

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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American Association Headquarters Situation Is Well in Hand

THERE is no reason for discouragement in the mix-up in the finances of the American Electric Railway Association disclosed by the audit of the treasurer's books now under way. While this is disconcerting for the moment, the association and the industry will benefit ultimately, due to the thorough analysis of operating methods which will at once be undertaken. The association work has expanded enormously within a few years and demands upon it have increased by leaps and bounds. The membership has responded generously with funds, but the work to be done grew faster than the machinery for doing it. This condition will be remedied. In the meanwhile, the essential activities will go on unhampered. The industry is behind President Gadsden and his colleagues to a man. If funds run low for a time, provisions will be made to finance the work. The association is recognized as vital to the industry. The present losses, while intrinsically large, are comparatively insignificant. Close ranks! Forward, march!

The Metamorphosis of the Electric Railway Shop

THERE is no question but that the maintenance shops connected with electric railway properties are undergoing a gradual but very noticeable evolution. This fact has been particularly impressed upon the men responsible for the preparation of this annual maintenance issue of the *ELECTRIC RAILWAY JOURNAL*.

The changes which have been brought about are due to many causes, not the least of which is the improved quality of equipment supplied by manufacturers. While it is true that some of the older equipment has made wonderful records for durability, the new equipment is superior in most characteristics. Take, for example, the motor. In this case the designers, by reducing weight, increasing overload capacity, eliminating sparking, etc., have put the modern motor in a class quite distinct from that of its predecessor. The manufacturers deserve credit for this achievement, although they have undoubtedly been influenced by complaints and constructive suggestions from their customers. Along with better motors have gone also better car bodies, trucks, controllers, heaters and the hundred and one details which go to make up a complete car.

The master mechanic comes in for a large share of the praise for improved shop practices in that he has recognized the opportunities afforded by new developments. For instance, he now dips and bakes armatures and field coils, where he did not deem this necessary or practicable some years ago. In one case at least he is dipping and baking the entire motor shells with field coils in place. Possibly in addition he is using an impregnating outfit in connection with his insulation program. He is slotting his commutators also, and he is certainly using better tools and adapting the tools to the work more skillfully than ever before.

As to reclamation work, the very mention of the term is enough to arouse enthusiasm. The possibilities of electric, gas and thermit welding and of gas and electric cutting are limitless. The reclamation department now has its established place, just like the forge shop, the wood mill or the paint shop. The writer visited one shop recently in which the welding, blacksmith and sheet-metal shop are combined in the reclamation department with an expert in charge, the work of these shops being so inter-related in modern maintenance work as to make this combination the most desirable administrative arrangement.

No Steam Railway Supply Exhibit at Atlantic City This Year

THE executive committee of the Railway Supply Manufacturers' Association has announced that the usual exhibit will not be held in connection with the annual convention of the mechanical section of the American Railway Association at Atlantic City in June. Such action has precedent, for during the war period the convention, exhibit and all, was suspended for patriotic reasons. Now the condition of the railroads and of the attendant supply business is such that regardless of the loss which the omission entails a drastic procedure is considered justified. The exhibit will be greatly missed, although the omission is no doubt warranted under present conditions. It seemed like old times during the past two years to hear the merry hum of wheels and the buzz of cheerful discussion on the pier at Atlantic City, presaging better times for the railroad business. The convention of the railroad men will now be a comparatively quiet affair. While the technical sessions and social affairs will be well worth while, they cannot but be adversely affected due to the absence of the exhibit "fans."

Electric railway men will naturally ask themselves whether this action of the railroad men will or should affect their own plans for the fall convention. It need not do so unless they are looking for a precedent for omitting exhibits. The manufacturing concerns in this field are to a certain extent the same as those making the decision to omit the June exhibit. However, the situation in the electric is different from that in the steam railway field, and in some phases it is better. Fares are rising and expenses receding slightly, and forward-looking transportation men feel sure that the trough of the wave of depression has been passed.

Under the present organization of the American Association, it is the railway men who decide the matter of exhibits, while the reverse is at least nominally true in the steam railway field. But obviously the exhibits would be a fizzle unless a large number of supply men co-operated. At the same time the railway men would not wish to exert undue pressure on the manufacturers to spend money unprofitably on the convention. It is to be hoped, however, that the plans for the American Electric Railway Association convention can be carried

out. Possibly the supply men can afford one exhibit this year, and fortunately the supplies required for the October convention are much less expensive to exhibit than those which are usually gathered together for the inspection of the steam railroad men in June.

Paying for Work Done, Not Time Put In

SEVERAL reasons stand out as contributing conspicuously to the success attained in the shops in Milwaukee with a premium system of pay, which is treated in the article by J. H. Lucas elsewhere in this issue. They are considered worth this special summary:

Great pains are taken in setting up the standard time allowance on a particular job and then this standard rate is never changed. Extra pay is commonly earned, and it is received promptly with the semi-monthly pay. The check-up on the man who fails to equal the standard time brings to light any unfair condition and acts as a spur to the poor workman. The workmen like the system, because if they have skill it brings them immediate recognition, and as their confidence in the system has been gained, they are not afraid to display it. The possibility of poor workmanship because of too much speed is eliminated by a thorough inspection system. The amount of record-keeping by the workman is very small, as is also that of the clerical help required to handle the record system in the head office. The foreman is rewarded in proportion to the amount of work he gets done on a premium basis, so that he is interested in extending the plan. He does not profit from any excess earnings of the men, nor does he profit from standard rates set too low. The rate is subject to his approval and he is interested in having this rate perfectly fair.

After six years of experience in the Milwaukee shops, Mr. Lucas' views of the general worth of some such system of rewarding labor in proportion to the work done are of unusual value. In discussing the subject in a broad way with the writer, he made this significant remark: "Let the electric railways install the Taylor system, piecework, profit-sharing or whatever they will, just so they get away from the hopelessly degrading influence of the plan of flat hourly pay for labor regardless of the individual capability, which unionism has succeeded in forcing so far forward in the last few years."

Seemingly, there never was a time more propitious than the present for the introduction or revival of efficiency methods. Managements are seeking for economy and labor is in a mood to receive with favor any scheme that will assist in retaining the present earning ability. Wages cannot be cut without calling immediate attention to the reduction of rates of fare, but there is a possibility of reducing costs through better efficiency and thus recoup past low earnings for a while. And anyway, far-seeing managements are not anxious to reduce the earnings of their employees if they can find a way to justify the present high labor expenditures, for there is a very direct economic advantage to a company in having employees who earn high wages.

During the last few years wages have increased to double and treble what they were before the war, and yet in many instances the output has been cut in two. We recall one instance where unionism forced a change in a large shop from an extensive use of piecework to the flat hourly pay basis, with the result that the total earnings of many of the employees were substantially

reduced and the maintenance costs of the company were increased on the average 75 per cent, and on some work as much as 200 per cent. It should be said in this connection that the unionization of the shop is understood to have been largely a matter of coercion, for 85 per cent of the men did not want the change.

In Milwaukee the premium system proved to be the most valuable bulwark against this cutting of production. The standard rate held firm, and while the amount of non-premium work increased during the time of inefficient labor, the company had the records and knew whom it was best to lay off when the time for retrenchment came.

Too many of the "old timers" in our business are afraid of "efficiency" or the "efficiency engineer." But the results of a common-sense study of the work done in any shop, looking toward a systematic and organized routine, will bring to light so many possible economies, so many existing inaccuracies and wastes, that the saving will probably be startling. Altogether, we feel that Mr. Lucas' estimate of 25 per cent as the saving realized by the company is a very modest claim. And with such possibilities in sight, present business conditions make this an excellent time to go after better labor efficiency in the shop and elsewhere.

How Can Maintenance Costs Be Reduced?

