 31, Rule 3, which requires that the car should be stenciled as being equipped with M. C. B. couplers. There is a distinction clearly made between couplers and drawbars. It further contends that, as the S. P. Co. marked its car as having been equipped with drawbar, it is not to be expected that the car inspectors can always know that this is intended to refer to M. C. B. couplers, and as the S. P. Co. failed to properly comply with the instructions contained in the rules and terms thereof, it cannot claim protection under Section 31 of Rule 3.

The S. P. Co. claims that the rules have been fully complied with as regards the stenciling, and if notation was made by the N. & W. foreman, as claimed in his letter dated April 17, 1899, "that the uncoupling rod was gone," it would seem conclusive evidence that the car was intended to be equipped with M. C. B. couplers, otherwise this notation would not have been considered necessary; furthermore, that this stenciling has never before been questioned by any company, and fully complies with the M. C. B. Rules.

DECISION.

In this case the question in dispute is as to whether the car was properly stenciled so as to give the information as to the fact that the car was equipped with M. C. B. couplers. The stenciling used by the Southern Pacific Railway reads, "California Drawbar Stem."

It is the opinion of the Arbitration Committee that this stenciling is sufficient to indicate that an M. C. B. coupler is required, as the California coupler is one of the well-known M. C. B. couplers. The Norfolk & Western Company is responsible for improper repairs and should make a settlement accordingly.



A MODEL STEEL AND IRON FOUNDRY.
THE SARGENT COMPANY'S NEW WORKS.

A MODEL STEEL AND IRON FOUNDRY.

THE SARGENT COMPANY'S NEW WORKS.

The Sargent Company was established in 1876 as George M. Sargent & Co.; later, the name was changed to The Congdon Brake Shoe Co., and in 1892 to the present title. This company now owns the property bounded by 58th, Sherman, 59th and Wallace streets, in the city of Chicago, and is constructing at Chicago Heights another plant, a perspective view and block plan of which are shown in the accompanying engravings. The present plant includes open-hearth steel, crucible steel and iron foundries. On or about the first of January, with the completion of the new plant, the iron foundry department will be removed to Chicago Heights, the crucible steel plant dismantled, and the 59th street works devoted entirely to the manufacture of open-hearth steel castings.

An interesting feature of the new plant is the steel foundry department, in which all kinds of small castings (formerly made in crucible steel) and castings for electrical and other special purposes will be made by the Tropenas process. This process is now in use in several plants in each of the steel manufacturing countries of Europe. It is the invention of Alexandre Tropenas, of Paris, (a graduate of the celebrated school of Ars et Metier) and consists in the use of a special converter process. The process was carefully investigated, both by the general manager and the superintendent of the Sargent Company, in several of the foreign plants before it was decided by the Sargent Company to adopt it, and it was finally settled upon as by far the most satisfactory process yet developed, for the manufacture of small castings and special grades of steel.

The iron foundry of the new plant has a capacity two to three times as great as that of the 59th street plant, and will be devoted exclusively to the manufacture of railway brake shoes. For the accommodation of this foundry and of the Tropenas steel foundry, two separate buildings have been erected parallel to each other, separated by a court 40 feet wide. These buildings are connected at one end by a cleaning room, and facing the court on either side are storerooms for all foundry supplies; and at the end of the court adjacent to the cleaning room, is the core room.

All foundry supplies, such as molding sand, limestone, coke, clay, etc., are delivered in cars on the stub tracks entering the court between the buildings. Pig iron and scrap are stocked beside the tracks in the yard and carried but a short distance from the cupola elevators. There is ample space on either side of each foundry for the storage of flasks.

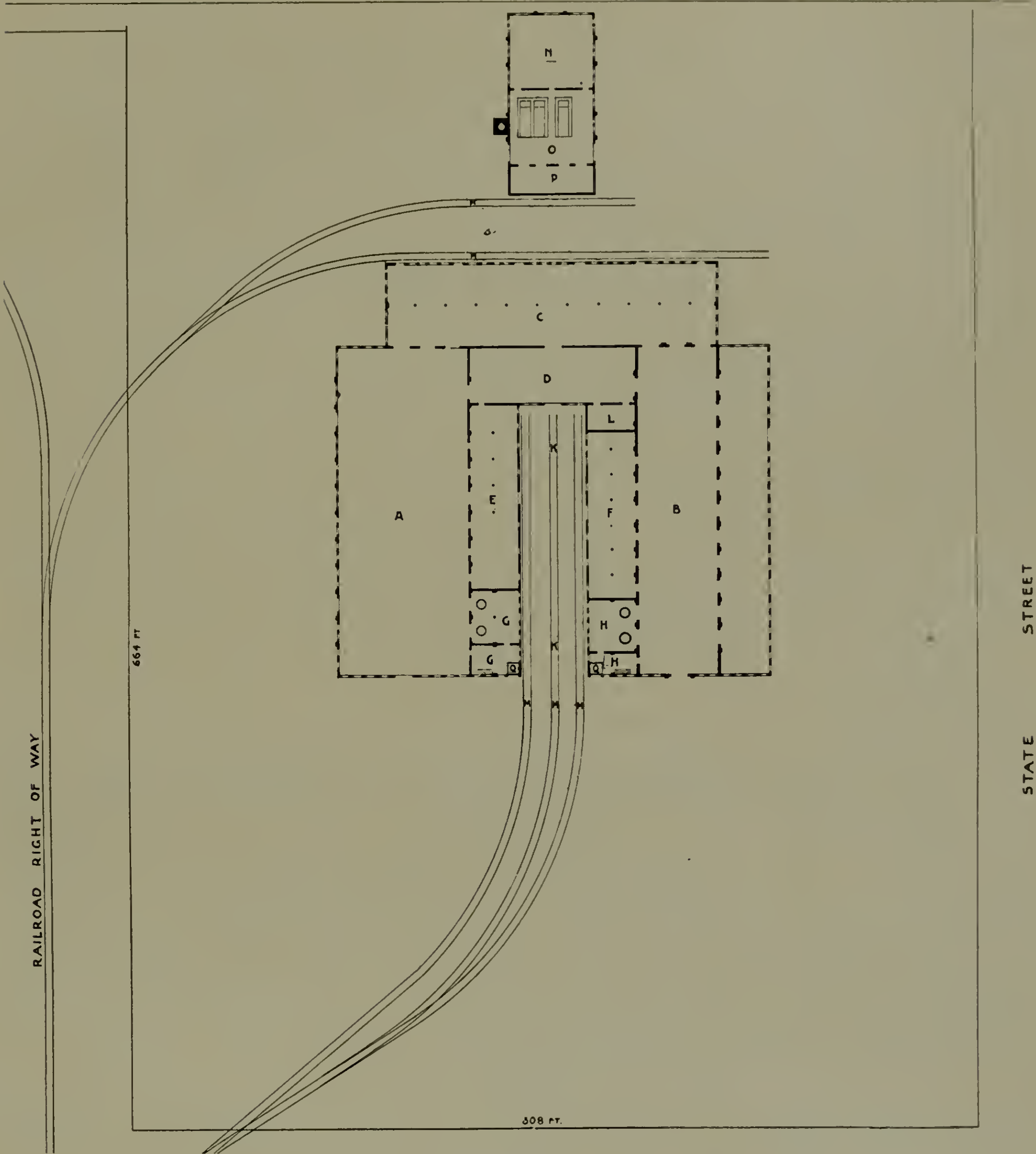
By this general arrangement for the storage of raw material and equipment, it is designed to diminish greatly the cost of handling, and by the convenient location of the cleaning room and core room, with reference to each foundry, a direct course for the semi-finished and finished product is assured.

A separate switch track serves for the transfer of all fuel supplies for the power house.

The iron foundry is a brick building 200 feet long with a clear space of 80 feet in width, accomplished by the use of a truss, which is the special design of the architects. The cupolas, one 60-inch and one 72-inch, are situated in the melting room on the court side at the south end of the foundry. The pneumatic molding machines, eight in number, made by the Tabor Mfg. Co., are placed in line lengthwise of the foundry and on the opposite side from the melting room. The melted metal is carried lengthwise of the foundry in a large reservoir ladle, traveling on a narrow gauge track; from this ladle it is delivered to buggy ladles, each operated by a single man, which are wheeled back and forth to the molds over the iron plate floor. This system of pouring has been used for a number of years in the 59th street works with considerable success; the pouring gang is continuously employed at this work during the entire day. This department is supplied with a 5-ton pneumatic-hydraulic jib crane and a number of air hoists. The blast for the cupolas is obtained from fans driven by electric motors.

The steel foundry building is 200 feet long, with one clear span of 50 feet, and a 30-foot annex, making a total space of 80 feet by 200 feet. The 50-foot floor is served by two 15-ton Shaw electric traveling cranes, with 3-ton auxiliaries, and a number of air hoists. Inside the melting room, which is located on the court side of the foundry at the south end, are placed two 60-inch cupolas, the blast for which is obtained from a large fan driven by an electric motor; and just opposite these cupolas, in the foundry building proper, are three Tropenas converters, each with a capacity of two tons, turned by special pneumatic-hydraulic gear. The blast for the converter, at pressure up to four pounds, is furnished by special No. 4 Root's blower, geared to a 50-horsepower electric motor.

The core room and cleaning room are located so as to be equally convenient to each foundry, and are fully equipped with friction driven



Ground Plan—Sargent Co.'s Works

A—Iron Foundry,	80 x 200 feet.		I—Molding Room,	30 x 200 feet.
B—Steel Foundry,	50 x 200 feet.		K—Court,	40 x 165 feet.
C—Finishing Shop,	50 x 200 feet.		L—Core Oven,	30 x 15 feet.
D—Core Room,	100 x 35 feet.		M—Railway Tracks.	
E—Sand Room,	112 x 30 feet.		N—Engine Room,	52 x 45 feet.
F—Sand Room,	100 x 30 feet.		O—Boiler Room,	52 x 47 feet.
G—Iron Cupola,	53 x 30 feet.		P—Coal Room,	52 x 16 feet.
H—Steel Cupola,	48 x 30 feet.		Q—Elevator.	

rattlers and self-oiling emery grinders, all driven by electric motors. Castings after being finished in the cleaning room are loaded directly into cars standing on a depressed track, which runs the length of the room, 200 feet.

The power house, like the other buildings, is entirely of brick and stone, 52x108 feet 7 inches. In this building are installed two 72-inch-x18-foot horizontal tubular boilers, equipped with special rocking grates and blowers, together with two large feed pumps, and a 300-horsepower feed water heater. In the engine room are located an 18x42-inch girder frame Reynolds-Corliss engine, built by the E. P. Allis Company; a 150 kilowatt generator, built by the Western Electric Company, and a duplex compound air compressor, utilizing over 100-horsepower of steam. The whole power plant is so designed as to permit of its capacity being doubled, as it is the expectation that the open-hearth department of the company will eventually be removed from 59th street to the ten acre plot of land adjoining the present Chicago Heights plant on the north.

It will be noted that both the iron foundry and Tropenas steel foundry are so planned as to permit of doubling the capacity of each department, by a simple extension of the buildings southward, without in any way interfering with the general system of handling materials and product.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

SEPTEMBER MEETING.

The regular meeting of the Car Foremen's Association of Chicago, was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, September 14, 1899.

MISCELLANEOUS BUSINESS.

President Morris called the meeting to order at 8:15 p. m. Among those present were:

Ashcroft, Norman	Egan, M. F.	Krump, M.	Stagg, C. A.
Bates, Geo. M.	Fitzgerald, M.	Kramer, Wm.	Snyder, R. H.
Baikie, J. P.	Grieb, J. C.	Mercatoris, M.	Stuckie, E. J.
Bossert, Chas.	Gardner, L. S.	Morris, T. R.	Showers, G. W.
Bundy, C. L.	Harkenrider, J.	Miner, W. H.	Sharp, W. E.
Blohm, Theodore	Johannes, A.	Olsen, L.	Smith, E. B.
Bond, L. E.	Keebler, C. F.	Prickett, J.	Thiverge, J. C.
Caldwell, D. B.	Kroff, F. C.	Rieckhoff, C.	Van Vleit, J.
Downing, D.	Kehm, H. C.	Saum, G. N.	Vieth, H. A.
Depue, Jas.	Kershaw, J. A.	Schultz, A.	Wensley, W. H.
Etten, L.			

Secretary Cook: We have applications for membership from the following gentlemen: R. T. Brydon, of the Wadsworth-Howland Paint Co.; M. F. Egan, of the Galena Oil Co.; Oscar Rundquist, of the C. &

G. T. Ry.; C. H. Carey, of the C. L. S. & E. Ry.; E. Fieldmier, of the C. L. S. & E. Ry. These gentlemen have been considered by the Executive Committee and their names accepted as members.

President Morris: Reports of committees are next in order; we would like to hear from the Committee on Revision of Constitution and By-Laws, Mr. Grieb, chairman.

Mr. Grieb: The committee is just getting started, and it may be that we will be able to submit something at the next meeting, possibly not until the meeting after that. We find we have quite a large task on our hands and little material at our disposal.

President Morris: If there are no objections the committee will be continued. We would like to hear from the chairman of the Entertainment Committee, Mr. Wensley.

Mr. Wensley: The Committee on Entertainment met on August 19, and decided on recommending a trip to Milwaukee, taking in the C., M. & St. Paul shops.

After brief discussion of this report it was voted that this club next month take a trip to Milwaukee and return, visiting the C., M. & St. P. shops, and the president was directed to appoint a committee on arrangements to take the matter up with the St. Paul Ry., and set a date and attend to other details. The president will appoint this committee later on.

President Morris announced that a communication had been received from Mr. Waughop, chief joint inspector at St. Louis, stating that the Joint Car Inspectors Association would hold their annual meeting in Cleveland on September 28, and cordially inviting any and all the members of the association to be present.

COMPARATIVE EFFICIENCY OF M. C. B. COUPLERS.

President Morris: Our first topic for discussion today, on the comparative efficiency of M. C. B. couplers on freight cars, is a very interesting one, and if the members will tell what they know about these couplers it would make very interesting reading in the report of our proceedings.

A rambling discussion followed, participated in by Messrs. Prickett, Kramer, Bond, Stagg, Kroff, Smith, Bundy, Grieb, Bates, Ford, Oleson, Stuckie and Kehm. There was not the general free statement of the comparative merits of different couplers that had been expected. In fact, there was no information of especial value brought out. The more suggestive statements made may be summarized as follows: Some recent knuckles turned out by a prominent coupler maker had proved too soft and were bending.—The opening of knuckles on the road is a mystery, for severe yard tests with couplers that have parted on the road have on occasion failed to cause a repetition of the road failure, or to reveal any reason for such failure.—It is very desirable to materially reduce the number of makes of couplers on the market.—The great trouble with couplers uncoupling is the knuckles wearing.—The majority of cases of trains parting, on account of couplers opening, are caused by "foreign cars."

The association followed with a discussion as to "which gives the better service in securing pockets to couplers, rivets or bolts," as follows:

RIVETS VS. BOLTS IN SECURING POCKETS TO COUPLERS.

Mr. Showers: I think you will all agree with me in saying that the most important part of a car is the draft rigging. The most trouble there is today, the greatest wrecks, are caused by couplers pulling out—break-in-two's, or wrecks of that nature. The amount of money involved in covering the damage is enough to change the draft rigging perhaps on the whole equipment. I brought up with me a few samples of the rivets, and some bolts that have been applied. I first show here a 1⅛-inch rivet that is now used by this company. We take a 1⅛-inch iron rivet; the distance between sleeve is 8½ inches. We drive it down until we fill the 1⅛-inch hole perfectly firm and solid; then use a swedging tool and put a very heavy head on. We know that iron when it is hot will expand, and the minute it cools then the contraction of the iron will make a tight job. I have here some bolts that were put on. There is a bolt here, ⅞-inch, applied January, 1899, and removed May, 1899. I would like to have some of you look at the bolts that are applied in couplers. We remove, on an average, about 50 such bolts per week. On cars that we have sent out with our rivets, the couplers are broken on the line and, in many cases, ¾-inch bolts are put in by the railways. We have a number of cases where 1⅛-inch bolts were applied. Companies apply these bolts to our cars and I have been in the habit of getting joint evidence. We have had quite a number of letters written to our management, complaining as to the objections I made to the bolts. I have had a number of cases sent home after they have claimed that they applied rivets. Here is a sample of the rivets applied by some of the roads. You will see that this rivet, from all appearance, was applied cold; if hot at all, it was very slightly so, and it was battered over very lightly, thus leaving the sleeve nearly the same as it would be by taking a long bolt and bending it over on end. I am of opinion that if all parties, in riveting sleeves to the drawbar, would put the proper head on the rivet they would not have any difficulty at all. Then, to make the matter more conclusive, when bolts are put in, you may draw them up as tight as you possibly can with a wrench, yet they will be nowhere near tight, I do not care what size wrench you may use; while with the rivet the iron is expanded, and when you draw it together and put on a solid head it is bound to contract, and when the iron contracts it draws it up so tight that there is no room for it to give way. I am aware that there is a little more labor involved in applying rivets than in applying bolts, and perhaps on light repair tracks it would be more convenient to use the latter. Yet as to the original question before the association for discussion, that is, which gives the best service, I think you will all agree with me in saying that the rivet is by far the best.

Mr. Wensley: I can't agree with Mr. Showers. One of our couplers is equipped with 1½-inch sleeve bolts. The Erie has as few wrecks as anybody, and I have the first one to hear of with bolts broken out.

Mr. Stagg: I do not agree with Mr. Showers as to rivets in couplers. Now you put a bolt in a coupler, jam the thread a little, and in my opinion you have just as strong an arrangement as rivets. I find rivets break. A great many cars that come to us are equipped with pockets and rivets and a great many rivets are broken. As to the economical side of the question, I consider a bolt a good deal more economical than the rivet. We used to take all our drawbars to the blacksmith shop to have three rivets put on; it cost 27½c. It only costs about 14c. to put in a bolt, and you get about as good service from the bolts as from the rivets. I can't see why a bolt is not as good as a rivet. Another thing, I have seen men spend three hours to get a pocket off a coupler; they would first cut the rivet all around, then stand and jam and jam and jam, trying to get the rivet out. With a bolt, you can break it, knock the nuts off, and in a short time have the bolts out.

Mr. Prickett: I think that a 1⅛-inch bolt which we are using, with two nuts on, and jammed up a little bit, is just as good as any of your rivets. It is put on quicker, and saves time. When the head of the coupler is broken, and you want to use the pocket again, it takes an hour and a half to two hours to cut rivets. But if you have got a coupler bolted in, you can cut the bolts out in half the time.

Mr. Kramer: I would be in favor of having a bolt in place of a rivet, because I will say that about 90 per cent of the rivets are broken, to 10 per cent of the bolts.

Mr. Sharp: I would not like to see this association go on record as favoring bolts instead of rivets. Mr. Showers, in opening the discussion, said a great many train wrecks were caused by drawbar pockets pulled off on account of improper rivets or bolts. I agree with him that drawbar rigging or draft rigging is the important part of the car, but fortunately the company I have the pleasure to be with at the present time doesn't have any difficulty with its draft rigging. You all know the rigging we use and the double spring. We have very little difficulty with the draft rigging at all. I think the great deficiency in draft rigging is more in the spring than in the rivets, bolts and pocket. Some have been speaking about the expense of taking out rivets; I was rather startled to know that it was costing so much to remove the pockets that are riveted on, and would suggest that you do it piece-work as a remedy. We have it done for 5c. a coupler. Perhaps you would get relief if you would establish the piece-work system. Our men rated at 19c. per hour make more than their rate. For my part, I favor the riveted pocket, and the reason for that has already been stated by Mr. Showers. You can get the pocket on tighter. The drawbar pocket that is not put on tight is not fit for service; with the rivet they can be put on tight.

Mr. Stuckie: Our friend just spoke about getting pockets out for 5c. apiece. I had an experience the other day with two men and I am afraid if they would follow that up they would eat very few meals a day. They couldn't make much at 5c. a pocket. There are a good many ways of looking at this. Railroad companies look for economy on all sides, and I, for one, can say from my experience that bolts give fully as good satisfaction, if not better, than rivets. We find a good many rivets broken and find it hard work getting them out, in many cases splitting the pocket in getting them out, and having to throw it in the scrap pile. I favor bolts.

Mr. Showers: I have heard considerable this evening in regard to "the expense." Now, what do they call "the expense?" A coupler pulls out on the road, wrecking a train, resulting in damage to the extent of hundreds, often thousands of dollars. A car repairer puts in three to five hours at 20 or 30 cents per hour! That pays for the wrecks, does it? The real efficiency is what we are after; not what costs the most at car repair shops. If we had no work to do on cars we wouldn't have any car repair shops. As to comparing bolts to rivets, I have here a 1⅛-inch bolt that was applied May 17 and removed August 15—a little less than three months. I would like to have some gentleman examine this bolt here. I will say that when we rivet our couplers on, we stamp a letter "C" to keep a record of how long the rivets stay; this is done by the letter being set in the head tool. One rivet was applied to our car No. 1118 in June, 1894, at 47th street. The car is in the yard today and I had coupler removed; the rivet was just as sound today, when I took it down, as when we put it in. Over five years in service, and perfectly sound. I took it out for the purpose of bringing it here tonight. I defy anyone to take a bolt and a wrench and make it as tight as this is.

Mr. Stagg: Mr. Showers is speaking from a private-line standpoint. I have not heard any railroad men here speak of wrecks. Mr. Showers speaks of wrecks caused by rivets and bolts giving out; I have been with the Grand Trunk for five years and never heard of a wreck caused by bolts or rivets breaking. I would like to know how many wrecks are caused from bolts breaking in pocket. The most wrecks are caused by rails or wheels, from defects in the track; very few from coupler getting under car.

Mr. Showers: I am not speaking from a car company's standpoint. I have obtained my information from actual service with railways as well as private corporations, and I have been at least five years with a railroad to one with a private line; have been in road service as well as shop service and have, perhaps, seen a wreck or two.

Mr. Kramer: I have been in the wrecking business for the last 25 years, and I have never seen a drawbar pulled out on account of rivets being broken. Drawbars when they do pull out will pull out altogether. spring and followers combined, and they cause a wreck in a case of that kind. However, most wrecks are caused by defective rails or cross-ties decayed, or defective frogs, flanges breaking, or break-in-twos.

A Member: It is now six years ago since we put a new draft rigging in our cars. We put it in about 800 cars. We have them all bolted with two bolts, and I do not know that I ever saw a bolt broken. The only thing is that you might lose the nuts; that is the only thing that I find wrong with the bolts. Of course, rivets are a very good thing too; but bolts are all right.

Mr. Kroff: I favor the rivets, because I think they can be put in more solid and firm than a bolt. I do not know as the bolts are breaking so much, but I do know they get loose and wear out, and in renewing a pocket or drawbar you have to renew the bolts, for they are worn out and cannot draw to pocket. I think if a rivet is put in properly it will give twice the service a bolt will.

Mr. Bond: I had a case recently at South Chicago. A drawbar was broken and it was riveted on. I had to set the car on side track and keep it there for 36 hours before I could get a drawbar with strap riveted on, where if it had had bolts I could have had the car out on the road on its time. It is all right in your own yard where you have a blacksmith shop, but when you take it out on the road and a drawbar pulls out, or anything breaks, and it is a long road to where there is an inspector with a drawbar, it is different. He has to put a chain on the car, and consequently it does more damage than anything else. I think a ⅞-inch bolt, with a good head and nut and key, the thread just allowing the nuts to draw up tight, so that a key will go under the nut through the bolt, will stand as long as any rivets, give better service and quicker results.

Mr. Morris: I believe what Mr. Bond says, about it being an easy way to repair a car; but as to its giving better service I think the rivet will give the best results of the two. Mr. Grieb, can you give us any information relative to drawbars pulling out on account of broken rivets, and causing wrecks?

Mr. Grieb: The C., M. & St. P. uses nothing but rivets, as I presume everyone knows. Some found out to their sorrow that bolts came out and rivets held. We have about 68,000 couplers in service under our cars, and aim to maintain nothing but rivets in them, I presume for good and sufficient reasons.

Mr. Wensley: I prefer bolts. We get cars about 6 o'clock of an evening for rush freight; one train leaves about 7:30, and another about 8:30. If I called a blacksmith and held those cars out a long time, I would hear from it next day. The bolts are much easier applied.

Mr. Morris: That doesn't seem to me to bear very much on the question we are discussing, as to which gives the best results.

Mr. Wensley: Bolts are the best.

Mr. Morris: There is no question at all but what it is easier to put in bolts than rivets, but the fact that a coupler breaks, and it is necessary to remove it, isn't anything against the use of rivets.

Mr. Bundy: I think, for my part, that the rivet is decidedly the best. Less drawbar pockets pull out with rivets than with bolts.

Mr. Smith: If it is a question of convenience in repairs, the bolts are the best; if a question of durability and safety, the rivet is the best.

Mr. Grieb: We have no trouble with pockets pulling out on couplers that are attached with a 1⅛-inch rivet properly applied.

Mr. Depue: We find very few pockets pulling off when they are riveted with a good 1⅛-inch rivet, and I think that where service—actual service—is in view, rivets are far preferable. When it comes to convenience of repairs it is something else.

Mr. Sharp: I move that it is the sense of this association that rivets give the best service.

The motion was carried.

CUT JOURNALS AND DAMAGED BRASSES.

Mr. Morris: Mr. Grieb, I believe you had a question that you wanted brought up before the association, in regard to brasses.

Mr. Grieb: There is a question in regard to the proper construction of Section 21 of Rule 3, M. C. B. Rules. It reads: "Journal bearings which require renewal by reason of change of wheels and axles, for which delivering company is responsible," and says that delivering company is responsible for these journal bearings. The question has been raised as to whether a company that has cut a journal on a foreign car on its line has the right to charge the brass that has been burned or destroyed. Or, is it responsible for the brass itself? If it was a question of interchange, there would not be any doubt as to how it should be handled; if the C. & N.-W. gives the C., M. & St. P. a car with cut journal, we would ask for defect card for cut journal and brass, or two brasses, if we found it necessary to apply them on a new pair of wheels, but if we are standing the journal on a C. & N.-W. car in our possession, how would it be?

Mr. Showers: The rule is very plain on this point. Doesn't it say that for journal bearings, removed from any cause other than that for which owners are responsible, they cannot bill owners?

Mr. Morris: The rules of '98 allow charging owners for brasses damaged in this way; does this new section alter that in any way?

Mr. Showers: I think it does.

Mr. Morris: The question is, whether delivering company and possessing company are the same in this case.

Mr. Kroff: I should think they were the same; the company that cuts the journal should be responsible for the brasses which may require removal.

Mr. Bates: I should think that if the C., M. & St. P. had a C. & N.-W. car in their possession with a cut journal, and made repairs themselves, that it would be proper to charge the bearing to the owner. Now, there are other sections in the rules where you can charge for missing material if you make the repairs yourself, whereas the delivering company is responsible if they do not make the repairs, and it seems to me this would be about the same. Take a car with a missing brake shoe; you deliver it to another line and you will have to card; make the repairs yourself and you can charge the owners, and I think this is about the same.

Mr. Showers: I do not quite look at that in that light. It seems to me that the way the rule reads, that removal of wheels or axles from any cause that owner is not responsible for, that they are not responsible for journal bearings; it doesn't say "owners," but says "delivering company" is responsible. In the part of the rules referred to by Mr. Bates, it says that with cars offered in interchange they will be responsible for missing parts, but if they make repairs themselves they can charge owners. There is no comparison to make. I am of the opinion they mean possessing company as well as delivering company.

Mr. Prickett: If the North-Western delivers a car to the St. Paul, for instance, with a wornout wheel for which they are responsible, the St. Paul removes the wheel. The North-Western is liable for the brass the same as they are for the wheel; but, on the other hand, if the St. Paul takes that car and runs it over its road and neglects to oil it, cuts the journal, cuts out the brass, it should be responsible for it, not the owner On the other hand, if the C. & N.-W. delivers them a car with hot journals and they cut journal, they should be responsible for it in that way.

A Member: I removed a repair card from one of our cars, where they applied a pair of wheels on account of wornout. The repair card was marked, "Bill for the wheels, no bill for the journal and bearing on account of cut." I think that was proper.

A Member: I would like to ask Mr. Prickett whether he makes any distinction between a journal that is cut for want of oil, and one cut by reason of brass being worn out.

Mr. Prickett: A journal cut for want of oil or for brass wornout. We very seldom find cases of journals cut on account of brass wornout.

Mr. Showers: I would take it in the light Mr. Prickett does, from the fact that railroad companies have authority to remove wornout brasses; if they do not avail themselves of that opportunity they should be in for it.

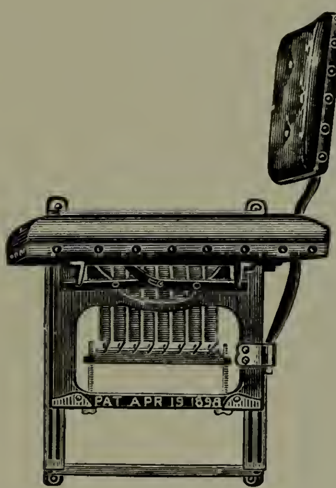
Mr. Morris: I would like to have something definite in regard to this, because it is something we are going to handle every day, and there should be a sort of unanimous feeling on the subject.

Mr. Showers: I move that if a railway company offers a car in interchange, and it is necessary to remove brasses for any cause for which owner is not responsible, cut journal or chipped rim, the delivering company is responsible. The same to bear out with possessing company.

The motion was carried by a vote of 22 to 5.

The meeting here adjourned.

The next regular meeting of the Association will be held in the rooms of the Western Society of Engineers, 1741 Monadnock Block, evening of October 12, 1899. This will be the annual meeting, at which the election of officers for the ensuing year will take place. Other important matters will come up, and the committee on arrangements for annual celebration will report.



IN POSITION.

DROPPED.

A NEW CAB SEAT.

A new drop cab seat has been turned out by the Stannard & White Company, the well-known cab seat makers of Appleton, Wis. The seat is very practical and convenient. It is a perfect working spring seat; and all friction is relieved by ball bearings. The seat can be gotten into and out of position very quickly, and with but little effort. It occupies only three inches of space when dropped.

The M. C. B. letter ballot has been counted, showing that all of the twenty-nine propositions to alter and add to the association standards and recommended practices, have been adopted, mostly by good majority votes.

The Traveling Engineers' Association met in annual convention at Cincinnati, Ohio, commencing September 12, and some account of its work will appear in our next issue. Officers for the ensuing year were elected as follows: President, P. H. Stark, Council Bluffs, Iowa; first vice president, C. H. Hogan, Buffalo, N. Y.; second vice president, W. J. Wallace, Baraboo, Wis.; third vice president, H. B. Brown, Newark, Ohio; treasurer, C. A. Crane, Fort Madison, Iowa; secretary, W. O. Thompson, Elkhart, Ind.

THE HEAVIEST LOCOMOTIVE EVER BUILT.

Brooks Twelve-Wheeler, for the Illinois Central Railway.

Total weight—232,200 pounds; weight on drivers—193,200 pounds; Cylinders—23x30 inches; heating surface—3,500 square feet, of which 263 square feet is fire box and 3,237 square feet tube surface; grate area—37.5 square feet; working steam pressure—210 pounds; boiler—82 inches.

TWELVE-WHEELED FREIGHT LOCOMOTIVE--- ILLINOIS CENTRAL RAILWAY.

The heaviest locomotive ever built is that which has recently been delivered by the Brooks Locomotive Works to the Illinois Central Railway. This engine was, we understand, designed entirely by the Brooks Locomotive Works, the Illinois Central simply specifying, as far as elements of its design go, the controlling clearances imposed on its line.

This engine has 23x30-inch cylinders; 57-inch drivers; a Player-Belpaire wagon top boiler, which is 82 inches in diameter, and which is designed to carry 210 pounds of steam; a long fire box over the frame, 132x42 inches; a grate area of 37.5 square feet, and a total heating surface of 3,500 square feet, of which 263 square feet is fire box and 3,237 square feet tube surface. The engine weighs 232,200 pounds, of which 193,200 pounds are on the drivers. The nearest approach to this in weight was the Union Railway consolidation engine, built last year by the Pittsburg Works, and illustrated in our issue of November, 1898, which weighed 230,000 pounds, of which 208,000 pounds were on the drivers. The full particulars as to dimensions and equipment of this engine are appended:

GENERAL DESCRIPTION.

Type	12-wheel freight
Name of builder	Brooks Locomotive Works
Name of operating road	Illinois Central Railroad
How many and dates of delivery	One—September, 1899
Gauge	4 feet 8½ inches
Kind of fuel to be used	Bituminous coal
Weight on drivers	193,200 pounds
Weight on trucks	39,000 pounds
Weight, total	232,200 pounds
Weight of tender, loaded	132,700 pounds

GENERAL DIMENSIONS.

Wheel base, total, of engine	26 feet 6 inches
Wheel base, driving	15 feet 9 inches
Wheel base, total, engine and tender	55 feet 2¾ inches
Length over all, engine	42 feet 0⅜ inches
Length over all, total, engine and tender	65 feet 7⅝ inches
Height, center of boiler above rails	9 feet 8 inches
Height of stack above rails	15 feet 5 inches
Heating surface, fire box	263 square feet
Heating surface, tubes	3,237 square feet
Heating surface, total	3,500 square feet
Grate area	37.5 square feet

WHEELS AND JOURNALS.

Drivers, number	Eight
Drivers, diameter	57 inches

Drivers, material of centers	Cast steel
Truck wheels, diameter	30 inches
Journals, driving axle, main	9½x12 inches
Journals, driving axle, other	9x12 inches
Journals, truck	5½x12 inches
Wheel fit, main	10⅛x8½ inches
Main crank pin, size	7½x7 inches
Main coupling pin, size	8¼x5 inches
Main pin, diameter wheel fit	8⅞ inches

CYLINDERS.

Cylinder, diameter	23 inches
Cylinder, stroke	30 inches
Piston rod, diameter	4½ inches
Kind of piston rod packing	Jerome
Main rod, length center to center	98 inches
Steam ports, length	28 inches
Steam ports, width	2½ inches
Exhaust ports, least area	110 square inches
Bridge, width	3½ inches

VALVES.

Valves, kind of	Improved piston
Valves, greatest travel	7 inches
Valves, steam lap (inside)	1⅛ inches
Valves, exhaust lap or clearance (outside)	Line and line
Lead in full gear	1-16-inch negative
Lead constant or variable	Variable

BOILER.

Boiler, type of	Player-Belpaire wagon top
Boiler, working steam pressure	210 pounds
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	15-16-inch and 1-inch
Boiler, thickness of tube sheet	¾-inch
Boiler, diameter of barrel, front	82 inches
Boiler, diameter of barrel at throat	91¼ inches
Seams, kind of, horizontal	Septuple, lap
Seams, kind of, circumferential	Triple, lap
Crown sheet, stayed with	Direct stays
Dome, diameter	30 inches

FIRE BOX.

Fire box, type	Long, over frames
Fire box, length	132 inches
Fire box, width	42 inches
Fire box, depth, front	90 inches
Fire box, depth, back	81½ inches
Fire box, material	Steel
Fire box, thickness of sheets	Crown, 7-16; tube, ⅝-inch; side and back, ⅜-inch
Fire box, brick arch	On studs
Fire box, mud ring, width	Back, 4 inches; sides, 3½ inches; front, 4 inches
Fire box, water-space at top	Back, 5 inches; sides, 7½ inches; front, 4 inches
Grates, kind of	Cast iron rocking

Tubes, number of..........424
Tubes, material..........Charcoal iron
Tubes, outside diameter..........2 inches
Tubes, thickness..........No. 12 B. W. G.
Tubes, length over tube sheets..........14 feet $8\frac{3}{8}$ inches

SMOKE BOX.

Smoke box, diameter outside..........85 inches
Smoke box, length from flue sheet..........75 inches

OTHER PARTS.

Exhaust nozzle, single or double..........Single
Exhaust nozzle, variable or permanent..........Permanent
Exhaust nozzle, diameter..........$5\frac{7}{8}$ inches ; $6\frac{1}{8}$ inches
Exhaust nozzle, distance of tip below center of boiler..........7 inches
Netting, wire or plate..........Wire
Netting, size of mesh or perforation..........$2\frac{1}{2}$x$2\frac{1}{2}$ inches and $2\frac{1}{2}$x$1\frac{1}{4}$ inches
Stack, straight or taper..........Steel, taper
Stack, least diameter..........$15\frac{1}{4}$ inches
Stack, greatest diameter..........$17\frac{3}{4}$ inches
Stack, height above smoke box..........$26\frac{1}{2}$ inches

TENDER.

Type..........8-wheeled
Tank, type..........“U” shape
Tank, capacity for water..........7,000 gallons
Tank, capacity for coal..........12 tons
Tank, material..........Steel
Tank, thickness of sheets..........$\frac{1}{4}$-inch
Type of under frame..........Oak
Type of springs..........Double elliptic
Diameter of wheels..........33 inches
Diameter and length of journals..........5 inches and 9 inches
Distance between centers of journals..........5 feet 3 inches
Diameter of wheel fit on axle..........$6\frac{3}{8}$ inches
Diameter of center of axle..........$5\frac{3}{8}$ inches
Length of tender over bumper beams..........24 feet 0 inches
Length of tank..........22 feet 0 inches
Width of tank..........10 feet 0 inches
Height of tank, not including collar..........72 inches
Type of drawbar..........M. C. B. Thurmond

SPECIAL EQUIPMENT.

Brakes..........Westinghouse automatic for drivers, tender and train service
Pump..........$9\frac{1}{2}$ inches
Brakes, driver..........American outside equalized, with shoes on back of wheels
Sight feed lubricators..........Nathan
Safety valves..........Ashton
Injectors..........Hancock Composite
Springs..........French
Metallic packing, piston rods..........Jerome
Metallic packing, valve rods..........B. L. W. Special
Spark arrester..........Improved Bell

THE National Railroad Master Blacksmiths' Association held its annual convention at Milwaukee, Wis., September 5 to 8. The work of the convention was excellent. There was a good attendance, and on the opening day, Mr. Robert Quayle, superintendent of motive power of the Chicago & North-Western; Mr. Angus Brown, superintendent of motive power of the Wisconsin Central; Mr. J. N. Barr, superintendent of motive power, and Mr. A. E. Manchester, assistant superintendent of motive power of the Chicago, Milwaukee & St. Paul, were present and addressed the convention. On the last day, officers for the ensuing year were elected as follows: President, G. F. Hinkens, St. Paul, Minn.; first vice president, G. H. Judy, Dayton, Ohio; second vice president, D. B. Swinton, Montreal, Canada; secretary, A. L. Woodworth, Lima, Ohio. There was a suggestive line of topics up for consideration, including "Making and repairing locomotive and car springs," "Tools for car forgings," "Fuel for furnace use," "Shop methods," "Forging wrought iron axles," "Proper method of case hardening," "Locomotive blacksmithing," "The tool smith," "Tool steel manipulation," "Mild steel vs. wrought iron," etc. In our next issue we will give some account of the proceedings.

PERSONAL MENTION.

Mr. R. L. Stewart has been appointed master mechanic of the El Paso & Northeastern, with headquarters at Alamogordo, N. M.

Mr. H. T. Ellison has resigned as master mechanic of the Chattanooga Southern.

Mr. T. Dickinson, formerly locomotive engineer on the West Shore, has been appointed master mechanic of the Rutland-Canadian, a part of the Rutland now under construction.

Mr. Frank Cain, master mechanic of the Texarkana & Fort Smith. with headquarters at Texarkana, Texas, has resigned.

Mr. James H. Kirk, master mechanic of the Salt Lake & Ogden, has been appointed general superintendent of that road in addition to his former duties, with headquarters at Salt Lake City, Utah.