JUST now electric railways are facing the problem of maintaining their equipment with little money. An easy way of offsetting the decreased revenues is by making drastic reductions in maintenance expenditures. Shop forces all over this country are engaged in patching up the various parts of equipment in order to make them last a little longer, and the need for additional rolling-stock is being met by rebuilding obsolete cars. All realize that this is but a temporary expedient and that efficiency and ultimate economy are being sacrificed, but the reduction of maintenance expenses is absolutely necessary for most roads just now. Some of the means by which maintenance expenses can be reduced on a sane basis are by doing away with waste labor and by increasing the present output of the shop equipment available. Waste labor is due to lack of proper supervision and looseness of organization. To obtain the best results, maintenance work must be planned systematically. There must be closer supervision of the workmen and of the materials used, and attention must be given to the proper distribution of the limited material and supplies available so as to bring about the most efficient results. Another factor tending to produce this looseness of organization is the uncertainty as to just what should be undertaken in the year's program. Only through a general supervision, so that all departments can be made to co-operate closely, can the greatest economy be obtained.

For the moment, the installation of new and efficient machinery seems out of the question on most roads, but the present shop equipment should be made to serve its purpose more effectively. One method by which machinery output can be increased with the present equipment is by the application and use of time-saving jigs and fixtures. A detailed study of the individual jobs will show what operation is consuming the most time. In many cases a little ingenuity will suggest some simple jig or fixture which will materially reduce the time and thus produce a substantial saving. Present shop effi-

ciency on a man-hour basis is entirely too low, and the present reductions in shop forces make it all the more important to increase by every possible degree the morale of the men. Men who show the proper interest in their work should be advanced consistently, and they will be found to work more earnestly and enthusiastically. A careful consideration of such questions as these will undoubtedly provide for getting better and more service from all the important factors, men and machinery.

The Present Trend of Way Department Affairs

WHILE the activities of way departments were restricted during 1920 there was a distinct improvement in them over 1919. There was a 25 per cent increase in amount of new track built and the amount of track rebuilt did not fall below that for 1919. There is encouragement in these facts, particularly in view of the continuation of the high prices for rails and other construction materials which prevailed during 1920. It would not have been surprising if the track activities had fallen below 1919; but actually they more than held their own.

Prices are now on the decline, due mainly to the reduction in labor cost which has been gathering force in all lines of endeavor. Much more favorable conditions are found in the track labor market and some companies have cut this item by 20 per cent. The signs point to even greater reductions. Meanwhile the track payrolls are at a minimum just now and no maintenance work other than that of the most urgent nature is being carried on.

With the decline in costs for labor and material will come an enlarged opportunity for expenditure on track projects which are urgently demanded by the deferred maintenance which has been piling up. Combined with the betterment of fare conditions which is gradually making headway, the reductions in costs should lead to greatly extended track programs and the year 1921 promises to be one of increased activities in the way department.

A greater amount of attention was paid last year to the fact that tracks may often be overhauled and put in serviceable condition to cover a period of five years or more at a reasonable cost and without complete reconstruction. The answer to the question, When is a track worn out? has been sought carefully and some surprising results have followed. This paper has recently published several articles describing methods of rehabilitation of apparently wornout tracks and an inspection of some of the jobs described leads to the conclusion that a careful study of the economics of track life on any property will tend to convince engineers of the unwisdom of considering tracks as worn out and needing complete renewal until every angle of investigation and computation has been exhausted.

The extent to which the arc welder and rail grinder have been used in prolonging the life of tracks and special trackwork has been constantly observed during

the past year. These two pieces of apparatus may lay claim, unchallenged, to pre-eminence as labor and expense-saving devices. Meanwhile there have been several developments in labor-saving devices which indicate that the end is not yet in sight and that way engineers are still capable of reducing costs. The motorization of the way department is on the increase. Cumbersome, time-consuming work cars and horse-drawn vehicles are being replaced by suitable motor trucks. By means of these, costs for handling materials are being greatly reduced and work is speeded up owing to the more frequent service obtained. A particular development along this line is the motor truck carrying a crane for handling heavy material.

An increasing tendency toward the use of substitute ties for tracks in streets has been noted and there is no doubt but that there is a field for them. However, there is a current of opinion prevailing which suggests that track engineers should investigate the design of such ties more carefully with the view toward determining results obtained from existing designs and attempting to guide the design along proper channels in accord with good engineering principles.

An Important Job—That of the Equipment Engineer

ON AN increasing number of electric railway properties a functionary who is proving himself a money saver is the equipment engineer. He differs from the master mechanic in that, in general, he has no routine duties of an administrative nature, and preferably he is a man who has had both theoretical and practical training. His function is to solve equipment problems of a technical character, and he has for his principal duty that of locating opportunities for savings. Another thing that he can do is to work up in economical and practical form the suggestions which the master mechanic, the foremen and the skilled workmen make to him from time to time.

Every practical man on a railway property knows that there are wastes going on around him. Even practices which are not actually wasteful are susceptible of improvement. But to know that there are chances for saving is one thing and to realize on these opportunities is another. It requires more time for the latter than is usually available unless some one is detailed for the purpose and relieved of other responsibility. A first-class man at this task ought, on a property of average size, to earn his salary many times over each year.

There are, of course, many small properties where an equipment engineer is out of reach, or seems so. Then some one else must perform his functions. The master mechanic must do double duty, without, however, letting one part of his work interfere with the other. Care in this respect is needed, for the state of mind required for solving technical problems is quite different from that required for "running" the shop. It is better to have a separate man for the purpose, if possible, even if supereconomies have to be practiced elsewhere to accomplish this.

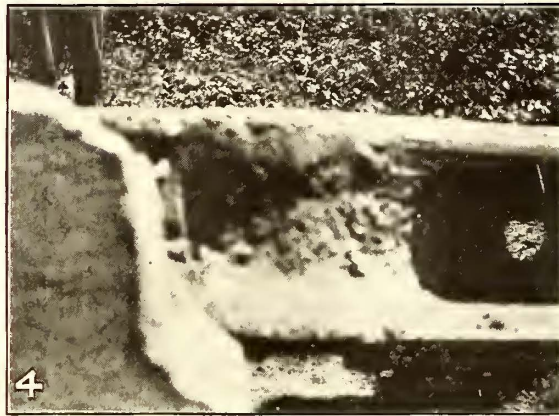
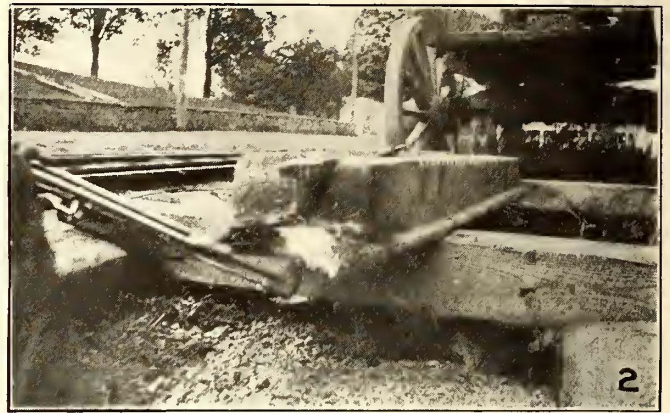
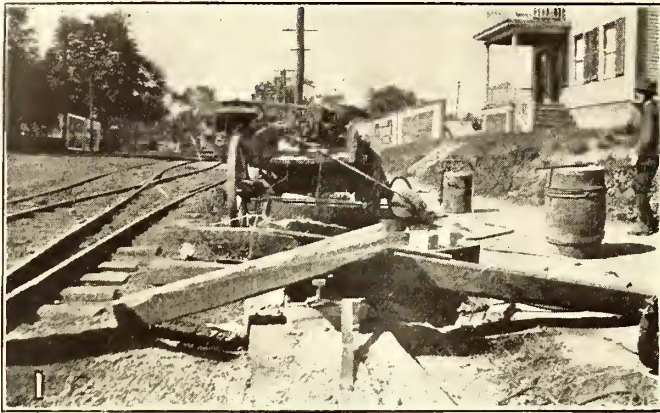
Quotation from the Federal Electric Railways Commission Report

No. 12

THE labor policies of the electric street railways will in the future be of great importance as an element in the restoration and the permanent maintenance of their credit. The full co-operation of labor is essential to the highest prosperity and usefulness of the industry. This is particularly true because in the case of the street railways the employees who immediately handle the service come into direct contact with the people who consume that service.