Mr. Thomas Burns, heretofore foreman at East St. Paul, Minn., of the Chicago, St. Paul, Minneapolis & Omaha, has been appointed assistant master mechanic, with headquarters at Sioux City, Iowa, succeeding Mr. J. K. Brassill, resigned. Mr. E. E. Machovec has been appointed foreman at East St. Paul, Minn., succeeding Mr. Burns, and Frederick Naylor has been appointed foreman at St. James, Minn., succeeding Mr. Machovec.

Mr. G. Middleton, locomotive foreman of the Canadian Pacific, at Kamloops, B. C., has been promoted to be general foreman of the shops of the Canadian Pacific company at Vancouver. He will also have charge of the engines of the company's steamships. Mr. S. Fraser, of North Bend, succeeds Mr. Middleton at Kamloops.

Mr. J. O'Hara, roundhouse foreman at the Glenwood shops of the Baltimore & Ohio, has resigned.

Mr. C. E. Walker, who has been master mechanic on the Baltimore & Ohio Southwestern Railway, at Washington, Ind., since July, 1895, has now made connections with the Chicago Pneumatic Tool Company, and will open an office for that company in Cincinnati, to look after the interests of its trade in that and contiguous territory. Mr. Walker is a thorough mechanic and well posted in all branches of railroad work. He learned the trade of machinist at the National Locomotive Works, Connellsville, Pa. In 1879 Mr. Walker went with the Chicago, Burlington & Quincy and since that time his advancement has been rapid, he having passed through all grades of mechanical work on several different railroads ; his last connection, as stated above, having been with the Baltimore & Ohio Southwestern Railway. His intimate knowledge of the practical application of pneumatic tools, will serve him well with his new connection, and his wide circle of acquaintances wish him the best of success.

Mr. H. D. Galbraith has resigned as general foreman of the shops of the St. Louis Southwestern at Texarkana, Tex.

Mr. Lewis Greaven has been appointed locomotive and car superintendent of the Interoceanic Railway of Mexico, with headquarters at Puebla, Mexico, vice Mr. H. E. Walker, resigned.

Mr. W. J. Miller has resigned as division master mechanic of the Kansas City, Pittsburg & Gulf, at Shreveport, La., to accept the position of foreman of the shops of the St. Louis Southwestern at Pine Bluff, Ark., to succeed Mr. Oliver Galbraith, resigned.

Mr. John Hair, division master mechanic of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed division master mechanic of the same road at Washington, Ind., vice Mr. C. E. Walker, resigned.

Mr. Henry E. Walker has resigned as locomotive and car superintendent of the Interoceanic Railway of Mexico.

Mr. Frank J. Smith, hitherto foreman of the shops of the Baltimore & Ohio Southwestern at Seymour, Ind., has been appointed division master mechanic of that road, with headquarters at Chillicothe, Ohio, vice Mr. John Hair, transferred to Washington, Indiana.

Mr. John H. Kiesling has been appointed master mechanic of the Gulf, Beaumont & Kansas City, with headquarters at Beaumont, Tex., vice Mr. F. G. Papineau.

Mr. Charles Brittengham, who has been an engineer on the Peoria & Eastern for many years, has been appointed road foreman of engines on the Chicago & Alton.

Mr. A. L. Kline has been appointed storekeeper of the Chicago, Burlington & Quincy at Western avenue, Chicago, vice Mr. H. H. Harvey, promoted.

Mr. Joseph K. Long, of the Ft. Wayne shops at Allegheny, has been appointed foreman of the smith shop at Wellsville, on the C. & P. Railroad.

Mr. W. H. Reilly has resigned as master mechanic of the Fort Worth & Rio Grande, and Mr. C. H. Burk has been appointed master mechanic pro tem. All business relating to the mechanical department will be addressed to Mr. Burk at Fort Worth, Tex., until further notice.

Mr. Geo. Brown has been appointed foreman in charge of the motive power and car department for the western division of the Chicago, Rock Island & Pacific, with headquarters at Goodland, Kan.

Mr. C. C. Farmer has resigned as air brake inspector on the Missouri, Kansas & Texas, and the position has been abolished.

Mr. George Whelan, clerk in the office of Mr. W. W. Atterbury, superintendent of motive power of the Pennsylvania Railroad, has been appointed chief clerk of motive power on the Philadelphia and Erie division of the Pennsylvania Railroad. His headquarters will be in Williamsport. Mr. Harry A. Anderson, who for some years has been chief clerk to Master Mechanic Brown, of the Juniata shops, will succeed Mr. Whelan in Mr. Atterbury's office.

Mr. Frank Roesch has been appointed traveling engineer on the Colorado & Southern lines. He has hitherto been a locomotive engineer on the same road.

Mr. H. W. Garratt is locomotive superintendent of the new Cuban Central Ry.; his headquarters are at Sagua la Grande, Cuba. The purchasing agents of this road are B. D. Hasell & Co., 66 Pine street, New York.

Mr. J. W. Doty, a traveling engineer on the St. Louis Southwestern, has been appointed foreman of that company's shops at Texarkana, Tex., vice Mr. Harry Galbraith, resigned.

Mr. John Medway has resigned as master car builder of the Swift Refrigerator Transportation Co. at Chicago. Mr. Medway was formerly superintendent of motive power of the Fitchburg, and was at one time president of the New England Railroad Club.

Mr. J. D. Murphy, foreman of the Strong City shops of the Santa Fe, has been appointed general foreman of the Atchison, Topeka & Santa Fe, at Dodge City, vice Mr. L. E. Foote, transferred to Raton, N. M. Mr. J. B. Hasty succeeds Mr. Murphy at Strong City. Mr. Henry Goegold has been appointed general foreman of the Pueblo shops of the same road.

Mr. J. B. Laurie has been appointed general purchasing agent of the Central Vermont, with headquarters at St. Albans, Vt., vice Mr. W. B. Hatch.

Mr. W. P. Dittoe has been appointed purchasing agent of the New York, Chicago & St. Louis, vice Mr. M. M. Rodgers, resigned. Mr. Dittoe has been with the Nickel Plate ever since it was built. He is a civil engineer by profession, and when Brown & Howard were building the road in 1881 he came west from New York with them. When the line was completed he remained in Cleveland, taking charge of the engineering force until the appointment of Mr. G. W. Vaughan as the chief engineer, when he assumed charge of the inspection department, where he has remained until now.

Mr. Robert K. Cassatt, son of A. J. Cassatt, president of the Pennsylvania Railroad Company, has been appointed assistant to the president of the New York, Philadelphia & Norfolk Railroad Company. Mr. Cassatt, while a civil engineer by profession, was at one time in the Altoona shops of the Pennsylvania Railroad studying the work of the mechanical department.

Mr. M. M. Rodgers has resigned as purchasing agent of the New York, Chicago & St. Louis, after a continued service of 17 years with that company. While only 38 years old, he has been in the railroad service 25 years, having started in at Altoona as messenger boy in the shops of the Pennsylvania railroad in 1875. He was later clerk in the motive power department of that road at Altoona. From 1880 to 1882 he was private secretary to the superintendent of the P., C. & St. L., and for the next three years private secretary to the general manager of the same road. Since March, 1885, he has been purchasing agent of the Nickel Plate. Mr. Rodgers resigns to enter private business, as a partner in a prominent railroad and steamship supply house in New York.

Mr. C. M. St. Clair has been appointed master mechanic of the Chattanooga Southern, vice Mr. H. T. Ellison, resigned.

Mr. John T. Carroll has been appointed mechanical engineer of the New York, Chicago & St. Louis, with office at Cleveland, vice Mr. Theo. H. Curtis, who, as previously noted, resigned to become mechanical engineer of the Erie. Mr. Carroll was with the Brooks Locomotive Works seven years as errand boy, office boy and draftsman successively. From there he went to the Erie as draftsman. He was later, for two years, with the Chicago, Rock Island & Pacific, and for the succeeding two years with the Chicago & North-Western, as draftsman, which latter road he left to accept his present post on the New York, Chicago & St. Louis.

The Wheeling & Lake Erie having absorbed the Cleveland, Canton & Southern, the mechanical department of the former is now organized as follows: J. B. Braden, superintendent motive power and cars, Cleveland, Ohio; J. E. O'Hearne, master mechanic, Toledo division, Norwalk, Ohio; John Bean, master mechanic Cleveland division, Canton, Ohio.

Mr. Alfred Lovell, hitherto assistant superintendent of motive power of the Northern Pacific, has been appointed superintendent of motive power of that road.

Mr. C. H. Hutchins, president of C. B. Hutchins & Sons, of Detroit, and a widely known and popular railway supply man, died suddenly in Detroit, August 26th.

Mr. Will W. Dodge, treasurer of the Dodge Manufacturing Co., of Mishawaka, Ind., died at his residence in that city on September 1st, aged 39 years. Mr. Dodge had been identified with the Dodge Manufacturing Co. ever since its organization and was a large contributor to its success and prosperity.

Mr. Joseph W. Taylor, secretary of the Master Car Builders and of the Master Mechanics' Associations, has been elected, also, secretary of the Western Railway Club, succeeding Mr. F. M. Whyte, who resigned because of his removal to the east to become mechanical engineer of the New York Central.

Mr. W. H. Harrison, who until a few months ago was for many years superintendent of motive power of the Baltimore & Ohio lines west of the Ohio river, died suddenly at his home in Newark, Ohio, September 9th, of heart failure, aged 68 years. Mr. Harrison was not only an able man in his profession, but he possessed a distinctively lovable personality, and his passing away has saddened many hearts. We gave a full account of his career, together with a portrait of his kindly face, in our issue of March, 1899.

Mr. O. H. Jackson has resigned as master mechanic of the Santa Fe, Prescott & Phoenix, and Prescott & Eastern Railways, to engage in other business. Mr. Frank Davisson has been appointed acting master mechanic of the roads to succeed Mr. Jackson. Mr. Jackson has been in active railway service for upwards of 40 years and proposes now to take a rest until the first of the coming year when he will enter the railway supply business, devoting thc large part of his time to pushing the Canady cam throttle lever, which he owns. Mr. Jackson's railway service prior to going west, five years ago, was mainly with the Big Four, O. & M., and the Erie.

SUPPLY TRADE NOTES.

The Boston Artificial Leather Co. is opening a large store at No. 12 East Eighteenth street, New York City. The company is moving its factory and business from Boston to New York City.

Harrison dust guards, made by the Harrison Dust Guard Co., Toledo, Ohio, have been specified for use on the following equipment: Two thousand cars now being built for the Southern Railway; 100 cars for the Flint & Pere Marquette, and 200 cars for the Detroit, Grand Rapids & Western.

Mr. Geo. F. Evans has severed his connection with the Westinghouse interests having resigned as manager of the Westinghouse Mfg. Co., Ltd., of Canada.

The Ajax Metal Co. extends a cordial invitation to all railroad managers, motive power and mechanical officials, to pay a visit at "Section M-13, Main Building," of the National Export Exposition, which is now being held in Philadelphia. The company will have representatives there at all times and will take pleasure in offering its services to all visitors whenever and wherever it can be useful. The company provides ample facilities for correspondence and will gladly give visitors every attention, if the opportunity is afforded.

The Standard Coupler Company has received orders for the equipment of 200 passenger cars with its Standard steel platform during the month of August. This company's caboose platform is rapidly growing in favor.

The new works of the Pressed Steel Car Company, under construction at McKee's Rocks, Pa., will probably be in operating order within 60 days. Besides the main plant, the company are building a large number of houses for employes, and a company store. The estimated production of the new works is 40 steel cars per day, and combined with the Allegheny plant, which has a capacity of 35 cars per day, the complete daily output will amount to 75 or 80 cars.

The Lloyd-Talmage Company, of New York City, has sold its railway supply business to W. J. Schaeffer & Co., 33 Barclay street, New York. The latter concern will handle a general line of machinists', mill, steamship and railroad supplies.

Somers, Fitler & Clarke, of Pittsburg, agents for the sale of the Otto gas engines, have lately made sales of a 20 horse-power engine to Kress Bros., Allegheny; 56 horse-power engine to the Canonsburg Iron and Steel Company, Canonsburg, Pa.; two 20 horse-power engines to the Auto-Car Company, Pittsburg; one 27 horse-power engine to Zug & Co., Pittsburg, and one 20 horse-power engine to Heyl & Patterson, Pittsburg.

President McKinney, of the Niles-Bement-Pond Company, announces that Jas. K. Cullen has been assigned as manager of the Niles works at Hamilton, Frederick W. Gordon as manager of the Bement plant at Philadelphia, and A. C. Stebbins as manager of the Pond works at Plainfield.

The Curtis & Co. Manufacturing Company, of St. Louis, reports that its air compressor department is crowded to its full capacity with orders. This company's air hoists are becoming extremely popular, there being 150 orders for them on its books at the present time. Several shipments of air compressors were recently made to Europe, one going to Paris.

The New York office of Valentine & Co., the well-known varnish and color manufacturers, recently reported the purchase of additional property adjoining their Brooklyn works, and the filing of plans with the building department for a large two-story building thereon. We now learn that even this extension will not suffice for the needs of their business, and that they have just filed plans for the erection at their Chicago (Illinois) works of a large three-story building; the ground floor to be devoted to tanks and the storage of varnish, the other two floors to contain machinery and other facilities for the grinding and packing of colors and paints.

The Q. & C. Company, of Chicago, Ill., has received a contract from the chief mechanical engineer of the Chinese Eastern Railroad for a steam cold metal sawing machine, which will be utilized for cutting steel rails on the Port Arthur section of the road.

The Philadelphia Engineering Works, which now form part of the Niles-Pond-Bement consolidation plant, are to be increased very shortly by the addition of a shop

380x50 ft., to be used for the erection of cranes. The new shop will be equipped with modern tools, air riveters, portable punching machines and electric traveling cranes capable of handling large girders.

The Standard Pneumatic Tool Company, of Chicago, sold 50 per cent more machines in August than during the corresponding month last year.

Manning, Maxwell & Moore, of Chicago, have taken the Chicago agency for the new bolt cutter brought out by the Ajax Manufacturing Company.

The National Tube Company have established their general offices in the Conestoga building, Pittsburg, Pa., with organization as follows: President, Edmund C. Converse; chairman of the board, Joshua Rhodes; first vice-president, F. J. Hearne; second vice-president, Horace Crosby; third vice-president, Francis L. Potts; general manager, A. S. Matheson; treasurer, A. F. Luke; assistant treasurer, William H. Latshaw; general counsel, Sullivan & Cromwell. The president, third vice-president, treasurer and general counsel have their offices in the Havemeyer building, New York. The directors are: Joshua Rhodes, J. J. Vandergrift, Charles H. Coster, Wm. B. Rhodes, F. J. Hearne, J. N. Vance, John Eaton, Francis Potts, F. R. Tobey, Jonathan Rowland, Daniel O'Day, O. C. Barber, Henry Aird, John Don, Edmund C. Converse, Wm. Nelson Cromwell, Wm. S. Eaton, A. F. Luke, Wm. J. Curtis, Horace Crosby, A. S. Matheson, Wm. P. Hamilton, and A. H. Gillard. Horace Crosby, second vice-president, has charge of the mercantile affairs of the company; Edward Worcester is general sales agent, and Geo. S. Garritt is assistant general sales agent, both with office in Pittsburg, Pa. Clifton Wharton, Jr., is sales agent in charge of New York territory, with office in the Havemeyer building, New York. A Boston office will be maintained at 70 Federal street, in charge of P. W. French and C. F. Velasco, sales agents. H. Cheston Vansant is sales agent in charge of Philadelphia territory. A. M. Lally is sales agent in charge of Pittsburg territory. H. S. Raymond is sales agent in charge of Chicago territory.

New shops and additions thereto are reported by our exchanges during the past month as follows:—The Houston & Texas Central is just finishing a new roundhouse at Ennis, Texas.—It is reported that the proposed large addition to the Baltimore & Ohio Southwestern shops at Chillicothe has been abandoned.—The Atchison, Topeka & Santa Fe has built at its Corwith (Ill.) shops a new boiler house and a sand house equipped with modern appliances.—The Valley Road has purchased 43 acres of land adjoining its roundhouse at Fresno, Cal. The company will construct repair shops on a portion of this land.—The Carrabelle, Tallahassee & Georgia Railroad is preparing plans for shops to be built at Tallahassee, Fla.—The Chicago & North-Western will build a 50-stall roundhouse at Clinton, Iowa, at an estimated cost of $60,000.—The Canadian Pacific proposes to build a new roundhouse at Fort William, Ont.—The Wisconsin Central announces that the question of removal of its shops from Stevens Point to Fond du Lac has been fully decided and that work will be pushed on the new shop buildings with all speed, but it will probably be a year before the shops at Stevens Point are wholly abandoned.—The Rio Grande Western is reported to have completed its brass foundry at Salt Lake City, which is located just west of the general blacksmith shops and was erected for the purpose of making engine and car brasses. A building is also being erected connecting the machine and blacksmith shops.—The Boston & Maine has built a new engine house at Rockland, Me. The new engine house is a 5-stall house and has all the modern conveniences of such a building. It is a frame building and has a brick-paved floor. Directly in front of the house will be located a new 60-foot turntable.—The Pennsylvania lines west of Pittsburg will erect in Allegheny City, Pa., a brass foundry, comprising a main building 60x80 feet, containing six furnaces, and two other buildings about 40x70 feet. The foundry will be used to manufacture brass bearings and other brass castings which have formerly been made at Ft. Wayne, Ind.

The Baltimore & Ohio has just ordered 20 more Vauclain compound consolidated freight locomotives from the Baldwin Locomotive Works. An order for 30 was placed with the same concern earlier in the month. The 50 are to be delivered about the first of the year.

The Q & C Company makes the following announcement concerning the transfer of its car door business to the National Railway Specialty Co.: "In view of the very friendly relations existing between our two companies, and for the convenience of our patrons, arrangements have been made by which the National Railway Specialty Co., J. M. Hopkins, secretary, will hereafter conduct the sales of our door business and all the details pertaining to same. The manufacture of the same will be continued by us and under our careful supervision." The two companies also jointly issue the following notice: "By virtue of agreements and licenses between the two companies whose names are attached hereto, on and after August 1, 1899, all Dunham and Q & C door fixtures, as well as all Security door fixtures, will be sold by the National Railway Specialty Co., 1475 Old Colony Building, Chicago. Material on all orders received by the Q & C Company since August 1st, will be billed by the National Railway Specialty Co. The Q & C Company will continue to manufacture the above mentioned door fixtures at their shops at Chicago Heights. A large stock of material, both of complete sets and parts thereof, will be kept constantly on hand to insure prompt delivery. Hereafter kindly send orders for Dunham and Q & C door fixtures to the National Railway Specialty Co., by whom they will receive prompt and careful attention. Q & C Company, by C. F. Quincy, Pres.; National Railway Specialty Co., by J. M. Hopkins, Gen. Manager."

The secretary of the Pressed Steel Car Company, of Pittsburg, is thus quoted: "I wish to contradict the report that any concern is about to compete with us in the manufacture of pressed steel cars in this country. It is impossible, as we control every conceivable patent for such manufacture. There is also no truth in the assertion that we contemplate erecting a plant in England, or anywhere else outside of the United States. We have contracts now for $10,000,000 worth of foreign and domestic trade. The present capacity of our works is 60 cars a day, and we expect to be rushed to our fullest capacity. Our new plant at McKees Rocks will be thrown open next week. It cost $1,250,000 and is the most complete affair of its kind in the world. It will employ about 4,000 men, and our combined capacity will be 175 cars daily."

At a meeting of its board of directors, on the 16th inst., the Ajax Metal Co., of Philadelphia, appointed Mr. B. F. Pilson, of Richmond, who has been connected with that company as southern representative for a number of years, as general contracting agent, to take effect October 1st. Mr. Pilson has been very successful in handling the company's business, and this appointment is a pleasant evidence of its appreciation of his services.

The Ajax Metal Co., of Philadelphia, informs us that the reports published in the daily and commercial papers, to the effect that it had joined the brass trust, are entirely incorrect, and that it is not its intention to go into any such combination. This company further states that it is not in any manner, shape or form, connected with any brass trust, and would not countenance a proposition of that kind.

RAILWAY MASTER MECHANIC

WALTER D. CROSMAN, Editor. EDWIN N. LEWIS, Manager.

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RAILWAY CLUB FUNDS should not be allowed to grow too large. There is no good reason, it is thought by careful observers of club work, why any club should have a surplus beyond that needed for a good working capital. Among our leading clubs the income is heavily eaten into by salaries and commissions, and the large cost of publishing the proceedings; but despite this there has been, in some cases, an abnormal surplus created. The practice of expending this upon spreads, excursions, and the like, which has been followed at times, is not good. The income is provided by dues, and by revenues derived from the sale of advertising space in the proceedings. To fritter away this income in the way of pleasures for a comparative few, is unjust to those dues-paying members who have neither time nor inclination to participate in a spread or to go on an excursion; and it is unjust to those advertisers who patronize club proceedings not so much for the sake of the advertising as for the sake of "helping the club along." It cannot be pleasant for such advertisers to see their contributions expended for an entertainment at which a large percentage—perhaps the larger percentage—of the attendants are supply men. As a matter of fact, a railway club should be a business club, pure and simple, and not a pleasure-seeking body; and it is a notable fact that those clubs which have the least to do with excursions and "smokers" are the clubs which produce, year in and year out, the highest class of work, and whose influence upon the railway technical world is most strongly felt.

Recurring to the matter of funds: It is not a proper function of a railway club to be an accumulator of moneys. But with a normally healthy club, possessing a good membership, and with a fair amount of advertising revenue coming to its treasury, some unnecessary surplus seems bound to be created; and then comes the question of disposing of this surplus to the best advantage. The wrongfulness of using it for spreads, junkets, etc., is quite obvious. But two clubs have found more commendable ways for spending their excess revenues. The Western

Railway Club maintains a valuable and growing technical library at considerable annual expense, and this season found still another very useful channel for its spare funds, in undertaking to give bound volumes of its past year's proceedings to all its members in good standing. This is something appreciated and valued by all members, whereas a spread at each meeting would be enjoyed by, perhaps, not more than 10 per cent of the members. The St. Louis Club has also taken a thoroughly commendable step in the way of directing its surplus funds into useful channels, having undertaken to give a scholarship in Blees Military Academy, open to competition among the sons of its members. At the last meeting of this club the successful candidate was presented to the members present in the person of Chas. E. Koons, a son of Charles Koons, master painter of the St. Louis Car Co. The boy is given the scholarship, a full student's outfit of clothing, uniform, text books, etc.,—in fact, he goes to the academy with his entire expenses borne by the club. This is better than forty spreads—or forty times forty spreads.

Locomotive Draft Appliances.

Mr. Bell's paper, read at the September meeting of the Western Railway Club, gives an admirable historical review of the development of spark arresting devices from the time of Pambour, in 1836, to the Master Mechanics report on Exhaust Nozzles, in 1896, a period of sixty years. The subject had been discussed by this club on two previous occasions, once in its early days, before the proceedings were published in pamphlet form. This was in December, 1866, and the discussion was published in the RAILWAY MASTER MECHANIC for January, 1887. Again the Draft Appliances on the Locomotives at the World's Fair were described in a paper by Mr. W. C. Squires, read at a Western Railway Club meeting in November, 1893.

Mr. Bell's paper is especially valuable as a historical document, as he is careful to give the dates, and reference to the book or paper where a description of each device may be found, or wherein authoritative comment is made upon the subject. The whole history of this struggle to find a satisfactory spark arrester, and the reasons why it has not yet been found, is well summed up by the author when he says: "It is necessarily an attempt to compromise two directly conflicting conditions—one being perfect freedom of draft, and discharge of smoke and gases, and the other the prevention of the escape of solid matter, in a state of ignition, from the stack. It naturally results from the impossibility of reconciling these conditions, that none of the long array of spark arrester designs has been entirely successful or satisfactory."

We are not now much nearer a solution of this problem than when Espy patented his cone and netting in 1833, and it would therefore seem best to give up the attempt to attain the impossible, and start out on new lines, and give attention to a modification of some kind which will eliminate, or reduce to a large extent, one of the conflicting elements. The smoke and gas must be ejected from the stack, and that is the purpose of the stack, the same as of any other chimney. The solid matter, in the shape of ignited sparks, should remain, as far as possible, in the fire box, and not be drawn through the tubes. The whole boiler, and its appendages, whether it be stack, smoke box, or fire box, should be so modified as to obtain this desirable result.

Certain experiences with Wootten fire boxes, eight feet wide and nine feet long, and having seventy-two square feet of grate surface, when used on western roads with bituminous coal, revealed the fact that under such conditions coal could be burned in heavy freight service, without drawing the fire into the smoke box, and no spark arrester was necessary. The engines were operated with a straight stack, and a smoke box entirely free from baffle plate or netting. We have here an extreme in the other direction, where the troublesome spark arrester was entirely eliminated. The large grate was found advantageous for bituminous slack, but for the regular run of bituminous lump coal, too much air passed through the grate to secure good economy, and for this reason the very wide fire boxes have not continued in favor.

The experiments referred to were made in 1885, and the practice in grate proportions since that time shows that no advantage has been taken of the facts which they brought to light. The width of fire boxes on modern bituminous coal burning engines is invariably made forty-two inches, so that the outside of the fire box is flush with the outside of the frames, and a convenient expansion fastening is thus secured. The size of fire boxes bears no apparent relation to the amount of coal to be burned per hour, and the proper proportions for such an active and important function seem to be sacrificed for simplicity in constructive details. With continued increase in the size of cylinders, the demand on the fire box, when made the regular width, will soon be so great that even the best spark arresters will be found unsatisfactory, and it will then be necessary to break away from present practice and extend the fire box beyond the frames. The width should not be the extreme eight feet, as formerly used, nor the very narrow box, between or flush with the frame, but any width necessary to secure such a moderate rate of combustion as will allow the coal to be burned under mild draft ; and large quantities of solid fire will not then be drawn through the tubes.

In burning coal with a mild draft, numerous advantages will be found. The exhaust nozzle can be enlarged, a larger mesh in the netting can be used, and in fact all objectionable ohstructions to the free exit of steam and smoke can be made more open, if not entirely removed; and above all, the rate of evaporation should be materially improved,

It is well known that Mr. Bell is a strong advocate of wider fire boxes, having read a paper on the subject before the Western Railway Club, in October, 1895, and we should have expected him to refer to their advantage in modifying the severe demand made on spark arresters by large locomotives. The author does recognize this in a brief sentence, in his present paper, where he refers to the performance of the fast passenger engines with wide fire boxes on the Camden and Atlantic railroad, as follows : "It will be recognized that in these engines the front end is less heavily taxed, as to spark arresting duty, by reason of the large increase of grate area attained by the employment of the wide fire box."

The principal object to which Mr. Bell's paper apparently leads is a description of his improvement in front ends, which dispenses with the spark valve, and which is self cleaning. While this arrangement is used on quite a number of large modern locomotives, on several different roads, we cannot regard it as a very important improvement.

It is certainly not conducive to economy to throw away solid fuel in an indefinite way, and it may be a wholesome reminder, whenever a smoke box is cleaned out, that one-half or three-fourths of a cubic yard of unburned fuel is wasted. Nothing is said about the saving in fuel resulting from the use of the self cleaning front end, and we are inclined to believe that it is accompanied with a sacrifice of some extra fuel. In the discussion of the paper none of the speakers advocated Mr. Bell's system of dealing with sparks, and, in fact, those who touched on that part of the subject, objected to it.

The author expects that a still higher development of locomotive draft appliances will be speedily obtained, but we are doubtful if it is accomplished by working on the line indicated by this improvement. We feel quite sure that a more permanent and effectual improvement will be made by increasing the grate area so as to enable the locomotive to work under milder draft. The spark arresting problem then becomes easy, and its lines simple.

M. C. B. STANDARDS.

As a result of the letter ballot, certain of the Standards and Recommended Practice of the association were modified as follows :

Standards.

Sheet 1.—Size of bolt holes changed to 1 1-16 in.

Sheet 2.—Size of bolt holes changed to 1 1-16 in.

Sheet 7.—Addition of axle with journal 5½x10 in., and the designation of the different standard axles by a letter.

Sheet 11.—Extension of contour lines; modification of standard limit gauge; change in radius of yoke; additions to the illustration of the automatic coupler.

Sheet 15.—General dimensions only for journal bearing given.

Recommended Practice.

Sheet B.—Play of shank of coupler in carry-arm changed to not less than ½ inch on each side.

Sheet C.—Diameter of bearing boring gauge, 3¾x7 in.; journal changed from 3 15-16 to 3 13-16 in. (This is not the result of letter ballot, but the correction of a clerical error.)

Sheet H.—Radius at top of pedestal changed from 50 in. to 5 ft. 0 in. (This is not the result of letter ballot, but the correction of a clerical error.)

Sheet I.—Fletcher journal box lid eliminated, and sheet used to illustrate the twist gauge for M. C. B. couplers, gauge for worn M. C. B. couplers, location of air brake parts on cars, and label for air brake hose.

Sheet K (New Sheet).—Illustration of drop test machine and details for M. C. B. couplers.

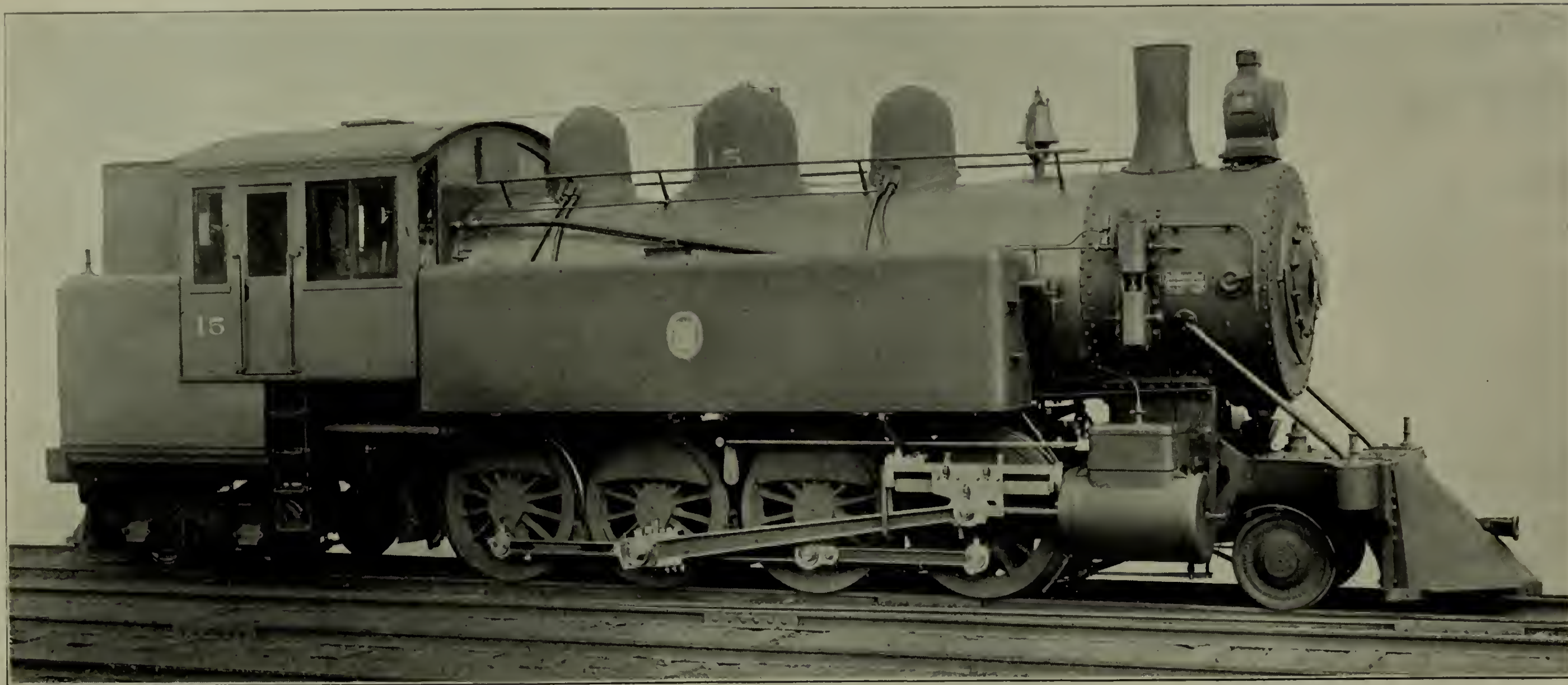
These changes and additions have been made, and lithographs illustrative of same are ready for delivery. A complete set of lithographs consists of 15 sheets of Standards and 11 sheets of Recommended Practice, 26 in all, and are sold at 25 cents per sheet, or $6.50 per set.

The pamphlet containing the Texts of Standards and Recommended Practice has been revised to date, and is ready for delivery. These pamphlets are sold at 25 cents per copy.

The Air Brake and Signal Instructions, and also the Rules for Loading Long Materials, were not revised at the last convention; but the Secretary has a supply of these on hand and can fill orders promptly. These are sold at the same rates as the Rules of Interchange.

A reprint of Arbitration Cases 453 to 570 is also now ready for delivery. These will be sold at 25 cents per copy.

The above may be had from Jos. W. Taylor, secretary, 667 Rookery Bldg., Chicago.



ONE OF THE LARGEST DOUBLE ENDERS EVER BUILT.

Schenectady Consolidation, for the Sydney & Louisburg Railway.

Total weight—239,000 pounds; weight on drivers—170,000 pounds; cylinders—22x28 inches; drivers—55 inches; heating surface—2,689.47 square feet, of which 176.92 square feet is fire box and 2,512.55 square feet tube surface; grate area—33.21 square feet; working steam pressure—200 pounds; boiler 72 inches.

DOUBLE END CONSOLIDATION LOCOMOTIVE —SYDNEY & LOUISBURG RAILWAY.

The Schenectady Locomotive Works have recently turned out two double end locomotives for the Dominion Coal Co., Ltd., of Cape Breton Island, Nova Scotia, for use upon the latter's road—the Sydney & Louisburg Railway. One of these double end engines is a mogul and the other is a consolidation, and they are believed to be among the largest double end locomotives ever built. They were both designed to meet the specifications of the Dominion Coal Co., which specifications were drawn to conform to the peculiar conditions of service met with on that company's road.

The consolidation engine, which we illustrate, weighs 239,000 lbs., of which 170,000 pounds are on the drivers. It has 22x28-inch cylinder; 55-inch drivers; a straight 72-inch boiler, designed to carry 200 pounds pressure; a fire box 114x41 7/8 inches; a grate area of 33.21 square feet; and heating surface of—tubes, 2,512 square feet; fire box, 176.92 square feet, total, 2,689.47 square feet.

Both this and the mogul have gone into service and are reported to be very satisfactorily meeting all requirements. The principal data concerning the consolidation engine are as follows:

GENERAL DIMENSIONS.

Gauge	4 feet, 8½ inches
Fuel	Bituminous coal
Weight in working order	239,000 lbs.
Weight on drivers	170,000 lbs.
Wheel base, driving	15 feet, —— inches
Wheel base, rigid	15 feet, —— inches
Wheel base, total	36 feet, 3 inches

CYLINDERS.

Diameter of cylinders	22 inches
Stroke of piston	28 inches
Horizontal thickness of piston	5½ inches
Diameter of piston rod	3¾ inches
Kind of piston packing	Cast iron
Kind of piston rod packing	U. S.
Size of steam ports	18x1¼ inches
Size of exhaust ports	18x2¾ inches
Size of bridges	1⅛ inches

VALVES.

Kind of slide valves	American balanced
Greatest travel of slide valves	5½ inches
Outside lap of slide valves	¾-inch
Inside lap of slide valves	1-32-inch
Lead of valves in full gear	1-16-inch
Kind of valve stem packing	U. S.

WHEELS, ETC.

Diameter of driving wheels outside of tire	55 inches
Material of driving wheels, centers	Main, cast steel; Inter. F. & B. steeled cast iron
Tire held by	Shrinkage
Driving box material	Main, cast steel; Inter. F. & B. steeled cast iron
Diameter and length of driving journals, main only 9 inches diameter,	8½ in. dia.x10 in.
Diameter and length of main crank pin journals, (main side 7¼x5 in.)	7 in. dia.x6½ in.
Dia. and length of side rod crank pin journals, (F. & B. 5x3½ in.)	Inter. 6 in. dia.x4½ in.
Engine truck, kind	2-wheel swing bolster
Engine truck, journals	6 in. dia.x10 in.
Diameter of engine truck wheels	30 inches
Kind of engine truck wheels	Plate

BOILER.

Style	Straight
Outside diameter of first ring	72 inches
Working pressure	200 lbs.
Material of barrel and outside of fire box	Carbon steel
Thickness of plates in barrel and outside of fire box	23-32, 9-16, ½, and 11-16 in.
Horizontal seams	Butt joint sextuple riveted, with welt strip inside and outside
Circumferential seams	Double riveted
Fire box, length	114 inches
Fire box, width	41⅞ inches
Fire box, depth	F. 70½, B. 67½ inches
Fire box, material	Carbon steel
Fire box, plates, thickness	Sides 5-16-in., back 5-16-in., crown ⅜-in., tube sheet ½-in.
Fire box, water space	Front, 4 inches; sides, 3½ inches; back, 3½ and 4 inches
Fire box, crown staying	Radial stays 1⅛-in. dia.
Fire box, stay bolts	1 in. dia.
Tubes, material	Charcoal iron, No. 12
Tubes, number of	348
Tubes, diameter	2 inches
Tubes, length over tube sheets	13 feet 10 inches
Fire brick, supported on	Studs
Heating surface, tubes	2512.55 square feet
Heating surface, fire box	176.92 square feet
Heating surface, total	2689.47 square feet
Grate surface	33.21 square feet
Grate style	Rocking
Ash pan, style	Sectional, dampers front and back
Exhaust pipes	Single, high
Exhaust nozzles	5¼ inches, 5½ inches, 5¾ inches
Smoke stack, inside diameter	16 inches
Smoke stack, top above rail	14 feet, 9 9-16 inches
Boiler supplied by	Two Hancock inspirators, type A, size No. 9 R & L.

TENDER.

Wheels, number of	4
Wheels, diameter	28 inches
Journals, diameter and length	5 in. dia.x9 inches
Tender trucks, 4-wheel center bearing swing spring bolster carrying back end of engine	
Water capacity	4,200 U. S. gallons
Coal capacity	4 tons

SPECIAL EQUIPMENT.

American steam brake on all drivers and on 4-wheel truck.
Two headlights.
Two Crosby 3-inch muffled safety valves.
Magnesia lagging on boiler and cylinders.
Leach sand feeding apparatus.
One No. 3 Star 6-inch chime whistle.

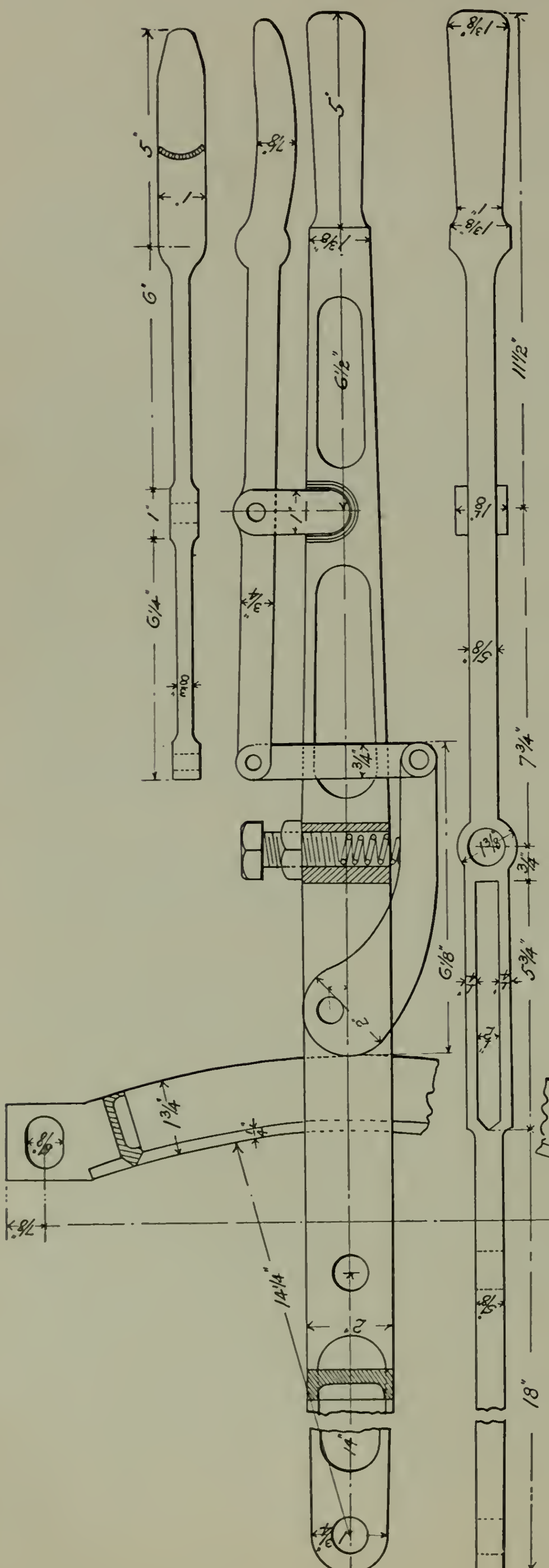
GAUGES FOR WORN COUPLERS.

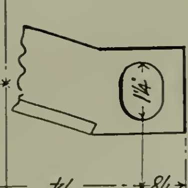
In accordance with the instructions of the Master Car Builders' Association, the question of the manufacture and price of the gauges for worn couplers was taken up, in connection with the Committee on M. C. B. Couplers, with the Pratt & Whitney Co., Hartford, Conn., and the latter advise that the cost of each gauge will depend considerably upon the number they make in the first lot; that they would not undertake to manufacture the gauges without knowing in advance that a sufficient number of orders would be received to warrant them in going to the expense involved in fitting up tools for this purpose. The Pratt & Whitney Co. quote $20.00 per gauge, but it is thought when made in quantities they would probably cost $15.00 each. In order that some idea may be had as to the number of gauges that will be required, Secretary Taylor asks association members to advise him how many gauges they will need. As soon as it is learned about how many gauges will be ordered, and a definite price determined upon, he will issue notice of the price and from whom the gauges can be obtained.

THE USEFULNESS OF THE MASTER MECHANICS' ASSOCIATION.

The Master Mechanics' committee appointed to report on the question, "What can the American Railway Master Mechanics' Association do to increase its usefulness?" has issued its circular of inquiry asking for an expression of view, and for suggestions on this subject, for the assistance of the committee in preparing and presenting a report which shall embody, as far as possible, the ideas and opinions of the members of this association. The committee asks especially for views and opinions on the following divisions of this question: The discussions at the convention, the official records of proceedings and their practical value to members and railroads generally. Suggestions should be sent to T. R. Browne, master mechanic, Juniata shops, Pennsylvania Railroad Co., Altoona, Pa. Mr. Browne is chairman of this committee, and the other members are G. M. Basford and L. R. Pomeroy.

A CAM THROTTLE LEVER.





The cam throttle lever shown in our engraving is called the Canady lever, and is owned by Mr. O. H. Jackson, who, until very recently, was master mechanic of the Santa Fe, Prescott & Phœnix and Prescott & Eastern railway companies. Its chief feature is the fine adjustment which it affords by reason of replacing the usual throttle latch with a cam. The capability of the fine adjustment of the lever, and the positive lock in any position with this cam, is plainly seen by reference to our engraving. There is no chance of the lever moving when the handle is released, no chance for a careless man to leave the throttle unlocked, and no notches to wear.

The levers are made of malleable iron, with the exception of the cam and quadrant, which are made of steel. The springs are made of the best steel wire and carefully tempered. There have been inquiries as to what would occur if the spring should break; and Mr. Jackson informs us that he has had eight levers in service on his road since last October, and has not as yet had a broken spring. But in event of a spring breaking, pressing the handle away from the lever locks the cam on the quadrant, so that it will not move.

The wear is very slight, as the cam is lifted free of the quadrant and held there before the lever can be moved, so that really leaves only a wear on the pins. These levers can be used in connection with the fulcrum on the bottom of the lever and the jaw on the throttle stem, of any engine now in service, making the expense of applying them only the cost of a jaw to hold the quadrant on the boiler head, and one stud to secure the jaw to the back head of the boiler.

This lever has been in use on the Santa Fe, Prescott & Phœnix since last October, as above noted, and is also in service on the Atchison, Topeka & Santa Fe, Texas & Pacific, and P. & E. division of the Cleveland, Cincinnati, Chicago & St. Louis.

NATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.

In our last issue we gave a brief note concerning the annual convention of the National Railway Master Blacksmiths' Association. The meeting was well attended and vigorously conducted. We cannot give the full story of the convention, but we print in the following paragraphs abstracts of a part of what was said:

MAKING AND REPAIRING LOCOMOTIVE AND CAR SPRINGS.

Mr. G. L. Lindsey presented a paper in which he urged oil as a fuel in this work. In quenching, he preferred fish oil above linseed, whale or lard oil. In drawing temper, he considered that a full heat quenched in oil does not provoke internal strains and that since oil does not harden the steel any too hard, there was no necessity in annealing. The changing of the bands in time, was a point wherein many cases of spring troubles could be avoided. The designing of springs should be studied in spring making, as well as the quality of the steel.

Mr. G. F. Hinkens presented a paper on this same topic, devoted largely to accounts of experiments in determining permanent set. One conclusion was that a temper obtained in oil is too soft for driver springs.

No conclusion was reached, in the discussion of these papers, as to the proper degree of heat to which steel should be brought before quenching, or as to the relative values of quenching liquids and compounds. So many views were expressed, that the feeling developed that a committee should be appointed to make complete tests of the various quenching liquids applied to steel, whose varying percentage of carbon should be kept in mind during these tests, although we believe the appointment of such a committee was not formally ordered. During the discussion Mr. Quayle stated that if master blacksmiths would demand a steel of certain specified quality that the heads of departments would not, he thought, make any serious objections to the higher cost thereof, if the results obtainable therefrom by a corresponding increase in length of service could be shown in figures; and he offered the use of his laboratory to the association.

TOOLS FOR CAR FORGINGS.

Mr. J. P. Fredrickson presented a paper on this topic, urging the centralizing of such work at the general shop, and pointing out the need for the best devices for the work to be given the master blacksmith, as well as the need for active aid from the higher officers—such aid as is given to the machine shop foreman.

FUEL FOR FURNACE USE.

Mr. E. Carlson read a paper on this topic, in which he stated that "it is wasting time to discuss the difference between coal and oil, even at the high prices we are now paying for the latter. It is cheaper, to say nothing of the cleanliness and, most important of all, we are getting by far a greater amount of work." He used oil for bolt forging and bending work and expected later to use it in axle and heavy shop work.

In discussion of this paper, Mr. Folk considered that oil was no more expensive than coal, and that it gave a more even distribution of heat throughout the mass of metal. He considered an egg-shaped interior the best for oil furnaces, for it permitted keeping the flame away from the metal. Mr. Judy pointed out that the flame, in striking the metal, deposited a form of carbon thereon, also impurities in the oil, with a resultant bad effect on welding.

SHOP METHODS.

Mr. Hinkens read a paper upon "Importance of the blacksmith shop relative to cost of construction and maintenance of railway rolling stock." He argued that a railroad shop could not be managed upon exactly the same lines as a manufacturing establishment. Much assistance, he pointed out, could be given to blacksmith shop management by other foremen presenting their work to the blacksmith shop in a methodical manner, and not unnecessarily sending in important work to be done in a rush.

FORGING WROUGHT IRON AXLES.

Mr. S. Uren read a report on "The best method of making wrought iron axles," some extracts from which follow:

The best quality of scrap only should be permitted to be placed in the slab piles. Scrap material from old boilers that have been coated with scale, or foreign substances, should be thoroughly cleaned in the rattler. Low carbon steel should be avoided in all cases. Slightly oxidized or rusty iron is not injurious, as the rust is pure oxide of iron, and a flux. After the iron has been carefully selected, it is put up in piles of 160 or 200 pounds on boards about 10x14 inches. The long pieces of scrap should be placed lengthwise on the board on the bottom and sides; the center should be filled in with short pieces, the short pieces lapping each other, and binders placed across the ends of the pile. The placing of the piles in the reverberatory furnace is one of the most important operations; fuel impregnated with sulphur or other injurious elements will be absorbed by the semi-molten piles, causing what is known as red short and cold short iron; its injurious effects can never be eradicated. Gas is superior for heating purposes on this account. Silicon from the furnace bottom or any of the furnace lining, should be guarded against. Each pile should be turned over for the purpose of heating it through thoroughly, and the piles should be swept off on the way to the hammer. The forger should square up the pile by light blows of the hammer, then draw the slab to the required dimensions. The forger often plates the pile thin with the first two or three blows, then doubles it over. This is a bad practice, as the impurities that may have adhered to the surface of the pile while being manipulated in the furnace, will be worked into the center of the doubled-over slab and prevent a perfect union. The slab should be drawn to about 1½ inches thick and 6½ wide, for the standard M. C. B. axle. The quality of the axle depends in a great measure on the proper working of the slabs. After the slabs are cut to the proper length and a sufficient number laid together to produce the axle required, as many of these piles are placed in the furnace as the capacity of the same will permit. The same conditions exist as in heating piles for slabs, as regards fuel, etc. The axle pile being brought to the proper heat is shaped roughly in round dies the entire length, requiring considerable dexterity and quickness. The reheating of this rough shape to a proper welding heat, about two-thirds of its length, is the most important part of the whole operation; if care is not taken, or the bridge wall of the furnace is not in proper shape, the end of the ingot will become overheated before the center of the axle is sufficiently hot to form a perfect union in the center of axle. The end, if finished after being brought to too high heat, will produce a bad crystalline journal, and will also be defective at the wheel fit. In our opinion this is the cause of many axles breaking at the wheel fit. If the center of the billet is not sufficiently hot a perfect union of the different layers is not produced, although the outside can be worked over so that the defects in the center of the cross section are not visible. The portion of the axle to be finished being brought to the proper heat the full length of the portion to be worked, the forger should place the center of the pile in the roughing recess of the die, manipulating the same until the end is reached, as quickly as possible; should the pile have a slightly higher heat at the center than at the end, the operation should be reversed, commencing at the end and working back to the center. The axle being worked down sufficiently in the first large swedges, is placed in the next smaller die or swedge, for finishing the half of the axle to the proper dimensions, this swedge being a little high in the center to give the axle the proper taper to its center. The third swedge or recess is provided with a projection at the bottom of the swedge, tapering to nothing at the upper sides of the die, for the purpose of cutting in the journal. The end of the axle should be placed in this die at as high a heat as practical for the purpose of producing good journals. As the forger has become so expert in making axles, that the portion operated on is almost down to its proper dimensions while at a white heat, while the metal does not attain its strength or ductility until it is worked at a low red heat, a trough of water should be convenient to the hammer and the heated portion of the axle partially cooled. After cooling, the iron is again placed in the finishing dies and lightly hammered over until the axle attains a blood red heat, or until it will cease oxidizing in cooling. Axles finished at too high heat scale in cooling, and being broken will show a crystalline structure. The proper weight of hammer is an important factor in the production of good axles; a light hammer will affect the iron on the outside only; a hammer of the proper weight will affect the iron to the center of the ingot. The writer prefers a heavy hammer not less than 4,000 pounds.

Papers on this same subject were presented by R. Toomey and by S. Harris. Mr. Toomey preferred that the piles of scrap should be built to 225 pounds. These he would have hammered out, cut in two, reheated and three slabs of these sections would work out a car axle. In discussion of these papers, Mr. Judy held that it was important to work the pile lengthwise of the anvil at first and then crosswise, after a good coherence had been obtained. He also urged that the merit of an axle depends most particularly in the care taken in heating and working the pile, for the pile, being made of short pieces of scrap, was in much danger of having hollow spots through the space existing between the ends of the small pieces. Mr. Riley held that four thin slabs were better than three thicker slabs, and that the first blow upon the pile should be struck with the pile up-ending, thus giving coherence to the mass, and forcing out the impurities due to fuel and slag. Mr. Uren preferred large slabs and a less number, because a 200-pound slab, being as large as could be conveniently handled, could be readily drawn down to 2½ inches thick, and there would be a less liability to imperfect cross sections, due to the imperfect welding together, throughout the length of the adjoining faces of the slabs. He stated that while care should be taken in selecting scrap free from steel, still a small percentage of steel, if it could be kept in the center of the axle, was not deleterious, for it added to the tensile strength by enriching the iron's carbon percentage, while of itself losing in carbon.

CASE HARDENING.

A paper by Mr. Buckley, on "The Proper Method of Case Hardening," set forth that there was such a variety of opinion as to the best compounds used for that purpose that a positive opinion was hard to form. The compounds which are named as favorites are, "raw bone with sal soda," "hydro-carbonated bone-black," "manganese of iron," and various carbon compounds—all giving carbonization of about the same depth. For heavy depth of carbonization, from 15 to 20 hours in the furnaces were necessary; and for light depth, from 8 to 10 hours. In the discussion Mr. Hinkens said he coated the pieces of iron in liquid glue, and used as a compound, charcoal, potash and salt. Mr. Jenkins coated his pieces in glue and rolled them in potash, using any compound. He used pure charcoal, and several others favored that, also, as a compound.

LOCOMOTIVE BLACKSMITHING.

Mr. T. C. Lace presented a paper on this topic, from which we make the following extracts:

The slot in driving springs is not long enough; this is one of the causes of breakage on the end of the spring, or chafing of the hanger till it breaks. The top plates of driving springs should be steel at the gib seat instead of iron, which is too soft, the gib often wearing into the iron, thus forming a fulcrum which breaks off the end of the spring or the hanger. The equalizers on heavy engines are sometimes worn at the slot by the spring hanger till a burr of about ⅜-inch is thrown out on each side—showing that there is more friction than is actually necessary for easy working. At times, these bearings will stick and throw a strain on another part, which breaks accordingly, while the floating weight on the end of the equalizers soon wears them out of shape, the remedy for which is to make the equalizers of steel, but these must not be overheated in forging or in dressing up. Chrome steel can also be welded on the centers and ends of iron equalizers, thus making them keep their shape. The equalizer swords should be made of mild steel finished on the anvil at a dull red heat, while the sword or D head hangers, which are in three-pieces, should have hardened bushings, the pin also being hardened; common pipe ground inside would answer for these bushings, and could be pressed or shrunk in. The valve yoke stem would be better case hardened. I know it is the custom to weld steel stems on in some places, but the steel you weld so readily is no harder than iron, which is easier to weld. The driver brake apparatus should have every pin hardened, the levers bushed, and the cam screws hardened, except the thread end. I will remark that wrought iron in its soft state makes one of the most inferior wearing surfaces known. It has the failing of mixing the fiber and tearing apart, instead of wearing uniformly. You have, no doubt, noticed this in chains and bolts about brake work on tenders and tracks.

THE TOOL SMITH.

Mr. T. C. Lace also presented a paper on "The Tool Smith," in which he argued that while tool steel had been widely discussed, nothing is said about the tool smith, who, if not the most important workman in a large establishment, is next to him. He is, as a rule, not easy to replace, and is conspicuous by his absence, if that is even temporary. This branch, continued Mr. Lace, above all others in the trade, makes the strongest call upon the intelligence and reasoning powers of the workman; this trade is not learned from books, but is the outcome of reason and experience, therefore it calls for men above the average to comprehend the intricacies, such as the degree of heat suitable for the various metals, angle and twist in cutting tools, hardening and tempering, making special forgings of tool steel, etc. The tool smith knows by intuition what kind of steel he is working on, and his memory is taxed often, to accord a certain mode of treatment to a certain brand of steel. He attends to this without any apparent effort, although the material he works costs from 6 to 30 cents per pound. Is this material cheap enough, asked Mr. Lace, to place in the hands of a novice, or, worse still, a man who is careless and ignorant of the properties of steel? The wrong lies, as far as Mr. Lace is able to judge, in the selection of men who are placed at the principal fire doing the steel work; and instead of the experience of one being handed down to the next, it becomes like an unwritten language, lost in the absence of the speaker. In closing, Mr. Lace said: "We wish to educate the tool smith so that he will be above believing in liquids or solutions to restore burned steel. All of these stand in line with charms and incantations."

TOOL STEEL MANIPULATION.

Mr. Stephen Uren presented a paper on this topic, an abstract of which follows:

There are five points in the manipulation of a good quality of crucible steel for tools, that should be strictly adhered to: the proper heat for forging to shape required; the proper manipulation on the anvil; the proper heat for hardening, after being forged or machine finished; tempering the tool to the proper degree of hardness to suit the different conditions the tool is intended for, and the proper heat for annealing.

No man in a railroad shop receives more unjust criticism than the tool smith; when the tools do not give satisfaction, the fault is almost invariably placed on the tool smith. He is either condemned for heating the steel too hot, or working it too cold, or not forging the tool to the proper shape, whether the fault is bad judgment in the man using the tool, or inferior quality of steel, whereas, in many cases, the fault is neither in the smith nor the steel, but in the abused use of the tool.

In all cases where the section has to be materially reduced, bring the steel to a good, bright red heat; continue working it until you would consider it the proper heat for hardening. If the piece is not to the dimensions required, reheat it. If little working is required to bring it to the required dimensions, an ordinary red heat is all that is required. In no case should the heated steel receive severe working below the heat that is required for hardening.

Proper manipulation on the anvil is as important as proper heating. Tools used to bring the metal to shape required, should have smooth surfaces, as the least nick or overlap or indentations, will cause any tool to break that is subjected to vibrating strains by impact force. The force of the hammer should be governed by the degree of heat in the steel and the breadth or thickness of the surface. Hammering below the proper heat will affect the surface only, while reheating for hardening will remove the surface-hardening the steel has received by hammering too cold.

The proper heat for hardening varies in proportion to the per cent of carbon—the only rule governing this is to heat the steel at as low heat as will produce the hardness required. Tempering the tool after being hardened, requires good judgment. The smith should know for what purpose the tool is to be used. The same heat required for hardening will answer for annealing. No steel should be brought to a higher heat than is required for hardening, if no work is done while in the heated state, as a high heat without being worked on the anvil will leave the molecular structure of the steel in an impaired condition.

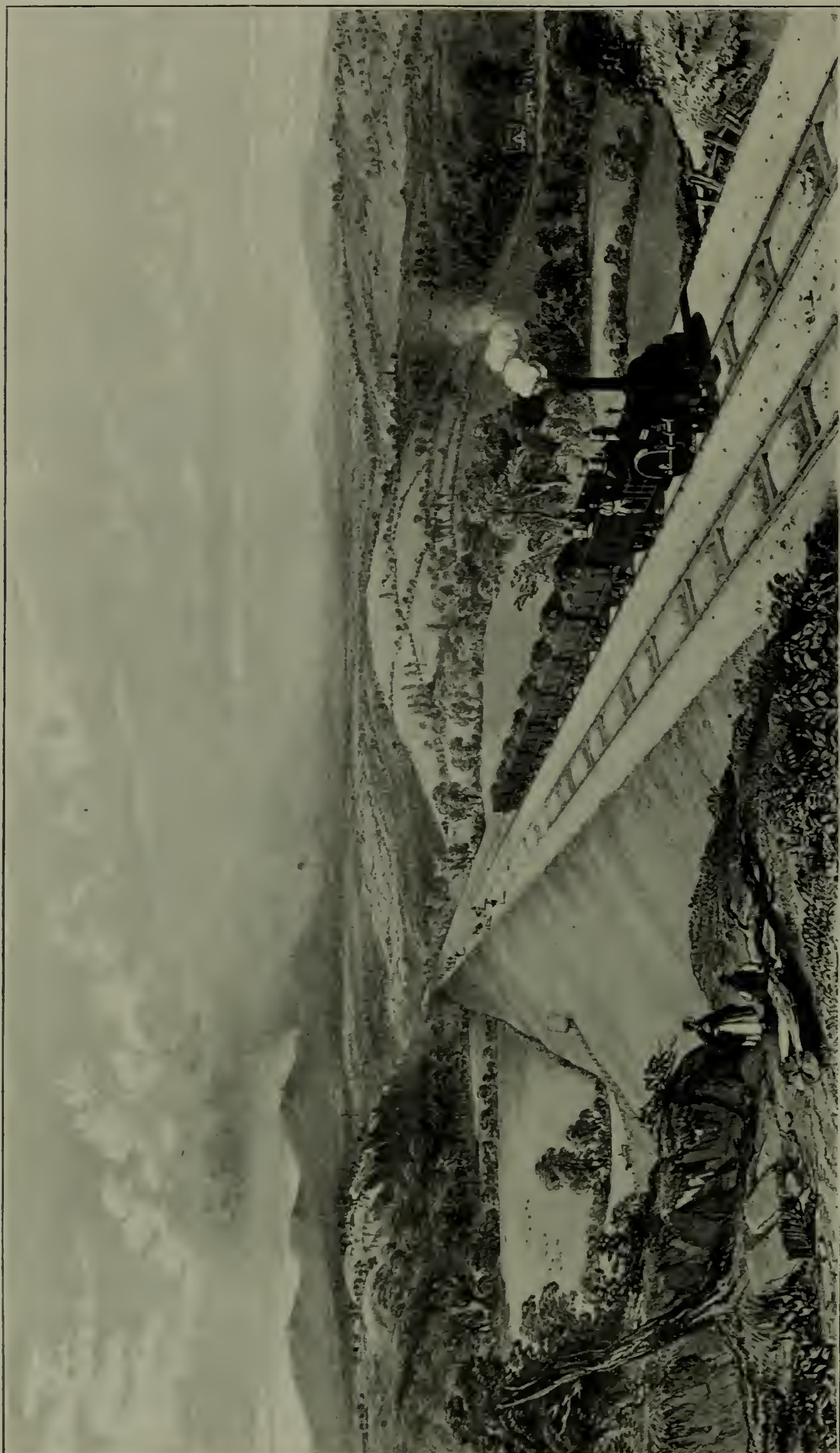
Many differing grades of steel in a shop, where all kinds of tools are produced, is confusing. A first-class quality of steel, produced from 99 per cent of the quality of iron best adapted for converting into steel, will answer any purpose in the range of tools required in a railroad shop. No tool requires a better quality of steel than the ordinary machinist's chipping chisel, or the blacksmith's cold chisel, for they come in contact with the most obdurate of metals, as well as soft material. They receive more punishment than any other tool. The hardest metals have to be removed by force transmitted from the head to the point of the chisel, consequently the quality of steel is as important a factor at the head as at the point of the chisel; if the head of the chisel will wear to a smooth surface and will resist the heavy hammering it receives without much compression or curling over, or slivering off at each foul blow, it is of a good quality of steel, and if the tool has been shaped properly on the anvil, after being brought to the proper heat for forging and hardening, and tempered to the proper degree, and accomplishes its work by heavy blows with sledge or hammer, without the point splitting, bending or breaking, it is of a steel that will answer for almost any railroad shop tool.

From my standpoint, two classes of steel are all that is required, viz: steel that will harden sufficiently to meet all conditions by the sudden extracting of heat, and self-hardening, or what is known as alloy steel, the heat extracted by air.

For ordinary purposes, pure water is the most practical hardening liquid, as it is the best extractor of heat. For small tools, or tools having delicate projections, the water should be tempered to meet the requirements, or oil substituted. For exceedingly small tools, oil will extract the heat in sufficient time to produce the hardness required.

MILD STEEL VS. WROUGHT IRON.

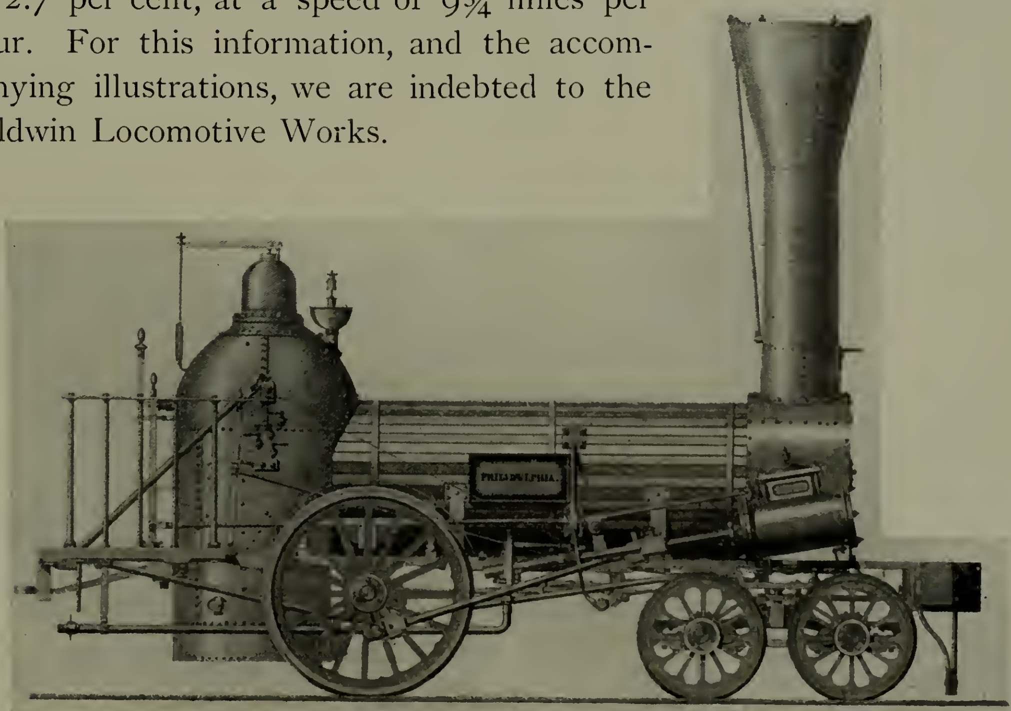
Mr. Mould read the report of his committee upon the "Relative Values of Mild Steel and Wrought Iron," in which the opinion was given that, for most purposes, mild steel was better than wrought iron, owing to the greater tensile strength and finer structure thereof. It could be worked much nicer, and flaws in the material were much less frequent. On his road, steel was used to a very great extent, and in almost every particular, especially in driving axles, which they had been using for 20 years, steel was giving excellent satisfaction. In the discussion, Mr. Uren stated that, in his opinion, wherever the metal was subject to purely tensile or compressive stresses, or if simple stiffness or ability to resist abrasion was desired, steel undoubtedly was the proper metal; but wherever there were vibratory stresses or a combination of stresses, he thought wrought iron far superior, because steel had no fiber but was granular in structure, and therefore less able to resist shattering, and was more subject to weather conditions, whereas iron, having a fiber, was more able to resist a combination of stresses, particularly those of a vibratory nature. Mr. Lindsey held that high carbon steel was better for vibratory stresses.



A BALDWIN ENGINE AT WORK IN ENGLAND IN THE EARLY '40'S.
ON THE LICKEY INCLINE, BIRMINGHAM & GLOUCESTER RAILWAY.

EARLY AMERICAN LOCOMOTIVES FOR ENGLAND.

England has so long supplied her own entire requirements for locomotives, that shipment of American engines to that country has, to most persons, the force of entire novelty. Nevertheless, it is not without precedent, as locomotives were built for English railways as long ago as 1840, in shops now comprising part of the Baldwin Locomotive Works, but then owned by Messrs. William Norris & Company. The accompanying illustration shows one of the locomotives, and the view on the opposite page is a reduced copy of an old print showing the same locomotive at work on the Lickey Incline of the Birmingham & Gloucester Railway, which is now part of the Midland Railway. The Lickey Incline extends from Bromsgrove to Blackwell, a distance of nearly three miles, and the rise is 1 in 37, or 2.7 per cent. Four locomotives were furnished with which to operate it, all of a design which was then peculiar to the Norris Works, comprising a single pair of driving wheels placed forward of the fire box, and a four-wheeled leading truck. The cylinders were 10½ inches in diameter by 18-inch stroke, outside connected and placed on an incline above the truck wheels. The driving wheels were 48 inches diameter, and the engine weighed, in working order, about 21,500 pounds. The locomotive "Philadelphia," here shown, which was one of the four above mentioned, is said to have hauled a train of loaded wagons, weighing in all 74 tons, up the grade of 2.7 per cent, at a speed of 9¾ miles per hour. For this information, and the accompanying illustrations, we are indebted to the Baldwin Locomotive Works.



BALDWIN ENGINE FOR ENGLAND—1840.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

OCTOBER MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, Oct. 12, 1899.

President Morris called the meeting to order at 8:20 p. m. Among those present were :

Baikie, T. P.	Davies, W. O., Jr.	Johannes, A.	Saum, C.
Blackburn, D. W.	Dana, E. W.	Kroff, F. C.	Stripp, R. G.
Bates, G. M.	Earle, Ralph	Kuhlman, H. V.	Saum, G. N.
Blohm, T.	Goehrs, W. H.	Miner, W. H.	Schultz, Aug.
Carey, C. H.	Gruhlke, E.	Morris, T. R.	Smith, E. B.
Callahan, J. P.	Grieb, J. C.	Nightengale, H.	Thomson, Geo.
Coleman, J.	Guthenberg, B.	Nordquist, Chas.	Wolfe, Charles
Cather, C. C.	Groobey, Geo.	Opie, Jas.	Weschler, H.
Callahan, Jno.	Aultman, Chas.	Olsen, Louis	Williams, T.
Constant, E. J.	Hunt, T. B.	Perry, A. R.	Wensley, W. H.
Cook, W. C.	Johnson, A. H.	Reinhard, F. B.	Wentsell, Geo.
Deen, C.	Jones, R. R.	Stagg, C. S.	

MISCELLANEOUS BUSINESS.

Treasurer E. B. Smith submitted his report for the year ending Oct. 12, 1899, as follows :

Received from R. Wharton, treasurer, balance on hand from last year	$ 11.78	
Received from the Secretary	252.92	
		$271.70
Total amount paid out on vouchers		261.65
Balance on hand		$ 10.05

The report was accepted and ordered placed on file.

Secretary W. C. Cook submitted his report for the year ending Oct. 12, 1899, as follows;

RECEIPTS.

Balance on hand from previous year	$ 11.78	
Amount received from entertainment fund, Oct. 17, 1898	36.92	
Amount received from memberships	125.00	
Amount received from renewals of old memberships	53.00	
Amount received from contributions	45.00	
		$271.70

DISBURSEMENTS.

For postage	$ 45.50	
For stationery, printing, etc	25.30	
For stenographers' reports at meetings	66.35	
Secretary's salary	72.00	
For rental of rooms	52.50	
		$261.65
Balance on hand at close of year		$ 10.05

The report shows only receipt of $125.00 from memberships, while there were 129 new members received during the year. The discrepancy is accounted for in this way: Three members who joined last meeting night did not pay their dues. That will be shown up in this year's business. And one member who joined a year ago overlooked the fact that he should pay his dues. We will have to charge that up to profit and loss.

We started our second year's business with 74 members. During the year we received 129 new members. Out of the 74 members from the first year, whose terms expired during the second year's business, we secured renewals from 53, and out of the balance I think that there will probably be about eight or nine that we will yet secure. Some of them only expired during the month of September, and probably have not arranged for payment on account of not being at the meetings. But I think we will only lose during the year about twelve whose terms expired during the second year's business.

The report was accepted and ordered placed on file.

Secretary Cook: We have applications for membership from the following gentlemen: W. E. Symons, superintendent motive power, Plant System of Railways; C. D. Pettis, general foreman I. C. Railway; C. R. Green, chief joint car inspector, South St. Joseph, Mo.; A. W. Tilly, general foreman, I. C. Railway at Clinton, Ill.; S. C. Kelly, general foreman, I. C. Railway at Centralia, Ill.; A. R. Perry, Atlantic Brass Co.

Mr. Grieb, of the Committee on Revision of Constitution and By-laws, reported that that committee was not as yet in position to present its report, and was given more time.

Mr. Groobey reported that the committee on the annual celebration had made arrangements with Mr. W. G. Collins, general manager of the C., M. & St. P. Railway, who had kindly consented to take as many members of this association as could find time to go to Milwaukee on October 21.

The next order of business was the nomination and election of officers. The names of Messrs. Sharp, Hunt, Morris, Kuhlman, Grieb, Groobey, Wharton and Callahan were presented as candidates. After the motion "that the nominations be closed" had carried, it was found that the only available candidate was the present incumbent, Mr. T. R. Morris, each of the other nominees having withdrawn. A vote resulted in unanimously re-electing Mr. Morris for the office of president.

For the office of vice president the name of Mr. W. E. Sharp was presented and the nominations closed. Mr. Sharp received the unanimous vote of the association and was declared elected.

Mr. W. C. Cook was presented as candidate for the office of secretary. The nominations then closed and he was unanimously elected.

For the office of treasurer, the names of Messrs. Deen and Groobey were presented. Mr. Groobey withdrew, and Mr. Deen was unanimously elected.

PRESIDENT'S ADDRESS.

President Morris then made the following address:

Gentlemen: In looking backward over the past year, the members of the Car Foremen's Association can find much to congratulate themselves upon. I do not think that any one of the nine charter members who organized the association on Oct. 6, 1897, ever imagined that it would grow to its present proportions, with a membership of nearly 190. This growth has been a steady and healthful one, there not having been a single meeting during the past year when new members have not been added to our list. The interest shown in the meetings has made this possible. The attendance has averaged about 70 for each meeting, and this for an association as young in years as yours speaks very highly for the members.

Another source of congratulation is the interest taken in the proceedings by the car inspector, as shown by his attendance at the meetings. One object we aim at is the education of this man, upon whom devolves the responsibility for the safety of trains and the safe transportation of passengers and freight. The more intelligence he brings to his chosen calling, the better satisfaction you will get in results. If he can, by precept or example, or by the exchange of ideas, be taught to improve his mind, his work will show it. The company for whom he works will be benefited, and he, personally, will be made a more valuable man, with higher ideals, resulting in financial and social benefits.

Another object of the association is to make the inspectors, who handle the immense interchange business of Chicago, acquainted with one another. A great deal of the bad feeling among inspectors is caused by misunderstandings. When inspector A meets inspector B—or, foreman, as the case may be—upon the neutral floor of the association rooms, he finds that Mr. B. is not such a bad fellow after all. He meets him a few times and hears him explain away some of the dark spots, which really exist only in the imaginations of the parties, and the consequence is—fewer cars delayed and a better feeling all around between man and man. I claim that during the two years existence of our association our work has benefited the railroad companies as well as ourselves to an immense degree. The railroad companies acknowledge it, but I do not think that we, as members, realize it to its full extent.

Another thing I claim is that we have been the means of giving the car foremen and inspectors a standing that they have never had before. The importance of our part of the work of running a railroad is being recognized.

Our first annual celebration of Oct. 17, 1898, drew the attention of local railroaders to our association, and the printing of our minutes in the RAILWAY MASTER MECHANIC has demonstrated that we are keeping up with the times, by discussing questions which are of interest to all car men.

Any one who comes to our meetings expecting to hear high-flown dissertations on the scientific manner in which cars should be inspected will be disappointed. We are plain people. Our strong point is not oratory. We tell what we know in our own way, and, while we sometimes make mistakes, we are always willing to correct them, and we are learning all the time. There is a future before us, both as an association and as individuals, and there is no reason why, if we continue as we have begun, we should not secure a standing among the railway clubs of this country that will be a source of pride to us all. To accomplish this, each member should constitute himself a committee of one, to forward the interests of the association in every way possible. This can be done by attending the meetings regularly, taking part in the discussions, and suggesting good live subjects, based on actual practice and experience, to talk about.

I want to thank you all for the very generous support you have given me as chairman during the past year, and hope that the cordial relations now existing among the members will continue.

I appreciate highly the honor conferred on me by a re-election to the office of president, although I feel that it should have gone to another. I thank you again. We will now proceed with the regular business.

CHARGING FOR "TEMPORARY REPAIRS."

There being no special subject on the program for discussion, Mr. Grieb suggested that the association might discuss with profit the question as to whether it was the practice of any of the roads interested in interchange at Chicago to charge when they made "temporary" repairs to such defects as would, if proper repairs had been made, be chargeable to owners.

Mr. Wensley: We don't make any charge. If I have to make temporary repairs to a car going east, I have it marked for the repair yard on its return, and then make proper repairs.

Mr. Stagg: I don't exactly understand what you mean by "temporary" repairs. Do you call strapping up a draft timber temporary repairs? If that is temporary repairs, I do not see why a man should not be paid for them. The probabilities are we may never get the car again. I do not approve of temporary repairs, if I can get out of it. But if I put a bolt through the sill, I am going to charge for it. When you know you are going to get a car back in 12 hours, it is different; but when a car is going 1,000 miles, we always charge.

Mr. Smith: I have a case in mind, now, where delivering road put a bolt in upside down on a draft timber, and put a repair card on. The chief inspector asked the delivering road for a joint evidence card, and he took it up with the general foreman, and the general foreman took it up with me. Some think that was not the proper thing to do. I would like to know what is customary with other roads in a case of this kind. I have not answered that letter yet, and it would help me out. It is a new case to me—for a man to get a bolt in upside down—I don't see why he could not have put it in right.

Mr. Wensley: We have cars of coal coming in the yard daily. We can't get inside the car, so we put a jack under the floor, raise it up, put a 1½-inch bolt in upside down, screw it up, and charge the owner for that bolt.

Mr. Smith: Do you consider that wrong repairs?

Mr. Wensley: No, sir; I don't.

Mr. Bates: We don't get many cases of this kind, but whenever we do, we fix them up the best we can, and if it is not proper repairs we will not make any charge; that is, if it is a bolt, as the gentleman has just mentioned. If a man can't make proper repairs, that is, put in a bolt properly, I don't think we should charge for it.

President Morris: How about other kinds of temporary repairs, aside from bolts—what would you do with those?

Mr. Bates: Well, I don't know of any other except wrong repairs. We make wrong repairs sometimes. We charge for those, and we card for them. That is the way we handle that.

Mr. Wharton: We make some temporary repairs. In the last two weeks we have had two tank cars with two broken sills. We had no tanks to transfer the oil into, and we had to make temporary repairs by strapping a piece on the timbers, letting it extend to the end sill, boring in holes, jacking it up, and putting it into position. We spent about five hours on each car for three men, getting out the timbers, boring them, and fixing them up. We put a notation on, and called it temporary repairs.

President Morris: Did you make a bill?

Mr. Wharton: Yes. A great many cars have bolts in them upside down; it is a common practice. We have to put them in that way nearly every day, to some car or another. It is impossible to always get bolts in properly, and when we put in two or three bolts we make a charge.

Mr. Jones: If we have a car that we cannot fix properly—if we make temporary repairs—we do not make any bill, and we put no card on.

A Member: It seems to me that it is impossible to make temporary repairs without making practically wrong repairs. As the rules read, I believe there is hardly any outlet for a man making temporary repairs. He practically admits that he is making wrong repairs. What he puts up another man has to take down. I do not think any one is justified in billing in that case.

President Morris: I would like to ask Mr. Wharton if his bills are paid.

Mr. Wharton: They are.

Mr. Stagg: We have quite a number of cars coming on the repair track from the east, with timbers strapped up, and they always have repair cards on with the notation, "temporary repairs." But they don't say "no bill," and I have always taken it for granted that we were charged for those repairs.

Mr. Callahan: I am inclined to believe that temporary repairs are simply wrong repairs, and they should be carded for.

President Morris: You make no bill for temporary repairs; is that it?

Mr. Callahan: Yes, sir.

Mr. Kroff: We generally, when we turn draft bolts upside down, put on a defect card and bill the owner.

President Morris: You consider them wrong repairs?

Mr. Kroff: Yes, sir.