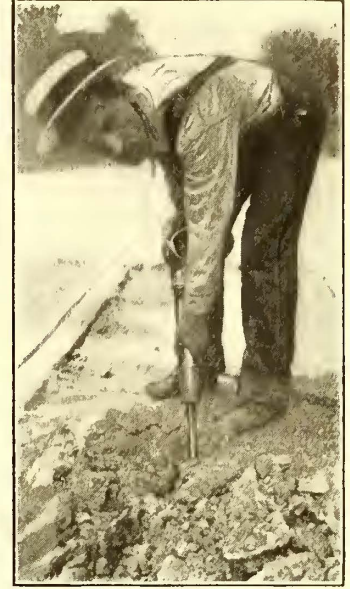
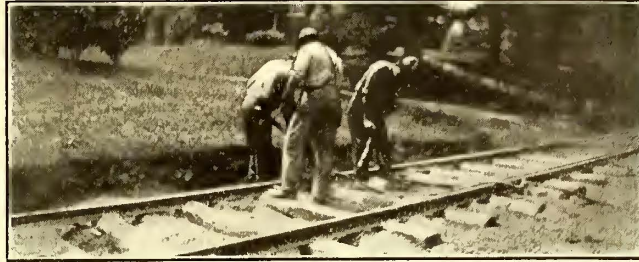
Much can also be done toward reduction in the cost of operation by developing the proper spirit of co-operation with employees.

Welding Has Proved a Life Saver for Small Electric Roads



1—Set-up for thermit weld.
 2—Cutting cast iron with oxyacetylene to prepare for mold.
 3—The reaction taking place.
 4—Completed weld before cleaning.

5—Repair to crossing by arc welding.
 6—Dynamotor type arc-welding machine.
 7—Seam-welded joint on 7-in. groove girder rail.
 8—Reciprocating rail grinder.



Track Labor Savers for Small Railway

BY A. J. STRATTON

Superintendent Maintenance of Way Eastern Pennsylvania
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The Application of Labor-Saving Tools and Track Machinery on Small as Well as Large Systems Has Produced Far-Reaching Economies—Also, Tools Will Not Continue to Operate Without Proper Inspection and Maintenance

THE electric railway industry has during the past five years undergone a great shaking up. Economies have been effected that formerly seemed impossible. Materials and labor reached undreamed-of price levels. The acute shortage of both commodities directed the attention of railway executives to means of conserving material and multiplying the efforts of labor. In the province of the track and roadway department the shortage was acutely felt. Tracks that would in times past have been reconstructed were rehabilitated and are functioning today and will continue to do so for years to come. Much of this work, however, would not have been possible had it not been for the use of labor-saving equipment and track machinery designed to prolong the life of the track.

It is not the purpose of this article to enumerate the various labor-saving devices in use on the larger systems of the country. The crane car, the pavement plow, portable welding units, elaborate storage yard machinery and other special equipment have been described many times in the columns of the *ELECTRIC RAILWAY JOURNAL*. The utility of these tools is not questioned, but the smaller company cannot afford to buy equipment of limited or infrequent use. When new equipment is bought for the track and roadway department the management is usually assured that the tool is going to be in use most of the time during the working season.

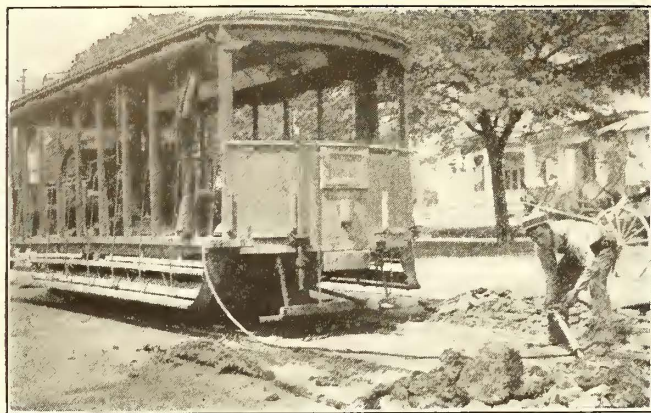
WIDE APPLICATION OF WELDING

Probably no tools have contributed more to the successful rehabilitation of tracks than the various types of arc welders. Joints may be welded, cups and dishes filled in, railroad crossings restored, the life of special trackwork prolonged, bonds applied and many other economies effected. The portable grid-resistance type of welder was placed on the market about ten years ago. The wide range of possibilities and the low first cost of the apparatus so appealed to track engineers that almost every electric railway in the country became the possessor of one or more of these equipments. Over-indulgence in electric welding during the next few years

was convincing, however, that while not a remedy for all track troubles, it had a wide sphere of utility. The introduction of the motor-generator or dynamotor sets further extended the really constructive work that might be accomplished by this process.

The grid resistance type of machine is probably unexcelled for heavy and rugged welding. The absence of moving parts and consequent low maintenance, the portability and the ease of operation are some of the points in its favor. On the other hand, the fact that the rail is always negative with respect to the generating equipment does not permit certain kinds of welding to be done. The fluctuations of line voltage, too, often interferes with production. The metal electrode is most successfully used with this type of machine. The dynamotor type of welder operates with the rail positive to the generator of the machine, making possible the seam weld joint, which is, however, patented. This joint has much to recommend it and is enjoying wide use. The maintenance of this type of machine is more costly than that of the grid-resistance apparatus. The cost of current, however, is much less. The track and roadway department is not, on the majority of properties, charged with the current used by track tools, but for those interested the following data are submitted: On a test to determine the amount of energy required to melt a pound of low-carbon steel, it was found that the grid-resistance type of machine used 10.8 kw.-hr., while the dynamotor consumed 4 kw.-hr. The test covered actual working conditions over several days, the metal being weighed and the energy metered with a kilowatt-hour meter.

The application of thermit welding to track construction is now thoroughly established. Joints may be welded, special trackwork made on the property, broken pieces of special trackwork may be repaired and truck-frame and other heavy welding repairs may be done in the shops. To the company possessing a pneumatic tie-tamping machine or other adequate portable air-compressor unit the cost of acquiring additional equipment for a thermit welding plant is small. The illustrations reproduced herewith show the set-up for the repair of



COMPRESSED AIR EQUIPMENT FOR REMOVING
CONCRETE IN TRACKS

a broken iron-bound, guarantee mate, the break occurring through the rail about 1 in. from the cast-iron frame. The mate was removed from the track and the compressor for furnishing air to the burner used for drying the mold was mounted in a farm wagon and placed alongside of the track. The weld was successful at a cost of less than one-third of the cost of a new piece, and owing to the fact that the weld was in the nature of an experiment the cost was unduly high.

OXYACETYLENE USED FOR CUTTING AND BONDING

It would not be fair to leave the subject of welding without some reference to the use of oxyacetylene as a cutting and welding agent. Owing to the availability of electric current, its use in track welding has been limited in favor of arc welding. In the shops and for bonding it has a wide application. It is superior to the electric arc for cutting and can be used profitably in trackwork for this purpose. A competent operator can cut out broken joints in connection with track repairs that are of a more or less temporary character in a fraction of the time that the work would take if the hacksaw were used. The cuts can be made so that a reasonably close joint is obtained. In addition to this, holes may be burned in the web of the rail for the bolts, the whole operation requiring not over a quarter of an hour. When special work has to be replaced at night when the cars are out of service, or when the time to perform this work is limited, the cutting tool is very useful in cutting bolts and in making cuts for temporary connections.