Mr. Goehrs: I don't know that we have had a case of this kind, but I consider that we are not responsible. If bolts are upside down they certainly are not right; they certainly are wrong repairs, and I should say that they should be carded for, for when you have properly changed your bolts and charged for labor you would not be out any bolts, because the bolts are all right. Now, about strapping up timbers—you can break a couple of sills, for example; strap them up so as to make car safe to go, and the owner has got to pay for the temporary repairs, and then when proper repairs are made he has got to pay a second time. I don't think one ought to pay for temporary repairs.

Mr. Cather: I am deeply interested in this question, and I think the matter ought to be settled among ourselves, one way or another, and we (that is, the Illinois Central) look upon the matter as does the gentleman who just sat down. It seems to me that there is a distinction between what may be termed "temporary" repairs and "wrong" repairs. We look upon it that a man may, in an endeavor to make repairs to a car, make them wrong, but still they are repairs. If we should put in a wrong drawbar, or if one of our men should put in a column bolt upside down, that man has made repairs, but he has made them wrong, it is true. If he obeys the rules he says so, and if he don't say so, the road that receives car in their joint evidence does say so. On the other hand, simply strapping up a draft timber is not in itself any repairs at all, and we have returned bills innumerable to southern roads for that kind of work. Oftentimes a charge of that kind is made without the party making it knowing that it is wrong repairs. The question seems to be the distinction between what is "temporary" and what is "wrong" repairs; but so far as the Illinois Central is concerned in regard to making and paying bills, we do not consider it billable. We look upon it as this gentleman says—they are simply paying twice. It would not be justice to bill the road that makes temporary repairs for the job of making the entire repairs. If the car owner gets that car, then he can't bill for making the repairs.

Mr. Hunt: I think there are temporary repairs made that are not charged for (some gentlemen have said they make such repairs), and others, I believe, do charge. The point we want to get at is, ought we to charge for temporary repairs, or ought we not? According to the rules, repairs must be complete in order to make a charge. Take rule 5, section 3: "When improper repairs of owner's defects have been made, and bill rendered, the owner may counter-bill against the company making the wrong repairs for the cost of changing the car to its original standard, or to the requirements of rule 4, if the work is done." Well, if they do the work and then we are to bill back again, that would leave the company damaging the car, even. Then, under that head, why should you not charge for improper repairs and let the party bill back? That leaves you square. Is it the proper thing to do? What should be done? And rule 4, section 14: "When repairs of any kind are made to foreign cars" (that means just what it says) "a repair card shall be securely attached to outside face of intermediate sill between cross-tie timbers. This card shall specify fully the repairs made, and reason for same, the date and place where made, and name of road making repairs. This card shall be provided with a stub, etc." Now, let us come to the point. What should we do in the way of charging for temporary repairs to owner's defects? Should we charge them and put on a repair card, or should we make repairs at our own expense; that is, at the expense of the road damaging the car, or what?

A Member: It occurs to me that Mr. Hunt is practically substantiated by just what has been the practice all the time. I believe in following the rules as they read. It seems to me that "temporary" repairs are confused with "partial" repairs. But if anybody, as Mr. Hunt has stated, in making repairs has attached a defect card, he practically admits he has made wrong repairs. That is all that is asked for. To render a bill on temporary repairs, and attach a defect card, admits that you have made wrong repairs. Turn a bolt upside down, or put a bolt in just to get car home, and another man has to take it down—it is not proper repairs. I believe the rules are very clear on that, and if they are followed out as read, I don't believe you can make temporary repairs without making wrong repairs. You can make partial repairs without making wrong repairs, but not temporary repairs.

Mr. Cather: There is a point right there that I would like to have brought out. If a road makes wrong repairs, the rules say that the owner of that car in making these repairs right may re-bill the party making the wrong repairs for the cost of making them right. Now, if the party making wrong repairs is responsible to the owner for the cost of making them right, does any one mean to tell me it is right for a road that has strapped up a draft timber, or strapped up a sill, or slipped in some bolt, for the owner to bill you for putting in a sill? That is not right, but that is what will happen if you get joint evidence for temporary repairs—you classify them as wrong repairs, and according to the rules you bill the man who made the the temporary repairs for the cost of making the repairs right. Now, I claim, personally, that any road making wrong repairs should be responsible to the owner for the amount that they bill; but what I think personally, and what is being done, are different things.

Mr. Grieb: It seems to me that some remarks made by Mr. Cather are probably due to a misunderstanding, or confusion of terms, that has arisen in this discussion. I would not like to see the term "temporary" repairs applied to "wrong" repairs. It seems to me they are two different articles. What I understand by "temporary" repairs is "partial" repairs—repairs made for your own convenience to get cars forward; not a complete job with wrong material used to do it; it is something you do for your own interest to further the movement of that car. The rules cover clearly the course to be pursued when making wrong repairs; but this one of making temporary repairs is still open, and some people do insist on sending in bills for temporary repairs, and it is a good deal of pleasure for the motive power clerk to sit down and fight it out. We like that. It has been the practice on the C., M. & St. P. Road not to make bills for temporary repairs. We consider that we make them for our own convenience—for our use and benefit. We may have good reasons for not making proper repairs. We would not be willing to ask the owners to pay us for making partial repairs and then compel him to undo the work we have done to make the repairs as they ought to have been done. I think we should confine ourselves to "partial" or "temporary" repairs—"partial," I think, perhaps, is better. Then, I think, there is but one logical conclusion. If you make these repairs for your own benefit, entirely removed from that of the owner's benefit, you ought to pay for your own convenience, and not to ask the owner to share it.

Mr. Hunt: In that case you would put on a repair card?

Mr. Grieb: Yes; I believe a repair card must go on any time repairs are made, no matter what kind or description.

Mr. Hunt: I believe, as you say, that temporary repairs are for the convenience of the company handling the car; and I believe there are a good many repairs made under that head and nothing said about it; but now the point is, do you put on repair cards? The rules say you must put them on for any repairs. If you put them on for temporary repairs, you might have it thrown onto you by a party getting joint evidence at the other end. The man down there says it is wrong repairs, gets joint evidence, and comes back at you with a bill. It is a question whether any card should be put on. If you made the repairs for your temporary use it has nothing to do with the repairs to the car, because it is not repairs to the car; it is in order to get the car over the road. But if you put on a repair card, the fellow down below don't know that. He goes to the inspector and says: "I want joint evidence," and you are stuck for the repairs the owner should pay for.

Mr. Grieb: I cannot see as Mr. Hunt does in respect to making bills. I do not see how this question could be the subject of counter bill. We say we make no bills for the repairs—for the partial repairs. Now then, what could you do with a joint evidence card until you got a bill?

Mr. Hunt: You do that by making it read "no bill?"

Mr. Grieb: We specify on the cards "temporary repairs; no bill." We understand that temporary repairs are not subject to bill. I move that it is the sense of the Car Foremen's Association that temporary or partial repairs, (it being understood that this does in no way refer to wrong repairs) be at all times considered not subject to bill, and in each instance a repair card be attached, with notation to the effect that temporary repairs have been made and no bill will be rendered.

Mr. Callahan: Before putting the question, I would like to ask Mr. Grieb if this question supposes that the parts used in making these temporary or partial repairs are standard material to the car. Say a man put in two draft timber bolts, there being four broken—is it understood that he used standard bolts for what he did put in?

Mr. Grieb: As I understand Mr. Callahan's inquiry, it is whether in repairs to two of four broken bolts, we should consider that temporary repairs had been made.

Mr. Callahan: No; four draft timber bolts broken; in making temporary or partial repairs you put in two; is it the supposition that you used ⅞-inch bolts in putting in the two bolts in renewing ¾-inch bolts?

Mr. Grieb: I would like to have it understood that it makes no difference what kind of material you use in making temporary repairs; your liability for the temporary repairs that you have made rests with yourself.

Mr. Kroff: I would like to ask Mr. Grieb whether the connecting line would have a chance to make these repairs, or is he solely responsible to the owner?

President Morris: That would be governed by the rules; the rules specify that.

Mr. Grieb: The supposition of this whole discussion is that it is repairs to such portions of the car as would be chargeable to the owner if proper repairs had been made.

Mr. Cather: I would like to have one question discussed—the question of applying draft timber bolts, when four, we will say, are broken. As I understand it, when an inspector applies two bolts, four being broken, his intention is to make repairs to that car. He has repaired that car to the extent of two bolts, and that in my opinion is classified as temporary repairs. If he put in wrong bolts it is a case of wrong repairs; it is not temporary. Now then, as I understand it, the whole thing hinges on the distinction between "temporary" and "wrong" repairs. If a road bills for ¾-inch bolts, should be ⅞-inch, we do not consider them temporary repairs. Temporary repairs are in fact no repairs at all, and any road that repairs that car has a right to bill the company for making them right. The fact that the party made temporary repairs does not enter into it at all.

Mr. Bates: Temporary repairs, as I understand it, would be, for instance, if a draft timber was broken in two and could not be taken out, on account of the car being loaded, and you took a piece of iron and bolted it on. I call that temporary repairs; but putting in wrong bolts I would call wrong repairs.

President Morris: I think that is the proper distinction.

Mr. Wensley: That is the way I look at it. Mr. Bates will find one of his cars coming home that I made temporary repairs to. I strapped up the draft timber. The car is going to New York city and will be given to him in a few days. If a car comes on the line in a defective condition I fix it up so it will go to destination and issue orders to the inspectors to have it come on the repair track on its return. I will then remove the temporary repairs and make proper ones; if not, I will card. That is what we call temporary repairs. But putting bolts on a car I do not call temporary repairs; I call it partial repairs.

Mr. Hunt: I think it is pretty hard to define what are temporary repairs. It seems to me that most any kind of make-shift repairs that you want to make are temporary repairs. When we make temporary repairs we mean that we are not going to charge for the work that the owner is responsible for; it is owner's defect, but we are not making proper repairs; we are making temporary repairs, and we say "no bill." But where wrong repairs are made, he should not bill because there is a card put on and you get your certificate at the other end and that permits you to bill. But it seems to me that when owner's defects exist and a party makes repairs, however he makes it, if he is willing to stand it and says "no bill," I think that ought to settle it.

Mr. Grieb's motion was here put to a vote and carried.

Adjourned.

The annual celebration of the Car Foremen's Association of Chicago occurred on October 21, taking the shape of an excursion to Milwaukee. Through the courtesy of the officials of the C., M. & St. P. Railway, transportation was provided for about 100 of the members, who, after a pleasant ride to Milwaukee, were received at the depot by the reception committee, consisting of Mr. A. E. Manchester, assistant superintendent motive power; Mr. J. J. Hennessey, master car builder; Mr. T. Higby, general storekeeper, and Mr. J. C. Grieb, chief clerk to J. N. Barr, superintendent motive power, all of the C., M. & St. P. Railway. After receiving a cordial greeting from these gentlemen, the party adjourned to the commodious dining rooms in the C., M. & St. P. depot, where dinner was served. After full justice had been done to the excellently served dinner, the party were informed that their coaches, manned by a local crew, were entirely at their disposal, through the courtesy of Mr. B. H. McNaney, superintendent of terminals at Milwaukee. After a short run of about three miles, to west Milwaukee, Mr. Manchester, Mr. Hennessey, Mr. Higby and Mr. Grieb proceeded to take the party through the shops, explaining the different processes and the systematic manner in which the work was conducted. The party was somewhat surprised to learn that the company were turning out 15 new box cars a day. With the immense amount of other work being done, it was evident that the building of this number of completed cars each day, could only be accomplished by the most systematic and economical handling of material. The visit to the blacksmith and erecting shops particularly showed to the practical men of the party how these results were made possible. The visitors, being principally made up of car men,, were more interested in this department than any other. The many features of interest in these shops cannot be mentioned in detail in this brief description, but suffice it to say that the visit will prove to be of great educational value to the members of the association. Mr. Manchester then led the party over to the locomotive department, where the different processes and different stages of repair work, and also the building of new locomotives, were fully explained. Before closing this note we would revert to the cordial speeches of welcome extended to the association by Mr. Manchester, Mr. Hennessey and Mr. Grieb. Each of these gentlemen spoke of the value of the association, and what it could do to facilitate a prompt interchange of cars. At 3:30 the party again adjourned to their coaches, and proceeded to return to the depot at Milwaukee, where the coaches were attached to the Chicago train. The return run to Chicago was scarcely noticed, owing to the animated discussions as to what had been seen during the day, and the expressions of satisfaction at the way the excursion had been conducted, by all concerned; and, on arrival in Chicago at 6:10 p. m., the party dispersed with pleasant recollections of an agreeable and well spent day.

TRACK TANKS FOR FREIGHT ENGINES.

The Baltimore & Ohio Railroad has a number of track tanks between Washington and Philadelphia, and intends to equip the entire main line in the future. This decision was recently arrived at through the use of passenger locomotives, equipped with water scoops, on fast freight trains. It was found that much time was saved, danger from stopping being reduced to a minimum, and cost of running lessened. The transportation officials made some calculations, and the figures showed a saving of no small sum where track tanks are used for slow freights on the divisions where business is very heavy. The extra stops for water take much time, and the wear and tear on equipment is no small matter, and if five stops on each train can be eliminated between Cumberland and Baltimore, where trains are the thickest, the saving will be quite large.

If the experiment on this part of the road proves successful, track tanks will be installed on every division between Baltimore and Chicago. As a starter, the 50 new Vauclain compound engines recently ordered will be fitted with water scoops.

COKE FOR LOCOMOTIVE FUEL.

In our issue of September, 1899, we gave some account of the very successful experiments made on the Boston & Maine, with coke for locomotive fuel. The use of this fuel has quite passed the experimental stage on this road, and is there now considered to be an unqualified success, and its engines are being rapidly changed over to suit the requirements of coke burning. But the expensive water grates which President Tuttle referred to in our September issue have been found unnecessary, and the ordinary cast iron grate has been found to be all right, when aided by introducing steam jets in the ash pan. President Tuttle is unreserved in stating that he considers the use of coke as the best solution of the smoke, cinder, dirt and spark problems, and in fire claims alone, as we previously stated, he expects to save $100,000 a year.

The use of coke on the Boston & Maine has been made possible, as we have before stated, because a local gas firm produces it as a by product; its cost to the railway is said to be about the same as coal.

In Chicago there is good promise that coke made from western coals can be produced by a new process at a figure making its cost about the same as coal. The Universal Fuel Co. has been making experiments in this direction with marked success. Since the patents have not been finally issued we are not at liberty to describe fully the methods used, but the ovens of the Universal Fuel Co. are open to inspection by those who are directly interested in this matter.

The ovens are designed in accordance with ideas and inventions of Prof. Joseph Hemmingway, a gentleman who has made a life study of coal and coke. Mr. L. Z. Leiter and Mr. Joseph Leiter became interested in his plans, and since the first oven was built it was evident that quite remarkable results could be obtained from the cheaper grades of western coals.

While in the past such coals have been coked in a small way, yet the product could not be successfully used, either as a fuel for locomotives or in foundry practice, both because of the amount of sulphur in the coke, and the lack of sufficient strength to sustain the load in a furnace. These objections seem to have been overcome by the Hemmingway process and, by utilizing the by products, the cost of the coke will be reduced to a point where it can compete successfully with coal as a fuel for locomotives.

In all coke the proportion of ash must necessarily be high, after the volatile matter has been removed, and means must be supplied to prevent slag or clinker forming on the grates. This may be accomplished by using exhaust steam under the grates. This is done on the Boston & Maine, as we will show presently; and it is a means commonly employed in smokeless furnaces, where the slack from western coals is successfully burned.

The analysis of an Illinois coal recently coked was as follows:

	COAL.	COKE.
Moisture	1.36 per cent	2.31 per cent
Volatile matter	29.29 " "	
Fixed carbon	59.81 " "	83.69 " "
Ash	9.54 " "	14.00 " "
Sulphur	1.88 " "	0.55 " "

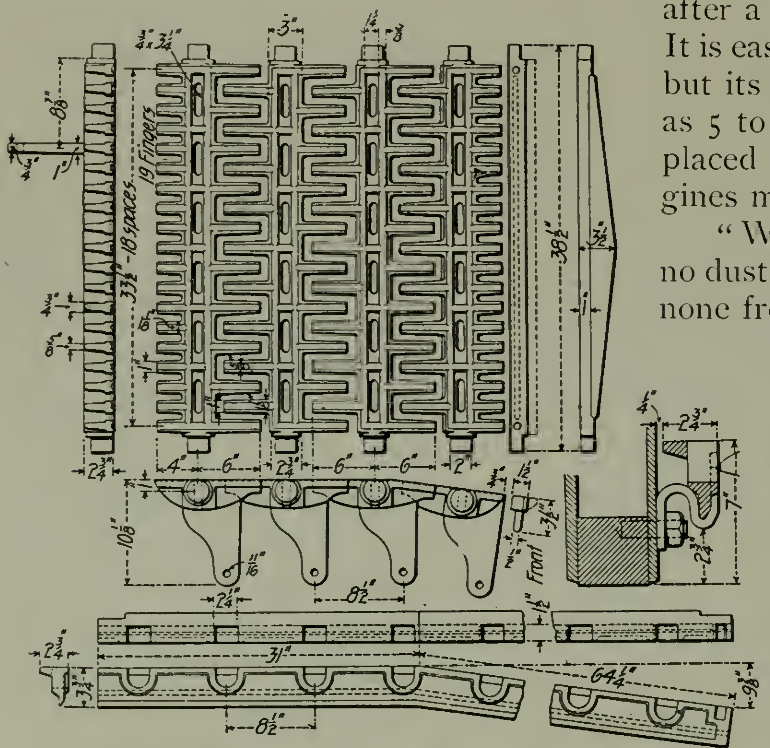
From this analysis it will be seen that the coal was an average Illinois coal, while the resulting coke is very good, being low in sulphur and reasonably high in fixed carbon—in fact, very much superior to the analysis given for the coke used on the Boston & Maine, which shows only 69.82 per cent of fixed carbon and sulphur.

Mr. Jno. C. McMynn, the well known expert on steam plants, and who has acted as consulting engineer during the experiments conducted for the Leiters, expresses himself as being confident that the smoke from locomotives can be successfully abated by the use of coke as fuel, and this without any material increase in the cost of fuel. It will, of course, require a series of experiments, in order to determine the exact cost of coke for each railway and the most advantageous location for the coking plant, but by disposing of the by products the cost can be reduced very materially. The plan of the Leiters is not to produce coke for the market but to dispose of rights to use their process to railways who will erect their own coking plants.

If suitable coke can be produced at suitable cost in the west, as these statements would seem to indicate, there would seem to be no reason why the Boston & Maine experience cannot be duplicated here. The Chicago city authorities are again agitating the smoke question just now, and had the matter up before the Western Railway Club, at its October meeting, and the Club has appointed a committee to consider the whole question of smokeless combustion on locomotives.

The *American Engineer*, in its October issue, goes into the change of practice on the Boston & Maine at considerable length, and from its remarks we make the following extracts:

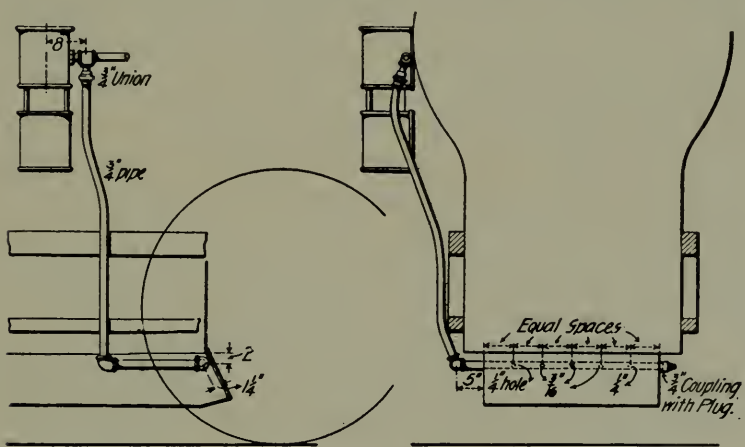
"In operation on the road there is a noticeable pale blue haze to be seen from the stack when the engine is working hard with the lever 'in the corner,' but after shortening the cut-off it is not to be seen except in tunnels or under bridges. The front ends are almost entirely clear, but the nettings are not removed because of the possibility of drawing small pieces of fuel through the tubes when working hard. Some clinker forms, but not as much as is found with Dominion coal burned without coking, and most of the coke clinker must be combustible, because it is very seldom necessary to remove it from the fire boxes even after a run of over 100 miles. It is easier to handle than coal, but its bulk is to that of coal as 5 to 3, and large racks are placed on the tenders of engines making long runs.



COKE-BURNING CAST IRON GRATE—B. & M. RY.

"With this fuel there is no dust or dirt in the cab, and none from the stack except a very fine, whitish, metallic dust, which does not adhere to clothing and is not sufficient to be in the least disagreeable. It is evident that the running gear, valve motion and driving boxes will be greatly benefited by the absence of flying dust and grit from the coal.

"At first it was considered necessary to use water grates because of the extremely high temperature of the fire, which resulted in burning out ordinary cast iron grates. The grates used in the earlier experiments had water bars like those for burning anthracite, and, while these did not prove troublesome in any way, it was considered desirable to avoid the troubles which time would be likely to develop by the burning out of the tubes. It was considered desirable to save the expense of fitting up the water grates, and also to provide means for using exactly the same grates for coke as for coal. Experiment developed the fact that coke may be burned on ordinary cast iron grates by introducing steam into the ash pans. This cools the grates and prevents them from melting by the intense heat; it also tends to reduce the amount of clinker. The present practice is to place a T in the exhaust pipe from the Westinghouse air brake pump and conduct a portion of the exhaust into a ¾-inch pipe which extends down and across the front end of the ash pan. The end of the pipe is plugged, and the steam issues from five ¼-inch holes in this pipe and passes back under the grates. This steam does not appear to have any noticeable effect on the fire, but it is possible that it aids combustion, as well as saves the grates. The engines are now converted into coke burners by the addition of this very simple piping and the use of a portion of this steam that would otherwise be thrown away. For the return to coal burning this pipe may be plugged, or it may be provided with a cock. A part of the air pump exhaust is sufficient for the coke, and only that portion is required that will naturally pass out of a pipe fitted up in this way, while the remainder goes up the stack. The steam jet piping and the cast iron grates used in connection with coke are illustrated herewith. The cast iron grate is not new, but is shown because it is successful in burning coke.



Steam Admission for Coke Burning.

"The evaporative performance is not yet known, but the regular performance sheets show a uniformly better record for coke than for coal, ton for ton. The advantage in severe passenger service is about one mile per ton. The records of this road are not given in ton-mile units. A part of the saving is in the reduction of back pressure, which is due to the possibility of opening out the nozzles. Mr. Henry Bartlett, superintendent of motive power, says that the nozzles of nearly all of the coke burning engines are made about ¼-inch larger than when using coal. This is a very important item, because it affects the power of the engine as well as the fuel performance, and if the records were made on a tonnage basis this ought to make a still more favorable showing for coke. When working hard there is some movement of light stuff in the fire, but it does not get to the tubes, and the tubes are not seriously coated. The coating is easily scraped off at the end of a run, and the tubes do not require cleaning out as often as with coal.

"In steaming qualities very little, if anything, is left to be desired. Coke gives a remarkably hot fire, and thus far there has been no indication of trouble with tube sheets or tubes. The fact that the fire door is not required to be wide open about half the time should favor these parts, and herein is another advantage of coke. The practice is to fill up the fire box within three inches of the door opening, working the fire somewhat thinner toward the front end. This is done when possible, while at a station or when the engine is shut off, because coke, like anthracite, requires a little time to kindle, and when started it will hold the steam for a hard run of from 6 to 10 miles without touching the fire. The writer saw the run from Lynn to Boston, 11 miles, made with 10 cars in about 15 minutes without the fire being disturbed in any way. The fire box is filled up about five minutes before leaving a terminal, and the fire is good for about 10 miles. The fire door may be kept closed, but it is generally left slightly open. This seems to improve the combustion. It also prevents the coating of the flues and appears to aid in burning up the clinker, although the introduction of the steam jet under the grates has practically overcome the difficulties with clinker. The flame is long, and the motive power officers believe that in spite of the high temperature there will be less destructive effect on the fire box sheets and tubes than is experienced with coal. From some engines a large amount of gas escapes into the cab while standing, unless the blower is put on, but in other cases the blower is seldom used. The gas is very much like that from charcoal. In running, it appears to be necessary to work the grates a little about every six or eight miles. When this is done and steam is admitted under the grates, no clinkers are formed except such as may be disposed of without giving trouble.

"In looking for some disadvantages about this fuel, only one was found. Coke burns so freely that it cannot be banked, and it is found necessary to rake the forward portion of the grates bare while standing in the roundhouse. The watchmen give idle engines a little more attention when using coke, but this is not a serious matter."

THE MASTER CAR BUILDERS' COMMITTEES.

Committees for the current year's work of the Master Car Builders' Association have been appointed as follows:

STANDING COMMITTEES.

On arbitration.—G. W. Rhodes, chairman; John Mackenzie, M. M. Martin, G. L. Potter, J. N. Barr.

On supervision of standards and recommended practices of the association.—A. M. Waitt, chairman; G. L. Potter, Wm. Apps.

On triple valve tests.—G. W. Rhodes, chairman; A. W. Gibbs, J. O. Pattee, W. S. Morris, Wm. McIntosh.

On brake shoe tests.—S. P. Bush, chairman; Geo. Gibbs, R. P. C. Sanderson.

On prices in master car builders' rules.—J. N. Barr, chairman; S. P. Bush, J. H. McConnell, S. A. Charpiot, T. B. Purves, Jr.

On tests of M. C. B. couplers.—W. W. Atterbury, chairman; W. P. Appleyard, W. S. Morris, F. A. Delano, H. Monkhouse.

SUBJECTS AND COMMITTEES FOR 1900.

Air brake appliances and specifications for air brake hose.—A. L. Humphrey, chairman; A. M. Parent, W. H. Marshall.

Design for wheel circumference measure.—J. J. Hennessey, chairman; W. J. Hemphill, E. S. Marshall.

Design for journal box, bearing, wedge and lid for cars of 100,000 pounds capacity; also design for journal bearing and wedge gauges for 80,000 and 100,000 pound cars.—E. D. Nelson, chairman; J. J. Hennessey, Wm. Garstang.

Revision of rules for loading long materials.—Pulaski Leeds, chairman; P. H. Peck. F. H. Stark, C. Coler, S. P. Bush, B. Haskell, W. H. Lewis, J. R. Petrie.

Revision of recommended practice for springs, including design for springs for 100,000 pound cars.—J. S. Lentz, chairman; A. G. Steinbrenner, F. W. Brazier.

Revision of passenger car rules.—H. J. Small, chairman; J. T. Chamberlain, Frank Rearden, H. F. Ball, Wm. Garstang.

Standard center plates.—R. H. Johnson, chairman; H. L. Preston, G. T. Anderson.

Draft gear.—C. M. Mendenhall, chairman; James Macbeth, T. B. Kirby.

Spread and design for side bearings.—J. W. Luttrell, chairman; H. M. Pflagler, B. Haskell.

Uniform section of siding and flooring.—R. P. C. Sanderson, chairman; W. P. Appleyard, J. S. Lentz.

Metal dead blocks: safety chains.—W. P. Appleyard, chairman; J. H. Pennington, Wm. McIntosh.

Subjects.—G. L. Potter, chairman; A. M. Waitt, A. E. Mitchell.

PISTON VALVES.

The Master Mechanics' Committee on Piston Valves has issued its circular of inquiry, embodying the following questions:

1. Have you any piston valves in service? If so, how long have you had them? 2. What advantages have you found in their use? 3. What disadvantages have you found in their use? 4. Do you have any difficulty with piston valves when the engine is drifting? If so, what is

BROOKS TWELVE-WHEELER, FOR THE DELAWARE, LACKAWANNA & WESTERN.

Total weight—205,000 pounds; weight on drivers—166,000 pounds; cylinders—21x32 inches; drivers—54 inches; heating surface—3,168 square feet, of which 218 square feet is fire box and 2,950 square feet tube surface; grate area—82.4 square feet; working steam pressure—200 pounds; boiler—78 inches; tank capacity—water 5,000 gallons, coal 10 tons.

the cause and remedy? 5. Do you prefer internal or external admission? 6. Is exhaust any benefit as a jacket for the steam passage? 7. Do you favor a solid valve or one with packing? If packing, state what kind you prefer? 8. Can you get a proper distribution of steam? 9. Is there less wear on eccentrics and links with piston valves than with slide valves? 10. Do you consider a bushing for the piston valve chamber desirable? State reason. 11. Please give any information that you have to show the economy in the use of piston valve. Kindly furnish the committee with a drawing or blue-print of what you consider the most satisfactory form and location of piston valve.

Replies should be sent to S. P. Bush, superintendent motive power Pittsburgh, Cincinnati, Chicago & St. Louis Railway, Columbus, Ohio. Mr. Bush is chairman of the committee. The other members are H. Schlacks and Wm. McIntosh.

TWELVE-WHEEL FREIGHT LOCOMOTIVE—DELAWARE, LACKAWANNA & WESTERN RY.

The Brooks Locomotive Works recently turned out 15 12-wheel freight locomotives for the Delaware, Lackawanna & Western. These locomotives, one of which we illustrate on the opposite page, have 21x32-inch cylinders; 54-inch drivers; conical connection wagon top boilers, which are 78 inches in diameter, and which are designed to carry 200 pounds of steam; wide fire boxes over the wheels, 123x97 inches in dimensions; grate areas of 82.4 square feet, and a total heating surface of 3,168 square feet, of which 218 square feet is fire box and 2,950 square feet tube surface. The engines weigh 205,000 pounds, of which 166,000 pounds are on the drivers. Complete details as to dimensions and equipment of these engines are appended:

GENERAL DIMENSIONS.

DESCRIPTION.

Type	12-wheel freight
Name of builder	Brooks Locomotive Works
Name of operating road	Delaware, Lackawanna & Western
How many, and dates of delivery	Fifteen—September, 1899
Gauge	4 feet 8½ inches
Kind of fuel to be used	Fine anthracite coal
Weight on drivers	166,000 pounds
Weight on trucks	39,000 pounds
Weight, total	205,000 pounds
Weight, tender, loaded	106,000 pounds

GENERAL DIMENSIONS.

Wheel base, total, of engine	25 feet 9 inches
Wheel base, driving	15 feet 0 inches
Wheel base, total, engine and tender	50 feet $4\frac{1}{4}$ inches
Length over all, engine	37 feet $4\frac{1}{8}$ inches
Length over all, total, engine and tender	60 feet $2\frac{5}{8}$ inches
Height, center of boiler above rails	9 feet $2\frac{1}{2}$ inches
Height of stack above rails	15 feet $1\frac{1}{2}$ inches
Heating surface, fire box	218 square feet
Heating surface, tubes	2,950 square feet
Heating surface, total	3,168 square feet
Grate area	82.4 square feet

WHEELS AND JOURNALS.

Drivers, number	Eight
Drivers, diameter	54 inches
Drivers, material of centers	Cast steel
Truck wheels, diameter	30 inches
Journals, driving axle	9x11 inches
Journals, truck	$5\frac{1}{2}$x12 inches
Main crank pin, size	$6\frac{1}{2}$x$6\frac{1}{2}$ inches
Main coupling pin, size	$7\frac{1}{2}$x5 inches
Main pin, diameter wheel fit	$7\frac{7}{8}$ inches

CYLINDERS.

Cylinders, diameter	21 inches
Cylinders, stroke	32 inches
Piston rod, diameter	$4\frac{1}{4}$ inches
Kind of piston rod packing	Jerome
Main rod, length center to center	98 inches
Steam ports, length	25 inches
Steam ports, width	$2\frac{1}{2}$ inches
Exhaust ports, least area	110 square inches
Bridge, width	$3\frac{1}{4}$ inches

VALVES.

Valves, kind of	Improved piston
Valves, greatest travel	$6\frac{1}{4}$ inches
Valves, steam lap (inside)	1 inch
Valves, exhaust lap or clearance (outside)	Line and line
Lead in full gear	1-16-inch negative
Lead constant or variable	Variable

BOILER.

Boiler, type of	Conical connection wagon top
Boiler, working steam pressure	200 pounds
Boiler, material in barrel	Steel
Boiler, thickness of material in barrel	$\frac{7}{8}$-inch and 15-16-inch
Boiler, thickness of tube sheet	$\frac{3}{4}$-inch
Boiler, diameter of barrel, front	78 inches
Boiler, diameter of barrel at throat	$83\frac{7}{8}$ inches
Seams, kind of, horizontal	Sextuple lap
Seams, kind of, circumferential	Triple lap
Crown sheet, stayed with	Radial stays
Dome, diameter	30 inches

FIRE BOX.

Fire box, type	Wide, over wheels
Fire box, length	123 inches
Fire box, width	97 inches
Fire box, depth, front	74 inches
Fire box, depth, back	64½ inches
Fire box, material	Steel
Fire box, thickness of sheets	Crown, ⅜-inch; tube, ⅝-inch; side and back, ⅜-inch
Fire box, brick arch	None
Fire box, mud ring, width	Back and sides, 3½ inches; front, 4 inches
Fire box, water space at top	Back, 4½ inches; front, 4 inches
Grates, kind of	Water tube
Tubes, number of	410
Tubes, material	Charcoal iron
Tubes, outside diameter	2 inches
Tubes, thickness	No. 12 B. W. G.
Tubes, length over tube sheets	13 feet 10¼ inches

SMOKE BOX.

Smoke box, diameter outside	81 inches
Smoke box, length from flue sheet	67½ inches

OTHER PARTS.

Exhaust nozzle, single or double	Single
Exhaust nozzle, variable or permanent	Permanent
Exhaust nozzle, diameter	5½ inches
Exhaust nozzle, distance of tip below center of boiler	5 inches
Netting, wire or plate	Wire
Netting, size of mesh or perforation	2½x2½ inches and 2½x1¼ inches
Stack, straight or taper	Steel, taper
Stack, least diameter	15¼ inches
Stack, greatest diameter	17¾ inches
Stack, height above smoke box	30½ inches

TENDER.

Type	8-wheeled
Tank, type	B. L. W. sloping top
Tank, capacity for water	5,000 gallons
Tank, capacity for coal	10 tons
Tank, material	Steel
Tank, thickness of sheets	¼-inch
Type of under frame	Steel channel
Type of springs	Double elliptic
Diameter of wheels	33 inches
Diameter and length of journals	5 inches x 9 inches
Distance between centers of journals	5 feet 5 inches
Diameter of wheel fit on axle	6⅜ inches
Diameter of center of axle	5⅜ inches
Length of tender over bumper beams	21 feet 8½ inches
Length of tank	19 feet 6 inches
Width of tank	10 feet 0 inches
Height of tank, not including collar	60 inches
Type of draw gear	M. C. B. Gould

SPECIAL EQUIPMENT.

Brakes	American for drivers, Westinghouse for tender and train service

Pump	$9\frac{1}{2}$ inches
Sight feed lubricators	Detroit
Safety valves	Kunkle
Injectors	Metropolitan
Springs	National
Metallic packing, piston rods	Jerome
Metallic packing, valve rods	B. L. W. special
Spark arrester	Improved Bell

LOCOMOTIVE FRONT ENDS.

At the September meeting of the Western Railway Club a valuable paper bearing the above title was presented by Mr. J. Snowden Bell. Mr. Bell, as many of our readers know, is a patent attorney, and also the patentee of the Bell front end arrangement. By reason of his occupation and of his natural especial interest in front ends, Mr. Bell is so situated as to present a valuable and authoritative review of this topic; and this he has done. He has adopted the historical form for his paper, and has followed this plan with apparent thoroughness. His paper is quite long—too long to permit of presenting it in these columns—and is profusely illustrated. We have prepared a very brief abstract of Mr. Bell's tracing of the history of front end designs as follows:

The importance of correct design and proportions of the front end of a locomotive boiler in promoting the effective and economical performance of the engine, while not entirely overlooked by the earlier constructors, has not, until a comparatively recent date, been given the recognition which it demands, nor induced the experimental research by which the principles involved may be so applied in practice as to insure the attainment of the best results under the conditions of service presented in standard American locomotives. The term "front end" is ordinarily understood to comprehend the smoke box and stack, and their accessories and contained members, the essentials of which latter are the steam and exhaust pipes, a draft appliance, and some means for preventing, or attempting to prevent, the discharge of sparks or ignited fuel from the stack.

The front ends of the early locomotives built in the United States were substantially similar to those of the English engines which preceded them. The smoke box was of D shape in cross section, and had a straight, open stack. The steam and exhaust pipes were carried to and from the cylinders, inside the smoke box, as in present practice, and the exhaust nozzles were usually double and high. The cylinders were attached to the bottom of the smoke box, if a crank axle was used, or to the sides, in outside connected engines. No special draft appliance or spark arrester was used. Apparently, as a matter of mere mechanical convenience, and without any rule or basis as to its volume or capacity, the smoke box was made about the same length as the cylinders, and this continued to be the universal practice until the advent of the lengthened or extended smoke box, or so-called "extension front," in 1859.

The contracted exhaust nozzle, as a means for effecting the forced draft which is essential in a locomotive boiler, was doubtless recognized at the outset, as it has been ever since, as a necessary evil—one that could not be avoided, but might, as subsequent practice has shown, in some degree be lessened; and while its greater objection, the resultant back pressure on the pistons, could neither be removed nor reduced to any material extent, the lesser one, that of throwing ignited and partially burned fuel from the stack, very soon became the subject of efforts at prevention. Any and every spark arrester is necessarily an attempt to compromise two directly conflicting conditions—one being perfect freedom of draft and discharge of smoke and gases, and the other the prevention of the escape of solid matter in a state of ignition from the stack. It naturally results, from the impossibility of reconciling these conditions and the imperfect compliance with each of them which it is possible to make, that none of the long array of spark arrester designs which have been proposed, or even of the comparatively small proportion of them which has been put into practice, has been entirely successful or satisfactory, and practically only two types—the diamond stack, and the open stack with spark arresting appliances in the smoke box—have survived the test of actual service, and are now in use to any substantial extent on the railways of the United States.

The first spark arrester was doubtless a cap of wire netting connected to a widened top section of an otherwise entirely open stack, such as is shown in familiar illustrations of the early Baldwin and Norris engines. The next step was the addition of a cone or deflector below the netting, thus giving the elements of the present diamond stack. The earliest authentic record of a spark arrester of any kind is believed to be the U. S. patent of J. P. Espy, June 29, 1833, a copy of which is published in the Journal of the Franklin Institute, Vol. XII, New Series, 1833, page 418. Espy's device, which he termed "a draft generating chimney cap," consisted of a horizontal conical cap, with a lower neck fitting around and turning on the upper end of the stack, and having a vane on its top "to turn the angle of the cap always to the wind." The open end of the cap was about "thirteen or fourteen times the area of the top of the chimney," and was covered with "wire gauze so fine that a pin's head can hardly be thrust through the meshes."

The volume of the Franklin Institute Journal above referred to, contains the earliest instance which has been found of a spark arresting appliance in the smoke box, being a communication from J. McIlvaine, describing and illustrating his "Arrangement for stopping sparks from the flues of locomotive engines in which wood is used as fuel." This appliance was a sheet of wire netting extending in an inclined position entirely across the smoke box, from the top of the flue head to the bottom of the smoke box front, the exhaust pipe passing through it. This is the pioneer in the line of perforated deflectors set in front of the tubes, and its principle is embodied, to a large extent, in present practice.

Appliances for regulating or approximately equalizing the draft through the upper and lower rows of tubes were the next addition which was made to the smoke box, and it is a somewhat remarkable fact that only two of them, and these the earliest that were developed, have continued to be used sufficiently to be worthy of mention, and are today elements of general and approved practice. These are the "petticoat" or lift pipe, and the deflecting plate in front of the flue sheet. The petticoat pipe was undoubtedly introduced at a very early date, and probably by some New England locomotive builder. According to the report in the 1884 Master Mechanics' Association Proceedings, the deflecting plate was designed by Isaac Dripps, in 1849, and an illustration is given showing an inclined perforated deflecting plate, practically the same as some of comparatively recent date. The standard and almost universal practice in front ends in 1859, and, in the large majority of instances, for twenty years or more thereafter, comprised a bonnet stack of large diameter, a petticoat or lift pipe, and low exhaust nozzles.

Prior to the year 1859, it had been the universal practice to make the length of the smoke box about the same as that of the cylinders, this being done mainly, if not entirely, for structural reasons, although it had also been, before that time, maintained by writers of admittedly high standing as authorities, that a reduction of smoke box volume was not only correct in principle but also advantageous in practice. A radical innovation was made in 1859, by adding to the smoke box a forward extension or "extension front," the length of which was first proposed as about 18 inches, but which was afterward made very much greater, the average length being, until comparatively recently, 36 inches, and in some cases 44 inches or more. The volume of the smoke box was thus increased considerably over 100 per cent. The invention of the extended smoke box was claimed by John Thompson, of East Boston, Mass., who was, at the time, master mechanic of the Eastern Railroad, and it was patented by him in the United States May 29, 1860, No. 28,520.

The theory of the patentee that the sparks and cinders would be deposited and retained in the smoke box extension, was relied upon to constitute it a spark arrester, and no netting or other spark arresting appliance was proposed. It is hardly necessary to say that this theory was speedily shown to be entirely unfounded, and additional devices for arresting sparks were found to be indispensable. Commencing with a horizontal sheet of netting, extending from the flue head to the smoke box front, above the top row of tubes, which was the first expedient adopted, or one of the earliest, various designs of netting and deflecting plates were, in the course of time, designed and applied by those who continued to use the extended smoke box. It is obvious that, in and of itself, this appliance can possess no merit as a spark arrester, and its capabilities as a spark receptacle or retainer are so limited that they are no longer urged as an argument in its favor, it being now generally recognized that practically all the solid matter that passes through the tubes is thrown out of the stack, and that if this can be done without liability to start fires on or adjacent to the right of way, it is desirable that the smoke box should be cleared by the exhaust.

Disregarding the numerous special designs of spark arresters, which had been previously, and were thereafter produced, the large majority of which was of the "freak" order, and made no record of substantial interest, or value in practical service, the ruling practice in locomotive front ends in 1860 was a short smoke box, or one about the length of the cylinders, a "bonnet" stack for wood and bituminous coal burning engines, and a straight open stack (sometimes provided with a grating on its top to arrest sparks) for anthracite coal, low exhaust nozzles (usually double), and a petticoat pipe. Very few applications of the extended smoke box were made prior to 1880, when it was adopted by the Pennsylvania Railroad, after which it rapidly gained in favor, and, until a few years past, was practically standard on the railways of the United States.

The extended smoke box had, by 1883, been adopted by locomotive builders generally, in deference to what, in the light of subsequent developments and changes in practice, may not unreasonably be termed a popular craze, and up to 1894, when a change of sentiment was first decidedly manifested, the tenor of the references to it in the reports of the association is uniformly commendatory.

The report of the committee on "Exhaust Nozzles and Steam Passages," at the twenty-seventh annual convention, 1894, contains the following significant conclusion:

"6. This test shows that an increase of the length of the smoke box over and above that necessary to get in a cinder pocket in front of the cylinder saddle is unnecessary and undesirable, as the long smoke box greatly decreases the vacuum. Sufficient area of netting can be put into a smoke box which is long enough to give room for a cinder pocket in front of the cylinder saddle."

As was stated by the late D. L. Barnes, a member of the committee, in the discussion of the report (p. 122): "This report is quite against the long, and decidedly in favor of the short smoke box. Zerah Colburn, many years ago, found that a short smoke box gave very much more vacuum than a long one, and these tests corroborate that conclusion." Since the publication of this report the decline of the extension, while for obvious reasons not as rapid as its rise, has been decided and continuous, culminating, as has been recently evidenced, in its abandonment by the Pennsylvania Railroad on their latest and most improved types of engines.

Mr. Bell proceeds, at length, with descriptions of many front end arrangements, and closes with the following conclusions:

It cannot be doubted that the subject of locomotive front ends is of such substantial importance to motive power officers as to merit a higher development than it has yet reached, and that such development will, under intelligent and thorough investigation and test, be speedily attained. It is equally obvious that the extent of the subject and the widely varying conditions of fuel, service and structural limitations under which it must necessarily be considered, preclude its discussion here further than, as has been attempted to be done, upon the general lines of a comparison of past and present practice, and a review of the expressions of the Master Mechanics' Association regarding it. Upon this basis, as well as upon a study of the mechanical principles which seem properly applicable, the writer submits the following conclusions:

1. That a smoke box of greater length than is necessary to permit the use of a sufficient area of netting to provide for free steaming, is not only useless, but also positively prejudicial, as to the steaming of the engine and economy of fuel.

2. That, particularly with boilers of the present average diameter, the length from center of exhaust pot to front should not exceed, say, 35 inches, and that all necessary netting and draft appliances can be properly applied in a smoke box of such length.

3. That the front end should be of what is known as the "self-cleaning" type, and that the cinder pot or cinder hopper is wholly useless and a needless addition to the cost of the engine.

4. That where an open stack is employed, the taper or "choke" pattern will, if properly designed and proportioned, be more usefully and economically effective than a "straight" or cylindrical stack.

5. That the construction recommended by the American Master Mechanics' Association at its 1894 and 1896 conventions, embodies, as a whole, the most desirable and effective plan or design, under the general principles and conditions applicable to and controlling in locomotive front ends.

6. That, under certain conditions, the design of front end embodying a short smoke box, a diamond stack, low exhaust pot, and lift pipe, is as usefully and effectively applicable as that of the Master Mechanics' Association.

7. That the useful and economical effect of a locomotive front end is wholly and solely dependent upon the draft appliances and spark arresting devices employed, and that such effect will be reduced proportionately to any increase of smoke box length beyond that necessary for the application of said appliances and devices.

8. That experimental research can be advantageously made in the directions of: (a) ascertaining what reduction of smoke box length is practicable; and (b) whether or not an appliance can be produced whereby cinders may be returned to the fire box in a practically useful manner.

PERSONAL MENTION.

Mr. F. Sayre, of the car inspecting department of the Panhandle road at Columbus, Ohio, has been appointed superintendent of the car inspecting department of the Armour Co., with office in Chicago.

The office of master mechanic of the terminals division of the Great Northern has been abolished, and all duties pertaining to that position will hereafter be performed by A. C. Deverell, superintendent of St. Paul shops.

The jurisdiction of Mr. J. T. Robinson. master mechanic of the Southern Railway at Selma, Ala., has been extended to cover the entire Anniston division.

Edwin E. Ely has been transferred from the foremanship of the blacksmith department of the Philadelphia & Reading car shops, at Reading, to the same department in the locomotive shops.

Mr. G. F. Jones, who has been 14 years secretary of the Richmond Locomotive Works, has resigned that position to become southern representative of the Baldwin Locomotive Works. His headquarters and office will for the present be in Richmond.

Mr. Harvey Middleton has resigned as mechanical superintendent of the Baltimore & Ohio. Mr. Middleton, though yet a comparatively young man—being, we believe, only 47 years old—has held many high posts in railway service. His first railway work was as machinist and fireman on the Philadelphia & Erie. This was in 1876, 1877 and 1878. For the next two years he was master mechanic of that road. For the next two years he was division master mechanic of the Louisville & Nashville. From 1882 to 1884 he was master mechanic of the St. Paul, Minneapolis & Manitoba. For the succeeding five years he was superintendent of machinery of the Louisville & Nashville. He then served for one year as superintendent of machinery of the Atchison, Topeka & Santa Fe. From June, 1890, to January, 1891, he was superintendent of motive power and machinery of the Union Pacific. In April, 1891, he entered the service of Pullman's Palace Car Co., remaining with that company, as superintendent of construction and as manager of the works at Pullman, until February, 1896. In March, 1896, he was appointed general superintendent of motive power of the Baltimore & Ohio.

Mr. J. N. Barr, superintendent of motive power of the Chicago, Milwaukee & St. Paul, has resigned to become mechanical superintendent of the Baltimore & Ohio. Mr. Barr first entered railway service at the Altoona shops of the Pennsylvania Railroad, and while there had charge of the wheel foundry, where he commenced the lifelong study which has made him a foremost authority on car wheels. He is the inventor of the widely used Barr contracting wheel chill. Mr. Barr came from the Pennsylvania Railroad to the Chicago, Milwaukee & St. Paul in 1885. His first work on this road was as mechanical engineer, but in 1886 he was made superintendent of the car department. He held this office for two years, and in 1888 was made superintendent of motive power, which position he has since held continuously. Mr. Barr has been useful, not only to his road but to the railway world at large. He has been for years a distinct leader in the work of the Master Car Builders' and Master Mechanics' Associations, and of the Western Railway Club; and to him is due the Chicago interchange agreement, the principle of which was a few years ago injected into the Master Car Builders' rules of interchange, and which has happily revolutionized the whole theory and practice of the intricate work of interchanging cars between the railways of this country. The passing of Mr. Barr to a new field of labor means a distinct gain for the east, which, we may add, has, in recent months, been very fortunate in securing bright men from the west.

Mr. G. J. Fisher has resigned as purchasing agent of the Fitchburg Railroad.

Mr. William B. Langston, heretofore connected with the St. Louis Southwestern shops at Pine Bluff, Ark., has been appointed master mechanic of the Mississippi River, Hamburg & Western, with headquarters at Hamburg, Ark.

Mr. W. J. Robertson has resigned as master car builder of the Central Vermont, and the duties of the office have been assumed by Mr. C. E. Fuller, superintendent motive power. Mr. Robertson has been master car builder since October, 1892, and from Jan. 1, 1885, to October, 1892, was superintendent of motive power.

Mr. Mord Roberts, formerly master mechanic of the St. Louis, Iron Mountain & Southern, has been appointed general master mechanic of the Louisville & Nashville, with headquarters at Louisville, Ky.

Mr. John Conway, formerly master mechanic of the Florence & Cripple Creek, died October 6, aged 38 years.

Mr. W. C. Alderson, purchasing agent of the Lehigh Valley, has been made treasurer of that company, with headquarters at Philadelphia, to succeed Mr. J. Andrew Harris, Jr., resigned.

Mr George W. Smith, superintendent of machinery, and Mr. J. H. Kuhns, general storekeeper, of the Santa Fe Pacific have had their jurisdiction extended over the San Francisco & San Joaquin Valley.

Mr. A. C. Henry, purchasing agent of the Canadian Pacific, has been appointed general purchasing agent of the entire system, and Mr. E. N. Bender has been appointed assistant purchasing agent.

Mr. William Howe Smith, for several years purchasing agent of the Schenectady Locomotive Works, died at his home in Schenectady, N. Y., October 14. Mr. Smith had been connected with the Schenectady Works for about 35 years, and was at one time assistant to the president of that concern.

Mr. Frederick Kegler, division master mechanic of the Rutland & Washington division of the Delaware & Hudson Co., died at his home in Salem, N. Y., October 6.

Mr. A. Travis Whitsel has been appointed division inspector of fuel and locomotives of the 6th, 7th, 8th and 13th districts of the Wabash, and the Bement-Decatur line, including both these terminals, succeeding Mr. J. W. Evans.

Mr. R. L. Stewart has been appointed master mechanic of the El Paso & Northeastern, with headquarters at Alamogordo, N. Mex.

Mr. W. O. Taylor has been appointed road foreman of engines of the Philadelphia & Reading, with headquarters at Philadelphia, Pa.

Mr. George J. Hatz has been appointed division master mechanic of the Illinois Central at East St. Louis, Ill , vice Mr. A. C. Beckwith, resigned.

Mr. Frank Davisson has been appointed acting master mechanic of the Santa Fe, Prescott & Phoenix and Prescott & Eastern Railways, vice Mr. O. H. Jackson, master mechanic, resigned to engage in other business.

Mr. A. C. Loucks has been appointed master mechanic of the Missouri, Kansas & Texas, of Texas. Mr. Loucks has heretofore been acting master mechanic, to which position he was appointed when Mr. C. T. McElvaney resigned.

Mr. S. F. Forbes, late purchasing agent of the Great Northern, has been appointed assistant superintendent of motive power of the Central Railroad of New Jersey. Mr. Forbes began his railroad career in 1881 as timekeeper in the shops of the Chicago & Northwestern, and later served as assistant general storekeeper on the same road. From there he went to the Great Northern as general storekeeper, later becoming superintendent of shops and finally purchasing agent.

Mr. A. W. Quackenbush has been appointed master mechanic of the Omaha, Kansas City & Eastern and Omaha & St. Louis Railways, vice Mr. J. W. Stokes, resigned. Mr. Quackenbush was formerly superintendent of machinery of the Chicago & Alton, and has been for several years, until resigning to accept his new position, superintendent of machinery of the Southwestern Missouri & Arkansas, at Cape Girardeau, Mo.

Mr. R. C. Blackall, superintendent of motive power of the Delaware & Hudson Co., has been at his own request retired, and has been appointed consulting mechanical superintendent of that system. Mr. Blackall has certainly earned a rest from his long continued activities. He is 68 years old, and has been in active railway service for the past 50 years. Mr. Blackall was born in the city of Albany in 1831. His first railroad work was from 1850 to 1853 with the Saratoga & Washington Railroad Co., at Saratoga, under Mr. W. B. Gage, master mechanic. From there he went to the Hudson River Railroad Co., and worked in that company's shops at Greenbush from 1853 to 1860 under Mr. Wm. Buchanan, superintendent of motive power. In 1860 he was appointed master mechanic of the Albany & Northern Railroad, and remained there until that road was sold to the Rensselear & Saratoga Railroad Co. In 1863 he was appointed master mechanic of the Albany & Susquehanna Railroad Co. In 1870 this road was leased to the Delaware & Hudson Canal Co. From that time to the present he has remained in the employ of the Delaware & Hudson Co., as superintendent of motive power. In 1872 Mr. Blackall joined the Master Mechanics' Association and in 1896 and 1897 he had the honor of being president of the association. In 1879 he joined the Master Car Builders' Association and served on the executive committee of that organization for several years. Mr. Blackall has long been a prominent figure at the annual meetings of these associations and the attendants at these conventions will always have pleasant memory of the hearty spirit of hospitality with which he invariably rounded out the pleasures of the Saratoga conventions. The strength of character and dignified kindliness of the man are reflected in the likeness of him which we present. It is pleasant to think that he is now so situated that he is relieved from the exacting cares of an executive office, while still placing the benefit of his ripe mechanical knowledge at the disposal of his road and of the railway world generally.

MR. R. C. BLACKALL.
Consulting Mechanical Superintendent
Delaware & Hudson Company

The duties of superintendent of motive power of the Delaware & Hudson Co. will be performed by Mr. J. R. Slack, assistant superintendent of motive power.

Mr. C. P. Coleman, at one time general storekeeper of the Lehigh Valley, and for some time past purchasing agent of the Bethlehem Iron Company, has been appointed purchasing agent of the Lehigh Valley, with headquarters at Philadelphia, vice Mr. W. C. Alderson, who has been made treasurer of that road.

Mr. W. Dickson has been appointed traveling engineer on the Tampico branch of the Mexican Central Railway, vice Mr. W. W. Scott, who was killed on the road

Mr. Frank Hufsmith, superintendent of motive power and rolling stock of the International & Great Northern, is one of the distinctively prominent members of the mechanical railway world of the southwest. He has been with the road named for the past 10 years, and his valuable services were pleasantly recognized by his management about a year ago, when it changed his former title of master mechanic to that which he now bears. Mr. Hufsmith's first railway work was on the Atlantic & Pacific, where he learned, first, the machinist's trade, and later that of a fireman and locomotive engineer. In 1873 he was made roundhouse foreman on the Iron Mountain route, filling that position for five years. In 1878 he went with the Little Rock & Ft. Smith road as master mechanic and master car builder, filling these positions also for five years. In 1883 he was appointed superintendent of the Little Rock & Ft. Smith and Little Rock & Mississippi River & Texas. In 1886 he left these roads to become superintendent of transportation of the St. Louis, Arkansas & Texas, which position he filled until, in 1889, he resigned to become master mechanic of the International & Great Northern, with which road he has since remained continuously. Mr. Hufsmith is widely known, not only as a first-class mechanic, but as a thoroughly good fellow. His home popularity is evidenced by the fact of his having been for several years mayor of his home town, Palestine, Tex.

MR. FRANK HUFSMITH
Superintendent Motive Power and Rolling Stock
International & Great Northern R. R.

Mr. James Gaston has resigned as general foreman of the car department of the Louisville, Evansville & St. Louis to accept the position of manager of the George E. Bryan Paint Company at Cincinnati, Ohio.

Mr. W. F. Bentley has been appointed master car builder of the Baltimore & Ohio lines east of the Ohio river, with headquarters at Mount Clare, Baltimore, and Mr. E. A. Westcott has been appointed master car builder of the lines west of the Ohio river, with headquarters at Newark, Ohio.

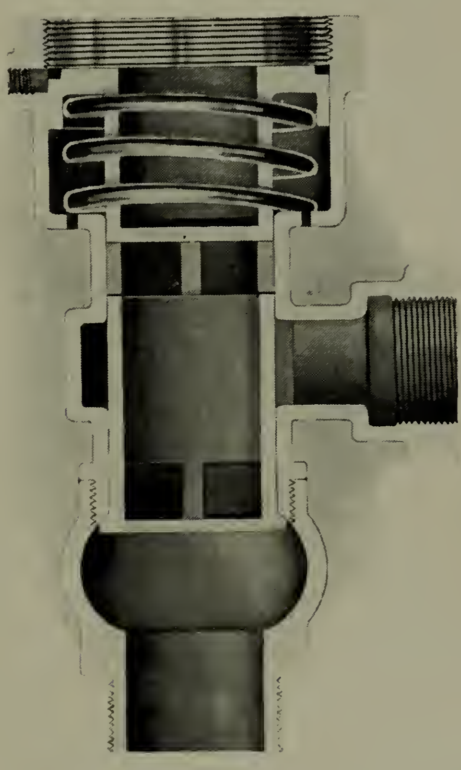
Mr. Ben Stine has been appointed foreman of the Sherman, Shreveport & Southern road, vice James Long, resigned, on account of ill health.

Mr. William F. Hinderer, formerly assistant master car builder at the McKees Rocks shop of the Pittsburg & Lake Erie, died October 15, at his home in Braddock.

Mr. E. S. Greusel, master mechanic of the Burlington & Missouri River road at Havelock, committed suicide October 9 by shooting the top of his head off. For some time, his friends say, he has been despondent. He was 52 years of age and had been in the employ of the Burlington more than 40 years.

THE CLIMAX BLOW-OFF COCK.

A very simply constructed blow-off cock is that known as the Climax. It is especially designed for blowing out locomotive boilers. Reference to our sectional view will reveal its method of operation. The steam or air enters at the head of the cock, and the area of the top of the piston is so much greater than the end of the piston on which there is the full boiler pressure that it readily opens. When open, the two ports of the piston correspond with the opening on the side, through which the steam passes out, and with the circular passage on the end. The spring is used for the purpose of holding the piston closed when there is no steam pressure in the boiler, thereby preventing any flow of water from the boiler when the engine is not in use. This blow-off cock is made entirely of steam metal.



It is especially claimed for this blow-off cock that it will not stick, for if any sediment should catch in the ports the very high steam pressure which closes it would shear such sediment off, and allow the piston to close, which would shut off the steam regardless of whether or not the seat closes clear down. The area of either one of the ports being larger than the intake of the blow-off cock allows a perfectly free passage of the steam and dirt. This blow-off cock is offered by Mr. F. G. Street, 535 Temple Court Building, Chicago.

NEW SHOPS AND ADDITIONS.

New shops and additions thereto are reported by our exchanges during the past month as follows:

The Flint & Pere Marquette Railway Company is contemplating building a new roundhouse at its 16th street grounds in Port Huron, Mich.—The Mexican Central is rebuilding its Tampico shops, on a larger scale.—It is reported that the Kansas City, Pittsburg & Gulf Railroad will erect additional shop buildings at Pittsburg, Kan., one of which will be a brick building, 100x142 feet in size, and will be especially fitted for rebuilding, repairing and painting coaches. A brass foundry is also to be built.—The

Union Pacific Railroad Company is making arrangements to erect a roundhouse opposite the pumping house on the south side of the Blue river at Manhattan, Kan.—A roundhouse is to be built by the Lake Shore at the southwest corner of Mackinaw and 86th streets, Chicago. It is to cover 172x75 feet of ground and is to cost $6,000 —The Lake Shore Railway's carpenter shop in Cleveland, at the foot of Buell street, was destroyed by fire September 26. Loss about $10,000.—The Philadelphia & Reading has let a contract for the erection of a large car repair shop at Reading, to Ryan & Kelly. This will be a one-story brick structure, 85 ft. 2 in by 402 ft.—The frame structure of a portion of the Delaware & Hudson shops, at Oneonta, N. Y., was burned recently.—Work on the proposed improvements in the Santa Fe yards in Argentine has begun. Ground was broken for the erection of a big coach shed north of the roundhouse. The building of the repair shops has been commenced.—Nine stalls of the 23-stall roundhouse of the Chicago, St, Paul, Minneapolis & Omaha at Sioux City, Iowa, were burned recently.—The material and machinery for the new shops of the Mexico, Cuernavaca & Pacific, at Cuernavaca, have arrived.—The Missouri, Kansas & Texas is building an addition to its roundhouse, erecting new coal chutes and otherwise improving its shops and yards at Denison, Texas.—The Oregon Railway & Navigation Company is reported to have purchased 33 acres of land at Winona, Wash., on which it will build division shops.—The shops of the Rock Island & Peoria and the Chicago, Rock Island & Pacific at Peoria, Ill., are to be in part rebuilt and rearranged.—The Chicago, Burlington & Quincy has completed a new roundhouse, storehouse, oilhouse and coal chutes at Hannibal, Mo.—The old Wabash roundhouse at Fort Wayne, Ind., recently used as a repair shop for engines, was destroyed by fire on October 10.—The New York Central is building a new roundhouse, coal sheds and machine shops at Ravenna, N. Y.

BOOK NOTES.

HEAT AND HEAT ENGINES: A study of the principles which underlie the mechanical engineering of a power plant. 576 pages and 198 illustrations. 8vo, cloth, $5.00. By Frederick Remsen Hutton, E. M., Ph. D., Professor of Mechanical Engineering at Columbia University. New York: John Wiley & Sons.

The author explains in the preface that the present work has been prepared to answer, in part, questions which the student should ask at the end of his study of an earlier work by the same author, entitled, "The Mechanical Engineering of Power Plants"; and while the present work will be read by practicing engineers with much profit by way of reviewing early studies in the profession, it is very evident that "Heat and Heat Engines" has been written for the use of the younger student. Because a majority of our readers are interested most in problems relating to the consumption of fuel, and the getting of the most benefit from the fuel used, we may refer them particularly to the first twelve chapters of the book, with the assurance that if they have covered the same subjects in earlier studies, the review will be profitable to them, and that if the present work is used by the beginner, he will find the gradual development of the subject interesting and highly instructive. The author says in the preface: "The treatment assumes, and does not attempt to prove, the dynamic or mechanical theory of heat, and does not ask or require to know whether there is an intermolecular ether or not, nor whether the energy of heat manifests itself by producing a vibratory or undulatory or vortex motion of matter, or is an electro-magnetic phenomenon"; and the prospective reader may be assured that such assumption is made and no proof given. The work is to be commended in saving the younger student the confusion which must result from a discussion of the theory of heat at a time when he is not in a condition of mind to understand the arguments. It is sometimes quite as profitable to reason from effect to cause as from cause to effect, and it is probably just as well that the student know something about heat before he tries to find out what it is.

There are some equations, but most of them appear in the treatment of the transformation of heat into power; the few equations which appear in the chapters relating to the liberation of energy from fuels into forms available for producing work are not formidable, and as these chapters will be of greater interest to the majority of our readers, we may assure them that the equations will not be a serious objection to a study of the work by them. The subject of fuels is very thoroughly treated—their composition, value in heat units, and money value as fuels, and methods of determining each. The temperature of combustion and methods of measuring such temperatures, the rate of combustion and the effect of the velocity of draft on the fuel economy, receive as thorough treatment as the scope of the work will allow. It may be well to add here that the prospective reader should not allow the kind of illustrations chosen, or their execution, to deter him from reading the book, for, while a considerable portion of the text may be obtained in scattering books on other literature with which the illustrations may be associated, the orderly manner in which the subject is treated will be appreciated.

The transfer of heat is considered, and the four processes by which heat can be transferred; radiation, contact, conduction in solids and convection in liquids, are explained. Heating surface and the counterpart, cooling surface, and evaporation in boilers, receive attention. There are also chapters on gas and compressed air engines, hot air and internal combustion engines, mechanical refrigeration, and a short chapter on the injector.

THE COLUMBIAN SYSTEM FOR LIGHTING RAILWAY CARS BY ELECTRICITY.

Now that the electrical current is used so generally for illuminating purposes it is natural that persistent efforts should be made to extend it to the field of railway car lighting. The early attempts to do this were not practically successful, and for awhile the matter seemed to be dropped, but the great improvements which have been made in electrical mechanism have encouraged renewed effort to give to the railroads and the traveling public the advantages and comforts which result from the successful installation of the incandescent electric light.

The experience of railroads has not been favorable to systems of electric lighting in which the current is produced by means of steam engines installed on one of the cars of the moving train, though one of the finest, if not altogether the finest, regular trains in the country is lighted in that way. Many experiments in various parts of the country seem to have narrowed the problem to that of using the axles of the cars of a moving train to actuate the dynamos which produce the electrical current.

The Columbian Electric Car Lighting and Brake Co. offers a solution of this problem which is proving satisfactory and sufficient on a number of leading roads. The general features of this system can be understood from the following description which we abstract from the *Electrical World and Engineer*:

"In this system the generator is driven by gearing from a car axle. Each car has its own generator, as well as a storage battery, to supply current during stoppages and at times of abnormally slow speed.

"The generators are standardized, and provisions made for fitting them to any ordinary car axle, turned or unturned, by means of a split sleeve and chuck jaws, which latter grip the axle, and are adjustable to permit of exact concentricity of the motor bearings with the axis of the axle (see Fig. 1). The mechanism whereby the direction of the current from the dynamo is changed in case of change of motion of the car, thus enabling the battery to be charged regardless of the direction of motion, is shown in Fig. 2. As will be seen, this is accomplished by means of a worm on the armature shaft, which engages a gear, which in

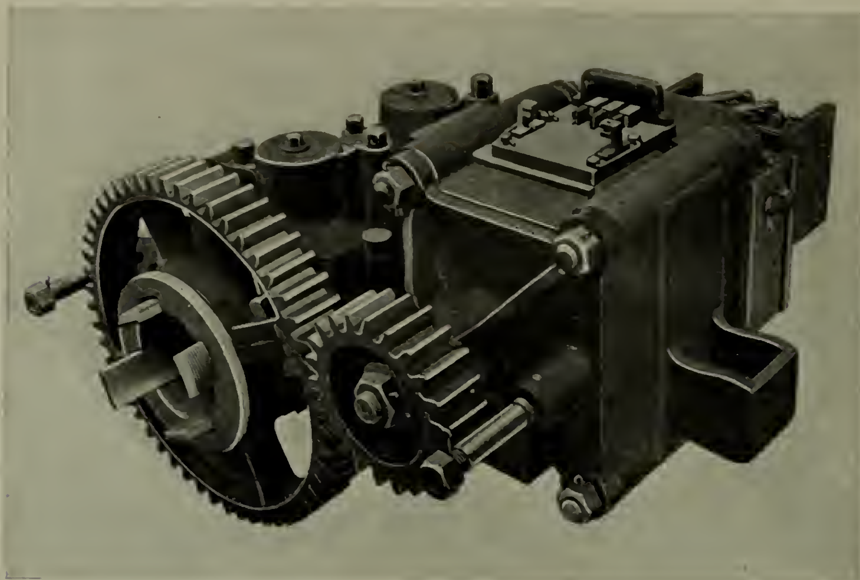


FIG. 1—END VIEW OF GENERATOR.

turn actuates a pole-changing switch.

"The generator, which is shunt-wound, is excited from the storage battery, the exciting current being regulated to the speed of the armature by a rheostat in the shunt circuit, which cuts resistance in or out as the speed of the car increases, thus keeping the e. m. f. constant. The rheostat is automatically operated by a pawl mechanism, the pawls being constantly kept vibrating by a small motor; one pawl or the other is made to engage with a ratchet turning the rheostat arm by the action of an electro-magnet in the armature circuit. In connection with this regulating arrangement is another actuated from the same electro-magnet, whereby resistance is thrown into the lamp circuit when the dynamo is charging to compensate for the rise in battery e. m. f., which then results. There is also a cut-out switch to disconnect the battery from the generator when the car stops, or the speed falls below a certain minimum.

"The operation of the device as a whole is as follows: Assuming that the train is running below normal speed, the lights will be supplied direct from the storage battery, getting its full e. m. f., and the machine is cut off from the battery by the automatic switch. As the speed rises, the automatic switch closes, the current flows through the solenoid which attracts its armature, engaging the pawl which turns the main shaft in such a direction as to cut resistance into the field circuit to limit the charging current, as well as into the lamp circuit, to take up the increased electro-motive force of the cells. More and more of these resistances are cut in, as the speed and charging current rises.

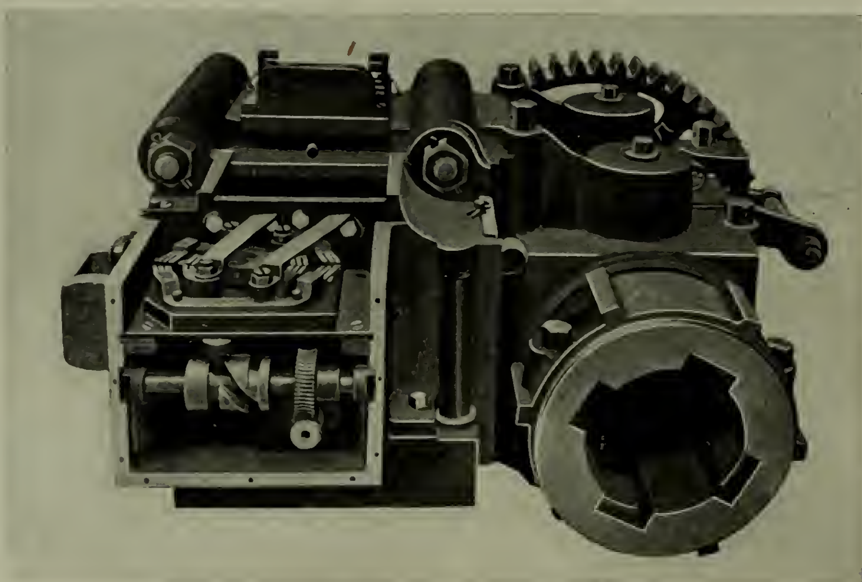


FIG. 2—POLE CHANGER.

"As will be seen, the system is absolutely automatic, no at-

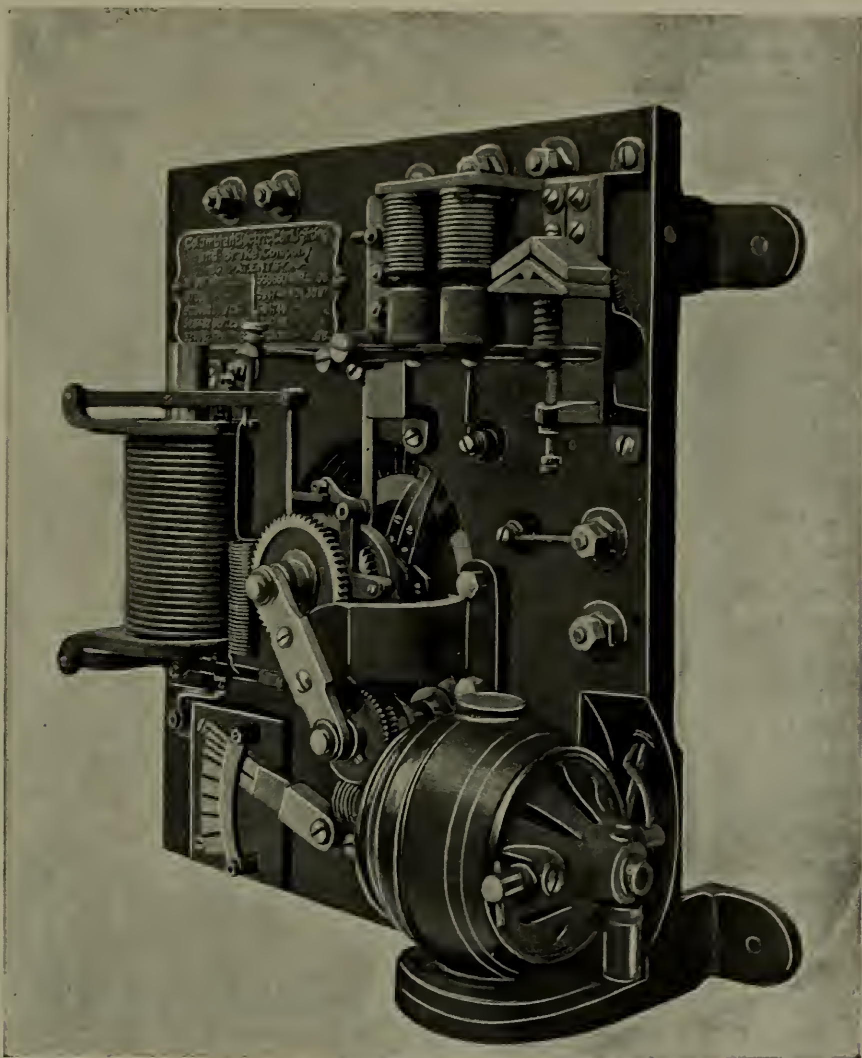


FIG. 3—REGULATOR.

tention being required on the part of the train operatives. The load on the machine is kept constant, a resistance replacing a lamp or fan motor when one is turned off."

The company states that it has the system in operation on the New York Central, Pennsylvania Railroad, Baltimore & Ohio, Union Pacific, Pennsylvania lines west of Pittsburg, Canadian Pacific, and other important roads, and that it is lighting the cars of these roads to perfection. The office of the company is at 11 Broadway, New York city.

SUPPLY TRADE NOTES.

The 10 new Boyer long stroke riveting hammers, which the Pressed Steel Car Co. have had in use for some time at their Allegheny shops, have proven so satisfactory that they have now placed with the Chicago Pneumatic Tool Co. an order for 60 more of these hammers. The hammers are used for riveting in the erection of the cars manufactured by that company, and have proven durable and rapid, effecting such a saving in labor as to greatly expedite the work and increase the productive capacity of the works. Severe tests were made to determine the desirability of using these riveting hammers, and the results of these tests are indicated in the order just placed for 60 of them. These long stroke hammers are the greatest advance yet made in pneumatic tools, and orders for them are already taxing the manufacturing facilities of the Chicago Pneumatic Tool Co.

Mr. Harry G. Darwin, who, for the last 11 years, has been associated with the Safety Car Lighting and Heating Co., has become connected with the Lappin Brake Shoe Co. His title is "Special Agent," and his headquarters will be at the general offices of the company at 41 Cortlandt street, New York. The management of this concern is surrounding itself with a strong staff of able and successful men.

The Reagan Fuel Economizing Co. has been organized with headquarters at 59 Clark street, Chicago, to introduce in the west the Reagan grate. This grate is applied to locomotives as well as stationary furnaces, and has made some remarkable records in the way of saving fuel and securing satisfactory steam pressure.

Mr. Lee S. Chadwick, who graduated in the class of '99 from Purdue University, stepped at once from the class room to that of superintendent of the Ball-Bearing Co. of Boston. The additional fact that he is successful in discharging the duties of his present position speaks well for the "practicalness" of the instruction given at Purdue.

The Q. & C. Co. now exclusively controls the sale of magnolia anti-friction metal to the railways, both steam and electric, of the United States, Canada and Mexico. This new line was taken on by the Q. & C. Co. on October 16.

Merchant & Co., Inc., of Philadelphia, New York, Brooklyn and Chicago, extend a cordial invitation to every one interested in their line of goods to pay a visit to their exhibit at the National Export Exposition now on in Philadelphia, "Section D-6, Main Building." This company will have representatives there at all times, who will be glad to see all visitors and give them information about the goods they have to offer. The exhibit itself is a novel one, consisting of a handsome booth, covered with their well known Merchant's Spanish tiles, and having two "Star" ventilators, one of the "Standard" form and the other of the glass top "Skylight" form. Above this roof there is an apparatus which distributes water in the shape of rain, so that the visitor has a practical example of the value of good roofing as a protection against the weather. Within the booth is a full line of the product of their smelting works, consisting of the largest line of Babbitt metals produced in America, as well as every description of solder and newspaper metals; also a full sample line of Merchant's high grade roofing, bright tinplates and metal ceiling; also brass tubing, which they handle in very large quantities. This exhibit will be of marked interest to every one, and is well worth a visit by those interested in the best bright or terne tin in ventilators, and in the general line of roofing material; also to the numerous manufacturers and users of machinery who require brass and copper goods and Babbitt metals.

The National Electric Car Lighting Co. on October 14 sold, assigned and transferred to the Electric Axle Light & Power Co. its entire assets, consisting of property, patents and patent rights, contracts, agreements, privileges and good will. The business formerly done by the National Electric Car Lighting Co. will be continued by the Electric Axle Light & Power Co., 100 Broadway, New York City.

Mr. E. P. Bigelow is now the general eastern agent of the American Steel Foundry Co. of St. Louis. Mr. Bigelow's office is at 206 Havemeyer Building, New York City.

The Boston Artificial Leather Co. has removed its office and warerooms to New York City. The demand for moroccoline having increased to such large proportions the company found its facilities for the manufacture of it wholly inadequate to meet the demand. The change of location, therefore, was deemed most desirable. The new factory is located within a few miles of New York, and with increased facilities for manufacturing moroccoline all orders will be filled with satisfactory promptness. Moroccoline is rapidly becoming a staple article, its merits being recognized and its superiority over all other kinds of imitation leather being acknowledged by the furniture and upholstery trades, and many other lines of business, by which it is largely used.

RUSSIAN CONTRACT FOR WESTINGHOUSE AIR BRAKES.

A contract for American apparatus, amounting to $15,000,000, could not fail to absorb a good deal of public attention. The fact that the Imperial Russian Government was one of the contracting parties, and the apparatus was such a purely American invention as is the Westinghouse air brake, were further factors in securing notoriety. Mixed with a feeling of national pride that American mechanism should be considered superior to all others, there arose also a spice of envy among competitors, which led to statements in the public press contradicting the exclusive nature of the Russian contract with the Westinghouse Brake Company.

The controversy has now been entirely set at rest by an important communication transmitted by Consul-General Holloway, of St. Petersburg, under date July 27, 1899. This communication fully confirms the exclusive nature of the contract for air brakes granted by the Imperial Russian Government to the Westinghouse Brake Company, and completely confirms every statement which the latter have given to the press from time to time. The order issued by the Russian Minister of Ways of Communication states :

Article 1. In virtue of the opinion of the State Council, recorded on the 30th of March, 1898, imperially sanctioned, continuous automatic brakes are to be applied to the engines and trucks of the freight stock circulating in direct traffic on the Russian system of normal 5-foot gauge railroads.

Article 2. In conformity with the decision of the Minister of Ways of Communication, and of the extraordinary congress of representatives of the service of rolling stock and traction, summoned in January of this year (1899), on the question of the choice of the fundamental system of continuous automatic brakes for freight trains, the Westinghouse system of brakes is adopted.

The Westinghouse air brake has been a potent factor in fostering railway traffic in the United States. It has enabled heavier and longer trains to be operated and a more frequent service maintained. The Westinghouse type of air brake has been tried for so many years that it has the prestige of long successful operation. On this account it was decided to employ it exclusively upon the rolling stock of the Government lines, as well as upon private railways, in Russia.