The electric welder and the rail-grinding machine are inseparable for many track repairs. The reciprocating grinder is a valuable tool for reducing corrugation, but is high in first cost for the small property. The various types of wheel grinders that are derailed easily are operated at a small expense together with the electric welder in the repairs to special work and cupped joints.

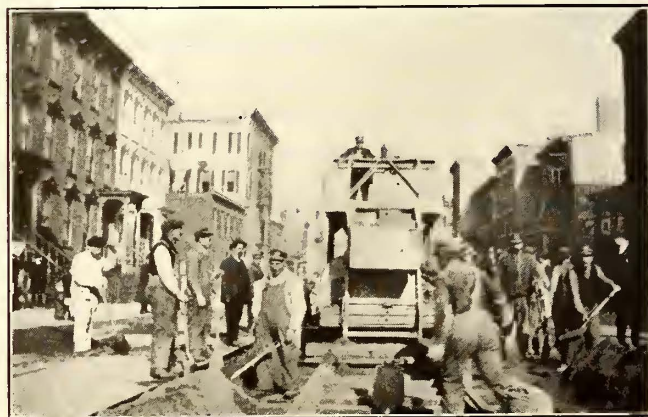
Among the least costly and yet most useful tools that should form a part of every electric railway's track equipment is the portable blacksmith outfit. Track departments are frequently forced to depend on the shops for work of this nature. Too often the master mechanic finds more work for his blacksmith in his own department than can be turned out, with the result that the work of other departments must wait, or not be done at all. A portable forge and anvil, with a dozen inexpensive tools that can be moved from place to place as the occasion demands, can maintain

the track tools in good condition, make repairs to open track special-work layouts and, most important of all, make the joint plates used on repair work really fit. When the failures of joints in paved streets that are caused by the neglect to make the joint as nearly as possible mechanically sound are taken into consideration the blacksmith outfit rises in importance.

CONVENIENT WORK CAR IS VALUABLE

Almost every electric railway has some sort of a work car. It may be a big steel-underframe crane car, capable of hauling several trailers or steam road equipment, or it may be a plain single-truck platform car, that is just "car." The single-truck work car, with sides that may be raised or lowered and having a capacity of about ten cubic yards, is a valuable tool to any roadway department. It cannot, of course, carry 60-ft. rails, but if properly motored can haul a fair load on a rail truck. Owing to their ability to get through traffic expeditiously, these cars usually have the approval of the transportation department. In handling small amounts of material, tools and supplies they are superior to the double-truck cars and can be operated at much less cost. Now that the single-truck open car has nearly become a thing of the past, the conversion of a few of these into work cars would prove of real assistance to many track departments. One of these changes just referred to was made last year by a small Eastern property at a total cost of \$126. This included the cost of removing the old body and adding a new floor and drop sides. The trolley stand is carried by a post in the center of the car and braced with insulated steel rods which run to each end and are located so as not to interfere with material carried.

Pneumatic tie-tamping outfits have not only increased the output of work per man in this particular but have improved the quality of work done. Their best work is accomplished when rock or slag ballast is used, although they may be used successfully with gravel or cinder ballast under careful supervision. The utility of these machines is not confined to tamping ties. With a pointed tool, brick or granite block pavement with grouted joints may be quickly removed, and the blocks or bricks cleaned. The concrete track foundation also may be rapidly broken up, using a small part of the force of men otherwise necessary. An illustration shows an experimental outfit built several years ago. A compressor that was being displaced in the shops was mounted on a car and a small air tool purchased. The tool was not of sufficient size, but the work performed



LARGE CONCRETE MIXER OPERATING ON TRACK
BEING CONCRETED

was more than equal to that of four men engaged in the same work of removing concrete paving foundation. In connection with the use of thermit welding, or where compressed air is used in any manner, this machine becomes a valuable adjunct.

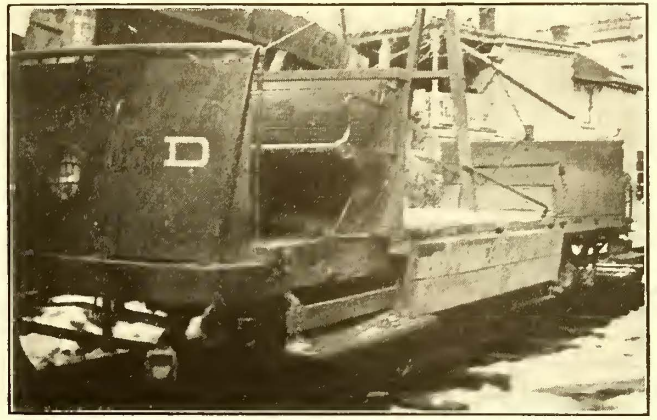
SMALL CONCRETE MIXER HAS ITS PLACE

The small concrete mixer with a capacity of a quarter yard or less has a distinct place with all companies having a considerable mileage in paved streets. It should be equipped with a loading skip and preferably should be gas driven. The electric drive restricts the use of the machine to areas served by the electric circuits furnishing the proper voltage for the motor. The machine is scarcely large enough to use on extensive new paving work, but will rapidly pay for itself on paving repairs and in the construction of the numerous small concrete jobs that originate in the power house or shops. When used to replace concrete removed for the repair of joints the machine and the concreting material can be placed on a work car and the work can be performed under moderate traffic, thus avoiding the placing of the materials in the street at all until finally dumped in the excavation.

The electric drilling machine, as applied to the drilling of joints and tie-rod holes, was one of the first labor-saving tools to be adopted on electric lines. When properly used this tool is a real labor and time saver. If properly inspected by a competent mechanic and fused so that in the event of electrical trouble the motor will be protected from damage the electric drill will operate at a minimum of expense.

For a company operating considerable city street or suburban mileage the use of the light automobile truck offers an attractive proposition. First, it may serve as a vehicle for the roadmaster or general foreman, thus enabling him to be rapidly transported from place to place, and to cover his territory more times than would be possible if he depended on trolley cars for transportation; second, it enables the driver of the truck to rapidly move tools or small amounts of material from one job to another, thus relieving the work car of this duty. At the present time when the cost of operation per car-mile has reached so high a level every car-mile saved in a day's operation of work cars means dollars and cents.

In conclusion, the fact should not be lost sight of that no power tool can continue to operate long without proper inspection and maintenance. As a rule this should be the work of skilled mechanics. The tendency



RECONSTRUCTED SINGLE-TRUCK OPEN CAR USED FOR TRACKWORK

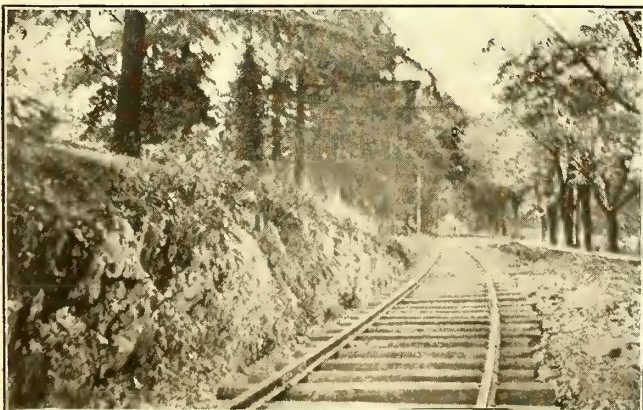
of the average trackman is to use a tool until it breaks down. An inspection at intervals of all power-driven equipment will often take a machine out of service for minor repairs which if allowed to lapse would put the machine out of commission for a much longer period of time.