Article 3. The order issued by the Minister of Ways of Communication admits the experimental introduction of other systems of continuous automatic brakes under certain stringent conditions, but excludes their general use until the expiration of the present Westinghouse contract in 1903. The conditions are as follows : (a) The previous trial of the new system on trains of local circulation, during not less than three years, for its thorough trial under the ordinary conditions of working ; (b) The possibility of the combined action of the new system with Westinghouse system ; (c) The mutual interchangeability of the connections (couplings) ; (d) Previous to the introduction of the new system into direct communication, the question of its practical suitability for this object is to be considered by the congress of representatives of the service of rolling stock and traction, and the ratification of the conclusion of the congress is to follow the usual course.

It is well known among railway experts that trains made up of cars carrying different systems of brakes are often endangered thereby. The compressed air used in connection with the brakes is a very powerful force, requiring the greatest care in manipulation. To control the energy of steam-driven trains, a higher force than could be produced by manual effort became necessary, and this was found in compressed air. The controlling apparatus in the hands of the locomotive engineer is necessarily of a very sensitive nature, and is capable of use in various degrees. The quick-action brake is employed on ordinary occasions for stopping trains, but by a further turn of the lever the same apparatus causes the emergency brake to be put into operation, applying the full energy of the compressed air. It may, therefore, be easily understood that trains made up of cars carrying different types of brakes may be seriously imperiled, since some of the brakes will not respond as quickly as others to the control of the engineer. In fact, several railway accidents have been traced to this very cause.

The imperial Russian order involves the equipment of 300,000 freight cars, as well as a large number of locomotives. Sixty thousand cars are to be fitted with Westinghouse air brakes, and the remaining 240,000 with air pipes and couplings, inside of three years. The decree stipulates that 20 per cent of the freight cars of a train shall be equipped with air brakes, all of which will be capable of control by the locomotive engineer, as the air pipes and couplings will be continuous throughout each train.

One of the stipulations made by the Russian Government is for the manufacture of the air brakes in Russia. For this purpose the Westinghouse Company has erected a fine plant at St. Petersburg, equipped with the latest improved American machinery, and is now employing a large force under expert American engineers. The general manager is Mr. A. Kapteyn, of London, who is assisted by Mr. Walter Phillips, of Philadelphia, and by American experts in charge of the various departments.

Consul-General Holloway, of St. Petersburg, writes: "Russia is the first country in Europe to use the continuous air brake for its freight and military trains. While Russia began the development of its industrial resources much later than other nations, she is pursuing the policy of equipping her new factories with the latest modern machinery and adopting the most perfect methods of manufacture, as shown by the many new industrial plants in course of construction, which are almost without exception among the finest to be found in Europe. These are being assisted by the enterprise of Americans, who are beginning to appreciate and take advantage of the opportunities offered by this country."

In order to meet the requirements of the Russian railways, the Westinghouse Company have decided to double the original size of their works in St. Petersburg. It is intended, as soon as the brakes can be manufactured, to apply them to all the freight cars on the Imperial and private railways, the present arrangement for 20 per cent of each train being but preliminary to their universal application.

RAILWAY MASTER MECHANIC

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EDWIN N. LEWIS, MANAGER.
W. E. MAGRAW, ASSISTANT MANAGER.

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THE HIGHER PRICES demanded at present for railroad material and equipment are more far reaching in their effect than one would imagine at first thought. We have previously noted work which has been postponed with the expectation that it could be done cheaper in the reasonably near future; and we wish to point out now the fact that the higher prices for railway supplies are having a very decided effect on the design of cars and locomotives, and one that is really interrupting the usual rate of progress. The railways are adhering to old designs and buying nominally cheaper, though probably ultimately costlier, supplies, while the experience of the officers dictates something better. During the continuance of these high prices care must be taken not to estimate the ability and good judgment of the mechanical officers by the design of the equipment purchased; because sometimes a grave injustice will be done.

THE SYMPATHY and assistance which the managements of many railways give to railway branches of the Y. M. C. A. are the outgrowth not so much of religious or sentimental feelings as of a conviction that the influence of such organizations is of practical, everyday advantage to their roads. That the money and privileges given by a railway to these institutions on its lines are a "paying investment," is not questioned by any one who has investigated the subject thoroughly and without prejudice. But why is it that the managing powers of nearly all our roads manifest no particular interest in associations of employes which have for their express object the education and improvement of their members in their railway work? The benefits which a road derives from the Y. M. C. A. branches on its line are indirect, but it is directly benefited by any organization which helps its men to a better understanding of their duties, and makes them more intelligent and active in their daily work. And yet how little direct encouragement and help are bestowed by the managing railway officials on such organizations. For example, if the car foremen and chief car inspectors of a city wish to get together occasionally and discuss the questions which are constantly arising in the course of their daily duties, and give each other the benefit of their experience, they must, out of salaries which are never more than adequate, pay all the expenses incurred; and often the time taken to attend the meetings is grudged them. The same would be true of any other class of employes. It would seem that our railway managers might, with advantage to the properties which they control, give more substantial encouragement to such efforts at associational work.

THERE ARE many little "kinks" which contribute to the usefulness of a bulldozer, or forming machine, and the number of them which the manipulator has at his command determines the variety of operations for which this useful tool can be used by him and also determines, largely, whether the tool is kept busy or whether it stands idle much of the time. A very common operation, that of making a right angle bend, may be performed in such a way as to reduce the section of the metal at the bend—and this is the most common result from the average dies—or the dies can be designed so as to increase the section at the bend. The latter is much to be desired. If the stock is not sliding properly in the dies the forgings will take a rough appearance; to correct this and to give a nice finish to the output use graphite on those parts of the dies over which the stock is to slip.

JOURNAL BEARINGS were among the parts of cars first standardized by the M. C. B. Association, and the standards for these were adopted long enough ago for a layman, at least, to suppose that only a few odd journal bearings should be in use at the present time. The layman, however, is wrong in his supposition, because we have recently learned that at some of the larger interchange points one hundred different designs of bearings would hardly cover the number required for repairs. The list of M. C. B. bearings is a very short one, but the number of combinations which can be worked by a slight increase and a slight decrease in the principal dimensions of length, breadth and height is quite appalling. An effort worthy of better results than were obtained was made to reduce the number of coupler knuckles kept for repairs; the possible economies to result from a reduction in the number of odd-dimension bearings would amply repay for a more determined effort, if possible, in this direction.

Harmony in Each Department.

There is a very decided tendency at present, and it has been growing for some years, toward a more friendly relation between the various departments of railways, and it is being appreciated that certain work should be done by a certain department, not so much because traditions so determine, as because the work can be done cheaper and with less friction by that particular department. With this very desirable change in the relations *between* the different departments, a more decided improvement than has been made might have been expected *within* the various departments. It is possible that, on the roads on which the most friction occurs within a department, the conditions are not appreciated by those who are directly interested and, as our attention has been called recently to the evidence of friction within the mechanical, car and locomotive, department of several prominent roads, it is our desire to describe some of the symptoms and to prescribe a few well known remedies, trusting that each "long and patient sufferer" will recognize some of the "aches and pains" as common to his case, and that he may profit by the prescriptions, or prescribe himself something more effective for his particular case.

When the locomotives and cars are going into and out of the repair shops in "bunches" of eight or ten at a time, or a month's work is going in during the first few days of each month, and the entire monthly output is coming out on the last day or two of the month, it may well be concluded that something more than a "laxative" is required, and when the remedy is decided upon it will be best to administer it in allopathic doses, because under such conditions the output is restricted to about 50 per cent of the possible output of the shops and of the men.

The general foreman is largely, if not entirely (and he should be entirely), responsible for the amount of work turned out; therefore his appointment should be a question for serious concern. He must be broad enough to recognize the needs, the limitations and the resources of every shop contributing to the output, and he should be able to allow for, or to take advantage of, each condition. It is probable that no one will question the truth of the foregoing declaration, so that, if a discussion is to be provoked, it will be necessary to advance another question for consideration and this will be done by asking whether the general foreman, as we meet him today, has had the training that especially fits him for the position? The assertion is ventured that, with very few exceptions, the general foreman does not have such special training. He is usually appointed from the minor foremen of the erecting shops and he knows little of the forge shops, of the boiler shops or of the foundries, and too often his promotion means to him the authority to give orders and a notice not to receive suggestions. These conditions make him an "erecting shop" man instead of a "general" man and his usefulness is limited accordingly; he fights the battles of the erecting shop against the other shops, and instead of being a general man, directing everything to a common purpose, he is showing partiality to the erecting shops at the expense of the other shops. It will be no better to take a general foreman from any other than the erecting shops, because he will show partiality to whatever shop from which he may come, unless, perchance, he is an ideal general foreman. This may seem to be a rather harsh criticism, but it is believed that those who consider it most harsh are in the best condition to profit by a careful consideration of it. Of course it is just as essential that the foreman of each shop shall be thoroughly acquainted with the work of the shop over which each has control, otherwise a certain class of work may clog the shop.

With the general foreman and shop foremen working in harmony for the maximum output of every shop, and with assistance from the heads of the departments, the cars and locomotives will arrive in a continuous stream and be of such condition of repair that each shop will be always working at about its maximum economical capacity; each car and locomotive will be scheduled into the shop, through the shop and out of the shop; it will be a minimum number of days out of service; and the cost of repairs will be at a minimum.

In the all-in-together all-out-together system every machinist is a stripper for the first few days of the month, and the boiler maker and blacksmith wait on them; and in the car department every painter is a cleaner and the carpenters wait for them; or the large amount of heavy boiler repairs for a month limits the output of the locomotive shop, while a large amount of burning off paint may, similarly, limit the output of the car shops. On the other hand, with the cars and locomotives arriving at the shops regularly, and their selection based upon the kind of repairs they are to receive and the condition of work in each shop, and with a regular schedule, carefully arranged and faithfully carried out, for the progress of the work through the shops, each and every shop will be worked to about its maximum economical capacity and the output of the shops as a whole will be the maximum.

Under this arrangement each man can be treated as a specialist and, as is done in manufacturing establishments, he can be given the same kind of work day after day, with the result that the work will be done better and quicker. This will also increase the output. The adoption of the schedule method, together with a careful selection of the cars and locomotives to meet the needs of and condition of work in the various shops has, in several instances, increased the output 25 per cent with no increase in the number of men employed. The successful working of the system, however, requires harmony within the department.

ROAD TESTS OF LOCOMOTIVES.

At the September meeting of the New York Railroad Club, Mr. R. P. C. Sanderson read a paper entitled "Some Deductions from Road Tests of Locomotives." The main point of Mr. Sanderson's paper was that in making road tests too much is attempted and that expectation to obtain in such tests anything of specific value as to fuel economy, steam consumption, etc., is doomed to disappointment. In participating in the discussion of his paper Mr. Sanderson made the following remarks, which compactly present the ideas he wished to convey:

"I think that certain rules have been laid down for tests of locomotives which have been very generally followed, which are altogether too elaborate, and my paper was intended to show that all this elaboration that we go about in our attempts to get accurate results for the efficiency of the engines as regards fuel economy, steam consumption and other details, is wasted energy; but when it comes to seeing what a given locomotive will haul over a given division, there is absolutely no other way of doing it than by testing it, putting it to the proof. A couple of years ago, about the time that tonnage rating was first taken up, we went to work on that, and, taking the profile of each division, calculated for each class of locomotives according to the most accepted rules of theoretical tonnage rating over the ruling grades, leaving the momentum grades out of account. With some of the modern heavier engines the calculations came out almost exactly right. But with some of the over-cylindered engines it was away below. One class of engines in particular, hauled nearly double what the formula said they ought to haul, and on the same grades with the same curvatures on different divisions the engines would not haul the same tonnage, do what we would with them, and there was no jockeying in it either, because they were watched by men who knew about jockeying and knew how to stop it, and the engines were handled by road foremen who were trying to do their best. When you come to the hauling of tonnage, the road test is the only thing; but when you want to find out the merits of a piston valve against a slide valve, the internal friction in the engine, the merits of the draft appliances, the question of petticoat pipes versus no petticoat pipes, and this and that and the other, you have got to go on the laboratory rollers and keep conditions absolutely uniform—keep out all the disturbing elements, do away with the personal equation in the matter—before you can get any results that you can feel satisfied may be depended on."

In the paper Mr. Sanderson pointed out some of the causes which may seriously affect the results of road tests and which may not ordinarily be recognized as disturbing elements. He bases his points upon experiences he had himself had in making tests. As illustrating these experiences we quote one or two samples as follows:

One of the engines used in the test was of a new class, having large extended wagon-top, radial-stay boiler. These engines do not carry their water as steadily, and it took the engineman some time to get on to the proper height to carry his water so as to keep the steam up. As he became more accustomed to this and understood the engine better, the figures for evaporation in pounds of water per pound of coal from and at 212° fell from 12.85 to 11.22 to 9.9 down to 9.5 where it belonged. Now, it required close watching to see that the steam was unduly wet, and this, without a calorimeter, which is unhandy to use on a locomotive, could have very easily been overlooked. Had the results for the first and last mentioned trips been compared for the purpose of, let us say, ascertaining the merits of one kind of coal as against another, or perhaps of a feed water heating device, it would have shown a saving of 35.2 per cent, and led, perhaps, to placing a year's contract for coal with a new company, or led to the application of a large number of worthless feed-water heating devices.

Another case:

In testing one engine having piston valves, the tonnage was steadily increased from 733.5 tons, a light load, to 898.5 tons, a considerable overload. The results obtained, however, were exactly contrary to what was to be expected. The coal per 100 ton-miles decreased steadily from 13.2 to 12.8 to 12.6 to 12.3 to 11.7. There were two reasons for this fact—one was in the engine crew: From the time they had handled the engine the first eight miles on the first trip, both men fell in love with the engine, and unquestionably a strong prejudice in favor of this particular engine led them to, perhaps unintentionally, handle her more and more successfully. More than that; it takes an engine crew some time to learn the personal peculiarities of each engine, so as to get the best work out of her under all conditions. Further, as the distance during which the engine was exerting herself to her maximum, and therefore consuming fuel wastefully, was only about 30 per cent of the entire distance, it was profitable to force the engine to the utmost during this distance, regardless of economy; because during the rest of the trip the engine was not overtaxed and was piling up ton-mileage faster in proportion than she had consumed coal wastefully on the short portion of the run; so that the net result was the saving of coal per ton-mile for what might be called excessive overloading of the engine.

Another case:

To obtain some further light on the quantity of coal required per ton-mile, ten trips were made with loaded coal trains varying from two thousand to two thousand four hundred and fifty tons over a 133.6-mile division of generally level character, but which, with the exception of a few miles of dead-level track, is really a continuous succession of momentum grades. When the trains were not stopped in the bottoms, and were allowed to go, results showed that the coal per 100 ton-miles was about the same for all tonnages. The explanation of this is that, as the dips were all short, by wheeling the cars a little faster down the hills, enough momentum could be stored up to easily carry the train over the top of the next hill without working the engine much harder than usual. As a fact, for normal trips not affected by outside causes, the coal per 100 ton-miles varied only a decimal point or two up or down, sometimes one way and sometimes another, although the tonnage was increased over four hundred tons over the regular service rating. It takes very little more effort to keep a heavy person going in a swing than it does a light one, after they have been set at full swing. About the same push on the downward half of the swing will carry them up and back again. There is an important lesson to be drawn from this, namely, that if stations, passing sidings, water tanks, and so on, could all be located either on levels on tops of the hills, or just beyond the crests of the hills, on roads having broken grades of this character, the tonnage could be very considerably increased. As it is, on the division referred to, with railway crossing stops in the bottoms, awkwardly located stations, passing sidings and tanks to contend with, the tonnage must not be regulated by what the engine could get over the division with safety, but by what she can get away with at certain awkward places, without stalling and doubling, thus balling up the road and causing overtime.

A third case:

With two trains varying only 21.4 tons, in both cases considerably below the normal rating of the engine, the pounds of coal per 100 ton-miles increased from 10 to 14.8. The reason for this was due to frequent stops for blocks and for passing trains, the delays in one case being 1 hour and 5 minutes, in the other 6 hours and 40 minutes. It was not so much the length of the stops, for the coal and water used during exceptionally long stops were kept account of and deducted, but the greater number of stops, requiring that many more accelerations of the load from rest to motion, was the important factor. In the subsequent trials with 2,000-ton trains on the division 133.6 miles long, this was prominently illustrated; on one trip, with everything favorable, few stops, few trains to meet and easy places to start from. Another trip with numerous stops, many of them hard places, although none of them long stops, the latter showed an increase of 18.1 per cent in the coal per 100 ton-miles, for which there was no other conceivable reason than that mentioned.

Mr. Sanderson cites another instance where, when everything was ready for a trip, the regular fireman was taken sick and another first-class man picked out to fill his place. While this man tried his best to show his ability equal to that of the man he had succeeded, yet for the reason that he was not working in harmony with the engineman, and, perhaps, because he was not equally proficient, the coal consumed per 100 miles jumped up 17 per cent.

The author contended, finally, that the personal element in engine performance is the most important factor of all; and that tests with single trains may give not only inaccurate results, but, for some of the many reasons cited, may show results apparently exactly contrary to the facts. "While the objection often raised to laboratory tests," again says Mr. Sanderson, "that they do not represent road service, is correct, still, if absolute, or if even tolerably reliable, results are required, laboratory tests are the only sure way of obtaining them. In the laboratory nearly all, if not all, the variables can be eliminated and each particular feature of the engine can be tested on its merits alone." The author, however, admits that fair road service tests may be had with passenger trains.

DUTIES OWED EMPLOYES AND CAR REPAIRERS ESPECIALLY.

In the case of Pool against the Southern Pacific Company, the supreme court of Utah says that it is well settled that the contract of employment imposes upon the master the implied obligation not to expose the servant to dangers which the master, by the exercise of reasonable care, skill and prudence, can avert.

The evidence in this case showed that a car repairer was directed to repair a car standing on a track other than a repair track, that he went under the car for the purpose of making repairs as directed, that no danger flag was placed on the car being repaired, and that while he was so employed an engine and caboose, under the direction of the foreman of the switchmen in the train department, who had actual knowledge of the car repairer's position under the car, were backed against the car, resulting in the injury and death of the car repairer.

Applying the rule stated to these facts, the court holds it clear that the railway company had not properly discharged the duties which it owed to the car repairer under the contract of employment, and was guilty of gross negligence.

Continuing its discussion of the law, the court lays it down that among the implied duties imposed by the contract of employment upon the master are, that he shall provide reasonable and suitable means and appliances to enable the servant to do his work as safely as the hazard incident to the employment will permit, and that he will provide a suitable and reasonably safe place for doing the work to be performed. The master cannot escape liability for injuries inflicted upon his servant for a negligent discharge of these duties by intrusting their performance to another. These duties are personal duties of the master, which can in no way be delegated so as to relieve him from responsibility. A failure to perform these duties, or any negligence in their performance, is the negligence of the master, for which he is liable. Such negligence is not a hazard necessarily attendant upon the occupation of the servant, nor is it one which he, in legal contemplation, is presumed to risk in the service of the master.

Besides, the court holds that where the place where the car repairer was ordered to work was not necessarily or inherently dangerous, he had a right to presume that he would not be exposed to unnecessary danger, and to presume that the railway company had used proper care to render the place where he was to work reasonably safe, and the fact that he, in obedience to the order of the foreman in charge of repairers, went to work under the car, beneath which he was fatally injured, did not establish contributory negligence.

Then, too, the court insists that when the nature of the business is such as to require it, the law imposes upon the master the duty of making and promulgating suitable rules to promote the safety of his employes. And it particularly holds that where the nature of the employment of car repairer is so hazardous as the evidence herein disclosed, the duty is imposed upon the master, of making and promulgating a rule requiring the placing of danger flags upon cars when

SCHENECTADY COMPOUND TEN-WHEELER—NORTHERN PACIFIC RAILROAD.

Total weight, 175,500 pounds; weight on drivers, 134,200 pounds; cylinders, 22 and 34 x 30 inches; drivers, 63 inches; heating surface, 3,012.7 square feet, of which 208 square feet is fire box, 2,772.6 square feet tube and 32.1 square feet water tube surface; grate area, 34.22 square feet; boiler, 70 inches; working steam pressure, 200 pounds; fuel, bituminous coal. Tank capacity—water, 4,350 gal.; coal, 9 tons.

repairers are under them, and forbidding any coupling to be done by a locomotive while they are so engaged.

Nor does the court consider that a laborer in the car shops of a railway corporation and the foreman of the switchmen in the train department are fellow servants. But even if the injury complained of was directly caused by the act of a fellow servant, if the chances of its occurrence would have been greatly less if the railway company had faithfully performed the duties it owed to the car repairer, and its negligence in this regard contributed to the injury, the court holds that the railway company would be liable for damages.

HEAVY COMPOUND TEN-WHEEL LOCOMOTIVE —NORTHERN PACIFIC RAILROAD.

Fourteen heavy compound 10-wheel locomotives have recently been built for the Northern Pacific Railroad by the Schenectady Locomotive Works. On the opposite page we give a view of one of these engines. They are of the same general type as previous locomotives built for the Northern Pacific by the Schenectady Works. These engines have cylinders 22 and 34x30 inches; 63-inch drivers; extended wagon top boilers which are 70 inches in diameter, and which are designed to carry 200 pounds of steam pressure; fire boxes 120 3-16x41 inches in dimensions; a grate area of 34.22 square feet, and 3012.7 square feet of heating surface of which 208 square feet is fire box, 32.1 square feet water tube and 2772.6 square feet tube surface. The engines weigh 175,500 pounds, of which 134,200 pounds are on the drivers.

These locomotives are now in very successful operation on the Northern Pacific in the most severe service, and are giving most satisfactory results in economy of fuel and repairs, and hauling capacity. This service has demonstrated the advantage of using the piston type of valve on the high pressure side, with which, it will be noted in our engraving, these engines are fitted; this is evidenced by the ease of handling and the decreased strain in the valve gear, which is quite notable as compared with the slide valve. On the low pressure side, Allen-American valves are used.

On these engines the fire box is depressed at the front end, to give as much depth as possible under the tubes. The springs are underhung. The drivers have cast steel centers. The special equipment includes Jerome valve stem and piston rod packing, Hancock inspirator and Ohio injector, American air driver and Westinghouse air brake and pump, Ashton safety valves and Leach sand feeder.

The tender has a water capacity of 4,350 gallons, and coal capacity of nine tons. It has a 10-inch channel frame.

A MODEL WORKINGMAN'S VILLAGE.

THE HOME OF CHICAGO, BURLINGTON & QUINCY SHOP EMPLOYES AT WEST BURLINGTON, IOWA.

A visitor at the West Burlington shops of the Chicago, Burlington & Quincy Railroad is always sure of being well repaid for his call, for the equipment and operations in these shops always present the distinct characteristic of progressiveness. But there is something else of value to see at this point, aside from the shops and their work. By stepping across the tracks, and walking a short block, past the comfortable home of the master mechanic, one finds himself in a truly model workingman's village. Here nearly 70 per cent of the shop hands live, in handsome little homes—homes that nearly all of them own—nearly 50 per cent of them now all paid for. The homes vary, of course, in style of architecture and finish, according to the circumstances of the owners—but all are neat, and many really handsome; and all are surrounded by good sized yards, devoted to lawns, flower beds or kitchen gardens. A good barn is also seen on many of the lots—over 60 per cent of the householders having their own horse and buggy. The streets are, in the main, well shaded with fine trees, the roadways and sidewalks are well kept up, the lawns are beautified with flowers and shrubbery, the windows are prettily draped—and altogether the pleasanter aspects of a handsome country village are strongly in evidence. And all this owned, occupied, and governed by fortunate members of a class of men who, as a general rule, find their lot so cast that a great part of them have, to put it mildly, very indifferent home surroundings, and hold rent receipts instead of deeds.

Just three miles due west of the Mississippi river, on the great Burlington route, is situated the beautiful and homelike little town of West Burlington, which was until the last 16 years recognized only as a part of the rolling prairie of Iowa. Settlement was first made in this place in about the year 1834. But where the pioneers built their log huts and cleared away the timber, of which, we are assured, there was an abundance, and became excellent farmers on improved farms, there now is situated the prosperous little town which is the subject of our sketch.

The shops were built in 1881 by the Chicago, Burlington & Quincy Railway, and were occupied in 1882. These shops, by the way, which were illustrated in the Railway Master Mechanic of August, 1886, are today considered as among the model shops of the country. The village organization was established in January, 1884, with Thomas C. Scholes as mayor. Mr. Scholes was at that time general foreman of the shops. Soon after the shops were built, the town—or, rather, the country—took on a businesslike look. House after house went up, not to be rented, but to be bought by the shop employes. Some of them were built to be paid for on the monthly instalment plan, and in some cases part payment was given down and a mortgage placed for the remainder of the purchase price.

A Blacksmith's Home.
The residence of Mr. John Enberg. A very beautiful cottage home, furnace heated. Mr. Enberg is a blacksmith, and his wage rate is $2.75 per day.

The plan upon which the workmen obtain their homes is equitable in form and easy in detail. The unsatisfactory features observed in the methods in somewhat similar towns are not in evidence. For instance, the house is not necessarily built after a stereotyped set of plans designed by the selling company, but is just what the purchaser wishes it to be, there being a tacit understanding, however, that no one shall undertake to buy a home that is beyond his means. The town was laid out by the West Burlington Land Association, a company which, while indirectly connected with the railway company, is yet an entirely independent and distinct corporation. In providing for a home, the workman arranges to buy a lot from this association, gets up his own plans and specifications, lets the contract to whomever he wishes to, and when the work is done the association pays all bills and hands the key to him, on the sole condition that he pay the association a certain sum monthly. The prices charged for the lots are only in touch with the times, and the rate of interest charged is 7 per cent. At the end of each year, or oftener, if desired, the association furnishes the purchaser with a statement showing just how the deal stands. At the end of the year the purchaser is credited with half of the interest on the amount he has paid in during the year, so that there is no compounding of interest. The purchaser is at liberty to insure his home with any company he chooses.

The present population of the town is nearly eleven hundred, and there are not more than fifteen or twenty shopmen, with families, who are renting their homes.

A Machinist's Home.

The residence of Mr. G. W. Scholes, a machinist, who has been in the employ of the company for 25 years. The house is modern throughout, and is furnace heated.

Nearly 50 per cent of the owners now have their homes entirely paid for, and the remainder are steadily paying for theirs, and lapses are practically unknown. The present force working at the shops is about seven hundred men, and between 60 and 70 per cent of these men live in West Burlington.

The municipal government of West Burlington consists of a mayor and six town trustees. The mayor is elected every two years; the trustees serve three year terms. The citizens participate very warmly at the elections, and on nearly all occasions the best men are chosen. The council meets in regular session on the second and fourth Mondays in each month. The mayor receives 50 cents and each trustee 25 cents per meeting night, if they are present. The town has a marshal who is paid $50 per year for looking after the interests of the place and the preservation of good order when it is necessary. But it is a very quiet town in this regard. There never has been, and is not now, a house of ill fame in the town; and the saloon is a feature that is not only not obtrusive but that is very carefully regulated. There are only two saloons, and these are in the far eastern part of the town. They each pay a license of $300, which gives an annual revenue to the town of $600; this revenue is used exclusively in improving the streets. The saloon keepers are law abiding citizens and run their places in a strictly orderly manner, no rowdyism whatever being allowed. In fact, the citizens are, as a rule, men who do not patronize saloons excessively. The present and past administrations of the shops have been such as to effectively discourage excessive drinking.

A Painter's Home.
The residence of Mr. Chas. N. Craig, a painter, whose wage rate is $2.25 per day. The house is very nicely furnished throughout.

The social pleasures of West Burlington consist chiefly in mingling together in church and lodge work. Music has been a leading diversion. For the past few winters a large class of pupils has studied vocal music under an eminent instructor, and each spring this class has given a concert of considerable merit. There is scarcely a house in town that does not contain a musical instrument of some kind—pianos mostly. The children are all, practically, taught music, and the singing and playing of the small tots is quite a feature.

There are two public halls in the town—the opera house, used for small shows, large public meetings and general meeting purposes, and the K. of P. hall, used solely for lodge purposes. In the latter meet the following orders: Knights of Pythias, Ancient Order of United Workmen, Woodmen of the World, Modern Woodmen, Court of Honor, Degree of Honor, and the Ladies Auxiliary to Woodmen of the World.

The citizens spend their leisure time, aside from that taken up on the lines above indicated, in taking care of their homes, garden making, and study. There is considerable reading done, and upward of 400 daily papers are delivered in the town every day. Buggy riding is, in summer especially, a leading feature, and it is a fact that over 60 per cent of the people in this town possess their own horse and buggy.

There are seven churches in the town; one each, Methodist, Congregational, Roman Catholic, German Evangelical, German Methodist, Swedish Lutheran and Swedenborgian; each of these churches has two services on Sunday and a Sunday-school.

The public school is the pride of the town. It is a large two-story brick structure, heated by hot air furnaces. There is an enrollment of 280 pupils, who are led by 6 teachers. This is conceded to be one of the best graded schools in the state.

The cost of living in West Burlington is about the same as in the city of Burlington. The town has four general stores, two hardware stores, one meat market, one confectionery, one cigar manufactory, one millinery store and one livery stable. None of these stores is operated by the company; and the citizens are perfectly free to buy of any or all, or to buy in Burlington. There is not the slightest semblance of the pernicious "company store" system that has made life unbearable in some other towns. The company furnishes one lady in each home with a quarterly pass, good on any train between West Burlington and the city of Burlington, and any employe can get a trip pass to the city as often as he may require it, so that city shopping, if desired, is easily at command. The taxes are about one-half what they are in Burlington, and the few rented houses go at rates about equivalent to those found in Burlington.

The fire protection consists of 6-inch mains laid through all the principal streets, with a hydrant at each corner. There is a volunteer hose company of 20 members, which drills once a week during good weather. The equipment consists of two hose carts and 1,400 feet of hose.

In all the town there is not one tramp mechanic or laborer, which clearly indicates that the citizens are a class of steady workers. The quiet, regular habits of the citizens are reflected in the general health conditions, which are remarkably excellent. Indeed, the enthusiasts of the town attempt to claim that the "people never die, except of old age." Good natural drainage, pure air and a normally favorable climate contribute to the fine showing in this regard; but there is no doubt that the regularity of the life of the people, and their generally happy and contented frame of mind, conduce to the notable freedom from disease characteristic of the town.

The Public School Building

In which great interest is taken and of which the citizens of West Burlington feel justly proud.

There is no question but what the shopmen at West Burlington, who have at command the facilities of this beautiful home town, right within a step from their benches, are much more happy and prosperous than if they were living in a stuffy flat or mean cottage in one of the larger cities. As an indication of the kind of home that the ordinary shop workmen enjoy in this model village, we give views of a few of the houses that they own.

The Chicago, Burlington & Quincy Railway is not directly connected with this town scheme, as we have stated, but it is indirectly, and it is to be congratulated upon the success which has followed its fostering care. There is not the slightest trace of an autocratic system about the town or its government; and no evidence whatever of the paternalism which American citizens hate. The villagers are free, independent and happy. And the company is correspondingly benefited. For labor troubles are almost unknown, and the "walking delegate" finds cold comfort at West Burlington.

IN the early days of railway association work this story used to be told about Jim Harris, who partly stammered and partly lisped: One day he went to Mr. White, manager, and said: "We w-wa-want t-t-to th-thart a railway Chrithtian athothiation." "A railroad what?" "A railroad Chrithtian ath-o-thiation." "A railroad Christian association?—a Christian association? That beats the devil!" Jim looked at him and said, "Yeth, thir, that ith what we are organizing for."—*The Headlight*.

SCHENECTADY PUSHING LOCOMOTIVE—DELAWARE & HUDSON CO.

Total weight, 176,000 pounds; weight on drivers, 157,500 pounds; cylinders, 22 x 28 inches; drivers, 50 inches; heating surface, 3,348.54 square feet, of which 225.53 square feet is fire box, 3,036.26 square feet tube and 86.75 square feet water tube surface; grate area, 90.19 square feet; boiler, 74 inches; working steam pressure, 180 pounds; fuel, fine anthracite. Tank capacity, 5,000 gal. water; 8 tons coal.

CONSOLIDATION PUSHING LOCOMOTIVE—DELAWARE & HUDSON CO.

The Schenectady Locomotive Works recently built for the Delaware & Hudson Co. six consolidated pushing locomotives, a view of one of which we give on the opposite page. This engine has 22x28-inch cylinders; 50-inch drivers; a straight boiler, which is 74 inches in diameter, and which is designed to carry 180 pounds of steam pressure; a wide fire box, 120 inches long and 108 inches wide; a grate area of 90.19 square feet, and a total heating surface of 3348.54 square feet, of which 225.53 square feet is fire box, and 3036.26 square feet tube, and 86.75 square feet water tube surface. The engine weighs 176,000 pounds, of which 157,500 pounds are on the drivers.

The total weight of these locomotives was limited, and especial effort was made to get as much heating and grate surface as possible within the limits allowed. As above stated, the grate area is 90.19 square feet, and the total heating surface 3348.54 square feet, and this is believed to be the largest amount of grate and heating surface ever applied in a locomotive with the total weight that this has—176,000 pounds. The fuel to be used is fine anthracite coal.

Cast steel driving wheel centers are used throughout on this engine, the centers for the main wheels being made of heavier pattern than for the remaining wheels. The frames are also of cast steel. The rods are of light channel section. The driving axles are made with enlarged wheel fits.

The engine is equipped with Richardson balanced valves, Jerome piston rod and valve stem packing, Nathan Monitor injectors, American steam driver brake and Westinghouse air brake and pump, Crosby muffled safety valve, "She" sand feeder, and Magnesia lagging.

The tender has a water capacity of 5,000 gallons and coal capacity of 8 tons. It has a steel channel frame, and carries a shelter cab telescoping into the cab on the engine.

SOMETIME AGO Engineer John Hagerty, of the Baltimore & Ohio, was oiling his engine at Connellsville, while waiting for the passengers to alight. He heard another train coming and believed that it was not under proper control. He sprang into his cab, opened the throttle and started his train. The other engine struck the rear car, but it was not a hard blow, and Hagerty's promptness saved ten or a dozen lives. The company has ordered a handsome gold watch, suitably inscribed, and a gold chain, for Engineer Hagerty, as a reward for his devotion to duty and "using his brains" in time of emergency.

THE ORDINARY APPRENTICE.

BY D. J. DURRELL.

The title of the article, "The Special Apprentice," in the September number of the RAILWAY MASTER MECHANIC, is very honestly admitted by the writer of said article to be a "catch." I, who have read it carefully, have found it to be a catch, insomuch only that its application to the more favored apprentice would show a class of apprentices who have, by close application to their studies, merited places in the service of the railway shops of the day under favorable circumstances, and under such conditions that, by still closer application, the way is shorn of the roughness experienced by their less favored fellow, the Ordinary Apprentice. It is to this class, especially, that I would like to call the attention of railway managers, superintendents of motive power, and others in authority, of a philanthropic mind, upon our railway systems.

In the beginning, I would concede all honor to such institutions of learning as the Institute of Technology at Boston, Stevens, Cornell, Purdue and other kindred institutions, and to those who have the mental and moral welfare and training of our young men, more favored than their brothers, in their keeping. I say, all honor to such, and may the time be not far distant when the advantages derived from a course at such an institution be within the reach of every young man desiring the same. But the fact remains that the majority, we might say the entirety, of the mechanics of 10 or 20 years hence will be made up of, not young men who have had the advantages referred to, but of those who have been obliged to leave the public schools at the close of a grammar course by circumstances familiar to every reader of this article, and of many who have been unable to finish even such a course in our schools.

Mr. Robert Quayle, in his address before the American Master Mechanics' Association Convention at Old Point Comfort, in June last, asked the question, "What can the Master Mechanics' Association do to increase its usefulness?" Also, in regard to the care of employes, he made use of the following language: "The welfare and comfort and the surroundings of our men, both on and off duty, interest us now; but much more ought to be done in these matters in the lines of reading rooms, places of recreation, and in providing *lectures, instruction* and *entertainment.* We should use the technical papers intelligently. * * * *Will not a little work in this direction pay well?*" (The italics are mine.)

The writer fully appreciates every effort that has been put forth and is being made on the part of railway officials, and especially those at the heads of the mechanical departments of our railways, in the interests of the young men employed in the various departments; but while the subject has been brought up time and again, and has been made more fruitful after each presentation for discussion, there seems to be one of the greatest opportunities for future good to the greatest number, and a worthy number, by the Association taking up the apprentice question, and through concerted action, upon the advice and benefiting by the experience of our representative association members of both the railway service and institutions of learning, to enable the ordinary apprentice the better to perfect himself in his chosen or ofttimes forced following, from the ranks of which our railways must, in a few years, draw entirely for their skilled labor, be it in the workshop or upon the road.

The question need not be asked, "Who makes the best workman, the educated or the ignorant employe?" "The day of the general workman," some one will say, "has passed, and this is an age of specialists." Granted; yet is the man, though he may be a specialist in any department of railway service, the more economical employe? or in the end is such a one the more contented, or the one more to be relied upon at all times, than the man, not a machine, who is capable of reasoning powers, who will look upon his employer's interests as well as his own and be the better able to arrive at the proper conclusion of any subject in his line which may present itself?

The young men who have had the advantages of college educations, or of having had a course in one of our many technical schools, where so many are prepared for college, or become "special apprentices" in the railway service, are not the men who will fill your workshops in the next few years, but they are those who, by reason of their advantages, are fitted to enjoy more advanced places in the service and the rewards incident thereto. Therefore, it lies directly with the railway officers, and with those in charge of the mechanical departments, to study the question and, by persevering diligently, to so aid the ordinary apprentice that their future employes will be men rather than machines, skilled workmen rather than tools.

Some twenty years since, Mr. Charles Paine, the noted civil engineer, while general superintendent of the Lake Shore & Michigan Southern Railway, established a system of evening schools for his apprentices and young men in the service of the company, though none were excluded. Several of these schools were inaugurated upon different parts of the line between Chicago and Buffalo. Mr. E. T. Jeffery, now president of the Denver & Rio Grande Railway, inaugurated a school on the Illinois Central Railroad at Chicago. The late Mr. H. G. Brooks went to considerable expense in fitting up a schoolroom and starting a school for the young men of the Brooks Locomotive Works. It is sad to chronicle the fact that, so far as the writer is informed, none of these schools is now operative. Mr. Paine left the Lake Shore and removed to New York, where he is now in the enjoyment of one of the largest practices, in his profession, in this country. Mr. Brooks has passed away, but is remembered by hundreds of men throughout the country who have succeeded, owing to his liberality, and who love and revere his memory. Mr. Jeffery, though he was called to a higher place in railway life than even the general managership of the Illinois Central, has not for a moment forgotten the young men in his care, and these have, in far away Denver, the benefits of an evening school for several months of each year. These schools, though of minor importance to the railway world and to the field of engineering, have been the means of starting in life many who otherwise would have been mere workmen, but who have, by the opportunities offered, become master workmen. The writer is personally acquainted with men who now hold such positions as general manager, general superintendent, superintendent of motive power, master mechanics, general foremen, mechanical engineers and draftsmen, skilled mechanics and reliable locomotive engineers, through the medium of instructions gleaned in these schools; and while, as one master mechanic in one of our prominent railway clubs, a few years since, when this subject was brought up for discussion, remarked, "railways were not run to make managers, superintendents and the like," the fact holds good that such men have been made by such means, and that they have, one and all, been honored members of the railway profession.