Leather Mats Solve Cold Floor Problem

The Chicago Elevated Railways Are Installing These Leather Coverings to Overcome Passenger Objections to Composition Floors—Other Advantages Which Accrue from Their Use

IN ORDER to make the last all-steel cars purchased by the Chicago Elevated Railways entirely fireproof, composition floors were specified. It developed during the first winter these cars were in service that there were numerous complaints about the floors being cold. Investigation was made to determine whether the floors really were colder than in the older type cars, for the composition floors had been well insulated. While the thermometer tests showed that the floor was actually no colder than the wooden floors in other cars, and that the difference in temperature between the air at floor level and at head level was no greater, it was nevertheless determined that apparently because of the greater conductivity of the composition floor it really did feel colder to passengers. Another explanation given was that on the composition flooring a passenger's shoes are in full contact with a perfectly flat surface, while with a car with wooden floor and floor strips, only a comparatively small part of his shoes is in actual contact with the floor, the air spaces between floor strips forming an excellent insulating material.

It was also found out in the investigation that the composition floor is slightly porous and consequently on wet days it absorbs some moisture and perhaps feels colder on this account. An effort was then made to overcome this porosity by applying a waterproofing compound to the floor after it had previously been thoroughly dried out for twenty-four to forty-eight hours by turning on all of the heaters with the car closed and standing inside the shop. After this waterproofing had dried, the surface of the floor was painted with a colored cement paint. This process of treating the floor was followed annually for some three years, and while it did improve the situation, it did not do away with the complaints of cold floors.



POINTED TOOLS WITH PNEUMATIC TIE TAMPERS WERE USED TO CLEAR THIS ROADWAY

Considerable study was then given to the problem of using some kind of floor matting or wooden strips. Rubber matting, cocoa matting, steel matting, leather matting and floor strips installed on top of the composition flooring and various other remedies were all tried. It was obvious almost from the first, according to H. A. Johnson, organization engineer, that the leather matting was the best suited to the purpose, but the objection to this was its high cost. However, after trying out all of the other suggested schemes and mattings, ten cars were equipped with the leather mats last year and this year additional cars are being equipped.

On cars equipped with longitudinal seats, the matting is used in a wide strip, extending from one bulkhead to the other and wide enough so that it reaches a few inches underneath the edge of the seat cushions so that a passenger's heels rest on it. In cars equipped with



LEATHER FLOOR MAT AS USED IN CARS OF CHICAGO ELEVATED RAILWAYS

cross-seats, the mat is arranged to cover the aisle space between the seat pedestals, and additional pieces of matting, hinged to this main aisle strip, extend in between each seat. An arrangement of the matting for the longitudinal seats at the ends of these cars is made similar to that described for the all-longitudinal seat cars. In cars of both types of seating arrangement, the matting is laid down in three to five sections per car so that it may readily be rolled up and handled by one man. With the matting for the cross-seat cars, the pieces extending between the seats are simply folded over the aisle piece and rolled up with it to remove from the car. In order to prevent passengers from stumbling over the ends of the mat, which is about $\frac{3}{4}$ in. thick, a wood strip beveled off was fastened to the floor at each bulkhead and the first section of the matting laid on the floor against this strip. No fastening whatever for the floor mat is required, as its flexible chain-link construction and weight makes it lie perfectly flat with apparently no tendency to get out of place.

Mr. Johnson says the leather floor mat has very satisfactorily solved the problem. Not only is the leather a very good insulator of both heat and electricity, but it has the air space openings which improve the heat insulating properties and it has a very high anti-slip property. The advantages of the matting are particularly noticeable on wet, snowy days, for it provides a place for the water, snow and dirt to fall where it is not tramped in by passengers. Without the matting

on such wet days, water accumulates into puddles on the composition flooring, sometimes clear into the center of the car, through which passengers must walk. The wearing qualities of the leather mat, inasmuch as it is made of leather punchings placed on edge, is thought to compare favorably from the experience thus far with that of the wood strips on the ordinary wooden car floor. Incidentally, the Elevated companies recently replaced some wood floor strips which had been in service for more than twenty years without renewal. If the indicated wearing quality of the leather mat is proved the first cost may appear in a different light. The presence of the leather mat in a car adds slightly to the cost of car cleaning, though the fact that it is readily removed for cleaning purposes minimizes this extra cost. With the floor mat removed, the smooth, sanitary advantages of the composition floor are retained and the mat itself is easily cleaned after it is taken out of the car by turning the hose on it. The mats are used only during the winter months, and are stored for the eight warmer months so that this additional cleaning trouble and expense is encountered only four months of the year.

The use of this type of floor mat is also being considered for use on the interurban cars of the Chicago, North Shore & Milwaukee Railroad as a substitute for the corrugated rubber floor mat used on the newer type cars and the alternate steel link and composition link mats used on some of the older type cars.

A Loose Band Makes Bad Music

A LARGE railway company had been successfully operating a number of large motors for several years with practically no failures of any kind. The company was congratulating itself upon this lack of trouble, when one of the armatures failed, and upon investigation the failure was found to be due to armature band trouble.

Indications were that the core bands on the armature in question had worked loose, thus allowing movement of the windings and finally causing the failure. The first thought was that probably the material in the bands was of an inferior grade and had stretched, but tests indicated that this was not the case. In an attempt to obtain information as to the probable cause of this failure another machine was opened up and the bands inspected. It was noted that the core bands were slightly loose, several of them being cut off, and it was then found that the insulation under these bands had become dry and brittle.

With this information at hand the following theory was advanced as being responsible for the trouble. When the insulation is placed under the band it is soft and the band is tight. After the motor has been in service for some time, however, the working temperatures of the motor cause this material to dry out and shrink, allowing the bands to become loose. It was then decided to replace the strip of insulation material under the core bands with a strip of tin, and this change, after a number of years of service, was found to give very satisfactory results.

As a result of this experience all armatures, during the overhauling of these motors, have been rebanded, replacing the insulation under the core bands with a strip of tin to which the band wires are securely soldered. This results in strong and durable bands which have not given any further trouble by working loose in service.

Utilizing Figures to Keep Down Costs

Mechanical Department of New York State Railways Rearranges Data from Auditor and Storekeepers in Special Forms Suitable for Stimulating Spirit of Economy in Shops and Carhouses—Organization in Divisions Utilized to Develop Competition Among Several Parts of Property

AN ILLUSTRATION of the ways in which the periodical reports prepared by the accounting division of an electric railway organization can be utilized to advantage in promoting economy is furnished by the equipment department of the New York State Railways. This company operates city lines, principally in Rochester, Syracuse and Utica, and inter-urban lines in the same territory. The administrative headquarters of the system are at Rochester, where the president, James F. Hamilton, is located, but for operating purposes there are two main sections, respectively the Rochester lines, under Mr. Hamilton's managership, and the Syracuse-Utica-Oneida lines, of which B. E. Tilton is general manager. J. F. Uffert, located at Rochester, is superintendent of equipment for the entire system, and H. S. Sweet, with headquarters at Syracuse, is engineer of equipment. H. C. Kaercher is master mechanic Rochester lines; J. F. McInerney, master mechanic Syracuse and Oneida lines, and F. T. McCann, master mechanic Utica lines.

WHAT IS DONE WITH THE RECORDS

As on all electric railways, the auditing department furnishes monthly to the equipment department the records of operating expenditures on the property classified according to the standard system of accounts. From these, the items of interest to the master mechanics are totaled by divisions and sent to the master mechanics in the various cities for comparative study, together with comment, if such seems necessary, from the superintendent of equipment. A similar procedure is followed with the accounts of jobs involving capital expenditure, showing the amounts expended during the month and the unexpended balances.

Next, in order to permit the master mechanics to gage their progress, a combination sheet is prepared showing for each division the cost of maintaining equipment, that of car operation and the total operating expense, with percentages of increase or decrease for the same month over a period of four years. This not only permits cost tendencies to be determined but also shows which shops are making the best records and stimulates emulation.

To make the data still more interesting they are worked over to show the costs in cents per car-mile and per car-hour for the current and preceding two years. The sheet containing this information also shows the percentage of the company's gross revenue and the percentage of the total operating expenditures which are used by the equipment department.

All of the above figures are given in tabular form. They could be easily graphed if desired, but Mr. Uffert finds the tabular form simpler and more effective for his purpose.

Coming now to the material items, which more directly affect expenses, possibly the most important record is the monthly report on consumption of brake-

MECHANICAL DEPARTMENT			
_____ LINES _____			
DATE _____ 192_____			
CHARGES FOR MATERIAL ISSUED FROM STOREROOM AND CREDITS FOR MATERIAL SOLD.			
ACCTS.	DEBITS	CREDITS	
89			
80			
87			
71			
TOTAL			

STOREKEEPER'S FORM FOR REPORTING MATERIALS CHARGES DAY BY DAY TO MECHANICAL DEPARTMENT

shoes, lubricants, trolley wheels, lamps, carbon brushes, etc. These show the items, both quantities and costs, for each carhouse on the entire system. Costs are calculated with arbitrary unit prices so as to permit comparison on an equivalent basis, otherwise they would not furnish a measure of maintenance efficiency. The costs can readily be translated into current values, if desired, for comparison with data secured from outside the property. These figures are also totaled for each division and are put into the unit forms of car-miles operated for each item and cost per thousand car-miles.

CARHOUSES RATED BY BRAKESHOE WEAR

To induce rivalry among the carhouses, the item of brakeshoes has been selected as a basis of carhouse rating, brakeshoe wear lending itself better than any other item for this purpose. To furnish the information for this rating, and, of course, primarily to reduce brakeshoe consumption, all scrap brakeshoes are inspected to determine the scrap worth and the causes for scrapping. The latter are classified as: (1) Worn out; (2) tapering; (3) overlapping, and (4) wedged. The percentages of total wear secured are calculated and tabulated, with data from the last report included for comparison, and the carhouses are listed in order of merit. The operation of this plan has secured some remarkable percentages of wear, and the tables show clearly how much can be saved by careful watching of shoes, turning them at the proper times, etc.

The local master mechanics post these records to stimulate the carhouse inspectors to make their best

efforts. The posters show not only the ratings by car-houses but also by lines.

It is not practicable to furnish the master mechanics with relative ratings on other items, but as much detail as possible is given them to enable them to determine where the "leaks" are. For example, in lubricants there are three kinds classified, that is, car oil, compressor oil, and gear lubricant. Data are also supplied on wheels, field coils, gears and pinions. All of these records cover not only the preceding months but also the year to and including the current month.

In order to permit a comparison of labor items, weekly reports are furnished by the master mechanics of the present numbers of employees on their rolls. The central equipment office compiles these with the corresponding numbers for two preceding years. Weekly payroll reports are also prepared showing increases or decreases over the preceding year. As a check against these tabulations the accounting department furnishes weekly reports of payrolls and names on the lists, show-

reproduced. It contains also credits for material sold. These data are totaled daily in the office from the beginning of the month to date, permitting an almost instantaneous approximate statement to be made of the expenditures and also the necessary corrective measures to be taken to prevent totals from getting beyond control.

When special campaigns for keeping down expenses are under way, comparative monthly figures are compiled and cumulative totals are furnished to the master mechanics from day to day.

THE REPEAT BOARD AND ITS FUNCTIONS

A conspicuous chart in the office of each master mechanic is what is known as the "repeat board." This is a chart with a horizontal space for each car and a column for each day of the month. Every time a car is "pulled in" or "changed off" or is crippled on the line an entry is made and the nature of the defect is indicated by an appropriate symbol.

FORM N-304																				
REPORT OF CARS TURNED IN																				
192																				
CAR HOUSE	E. MAIN	PORTLAND	STATE	LAKE	TOTAL CITY	ROCHESTER AND Sodus Bay	R. & E.	TOTAL INTERURBAN	TOTAL	CAR HOUSE	E. MAIN	PORTLAND	STATE	LAKE	TOTAL CITY	ROCHESTER AND Sodus Bay	R. & E.	TOTAL INTERURBAN	TOTAL	
Average Number of Cars Operated Daily										Push Buttons										
Percentage Turned in										Register equipment										
Air Compressor										Resistance										
Light circuit										Water low										
Motor case										Inspected and found O.K. by barn men										
Motor leads and Cables										TOTAL										
Motor suspension										Previous										
Pinion										Increase										
										Decrease										

FORM USED FOR COMPILING DATA REGARDING PULL-IN CAR DEFECTS

ing increases and decreases with respect to preceding reports both for divisions and the whole system. The mechanical department office then prepares for the master mechanics weekly payroll reports showing the numbers of men on the department payrolls of all divisions, the amounts of these payrolls, the total company payroll, the increase or decrease of the equipment department labor items for each division and the whole, the same for the total company payroll, the percentages of increase or decrease for the equipment and other departments and for all departments and the percentage that the equipment department payroll is of the whole.

CO-OPERATION WITH THE STOREKEEPER

Every day the storekeeper for each division sends to the equipment office a statement, by account numbers, of charges for materials issued from the storerooms. This information is sent on a 3½ in. x 6 in. ticket like that

Reports of cars turned in are compiled each week and copies are sent to the several carhouse foremen. In these defects are separated into mechanical, electrical and man-failure, and comparisons are made with the preceding year. Consolidated reports by carhouses and divisions are also made up with data put into the form of percentages and arranged in order of merit. The master mechanics meet monthly to consider these reports and other matters of interest. The meetings are held in different places, but generally in Syracuse, which is centrally located.

The various reports described above look rather formidable as listed. They are, however, very simple and require but part of the time of two clerks in the central office and the usual clerks at the several shop centers.

Few printed forms are required; the two which are reproduced are typical.

Portable Bond Testers

The Primary Object of Testing Bonds Is to Locate Those in Poor Condition, so that Proper Repairs Can Be Made—Portable Instruments Afford the Most Effective Means for This Class of Testing—Convenient Tables for Use of Men Making Tests Minimize Calculation and Assist in Locating Bad Bonding

BY G. H. MCKELWAY

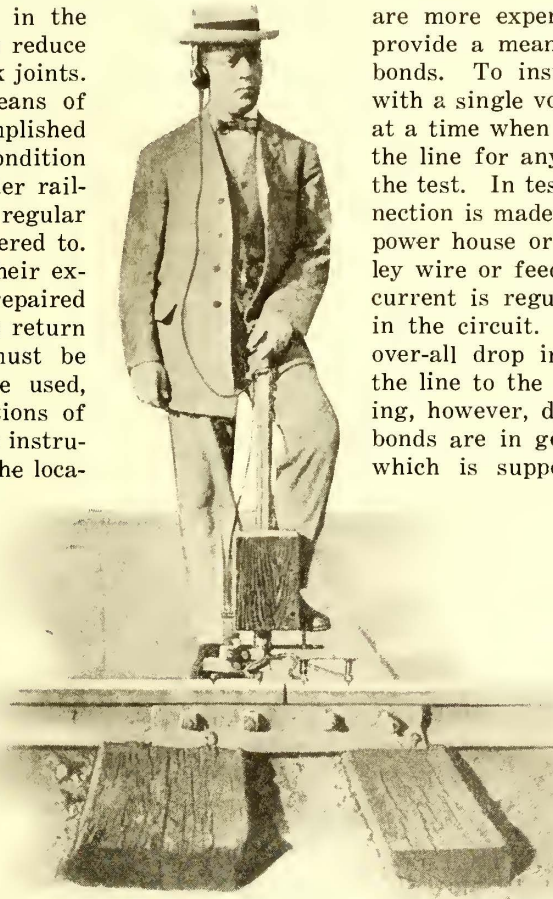
Engineer of Distribution Brooklyn (N. Y.) Rapid Transit Company

THE object of installing bonds in the tracks of electric railways is to reduce the voltage drop across the track joints. Electrical instruments provide a means of seeing how well this has been accomplished and for accurately determining the condition of the bonds. On many of the smaller railways the practice of making tests or regular inspections of bonding is seldom adhered to. When once the bonds are installed, their existence is forgotten until the track is repaired or relaid, unless the condition of the return circuit becomes so bad attention must be given it. Where exposed bonds are used, some railways make periodic inspections of the bonds instead of making tests with instruments. Such inspections determine the locations at which bonds have been stolen, the terminals have loosened or the strands have become broken to such an extent as to justify rebonding. Even where concealed bonds are used, a few companies rely upon inspection rather than testing for determining their conditions. In the making of such an inspection a method sometimes used is to note the temperature of the joints. The common practice is to make such an inspection just after or during a light fall of snow. The heating at joints will melt the snow away, so that poor bonding can be readily located. Such an inspection can only be made during the winter. However, some railways have tried this method at other times by requiring an inspector to feel each joint and thus judge of its temperature. Such a method is almost valueless, however, as the results obtained are very unsatisfactory as compared with those obtained from the use of proper instruments.