Our young men, now our ordinary apprentices, need your assistance, railway managers, and it seems that the field for the introduction of schools for these same young men was never so ripe as at the present time. I know that the schools mentioned have most essentially altered for the better, the lives of those who attended them. Why cannot our large railway corporations, many having several thousands of miles of railway lines, having many division shops, establish a school at each of such places and engage a suitable teacher for the benefit of the young men? Such a school or system of schools could easily be maintained at small expense. One teacher could attend several, by arranging evenings to suit, giving the boys such instruction as is essentially necessary in their case. To this instruction could be added a course in air brake instruction and kindred subjects. "*Would it not pay?*" Would not the results obtained far more than compensate for the trifling cost in dollars and cents for the instructor and the few appurtenances needed for such a system of schools? And would not the railway companies be the gainers in the end, by having men in their employ who were learned in the principles and in the practice of their several vocations?

It is not the intention in this article to outline a course of study for such students, or for such schools (though the same might happily be arrived at by a special committee from members of the mechanical associations or of our railway clubs, several of whom are engaged in educational work), but, that the establishment of such a system of schools upon one of our large railway systems would be looked upon as not only true philanthropy, but of inestimable benefit to the railway inaugurating the same.

ENGINEERING SCHOOL EXTENSION WORK.*

BY PROF. J. B. JOHNSON.

An important field into which I shall hope to see our state universities extend their activities is that of the technical education of young men employed in our manufacturing industries. In another address I have enlarged upon the necessity of giving to our industrial leaders and workers a much higher scientific and technical education than they now possess. Germany has set a pattern in this respect far in advance of the rest of the world, and I have recently had the opportunity of inspecting their system of industrial technical education. While we shall probably not try to imitate their system of trade and monotechnic schools to any very great extent, we must, in my opinion, do something to give our industrial leaders a better scientific and technical training than they have heretofore been able to obtain. A large proportion of these leaders in our manufacturing industries will always be men who have grown up in the business, from the lowest and most humble positions. Their previous schooling will have been very limited, and the problem we have to

*Extracts from the inaugural address as Dean of the College of Mechanics and Engineering of the University of Wisconsin.

face is how to give to these exceptional men of marked abilities a reasonable amount of scientific training in the line of their future employment. In my opinion the problem is already solving itself, as is the case with so many of our unsolved problems in this land of quick initiative and free opportunity. In place of the trade night schools of Europe we have developed here in the United States, in the course of a very few years, under private initiative and direction, a series of correspondence technical schools, with an enormous patronage. These schools, though few in number, now carry on their rolls over one hundred thousand students, these being scattered in all parts of the United States and Canada. Instruction is given wholly by means of special manuals, and by correspondence. Though some of these schools greatly magnify their work, and some are positive frauds, and all their students have, perhaps, too exalted an opinion of their accomplishments, yet they are reaching a class who could not leave their employment to attend other schools, and a good correspondence school can do a great deal for them. No regular technical school has as yet undertaken to do such work by correspondence, and I do not now advocate our entering this field. I should prefer to leave all this work in the hands of the men who have discovered the needs and the methods of satisfying them. So long as they do not grant degrees the state cannot, perhaps, interfere in their management. Their authority to grant degrees, however, if such be ever conferred, should be coupled with a rigid state supervisory control. The fact that they are enormously profitable, however, may lead to such fraudulent practices that the state may be called upon to enter this field also. In that case these state correspondence schools should not become an organic part of, but should be under the advisory direction of, the state university. In order that no confusion shall arise in the minds of the public between the correspondence and the intra-mural schools, the headquarters of the correspondence schools should be located at some commercial or geographical center, entirely away from the seat of the state university. All such extension technical instruction, however, should be under the control of a board, on which the technical departments of the state university should be well represented. It might well be that evening classes should be conducted at the headquarters of the correspondence school, although, in my opinion, the correspondence plan has great advantages over any system of evening schools, for men employed through the day in factory, shop, or office.

Perhaps the most striking thing about these correspondence technical schools is the great army of young men who are seeking an education in this way. After making liberal discounts for the dull, the shallow, and the indolent among them, we would still have left from ten to twenty thousand poor young men of native ability, of persistent earnestness, and of great promise, who are struggling against heavy odds to acquire a scientific and technical education, in these correspondence schools, as the only means open to them for this purpose.

In addition to these schools we have in this country trade, scientific, and technical journals *ad infinitum*, and every ambitious boy or man can readily take one or more of these weeklies which usually contain a considerable amount of good educational matter. Again, we are coming to have, in all populous centers in this country, good free public libraries which are great educational engines, the good work of which in industrial lines has never, I fear, been adequately appreciated by the rest of the community.

And, finally, we have adopted in America the free manual training school as best suited to the American boy, whose career is what he chooses to make it, rather than what has been predestined for him by the conventionalities of society.

Now, with all these agencies open to nearly every American boy, you may ask where does the state university find a suitable field for exercising its functions on these same young manufacturers? In my opinion the state university can do much in the way of directing and inducing these young men to avail themselves of these opportunities, and in the way of supplementing them. The great defect of the correspondence school, of the technical journal, and of the public library as educational agencies, lies in the *entire absence in them of experimental laboratory verification*. This the state can very properly supply. By joint action of state and city, these experimental shops and laboratories could be established in every manufacturing center, and if placed under a common state board they could all be made to work in harmony with the private or the state correspondence technical schools. If the use of these shops and laboratories be predicated always upon adequate theoretical accomplishment, as shown by examinations, and if such students were admitted at all times, both day and evening, for such periods as they might choose to employ in this way, thus enabling them to so employ their vacations, their evenings, or periods of enforced idleness, from time to time, I believe in a few years a large number of young men regularly employed in business and in the trades, would avail themselves of these opportunities to the great advantage of themselves and of society at large. The test examinations need be only sufficient to show that the applicant knows enough of the subject to safely handle the apparatus and to reduce and interpret his results. As no certificate of proficiency would be given by the state, a much smaller and narrower theoretical knowledge would be accepted from these students than would be demanded from our regular students in the university courses.

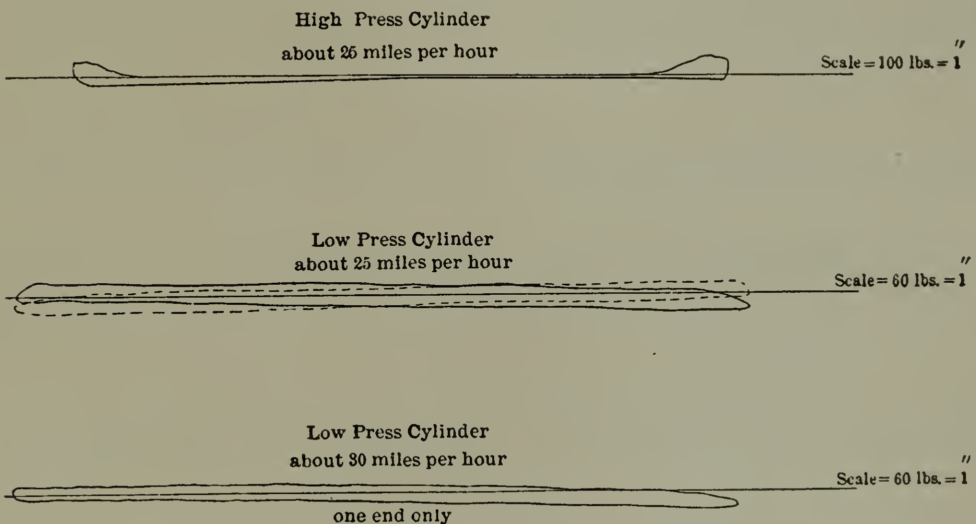
If such technical educational agencies be inaugurated and well advertised throughout the state, I believe it would result in a great many ambitious young men setting themselves to work in the correspondence school to prepare for these opportunities. The test examinations would serve, also, as a check upon the thoroughness of the instruction given in the correspondence schools, and it might well be that certificates from some of these schools could be received as evidence of a sufficient proficiency to enable the student to pursue his laboratory studies at these state laboratories and shops. In this way the technical work of the state could be very greatly enlarged, at a comparatively small cost for the instruction given, and an additional stimulus offered to every ambitious boy, however poor, to obtain a fair technical education along the lines of his chosen pursuit. In many cases his employer would gladly pay his expenses for a short experimental course at these state laboratories in order to have the benefits of his increased efficiency in the works. In this way, also, the technical instruction of the state may be brought home to the manufacturing interests, just as our agricultural school is now intimately related to all the farming interests of the state.

This action would in no sense lower, or compromise, the instruction given in the professional engineering schools, neither would there be a disposition, on the part of our engineering students, to revert to these short experimental courses. On the contrary, I should expect to see a goodly number of those who enter upon this more elementary technical education, become so enamored of the work that they would, at whatever sacrifice, regularly prepare for the engineering college, and come up to the university and complete these full engineering courses. If this should prove to be the case in but few instances, it would be a great gain to society, since these are the men who, when properly educated, are sure to become leaders in their respective callings. The collateral advantages resulting from bringing the work of the university into more intimate relations with the productive industries of the state, through its supervisory relation to these more elementary agencies, would also be not the least of the benefits resulting from such an extension of the technical instruction imparted by the state.

SOME FEATURES OF "DRIFTING."

In the course of a paper on road tests of locomotives, read before the New York Railroad Club by Mr. R. P. C. Sanderson, attention was directed to a series of drifting diagrams taken during these tests. The substance of the remarks relating to these diagrams follows:

Referring to the diagrams of engine 344, a 2-cylinder compound, it will be noticed that the high pressure cylinder diagram is excellent, but the low pressure diagram is peculiar and differs altogether from the usual drifting diagram of a locomotive. Compression begins to show shortly after beginning of the return stroke, which compression increases slowly toward the end of the stroke, and reaches about four or five pounds to the square inch. These low pressure cylinders are fitted with special by-pass or relief valves, called by the men "flip-flop valves," which are intended to open the ends of the cylinders to one another,

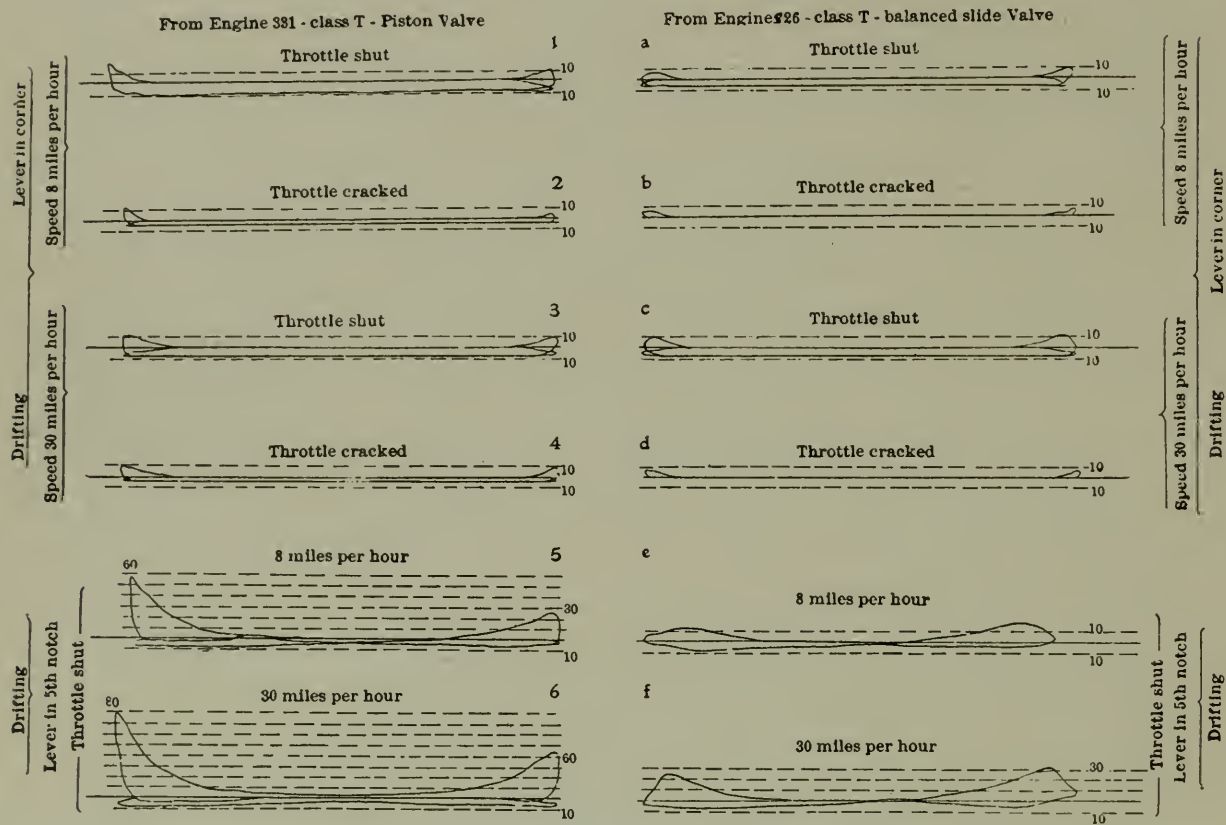


Drifting Diagrams. Compound Engine 344

and they also have a large relief valve on the steam chest. It will be seen that these were evidently insufficient to relieve the large 35-inch cylinder, and that there was a discharge of compressed something from the nozzle for each stroke. The vacuum gauge readings corroborated this very plainly, for when drifting fast this engine carried an average vacuum in the smoke box of from two to two and one-half inches, while the simple engines drifting under similar conditions carried a vacuum from one-half to three-quarter inch, mostly produced by air pump exhaust. The direct consequence of this was that the fire could not be kept still while drifting; the pop valves were constantly blowing and wasting steam, thus offsetting some of the coal saving due to the compounding.

As part of our trouble with cylinder lubrication is due to ashes being sucked into the cylinders while the engines are drifting, and as relief valves on our large engines are insufficient to neutralize the vacuum, and also as this question becomes an important one when piston valves are used, because these valves cannot lift off their seats to relieve over pressure, a study of this subject by means of indicator cards taken from engine 331 (piston valve) and engine 326 (regular balance slide valve)—both of these engines class "T"—cards being taken under exactly similar conditions, may be of interest.

Cards from 1 to 6 are from engine 331 (piston valve); cards A to F are from engine 326 (slide valve). Cards 1 and 2 are taken under pre-



DRIFTING DIAGRAMS, SIMPLE ENGINES

cisely similar conditions, except that the throttle was cracked in the case of card 2, which, it will be observed, nearly kills the vacuum. Cards A and B are corresponding ones for engine 326 (slide valve), and it will be observed, in the case of card B, the engineman happened to hit it exactly right, and there was absolutely no vacuum. Cards 3 and 4 and C and D are taken at a speed of about thirty miles per hour, drifting; 3 and C with throttle shut, 4 and D with throttle cracked open. Again will be noticed the success which followed the cracking of the throttle, killing the vacuum. These cards go to show that the use of the throttle in the manner indicated is the very best kind of relief valve we could have; and as, under such conditions, engines are usually blowing off steam through the safety valves when running down hills, the amount of steam worked through the cylinders in this way is absolutely not wasted—is not enough to propel the engine forward; therefore no increase of speed of the train would follow this practice.

Some men will not drop the reverse lever down in the corner when drifting unless they are watched; and as the piston valve bushing cannot wear itself hollow under such circumstances, the question arises as to whether there is any great amount of harm done by failure to drop the lever down in the corner. It will be noted, by referring to diagrams 5 and 6, that the compression under such conditions with piston valves is very severe, running as much as 80 pounds per square inch on one end when the engine is drifting at a speed of about thirty miles per hour. The corresponding diagrams E and F, with slide valves, do not show as much compression, as the valve lifts and lets the over pressure escape. It is plain from these diagrams that it is most important the enginemen should drift with levers down in the corners, and especially so with engines having piston valves.

THE CAR FOREMEN'S ASSOCIATION OF CHICAGO.

NOVEMBER MEETING.

The regular meeting of the Car Foremen's Association of Chicago was held in the rooms of the Western Society of Engineers, 1741 Monadnock Building, Chicago, Nov. 9, 1899.

Vice President Sharp, at the request of President Morris, was in the chair, and called the meeting to order at 8:15 p. m. Among those present were:

Alderson, A. S.	Depue, Jas.	Krump, M.	Reinhard, F. B.
Bates, G. M.	Gardner, L. S.	Konze, Wm.	Sharp, W. E.
Buker, J.	Gruhlke, E.	Kamen, Fred.	Stagg, C. S.
Bond, L. E.	Godfrey, E.	Miner, W. H.	Swift, C. E.
Bossert, Chas.	Guthenberg, B.	Miller, Wm.	Schultz, A.
Bell, W. A.	Grieb, J. C.	Morris, T. R.	Schultz, F. C.
Bourell, W. A.	Groobey, Geo.	Mercatoris, M.	Showers, G. W.
Blohm, Theo.	Helwig, H.	Martin, J. F.	Saum, C. L.
Cardwell, J. R.	Hansen, A. P.	Nordquist, Chas.	Spohnholtz, Chas.
Cather, C. C.	Johannes, A.	Norman, F.	Thomson, Geo.
Cook, W. C.	Kehm, H. C.	Olsen, Louis.	Thomas, Hugh.
Callahan, J. A.	Kroff, F. C.	Prickett, James.	Wentsel, Geo.
Deen, Chas.	Kuhlman, H. V.	Rieckhoff, Chas.	Williams, Thos.

MISCELLANEOUS BUSINESS.

Secretary Cook announced that applications for membership had been received from the following gentlemen, and that the applications had been approved by the Executive Committee:

George Rust, John M. Taylor and H. G. McMasters, I. C. Ry.; W. L. Jacoby, Latrobe Steel & Coupler Co.; J. G. Baker, C. T. T. R. R. Co.; Carl H. Peterson, Pintsch Compressing Co.; J. W. Callahan, Belt Ry.; John H. McEwen, John Van Dyke and S. H. Tuohey, Morris & Co. Refrig. Line; John B. Watson, A. L. S. T. Co.; Hugh Marsh, C., N. Y. & B. Refrig. Co.; James Buker, Consolidated Cattle Car Co.

The Committee on Annual Entertainment, through Mr. Groobey, its chairman, reports as follows:

Your committee appointed to make arrangements for the annual celebration beg to submit the following report:

Through the courtesy of the officials of the C., M. & St. P. Railway Co., transportation was provided for all members who expressed their intention of going to the West Milwaukee shops of the C., M. & St. P. Railway Co., on October 21. The accommodations provided were perfect in all respects, and your committee would suggest that this association place itself on record, expressing its appreciation of the consideration received at the hands of all the officials of the St. Paul Co., who were responsible for the arrangements. The party was met at Milwaukee by Mr. A. E. Manchester, assistant superintendent motive power; Mr. J. J. Hennessey, master car builder; Mr. T. Higby, general storekeeper; and Mr. J. C. Grieb, chief clerk to superintendent motive power. These gentlemen conducted the members of the association through the various shops, explaining in detail all operations involved. Mr. Manchester and Mr. Hennessey, in the course of short speeches, spoke of the value of this association. Their kind words and still more expressive actions, in addition to the pleasure and instructiveness of the occasion, left an impression on the minds of all visitors which we feel will have beneficial results in the future.

In conclusion, your committee beg to thank the membership of the association for their co-operation in making the annual celebration the success it certainly was.

GEO. GROOBEY,
WM. E. SHARP,
H. C. KEHM.

Mr. Prickett: I move that this report be received and placed on file and the committee discharged, and that a vote of thanks be tendered to them, and also to the St. Paul Railroad.

Carried.

The Committee on Printing, through Mr. Groobey (Mr. Hunt, the chairman, not being present), reported progress and was continued.

The Committee on Revision of By-Laws presented its report through Chairman Cather. It was then taken up, section by section, and discussed. Some minor changes were made and the report held over until the December meeting for action.

REPAIRING WRONG PARTS THAT ARE UNSAFE.

Vice President Sharp: We have now come to subject No. 4—the discussion of the question as to the practice in repairing wrong parts that are unsafe, on foreign cars that have been received in interchange. Will some one volunteer to open the discussion?

Mr. Morris: I appreciate the difficult position the chairman is in, in getting some one to open the discussions and this is the only excuse I have for getting up. We had a case recently—it was a car with a continuous drawbar rod—one rod. It came to us with about five inches of slack in it; the followers and springs were standard and proper; but we didn't consider that the car ought to go out in this condition. We shortened the rod; but we didn't know what to do in the way of putting a repair card on. We didn't think we ought to stand the expense of the repairs ourselves, and we didn't know how we could get redress. It was in the nature of wrong repairs. The company that had given the car to us was not the owner of it. If we should ask the delivering company for a defect card, they, very properly, would fall back on the plea that it was wrong repairs and they were not responsible. If we should ask them for a joint evidence card, they would also, very properly, refuse to give us the joint evidence card, we not being owners. Now, I don't think that there is any one here but that has had a similar case at one time or another. We didn't know just what to do with it ourselves, and I would like to hear from some of the other members as to what they would do in a similar case.

Mr. Showers: In that case I would like to ask why they should refuse to sign joint evidence for the wrong repairs, regardless of whether they were the owners of the car or not. If you received the car upon your line and it was in a condition that you considered unsafe to haul, and had had repairs made that were wrong, and that was the sole cause of its being unsafe to handle, why, it was evident that the wrong repairs had been made very recently, and it was also evident that it was necessary for you to make further repairs before car could go forward, and I see no reason why they should refuse joint evidence. That would give you a chance to bill the owners, letting them have redress on the parties who made the wrong repairs.

Mr. Wentsel: We had a case somewhat similar. The party who gave us the car had repaired the car and had applied two draft timbers and wrong draw lugs and applied an M. C. B. card to the car. When we received the car from this party it had the two forward draw lugs broken. It was not safe to handle and we applied two draw lugs, the same as they had applied. Where would you get your redress?

Mr. Kehm: The Illinois Central would take off the defect card that the Chicago & Erie put on that car, ask them to divide the card, giving a defect card for two, which would be placed back on the car; take the card for the other two and render bill against the Chicago & Erie; then put their own defect card on, for the two wrong lugs applied.

Mr. Prickett: That would be something in the line of "partial" repairs, and the M. C. B. rules, since '96, have not spoken of "partial" repairs. Now the way to get around that would be to erase what he had done on it, then call on the Chicago & Erie for a rebuttal card.

Mr. Kehm: In that case, he would have to change the defect card, (which is not permissible, I believe) by making the word "four" read "two." It would be much better to divide the card and get two cards reading two each.

Vice President Sharp: Does that offer a solution to your question, Mr. Wentsel?

Mr. Wentsel: I don't think it fits very well. In future I will change the draft timbers and take the card off. Then we will pay for one.

Mr. Mercatoris: I think the proper way would be to make proper repairs to the car.

Mr. Kroff: I think the proper way would be to renew cheek castings. There was a defect card on there; the man making the repairs replaces them with two wrong cheek castings that were broken. You would bill the owner and leave the defect card there, and that would give them redress and make them square.

Vice President Sharp: Am I to understand you would bill owners for the repairs?

Mr. Kroff: As I understand it, he received car with four wrong cheek castings; two were broken; and a defect card on there for four wrong lug castings. Now in that case I would bill owner of the car for the broken lug castings and leave the defect card on. It seems to me that would make things square.

Vice President Sharp: Could you not get redress by billing the party who issued card for the four, and put your card on for the two wrong ones?

Mr. Kehm: Then there would be two not carded for.

Mr. Wentsel: I think the proper way would have been to remove the draft timbers and remove the card and bill on the card.

Vice President Sharp: One of the rules of this association is that the names of railroad companies interested in a discussion will not be mentioned, but it seems that there is evidence enough here to know the parties interested can clear themselves up and get a vote without mentioning names.

Mr. Reinhard: I think the original question has been side-tracked. I do not think it is a proper answer to the question put by Mr. Morris. There seems to be a defect card in this case, and there may be some chance of getting redress. But the case Mr. Morris mentions is quite different.

Vice President Sharp: It is true, we have drifted from the real subject for discussion. Mr. Morris' case was a car that had no defect card for the wrong repairs. What would you do with a car of that kind?

Mr. Reinhard: I have never had a case of that kind come under my observation. But it does not seem to me that anybody who would make improper repairs to wrong repairs already made has any redress whatever.

Vice President Sharp: What if a car is unsafe to handle?

Mr. Reinhard: That would be optional with the road running car. You know you cannot hold a road responsible for wrong repairs not made by them. You have no card to fall back on.

Mr. Bates: It seems to me, in the absence of the rules making any provision for a case of this kind, that it would be the proper thing for the company receiving the car to make repairs and take it up with the owner. I do not see that he could have any hold on the delivering line whatever. Mr. Showers spoke of a joint evidence card. The rules say joint evidence cards must be signed by only the delivering line. In the case cited, the receiving road was not the owner; so I don't believe joint evidence would be of any use; and, as I have stated, I think the proper way would be to make right repairs and take the matter up with the owners.

Mr. Showers: The idea that I had was merely for the protection of the owner. When foreign cars are offered to him with wrong repairs, and he is compelled to make repairs, I do not think the owners of any car would object to paying the bill, if he would receive a joint evidence card signed by the delivering company. If he could trace the wrong repairs, he would have redress, and I am satisfied he would not refuse to pay for repairs if made.

Mr. Bates: Mr. Showers may have meant that, but he didn't say so before. It may be all right to get joint evidence card, signed by the delivering road, and forward that to the owner, and then let him handle it.

Mr. Mercatoris: The owner would want to know who made the repairs.

Mr. Showers: I don't think the owner would care who made the repairs, if he was not billed for them. He would receive no bill.

Mr. Mercatoris: But in case car had been in rough usage, and the owners would receive a bill for the breakage on that car, that would be billing him for something he was not responsible for.

Mr. Smith: I do not understand that this draft rod was in any way broken, but it had been too long; that the man who made repairs did not bill the owner and place card on car. It seems to me that the last man's remarks were proper—ask for a joint evidence card and notify the owner.

Vice President Sharp: Suppose, Mr. Smith, that the rod was originally broken by unfair usage. Is it right to bill the owners? Isn't it the spirit of the rules that when you make repairs, whether you bill or not, you should make them correctly?

Mr. Cather: It seems to me, with the mill I have gone through, that it is rather a simple question. If the man who puts in the wrong continuous draft rod does so through a defect which was an owner's defect, he will probably render a bill. If he does not render a bill, he sends a repair stub to the owner. Any way, no matter whether he puts a repair card on that car or not, if the rules are complied with, he sends the owner of that car a repair stub, and the owner has that means of knowing who applied the wrong draft bar or continuous bar originally, and, if billed, he holds the party applying it for the wrong part. Now, the question that Mr. Morris brings up is this: The car was received by him with this wrong continuous draft rod, and it was too long. He considered it unsafe, and he shortened it. In my opinion, the owner of that car is responsible to the Milwaukee for any repairs they make to it. So far as they are concerned, it is owner's defect. The owner of the car gets redress from the party making it wrong originally. You may say, "Suppose there is no bill rendered?" All right; if there is no bill rendered, the owner does not do anything, only in case the draft rigging was damaged through unfair usage. In that case, if the rules are complied with, the man gets a repair stub any way, marked "No bill" and saying how it was damaged. If the rules are complied with, I think, as a matter of fact, the case is simple.

Mr. Kroff: In a case of that kind, if I was to receive a car with one American continuous rod five inches too long from a connecting line, I would make repairs and make the card read, "Shortened the rod five inches; and why made, on account of being too long; received from such and such a line that I received it from." If owners wanted any redress, let them hunt it up.

Vice President Sharp: You have heard the practice on the Ft. Wayne Railroad; but I would like to ask Mr. Kroff if the party making these correct repairs would have redress against the party delivering him the car, under the rules, in view of the fact that the receiving road is the judge of what is safe to run over their line?

Mr. Kroff: Certainly. If I was the receiving road, I would be the judge, and I would make repairs and charge them to the owner, and simply say on the back of the stub why made, on account of one rod being five inches too long; received from such and such a line. If the owner wanted any redress, he would have to hunt it up.

Mr. Cather: I will make a motion that it is the sense of this association that the repairs of owners' defects, which have been improperly repaired, and which are considered unsafe, are chargeable to the owner.

Seconded.

Mr. Miller: I would make a motion, as an amendment, that, in case of bill, owners shall be furnished with a joint evidence card to protect them from the party making the wrong repairs.

Seconded.

Mr. Showers: I do not think the owner cares to trace the repairs, unless he has been billed for them; and if he has been billed for them, it is certainly possible to hold some one or get redress. That is the idea of the joint evidence card.

Mr. Stagg: The joint evidence card is evidence that he will be billed. Mr. Morris asked for a joint evidence card, and then the St. Paul sent a bill to the owner. That is evidence that he is going to be billed for the car.

Vice President Sharp: The original motion, as I understand it, was that the party making repairs, or making good wrong repairs, may bill the owner. The amendment was that, in addition to this, the party making the repairs should furnish the owners a joint evidence card for the wrong repairs that he received car with, and allow this joint evidence to accompany his bill. That will allow the owner of the car to get after the party who had made the bill previous to that.

Mr. Kehm: I would like to ask Mr. Miller how he is going to get joint evidence. The rules definitely state that joint evidence must be signed by the inspectors of the delivering road and the car owner. There is no intermediate line going to sign joint evidence for another road that is not the owner of the car, and it is useless to make an amendment of that kind.

Mr. Showers: As I stated some time ago, I do not think it necessary for any one to sign this joint evidence but the delivering line. Let that accompany the bill. The bill is sufficient to prove that wrong repairs have been made; the signature of the delivering line is sufficient to prove that the repairs were wrong. Then the owner is at liberty to sign the card himself.

The amendment, being voted upon, was lost.

Mr. Smith: I would like to hear Section 3 of Rule 5 read before we vote on the motion.

(Secretary Cook reads the section referred to.)

The motion was then carried.

CARDS ON STEEL CARS.

Vice President Sharp: You have all heard of the fellow that went snipe hunting, and the fellow that held the sack. One of our members seems to be in a similar position, and he wants the association to answer the question of where and how you are to place an M. C. B. defect card upon a steel car.

Mr. Mercatoris: All steel cars that I have come in contact with have had proper provision made for defect cards on the side of the car. There is a small block 8x8, bolted on to the car for defect cards to be applied to.

A Member: On the side of car instead of on the sill?

Mr. Morris: Is not that for transfer cards?

Mr. Mercatoris: That is the only place you can put them.

Mr. Prickett: Do you want to place an M. C. B. defect card or a repair card on the side of a car where it will be eaten up by the weather?

Mr. Mercatoris: I would put it there if I could find no other place.

Mr. Prickett: I think by the time it got to the owners there would not be much of it left.

Mr. Kroff: Probably all these iron cars won't fail at all and won't need any. It's a sure thing if they do not fail you can't bill them.

Vice President Sharp: The spirit of the M. C. B. rules is that there should be a place where you would put the card.

Mr. Prickett: I think in a case of that kind I would take a board and bore two holes in it, tack my card on to the board, and then wire the board to the car some place.

Mr. Reinhard: I think, in the absence of a board or any provision being made on a steel car, the proper way would be to take the card and send it to the owner. I saw a steel car the other day, and all the wood there is about it is a piece 3x8, 24 inches long, and that is a brake step. I think as long as they have not made provision, the best way would be to send the repair card to them.

Mr. Smith: I am inclined to think that there are not going to be many failures; but I think the matter should be taken up and that some provision should be made when they do occur.

A Member: A certain company's cars have a tin box underneath the car on the cross-tie for cards. It is the finest thing I have seen on a car; I think it is better than a board. Just drop your cards right in there; it says, "For cards."

Mr. Deen: I think that Mr. Smith will find out he is wrong about steel cars never failing. He will have a bill in two or three days for repairs I made. I could not find any place on the car to put a repair card, so I could not attach it.

On motion, the meeting adjourned.

The next meeting of the association will be held in the rooms of the Western Society of Engineers, 1741 Monadnock Block, Chicago, December 14.

MASTER CAR BUILDERS' COMMITTEES.

Changes in the personnel of the Master Car Builders' committees, as previously given, are as follows: The Committee on Design for Journal Box, Bearing, Wedge and Lid for 100,000 pounds capacity, etc., is now William Garstang, J. J. Hennessey and W. H. Marshall. On the Committee on Draft Gear, J. R. Slack is now the chairman, instead of C. M. Mendenhall. W. P. Appleyard is now chairman of the Committee on Dead Blocks instead of S. P. Bush.

TEN-WHEEL PASSENGER LOCOMOTIVE—LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

The Brooks Locomotive Works recently built for the Lake Shore & Michigan Southern Railway, 11 express passenger locomotives. The builders state that these are the heaviest 10-wheeled passenger engines in the world; and our engraving on page 404 shows that they are rarely

THE HEAVIEST TEN-WHEEL PASSENGER LOCOMOTIVE.

Brooks Engine, for the Lake Shore & Michigan Southern.

Total weight—171,600 pounds; weight on drivers—133,000 pounds; cylinders—20x28 inches; drivers—80 inches; heating surface—2,917 square feet, of which 223 square feet is fire box and arch flue surface and 2,694 square feet tube surface; fuel—bituminous coal; grate area—33.6 square feet; working steam pressure—210 pounds; boiler—66 inches; tank capacity—water 5,000 gallons, coal 9½ tons.

handsome. These engines weigh 171,600 pounds, of which 133,000 pounds are on the drivers. They have 20x28-inch cylinders; 80-inch drivers; extended wagon top boilers, 66 inches in diameter, and designed to carry 210 pounds of steam; fire boxes over the frames, 121x41 inches; grate area of 33.6 square feet; and a total heating surface of 2,917 square feet, of which 223 square feet is fire box and arch flue surface, and 2,694 square feet tube surface.

THE M. C. B. DROP TEST MACHINE.

In our August issue we gave the drop test machine proposed for adoption as recommended practice by the Master Car Builders' Association. The engraving was made from the preliminary drawing submitted by the coupler committee. Since that time a revised drawing has been prepared, embodying some few changes, and giving details in much greater fullness. This final design—which is now by letter ballot vote made formally an item of the recommended practice of the association —we give on page 406. In addition to the data given on the engraving we may say that the machine rests on a brick foundation, 7 feet square at the top, 14 feet square at the bottom, and with a minimum depth of 6 feet. The top of the foundation is intended to be 30 inches below ground, and a sealed and drained pit carried up and planked over to clear the anvil ½-inch all around. The cast iron anvil carries a cast steel block, the combined weight of both being 17,500 pounds. The steel block should be heated and set in the mould and the cast iron poured around to form the anvil. The specifications for the springs used are as follows:

Spring "A"—Two Bars, O. D. 8 Inches and 5½ Inches.

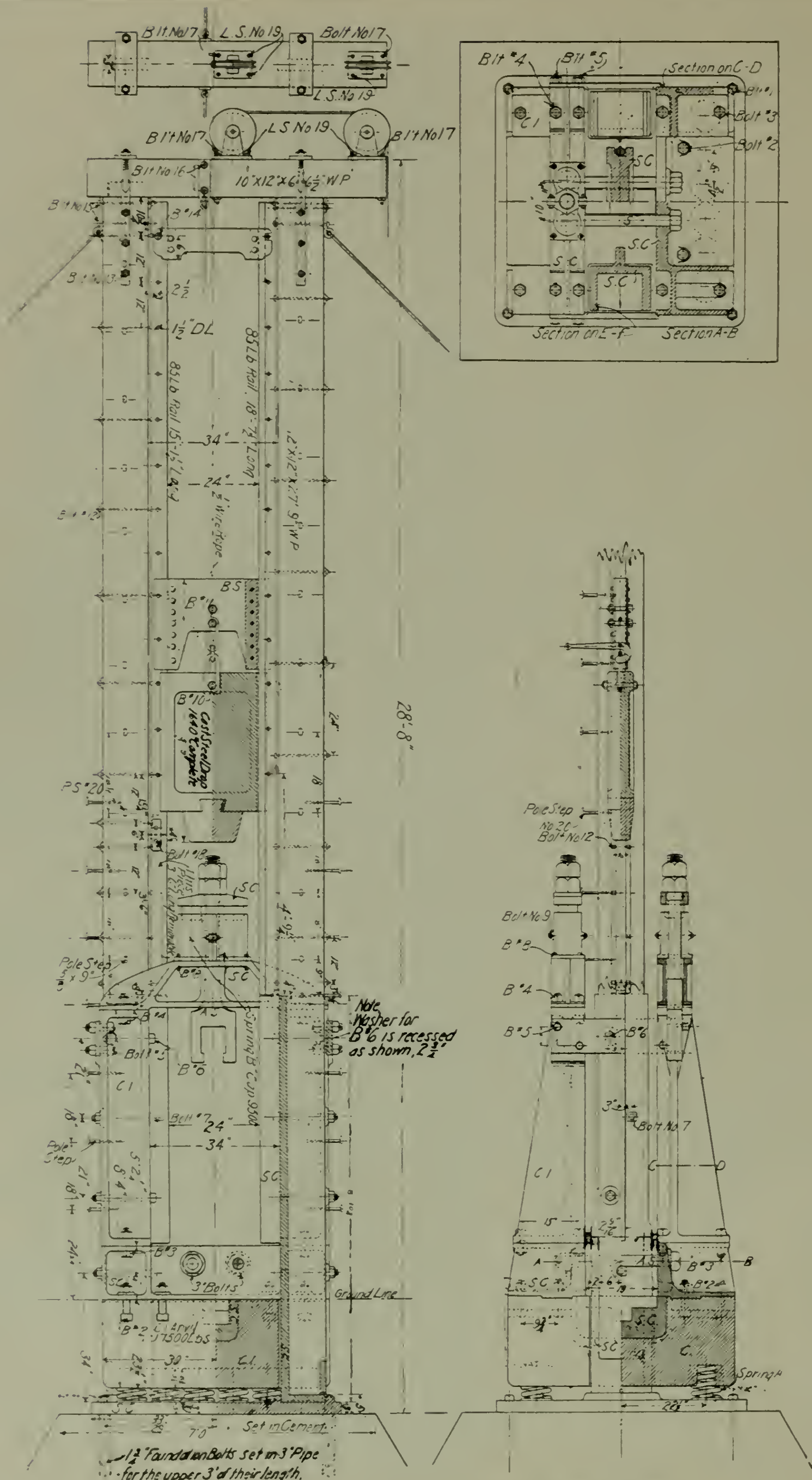
First bar—1 3-16 inches diameter, 99⅛ inches long, tapered to 109¾ inches.
Second bar—13-16 inches diameter, 99⅛ inches long, tapered to 106½ inches.
Normal weight—First bar, 31 pounds 1 ounce; second, 14 pounds 10 ounces.
Minimum weight—First bar, 30 pounds 2 ounces; second, 14 pounds 2 ounces.

Large	single coil—	Height, free, 9⅛ inches.	
"	"	"	solid, 5½ inches.
"	"	"	with 4,550 pounds, 7 inches.
"	"	Capacity, solid, 7,750 pounds.	
Small	"	Height, free, 9⅛ inches.	
"	"	"	solid, 5½ inches.
"	"	"	with 2,100 pounds, 7 inches.
"	"	Capacity, solid, 3,600 pounds.	

Capacity both springs, solid, 11,350 pounds.

Spring "B"—One Bar, O. D. 5 Inches.

98⅞ inches long, tapered to 105 inches.
Normal weight, 24 pounds 12 ounces.
Minimum weight, 24 pounds ¼ ounce.
Height, free, 10⅞ inches.
Height, solid, 8½ inches.
Height, with 6,000 pounds, 9⅜ inches.
Capacity, solid, 9,570 pounds.