MAKING TESTS WITH A VOLTMETER

One of the simplest methods of testing bonds with an instrument is to use a voltmeter and determine the drop of potential, either for the line as a whole or across individual joints. The first method shows how much power is being lost in the lines, but does not indicate whether this loss is the result of many joints in an average condition or a very few joints with bonds in bad condition, nor does this method give any information which will aid in locating badly bonded joints.

Tests on the individual joints take more time and



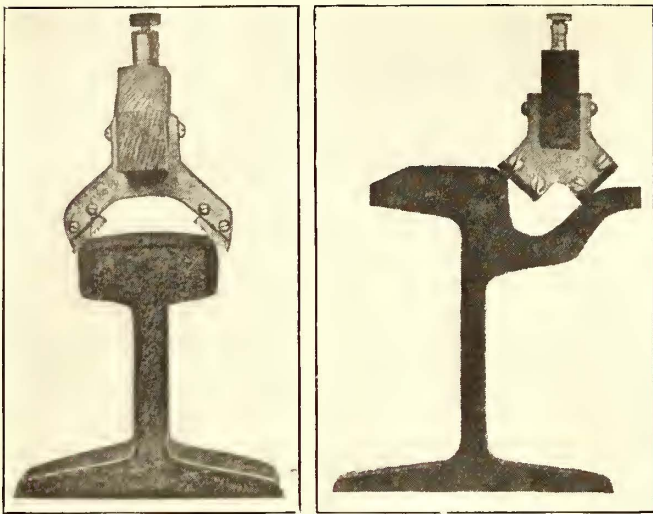
BOND TESTER WITH FOUR CONTACT POINTS

are more expensive to carry out, but they provide a means for definitely locating bad bonds. To insure accuracy for tests made with a single voltmeter, they should be made at a time when current is not being used on the line for any purpose other than that of the test. In testing a line as a whole, a connection is made at the end farthest from the power house or substation between the trolley wire or feeder and the track rails. The current is regulated by inserting resistance in the circuit. Such a test gives the total over-all drop in potential from the end of the line to the station busbar. A low reading, however, does not prove that the track bonds are in good condition, as the current which is supposed to return through the

rails may return to the station by following water and gas pipes, lead-covered cables or the rails of intersecting or adjacent lines. When the test is made on each individual joint, it is not necessary to shut down the line. A difficulty sometimes experienced is caused by a fluctuation of the current. Readings taken under these conditions give but

an approximation of the drop and should not be used for comparison, but will be sufficiently accurate to determine the location of very badly bonded joints. By the use of two voltmeters, one connected across the joint and the other connected between two contacts on the uncut rail a few feet apart, the drop of potential across the joint can be compared with that of the known length of unbroken rail. By reading both meters at the same time the tester gains accurate data.

This is a deservedly popular method, and to lessen the difficulty of reading the two meters simultaneously and to save space and weight, the two meters are sometimes combined and placed within a single case. Many prefer, however, to have the tests made by two men, each one reading one meter. With the two-voltmeter test the calculation necessary for determining the length of unbroken rail which would have the equivalent resistance to that of the joints is usually done later at the office and not in the field.



INVERTED AND UPSTANDING "V" CONTACTS

A means of avoiding calculation is to furnish the testers with a table showing the maximum reading of the meters placed across the joints for any readings taken on the uncut rail, if the joint is to be considered a good one. If the reading obtained is higher than this maximum, the joint is either marked or located in the notes so that it can be readily found again for repairs or rebonding; if the proportion between the readings is less than the maximum, no record need be kept unless it is desired to have such a record of all the joints for comparison with readings taken at other times.

An accompanying illustration shows a light compact outfit that can be handled by one man. It consists of a telephone receiver with a headpiece, a box containing primary batteries for supplying the current for making the tests and a jointed test bar with four contact points. This contact bar is placed on the rail in such a manner that the two inside contact points bridge the joint to be tested, but do not touch the rail, all contact being made by the two end points. A sound is received in the telephone receiver unless the resistance of the joints is so high that it may be considered as "open." By putting his foot on the bar, the operator presses it down so that the two center points touch the rail firmly. Another sound is then heard in the telephone receiver. With the usual calibration the two tones will be of equal intensity, when the resistance of the joint is approximately equal to the resistance of 6 ft. of unbroken 70-lb. rail. This calibration, however, can be altered so that the point of equal sound intensity will occur at some other measure of resistance if desired. When the second tone is louder than the first the resistance of the first is higher than what is considered good practice, and the joint should be rebonded. On the other hand, if the second sound is equal to or less than the first in loudness, the joint is usually considered as being in good condition. This instrument does not measure accurately the resistance of the joint, but it gives an indication of those joints which are good and those which are poor. With this instrument joints can be tested very rapidly, especially on quiet lines where there are no outside noises to interfere with the sound produced in the telephone receiver. Another advantage of this instrument is that the sounds are made by the current in the battery carried in the box with the instrument and are, therefore, not dependent upon the current in the rail. The instrument can thus be used at any time, regardless of whether the line is alive or dead.

Another type of single instrument used for bond testing is constructed on the principle of the Wheatstone bridge. With this, the current used for operating the instrument is that flowing in the track rails, and the contact bar consists of a single bar with three contacts made from pieces of hacksaw blades. This type of contact is more satisfactory than that of a single point or chisel, which is sometimes employed, as the surface skin of the rail head is a rather poor conductor and requires sharp points to pierce it and make sure of good contact. Three types of contact are employed where hacksaw blades are used. One type has the blade arranged to form an upstanding V. This is used in the grooves of girder rails. One type has an inverted V for use on the heads of T-rails and the third is a flat type for use on either girder or T-rails.

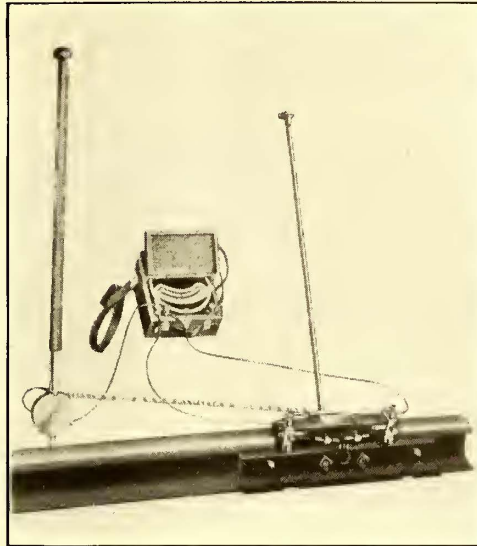
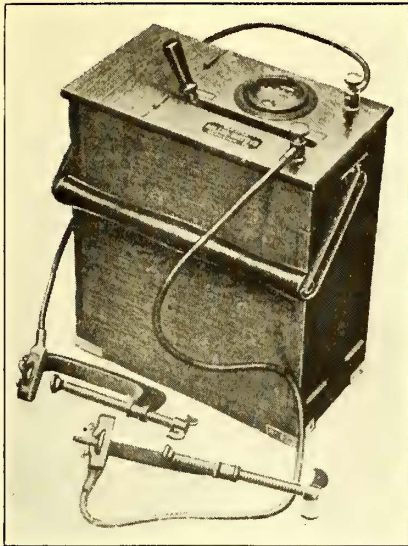
HOW THE TEST IS MADE