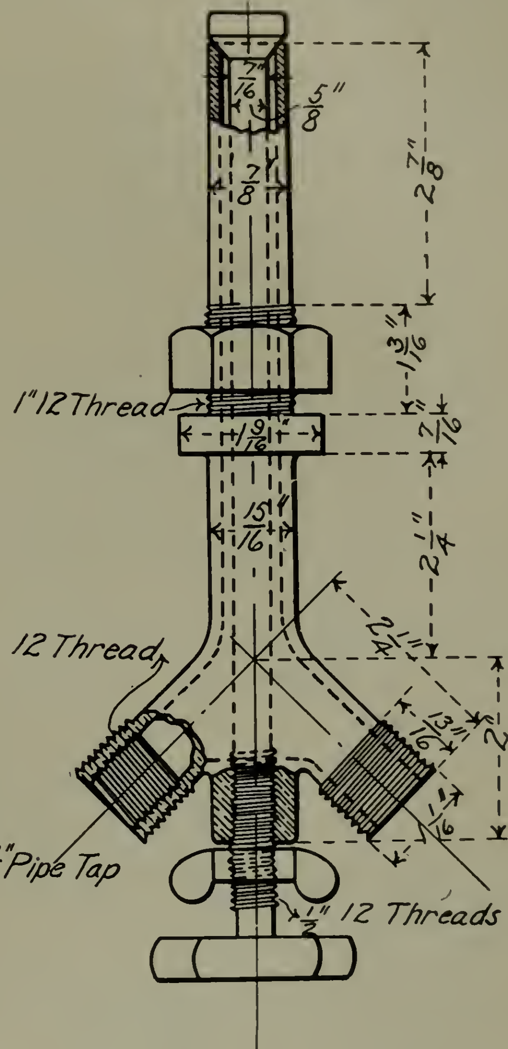


MASTER CAR BUILDERS DROP TEST MACHINE

(See page 405 for description.)

COOLING HOT JOURNALS WITH WATER.

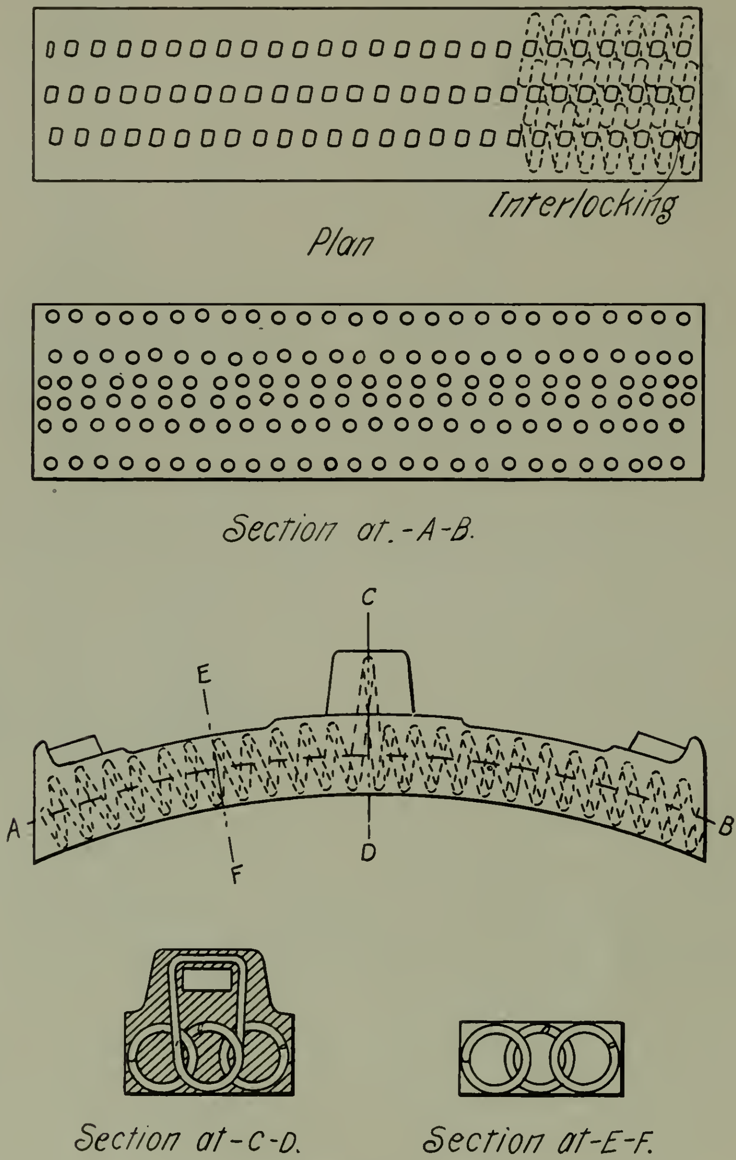
The committee on the use of water on hot bearings of engines and tenders, reporting to the recent convention of the Traveling Engineers' Association, sums up its report as follows: "From all the information at hand, as well as personal experience, your committee favors the use of water on hot bearings, and believes, if engineers are properly instructed in the use of water, and engine and tender are properly equipped, that favorable results will always be had. Your committee also believes that, where trouble has occurred from the use of water, it has always been where engineers have had no experience or proper instruction in the use of same. Your committee would recommend that engines on important runs be equipped with a ¾-inch main supply pipe with ½-inch laterals to the tops of each driving and engine truck boxes, with a globe valve for each lateral. Your committee also thinks it a good plan to use a small piece of rubber hose on the ends of the lateral pipes, as there is always danger of the wind blowing the water away from the bearing when the engine is running at a high speed. Care should be taken to



keep the tank free from dirt, in order that a free flow of water can be had at all times. Your committee submits a sketch of a Y-cock for use on the tenders, the same being originated and in use on the Chicago & North-Western Railway. We consider this a very good device—in fact, superior to anything that has come to our notice as a means of conveying water to the truck box. It has the advantage of being ready for use, and requires no wrenches, and the flow of water is very easily regulated; and it has an additional advantage of not stopping up easily; it also drains itself in cold weather, and is not liable to be frozen. Your committee strongly recommends the use of this, or a similar device."

A NEW BRAKE SHOE.

We illustrate herewith, a novel idea in brake shoe construction, the invention of Mr. John Medway, formerly of the Fitchburg Railway. Mr. Medway's patent covers the employment of inserts in the form of coils, preferably of iron or soft steel. Our illustration shows these coils



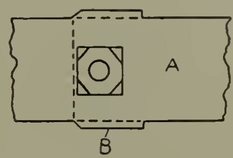
A New Brake Shoe.

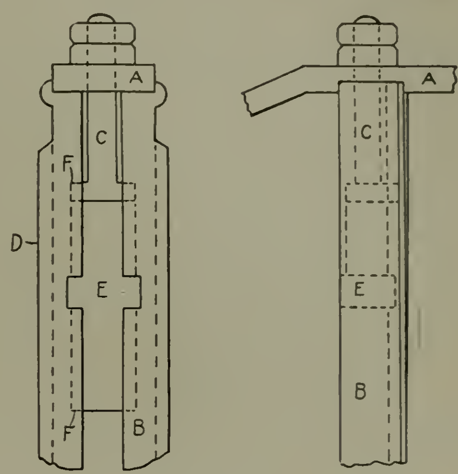
disposed longitudinally of the body of the shoe. The loop around the keyway protects the lug from breakage and consequent loss of the shoe. It will be noted, too, that the coils add strength to the body of the shoe.

The liberal distribution of soft metal over the face of the shoe insures a high co-efficient of friction. In the matter of longevity, service tests in competition with shoes noted for durability showed, we are assured, the Medway shoes to possess a decided advantage.

COLUMN BOLTS—A SUGGESTION.

A correspondent—Mr. W. de Sanno, of Kern City, Cal., sends in a suggestion as to column bolt design. He says: "Only those who have done this work know of the grief attending the removal or replacing of column bolts. Enclosed is a suggestion having in view the removal of all trouble in that line. I propose to use two short bolts in place of the one long one. You will notice the column is cored to admit inserting the bolt with the head at E, and with the body of the bolt pointing up or down, as the case may be. Fig. 1 shows the bolt in position. When inserted the bolt is pushed with its head against the shoulder F, top, or F_1, bottom. The distance from F to E is somewhat in excess of the thickness of the arch bar and two nuts. To meet any weakening effects of coring the column, it is reinforced on the line D (Fig. 1). If anyone knows why this is not an improvement over present practice, let him tell the readers of the MASTER MECHANIC."





PERSONAL MENTION.

Mr. L. R. Pomeroy, who has been for several years the eastern agent of the Cambria Steel Co. and the Latrobe Steel Co., resigned that position, November 15, to go to the Schenectady Locomotive Works. Mr. Pomeroy will, we understand, act as assistant to Mr. A. J. Pitkin, who is vice president and general manager. Mr. Pomeroy, while in the steel business for many years, has habitually been a remarkably close observer of the work of the mechanical departments of our railways, and is an associate member of the Railway Master Mechanics' Association. He is widely known as an authority in matters mechanical; and there are many men who would give a good deal to have access to his elaborate series of note books.

Mr. G. L. Potter, superintendent of motive power of the Pennsylvania Lines West of Pittsburgh, Northwest System, has been promoted to be general superintendent of motive power of Pennsylvania Lines West of Pittsburg—a newly created office. This well deserved advancement follows a continuous service with the Pennsylvania during Mr. Potter's entire business life. He first took up railway work in May, 1876, commencing as a machinist helper at the Renovo shops of the Pennsylvania Railroad. He remained there until the spring of 1882, when he came on the lines west of Pittsburg as a draftsman. He has since then in succession held the positions of assistant master mechanic, master mechanic, and superintendent of motive power, being located at Fort Wayne, Indiana. Mr. Potter's headquarters are now at Pittsburg.

Mr. R. H. Soule has resigned his position as western representative of the Baldwin Locomotive Works, to take effect November 30, with the intention of resuming railroad work.

Mr. James E. Simons has resigned as assistant master car builder of the Pittsburgh & Lake Erie Railroad to take the position of superintendent of rolling stock and machinery for the Pittsburgh Coal Company. His office will be in the Hussey Building at Pittsburg. Mr. Simons was born in Devonshire, England, in 1860, and first entered railway service in 1877 as machinist in the Nine Elms shops of the London & South Western. He was, later, a fireman on the same road. In 1881 he came to the United States and entered the car department of the Lake Shore & Michigan Southern, where he remained until 1886, when he entered the motive power department of the New York, Chicago & St. Louis. In 1888 he became joint foreman of car inspectors and repairers at Youngstown, Ohio, for the New York, Pennsylvania & Ohio and Pittsburgh & Lake Erie roads. On Feb. 16, 1891, he was appointed assistant master car builder of the Pittsburgh & Lake Erie, and has filled that post continuously until his present charge. Mr. Simons has been an active figure in railway circles, and has many friends who will wish him well in his new field of work.

Mr. W. W. Waddington, general foreman of the McKees Rocks shops of the Pittsburg & Lake Erie, has resigned to go back to the Western New York & Pennsylvania at Newcastle.

Mr. A. L. Kendall has resigned as master car builder of the Lake Shore & Michigan Southern at Englewood, Ill., to accept the position of general foreman car department of the New York Central & Hudson River at West Albany, N. Y.

Mr. A. C. Beckwith, formerly master mechanic of the Illinois Central at East St. Louis, has accepted a position with the International Correspondence Schools at Scranton, Pa.

Mr. John Cullinan has resigned as master mechanic of the Norfolk & Western at Portsmouth, Ohio, to accept a similar position with the Columbus, Sandusky & Hocking at Columbus, Ohio, vice B. S. Snyder, resigned.

Mr. E. C. Hoffman has been appointed master mechanic of the Great Northern at Breckenridge, Minn., vice Mr. J. C. Nolan, transferred.

Mr. John Player, superintendent of machinery of the Atchison, Topeka & Santa Fe proper, has been appointed superintendent of machinery of the entire Santa Fe system.

Mr. L. A. Shepard, mechanical engineer of the Philadelphia & Reading, has resigned to enter the service of the Sterlingworth Railway Supply Co. The change dates from November 1.

Mr. W. H. Sullivan has been appointed foreman of the Wabash shops and roundhouse at Peru, Ind., succeeding J. W. Brown, resigned.

Mr. Alex. Shields, master mechanic of the Southern Indiana, has resigned.

Mr. W. B. Langston has been appointed master mechanic of the Mississippi River, Hamburg & Western, with headquarters at Hamburg, Ark., vice Mr. C. J. Langston resigned.

Mr. William R. Thomas, treasurer of the Safety Car Heating & Lighting Company, died November 4 at El Paso, Tex.

Mr. D. B. Clark has resigned the management of the H. C. Frick Coke Company's car shops at Everson, Pa., to accept the management of the Pressed Steel Car Works at Ellwood City, Pa. J. F. Keighley, Philadelphia, succeeds Mr. Clark as manager of the H. C. Frick Coke Company's car shops.

Mr. Thomas Bailey, engineer of the Erie & Ashtabula division of the Pennsylvania Lines, has been promoted to be road foreman of engines.

Mr. Edward Sweeley, foreman of the car shops of the Pennsylvania Lines at Columbus, Ohio, goes to Logansport as foreman of the machine shops at that point.

Mr. Chas. Stoll, formerly of the Michigan Central, has been appointed foreman of the Toledo, St. Louis & Kansas City car department, at Toledo, to succeed Fred Braker, who has accepted a similar position with the Wheeling.

Mr. Milton Player, foreman of the Atchison, Topeka & Santa Fe roundhouse at Topeka, Kan., has resigned to accept the position of superintendent of the Atchison, Topeka & Santa Fe service of the Electric Axle Light & Power Co.

Mr. T. J. McCarthy has been appointed general foreman of the Union Pacific shops at Cheyenne, Wyo., vice J. B. Bay, resigned. Oscar Brice succeeds Mr. McCarthy as roundhouse foreman.

Mr. W. F. Heacock is now general foreman of the St. Joseph machine shops of the Kansas City, St. Joseph & Council Bluffs, the position formerly held by E. M. Crandall.

Mr. Alexander K. Cannon, general foreman of the Rio Grande Western machine shops at Salt Lake, has resigned and has been succeeded by J. E. Chisholm.

The position of traveling engineer, held by Robert Reese on the Lehigh Valley, has been abolished and the duties will be assumed by the foreman of engines.

Mr. Thomas L. Boyd, one of the oldest engineers in the service of the Lake Shore, died at Elkhart, Ind., recently. He was 70 years of age and had been connected with the Lake Shore System since 1866. Since 1896 Mr. Boyd had filled the position of assistant to the traveling engineer.

Mr. Cornelius Davis, of Florence, S. C., died November 5, aged 81 years. Mr. Davis was one of the first engineers to run a locomotive over the old South Carolina Railroad. He went to Florence in 1876, when the Coast Line shops were moved to that place from Wilmington, and up to two years ago was foreman of the machine shops.

Mr. R. H. Johnson has resigned as master mechanic of the Atlanta & West Point and Western of Alabama, to accept the position of general master mechanic of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., vice R. M. Galbraith, who has resigned to enter private business.

Mr. William Buchanan, lately superintendent of motive power and rolling stock of the New York Central, has been presented with an engrossed and illuminated copy of resolutions passed by the board of directors on his retirement from the service. The testimonial bears the signatures of Messrs. Depew, Callaway and Worcester, members of the special committee on resolutions.—*Railroad Gazette*.

Mr. J. E. White has been appointed foreman of the roundhouse and machine shops of the Louisville & Nashville at Pensacola, Fla., vice Mr. A. R. Waters, resigned. Mr. White has heretofore been foreman of the Mobile & Ohio shops at Whistler, Ala.

Mr. A. J. Dunn, foreman of the Southern Railway shops at Knoxville, Tenn., has been appointed master mechanic of the Atlanta, Knoxville & Northern, vice Mr. T. W. Newell, resigned. Mr. Dunn's headquarters are at Blue Ridge, Ga.

Mr. S. W. Simonds, formerly general engine dispatcher of the New York Central, has been promoted to be master mechanic of the Hudson River and Harlem divisions of that road.

Mr. Wm. J. Hemphill, heretofore master mechanic of the St. Louis, Peoria & Northern, has been appointed division master mechanic of the Chicago & Alton, with headquarters at Bloomington, Ill.

Mr. John King has been appointed master mechanic of the Chattanooga Southern, vice H. T. Ellison, resigned.

Mr. F. O. Walsh has been appointed master mechanic of the Atlanta & West Point, and Western, of Alabama, in charge of locomotive and car departments, with headquarters at Montgomery, Ala., vice R. H. Johnson, resigned.

Mr. W. H. Harrison, Jr., master mechanic of the Baltimore & Ohio at Newark, Ohio, has resigned.

Mr. Ira Downing, foreman in the Toledo shops of the Lake Shore & Michigan Southern, has been appointed general foreman at the same shops.

Mr. W. O. Thompson, general foreman of the Elkhart shops of the Lake Shore & Michigan Southern, has resigned to become the eastern representative of the Hancock Inspirator Company. Mr. Thompson has an unusually wide and favorable acquaintance gained through his service for several years as secretary of the Traveling Engineers' Association.

Mr. Charles R. Tunks has been appointed master car builder of the Lake Shore & Michigan Southern at Adrian, Mich., vice Mr. F. O. Bray, resigned. Mr. Tunks' jurisdiction will extend over the Detroit division, Lansing division and the Michigan division east of Sturgis and Goshen.

Mr. LeGrande Parish has been appointed master car builder of the Lake Shore & Michigan Southern at Englewood, vice Mr. A. L. Kendall, resigned. Mr. Parish's jurisdiction will extend over the western division, Kalamazoo division and the Michigan division, west of and including Goshen and Sturgis.

Mr. D. F. Crawford has been appointed superintendent of motive power of the Pennsylvania Lines west of Pittsburg, Northwest System, vice G. L. Potter, promoted. Mr. Crawford has hitherto been Mr. Potter's assistant.

Mr. G. C. Raoul has been appointed purchasing agent of the Mexican National Railroad, with headquarters at No. 6 Wall street, New York.

Mr. Thomas W. Welsh, until a few years ago superintendent of the Westinghouse Air Brake Co., died at his home in Wilmerding, Pa., recently. Mr. Welsh at one time was employed in the Pennsylvania Railroad shops at Twenty-Eighth street, Pittsburg, and later became foreman, which position he resigned to become superintendent of the Westinghouse Air Brake Co. He continued as a director of the Westinghouse Co. until the time of his death.—*Railroad Gazette.*

Mr. J. C. Fisher has been appointed master mechanic of the Southern Missouri & Arkansas, vice Mr. A. W. Quackenbush, who, as previously noted, resigned to become master mechanic of the Omaha, Kansas City & Eastern and Omaha & St. Louis.

Mr. John Preston, formerly master mechanic of the Mexican International at Puebla, Mexico, died at Amecameca, Mexico, on October 24.

Mr. A. B. Pirie has been appointed master mechanic of the Burlington & Missouri River at the Havelock shops, vice E. S. Greusel, deceased.

Mr. F. J. Kraemer has been appointed master mechanic of the Southern division of the Burlington & Missouri River, with headquarters at Wymore, Neb., vice A. B. Pirie, transferred to the Havelock shops.

Mr. T. R. Shanks has been appointed master mechanic of the Virginia & Southwestern vice Mr. John King.

Mr. Henry S. Reiley, assistant master of machinery of the Western Maryland Railroad, at Hanover, Pa., died October 20, in his fifty-second year.

Mr. M. F. Egan, Jr., died November 5 at his home in Chicago, aged 46 years. Mr Egan was in the service of the Union Pacific system for over twenty-five years and was superintendent of motive power of the Union Pacific, Denver & Gulf for some time prior to January, 1899, when he resigned on account of failing health.

The position of master mechanic of the Southern Railway at Mobile, Ala., has been abolished, and Mr. T. E. Harwell, the incumbent, has been given the title of general foreman.

Mr. Thomas B. Twombly, Sr., formerly for many years master mechanic of the Chicago, Rock Island & Pacific, died at his residence in Chicago, on October 31, aged 75 years. He was born at Dover, N. H. on January 7, 1824, and entered railway service on March 12, 1849, as machinist with the Connecticut River Railroad. He subsequently served as locomotive engineer on that road and other lines until 1856, from which date to March, 1857, he was master mechanic of the Newburyport & Georgetown. He was then for one year locomotive engineer on the Mississippi & Missouri, but returned to the Newburyport & Georgetown in February, 1858, as master mechanic, which position he resigned in 1859. From August, 1861, to July, 1867, he was foreman of the machine shops of the Mississippi & Missouri, and during the latter year was appointed master mechanic of the Chicago, Rock Island & Pacific, at Chicago. He retired a number of years ago.—*Railway Age.*

Mr. Joseph Wood, said to be the oldest locomotive engineer in the United States, died October 18 at Red Bank, N. J., aged 90 years. Mr. Wood was born in Bordentown, and at the age of 17 got employment on the steamboat "Superior," which plied on the Delaware, between Philadelphia and Bordentown. He was wood passer on the trial trip of the famous "John Bull" locomotive, which was shipped from England to America in 1831. Subsequently he was engineer on the Camden & Amboy Railroad, and afterward master mechanic of the Raritan & Delaware Bay Railroad. From 1841 to 1859 he was engineer for the New Jersey Transportation Company. During the civil war he was employed by the government as superintendent of water supply for engines from Alexandria south. After he quit railroading he turned his mind to inventions, and brought out a number of appliances now in general use on railways. He leaves two sons—James, of Jersey City, and John, of New York, both of whom are locomotive engineers.

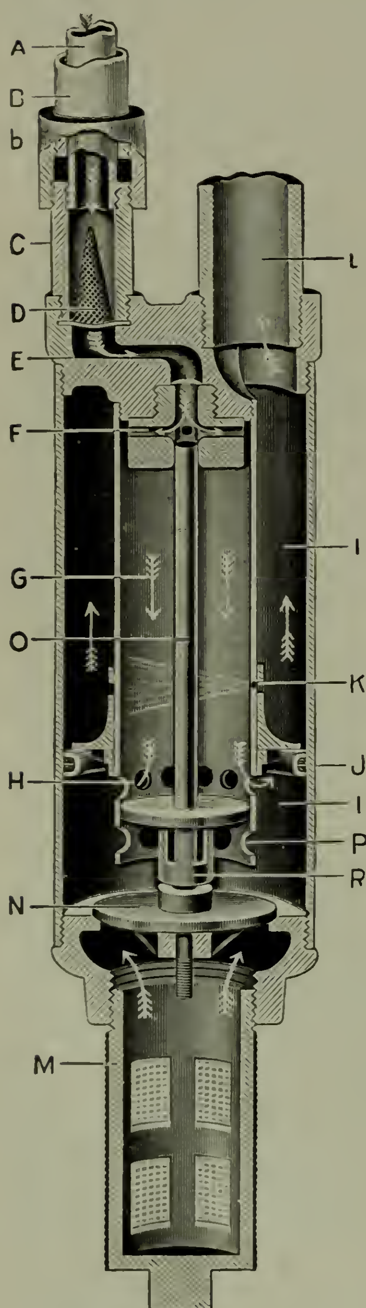
Mr. R. M. Galbraith, general master mechanic of the St. Louis Southwestern, has resigned and will enter private business. Mr. Galbraith was born Sept. 1, 1844, at Chester, England. He entered railway service in 1858, as machinist apprentice on the Terre Haute, Alton & St. Louis Railroad, at Litchfield, Ill., since which he has been, consecutively, 1862 to 1864, machinist in various railroad shops, and fireman on the Chicago & Alton Railroad; 1864, machinist and engineer on the United States Military Railroad until the close of the war; 1866 to 1868, machinist and engineer on the Union Pacific Railway; 1868 to 1874, foreman of shops of the same road; 1874 to 1882, division master mechanic of the same road; 1882 to 1888, in mercantile business; 1890, master mechanic of the St. Louis, Arkansas & Texas Railroad in Texas; and after the reorganization of that road as the St. Louis Southwestern Railway, in 1891, general master mechanic, which position he has continuously held until now. Mr. Galbraith's retirement to private life will be regretted by a wide circle of railway friends.

THE ERWIN STEAM RAM.

Out across the country, where power is unreliable, and windmill power is always more or less so, the problem of keeping tanks well supplied with water has had to be solved by means which are frequently anything but satisfactory. Recently, however, some of the railways have been using the Erwin pumping systems with results that are very gratifying, not merely on account of the liberal, constant water supply they give, but because the systems are, in themselves, practical, reliable and inexpensive, and because they give these results regardless of natural conditions, provided there is a vein of water within tapping distance.

The Erwin pumping system consists of a Triumph steam boiler and an Erwin steam ram, both of which are made by James B. Clow & Sons, of Chicago. The ram is a comparatively new device, and in some respects unique. On account of its compactness and small diameter, it can be suspended by its steam and water pipes below the surface of the water in a tubular well, or any kind of a well. It can be placed in a cistern, or can be so set as to pump directly from a lake or stream. Its advantages in operation are that it requires no oil, no packing, no attention; the amount of friction is slight, and water is raised with economy in the use of steam. The ram is made of brass, with steam metal bearings. The strainer is of malleable iron, with brass screen.

When the ram is at work, water is elevated by the alternate action of steam and atmospheric pressure. The steam, having first driven the water from the ram, is instantaneously condensed and a vacuum is formed. A volume of water is then driven into the ram by atmospheric pressure, and not only fills the vacuum chamber, but a large proportion passes on through the ram and into its discharge pipe. The steam and air thus co-act to make the discharge of water continuous. To the facts that a good portion of the work is done by the atmosphere, and that friction is almost entirely eliminated, the high efficiency of the ram is largely due.



The Erwin Steam Ram.

The ram is placed beneath the surface of the water in the well or other source of supply, and, before starting, water flows into it by gravity. When steam is turned on, it passes through the steam pipe A (see sectional view), nipple C, conical screen D, the main steam port E and radial steam ports F into the cylinder G. The water is then forced downward through the openings H into the surrounding discharge chamber I, whence it passes through the annular check valve J and out of the discharge pipe L.

When the steam reaches the lower end of the cylinder G, it is exhausted through the large openings H much faster than it is admitted through the steam ports F, is condensed in the surrounding discharge chamber I, and a partial vacuum is formed within the cylinder G. The vacuum is made more complete by a spray of water which then rushes inward from the discharge chamber I through the small opening K.

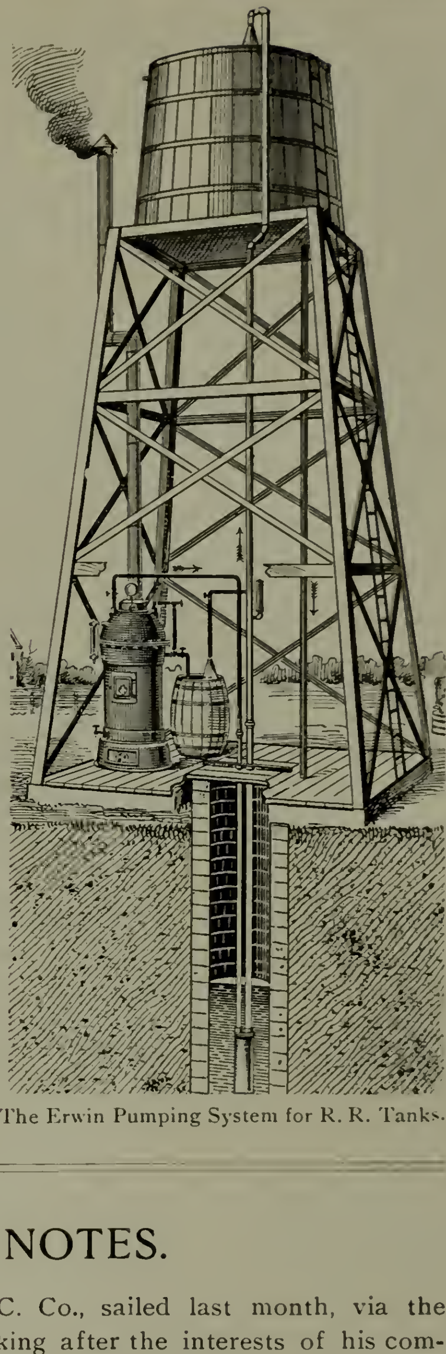
The instant a vacuum is created and condensation occurs, the pressure of the atmosphere on the water outside of the ram forces water upward through the bottom strainer M. The main check valve N then rises, and the valve rod O which is rigidly attached to it, shuts off the steam at the upper end of the cylinder. A volume of water under atmospheric pressure is at the same time forced upward through the discharge chamber and out through the discharge pipe. A portion of this water, however, passes through the openings P, forces up the float R, which moves freely on the valve rod O, and refills the cylinder.

The water under atmospheric pressure having then lost in momentum, the steam, acting downward on the valve rod, closes the main check valve, and, through pressure exerted on the float, again forces water out of the cylinder and through the discharge chamber and discharge pipe.

A covering pipe B surrounds the steam pipe for the distance it is submerged beneath water, to prevent condensation, and is received into the coupling b.

By connecting the discharge pipes of two single rams, a double ram, of twice the capacity of a single one, is formed. Each of the rams forming the combination has a separate steam pipe, but the discharge pipe is common to both. While they work in unison in forcing water, either one can be shut down, by turning off its steam valve, without stopping the other. In addition to doubling the capacity, therefore, the double ram renders a constant supply certain, in which respect it differs from the ordinary duplex pump, in which one cylinder at a time only forces water, and in which, if any part should give out, both cylinders would be rendered inoperative.

The practical applications for such a device as the Erwin ram are almost unlimited wherever the elevation of water is desired. We note that it is used not only for railway work, but also for irrigation and mining purposes, for steamboats, hotels, private residences, villages, etc. The illustration herewith shows one of the pumping systems, as it is frequently set up for railway work and for irrigation and farm purposes. Thus used, the boiler may be set within the base of the tower supporting the tank. After being pumped into the tank, the water may be used directly from it, or distributed from it, through pipes, to desirable points for use. The Erwin ram is in use on the Chicago & Northwestern, the Grand Rapids & Indiana, the Atchison, Topeka & Santa Fe and other roads.


The Erwin Pumping System for R. R. Tanks.

SUPPLY TRADE NOTES.

Mr. E. W. Hodgkins, representing the Q. & C. Co., sailed last month, via the Umbria, for an extended trip through Europe, looking after the interests of his company. Mr. J. K. Lencke, who has been abroad since January 1, has been recalled, and is no longer in the employ of the company.

The Kinsman Block System Co. has been organized to equip railroads with the block system developed by Mr. F. E. Kinsman, which makes the running of two trains in the same block practically impossible and, where fully applied, removes head and tail end collisions from the list of possible railway accidents. This system was brought to the attention of the railroads some years ago and attracted much careful attention. A period of litigation has recently ended and the system, with some important improvements, is now to be intelligently presented for approval and adoption. The officers of the new company are: F. E. Kinsman, president and general manager; Arthur H Colby, secretary, and Bertram Sears, treasurer. The offices of the company are in the Havemeyer Building, New York City.

Announcement is made of the organization of the New York Air Compressor Company under the laws of the state of New Jersey. The capital stock of the company is $100,000, and a complete foundry and machine shop plant has been purchased on the line of the New York & Greenwood Lake Railroad, at Arlington, N. J. Contracts have already been let for a full modern equipment of tools. It is intended to manufacture a complete line of air-compressing machinery at the new plant. The officers of the company are: J. W. Duntley, president; Alexander MacKay, vice president; W. P. Pressinger, secretary and treasurer. The directors are: J. W. Duntley, Alexander MacKay, W. P. Pressinger, William B. Albright, W. O. Duntley, Thomas Aldcorn and Austin E. Pressinger. The New York offices of the company are at 120 Liberty street.

A. O. Norton, Boston, Mass., manufacturer of ball bearing lifting jacks, has added additional special new machinery to his already well-equipped plant, to keep up with the increasing demand for his product. He reports several large export orders received this month.

Mr. William R. Thomas, the treasurer of the Safety Coke Heating & Lighting Company, died at El Paso, Tex., on November 4.

The Harrison Dust Guard Company of Toledo, Ohio, have delivered large orders to the Chicago, Rock Island & Pacific, Illinois Central, Michigan Central, Southern, Lake Shore & Michigan Southern, Toledo, St. Louis & Kansas City, Chicago & West Michigan, Seaboard Air Line, Wheeling & Lake Erie; Thornton N. Motley, New York; American Car & Foundry Company, and the Pressed Steel Car Company.

The Gold Car Heating Co., of New York City, has received a contract for several hundred electric car heaters for the Glasgow tramways.

The Ajax Metal Company, of Philadelphia, is adding to its testing department a fine testing machine, and in future will not only be able to make the analytical and microscopic examinations, but physical tests of friction, wearing and compressive qualities. It is proposed to make practical tests of bearing metals, oil and waste. These determinations will be published as they progress, using standards of all material in comparison, taking those that are largely used in the service; and those that are not, but should be. J. G. Hendrickson, the president, is familiar with the lubricating qualities of oils, having been connected with the Standard Oil Company before engaging in the metal business.

New shops and additions to shops are reported by our exchanges during the past month as follows: The Pressed Steel Car Co. will erect additional shops at its Woods Run plant, at a cost of about $200,000.—The Chicago, St. Paul, Minneapolis & Omaha will make extensive improvements in its shops at Sioux City, practically rebuilding them —The Pullman Palace Car Co. is figuring on building a repair shop in Denver.—The Southern Pacific will build roundhouses at Salinas, Cal.—The Brill Car Co. will build at West Philadelphia an extension to its car shops that will be 45 feet long, of brick and iron, one story, with slate roof, iron framework, electric wiring, etc.—The Baldwin Locomotive Works is asking plans and estimates for a six-story brick and iron building, 207 feet front on Broad street and 75 feet deep on Pennsylvania avenue and Hamilton street.—Swift & Co. are reported to be about to enlarge their Chicago shops so that about 10 cars a week can be turned out there.—The Minneapolis, St. Paul & Ashland will build a roundhouse and machine shops at Ashland, Wis.—The Ottawa & New York is building a $5,000 roundhouse at Hurdman's bridge, which it will use jointly with the Canadian Pacific.—The Canada Atlantic is erecting another addition to its workshops in Ottawa East, Ont. The new building will be 100 feet in length.—The Lehigh Valley has made additions to its shops at Sayre, Pa.; a new paint shop, with a capacity for 36 coaches, and a new blacksmith shop have been added, also a new freight car repair shop and planing mill. The former freight car repair shop will be used for passenger car work, and the building formerly occupied by the blacksmiths will be used for upholstering, brass cleaning and other work connected with passenger car repairs.—The Union Pacific is to build a roundhouse at Plainville, Kan.—The Southern shops at Augusta, Ga., are, it is reported, to be removed from Reynolds street, in that city, to Deadfall, a point about one mile from the city.—The Baltimore & Ohio is removing the old roundhouse, erected in 1849 in what is now the heart of the city of Cumberland, Md., and will, according to reports, erect repair shops on the site.—The Cleveland, Cincinnati, Chicago & St. Louis has let contracts for the construction of a 10-stall roundhouse, with machine shop annex, at Anderson, Ind.—John M. Cranor, of Daleville, Ind., has the contract for building the roundhouse of the Chicago & Southeastern at Muncie, Ind.—The Chateaugay Railroad has decided to convert an old foundry building in Plattsburg, N. Y., into a car shop. The work is in operation and the company is now turning out charcoal cars.—The Chicago & Southeastern will move its shops from Lebanon, Ind., to Muncie, Ind.—The Pennsylvania Company is building, at Ft. Wayne, an electric power station which, it is said, will be a model. The company has just completed coal bins at that point.—The Wabash will rebuild its Ft. Wayne shops which were destroyed by fire recently.

PNEUMATIC TOOL LITIGATION.

Important Victory for The Chicago Pneumatic Tool Company and the Boyer Pneumatic Tools.

The Chicago Pneumatic Tool Company, manufacturer of the well known Boyer pneumatic tools, scored an important victory recently in its patent litigation with the American Pneumatic Tool Company of New York. Between three and four years ago the American Company brought suit at New Haven, Connecticut, against a concern which was using one of the Boyer tools and succeeded in obtaining a preliminary injunction on the strength of an old decision it had obtained sustaining its patent in a prior suit which had not been strongly defended. Upon obtaining this preliminary injunction the American Company sent every concern using Boyer tools a notice of infringement, in which it claimed some $2,000,000 damages against the users of Boyer tools. The Boyer people promptly took an appeal from the preliminary injunction order, and the order was reversed by the Court of Appeals at New York City. This was about three years ago, since which time the suit has been progressing toward a final hearing on its merits. It was argued at great length before Judge Townsend, in the United States Court at New Haven, last June, and has been held under advisement by the court until now, when Judge Townsend hands down an exhaustive opinion, holding with the Boyer people on every point and declaring that the Boyer tools did not infringe the American Company's patent. The court also took occasion, in its opinion, to condemn the conduct of the complainant company, in sending out the circulars above referred to for the purpose of scaring and intimidating purchasers of the Boyer tools.

During the years this litigation has been pending, numerous competitors of the Boyer tools have sprung up, many of which are closely copied after the Boyer tools and are claimed by the Boyer people to be infringements of the Boyer patents. Having successfully defended themselves against the attacks upon their tools, the Boyer people now propose to turn their attention to infringements of their own patents. The Chicago Pneumatic Tool Company having been the pioneer in introducing pneumatic tools into railroad shops and metal working fields generally, and its Boyer tools having been the first successful tools for this work, is determined to protect the large business it has built up, and announces its intention of vigorously prosecuting in the future all imitations of its Boyer tools and infringements of its patents.

RINEHART'S INDIAN PICTURES: In the summer of 1898, the Government Indian Bureau invited all tribes of Indians in this country to send delegates to an Indian congress, and they gathered from far and near with their ponies, and tepees, and gaudiest trappings, in the Exposition grounds at Omaha. Never before had there been, and never again will there be, such a gathering. There were about five hundred of them, some partly civilized, but the greater portion picturesque in original savagery. Strange as it may seem at this late day, many of the Indians declared that before coming to Omaha they had no idea what multitudes of white men there were, or how hopeless it was to try to stand against them. This was probably the last time that so complete and spectacular a view of the North American Indian will be possible, and those who had the privilege of witnessing it are to be counted fortunate. At the time of the Indian congress, a prominent photographer obtained permission to take the photographs of the most noted chiefs present, and succeeded in obtaining a collection which never will be equaled. Mr. Rinehart, the photographer, copyrighted all these pictures, and placed in a few art stores some hand-colored proofs, which, notwithstanding their high price, sold at once, and these Indian pictures have become the fad of the year. The Chicago Great Western Railway has succeeded, at large expense, in obtaining from Mr. Rinehart the privilege of reproducing the best four of these pictures, Chiefs "Wolf Robe," "Louison," "Hollow Horn Bear" and "Hattie Tom," and has incorporated them in an art calendar for 1900, which is pronounced the most artistic production yet attempted. The heads are 6x8 inches, on one sheet, wonderfully reproduced in all their original colors, and when framed make most striking and effective pictures, particularly suited for holiday gifts. Owing to the expense, but a very small edition has been issued. They will be sent, however, while the supply lasts, to any person sending 25 cents in stamps or silver, to cover the royalty charges and the expense of packing and mailing, to F. H. Lord, general passenger and ticket agent, 113 Adams street, Chicago.

WANTED—At moderate salary and commission, position as salesman for established supply house, by gentleman with extensive experience in railway business, and in the sale of railway supplies. Highest references. Address "C," care of the RAILWAY MASTER MECHANIC.

WANTED—DRAFTSMAN—A man with a technical education and some experience in car and locomotive work. Address Y. M., care of Railway Master Mechanic.

A POSITION is sought by a thoroughly competent mechanical man, who is experienced in directing work in a railway shop and in manufacturing establishments. Particularly well up in car work. Now occupies a responsible position, but is desirous of making a change. Address, in confidence, the editor of the Railway Master Mechanic.

SITUATION WANTED—As Chief Clerk Motive Power Department or in similar capacity. Have had 15 years' experience in practical mechanical work and in administrative duties. Have a thorough knowledge of all classes of equipment in detail. Have had extended experience in the organization of forces and discipline of same. Can offer endorsements and recommendations by many high railway offiicials and others more or less intimately connected with railway affairs. Address "Charles," care Railway Master Mechanic.

A FOREMAN BLACKSMITH desires a position in charge of railway blacksmith shop. Is thoroughly up to date in shop methods and well accustomed to handling men. Best of references can be furnished. Address A. J., care of Railway Master Mechanic.

SITUATION WANTED—By a capable general foreman of locomotive repairs. Perfectly satisfactory reasons for leaving present position. Address G. F., care of Railway Master Mechanic.