This type of instrument is arranged to be hung around the neck of the operator by a strap, while the cover drops down between the operator's body and the box to assist in steadying it. To make the test, the operator places his foot on the contact bar, gives it a little motion to insure good contact, and adjusts the resistance in the two arms of the bridge by turning a knob in the center of the face of the instrument. The two other arms of the bridge are formed by the unbroken rail and the bridge across the joints to be measured. The turning of the knob not only adjusts the resistance of the two arms, but also moves a pointer around the scale of the instrument. When a balance



PORTABLE BOND TESTER IN USE

is obtained so that the galvanometer needle is at zero, the pointer shows the number of feet of unbroken rail, whose resistance is equal to the resistance across the joint. When the current in the rail is small, it is often difficult to determine when an accurate balance is obtained. For use under such conditions, a push-button



AT LEFT, PORTABLE STORAGE BATTERY EQUIPMENT FOR USE WITH BOND TESTER; CENTER, INSTRUMENT WITH SELF-WINDING TAPE AND MILLIVOLTMETER; AT RIGHT, DIRECT READING RAIL BOND TESTER

switch is provided on the case, which can be opened and closed. The static kick thus produced will cause the needle to move if the arms are not well balanced. One company which makes use of this type of instrument has a portable resistance such as is used with arc welders connected between the trolley wire and the rail farther away from the trolley station than the joint tested. The use of this resistance insures sufficient current for obtaining a reliable balance. As this type of bond tester is actuated by the current in the rail, it cannot be used when the line is dead, unless current for testing is supplied from some auxiliary source. A storage battery is sometimes used. This is either mounted on a small hand car or else carried in a box by an assistant. The manufacturers of this type of bond tester supply a storage battery of 187½-amp.-hr. capacity inclosed in a wooden box, on which are mounted a switch, an ammeter and a rheostat, together with terminals for attaching the necessary leads. This case is 12 in. by 7 in. by 15 in., and the complete outfit weighs 45 lb.

When the battery is used to supply current, the box containing the battery is placed on the ground near the joint to be tested. A connection is made to the rail by means of C clamps, two of these being placed on the rail at opposite sides of the joint and far enough apart to permit the putting of the contact bar between them when in position for testing.

Another type of bond tester which makes use of a contact bar has three contacts, like the one just described. Two of these contacts, however, are made from files and the third is made by a rod, which is pressed down on the rail by the hand of the man operating the instrument. This type of instrument does not require the adjustment of resistance and the resistance of the joints in terms of the equivalent number of feet of unbroken rail is read directly from the scale of the instrument.

DIFFERENTIAL MILLIVOLTMETER ALSO USED

Another type of bond testing instrument consists of a differential millivoltmeter in which the opposing forces are supplied by the current in the rail, which causes one voltage drop across the joint, and another between variable points on the uncut rail. A fixed contact bar is used, consisting of two points 12 in. apart,

which are clamped to the head of the rail, one of the points thus being on each side of the rail joint. Leads run from these two points to the terminals of the voltmeter, and in the tests the drop between the two points is balanced by varying the resistance on the other side of the circuit. This is not done by means of the resistance contained within the instrument case, but by moving a third contact along the uncut rail. This contact consists of a chisel point on the end of a wooden rod. Between the chisel point and the fixed contact of unbroken rail is a steel tape which shows the exact distance between the contacts. Therefore, while this instrument reads directly the resistance of the rail joint in terms of the equivalent length of unbroken rail, this length is read from a tape and not from the scale of the instrument.

Fine Record for Car Wearing Parts

THE Madison (Wis.) Railway has been particularly pleased with the service obtained from the fine new cars which were placed in service in December, 1916. These semi-steel cars, Nos. 65, 66, 67, 68 and 69, ran varying distances, from 165,000 to 200,000 miles, between December, 1916, and December, 1920, without ever coming into the shop except for ordinary inspection. During this four-year period the gears and pinions, motor and axle bearings, and armatures were not touched, except for the nightly inspection and brush renewals. In December, 1920, the armatures were taken out, turned and reslotted and put back in service, in some instances with new pinions, and in other cases there was enough remaining life so that it paid to put the old pinion back in service. At this time most of the armature and axle bearings were renewed.

The cars were originally equipped with 34-in. steel wheels which ran until June, 1920, the mileage records showing from 140,000 to 150,000 miles. Wheels are inspected once in two weeks on this property, and if one wheel appears to be wearing more than its mate, a wheel-truing brakeshoe is put on the other wheel and it is ground down until of the proper diameter. These cars are equipped with Brill 21-E trucks with hand brakes and GE-247-D ventilated interpole motors. The cars weigh 23,600 lb. and are of the single-truck, rear-entrance and front-exit type.

Forms for Premium System in Milwaukee Shops

The Milwaukee Electric Railway and Light Company
NON PREMIUM CARD
 Date 7-27-20 1920
 Card No. 126
 Mr. P. Hirschboeck Foreman in Charge
 The work described on this card has consumed an amount of time in excess of the standard allowed. Investigate and indicate on opposite side of card the actual reason for same.
 Workman's Name J. Mandrock
 Description of Part Fender Casting
 Operation Drill 7 - 11/32" & 1 - 33/64" holes Operation No. M-126
 Machine or Car No. 554 Charge No. S-4122
 Pattern No. D-131 Drawing No. 41-176-E
 Standard Time 22.5 Actual Time 26.9
 No. of Pieces 225
 E. Lochen
 PGT J.K. General Foreman

REASON	Check Here	REMARKS
1. Machine in need of repairs		
2. Excessive stock on piece		
3. Coating hard and sandy		
4. Waiting for Material		
5. Being broke in on job		
6. Incompetent	<input checked="" type="checkbox"/>	<u>New man</u>
7. Not trying		
8. Rate too low		

General Remarks:
 By P. Hirschboeck Foreman in Charge

OBSERVATION SHEET M-126
 DATE 5-18-15 No. 350 Lot No. 21895
 DESCRIPTION Fender Gate Hanger Pat. No. D-131
 MACHINE OR CAR NO. 544 - Drill Press Draw. No. 41-176-E
 OPERATION Drill 7 - 11/32" holes & 1 - 33/64" hole Charge No. S-4122
 WORKMAN Hugo Seelig Regular Rate Observer E.L.

	1	2	3	4	5	6	7	8	9	10	Average
a Set castg. in jig	7.54	7.30	.50	.42	.54	.42	.48	.36	.45	.58	1.86
b Drill 7 - 11/32"											
c holes	3.18	3.90	3.42	5.60	3.44	3.00	3.16	3.50	2.56	2.75	3.45
d Remove from jig	.30	1.04	.40	.31	.39	.32	.34	.30	.41	.32	.41
e Set castg. in jig	8.40	.39	.30	1.04	.48	.80	.40	.30	.38	.42	1.29
f Drill 1 - 33/64"											
g hole	3.00	2.50	2.40	2.34	2.25	2.40	2.49	2.55	2.66	2.10	2.47
h Remove from jig	.40	.22	.28	.20	.38	.25	.20	.22	.24	.28	.27
i											
j											
k											
l											
m											
n											
o											
TOTAL	22.82	15.35	7.30	9.91	7.48	7.19	7.07	7.23	6.70	6.45	9.75

REMARKS:-
 Each of the above unit operations are on one casting
 Average time per casting 9.75 min.
 Average time 9.75 x 100 castg. = 975 min.
 Recommended time 5.9 min. per castg.
 " " 5.9 x 100 = 590 min.
 " " jigs, machine set up, etc. 10 min.
 Total, - 600.0 min.
 Approved time 10.0 hrs. per 100 castings.

No. 426 Date March 5, 1921
 Name G. Petersen
 The Milwaukee Electric Railway and Light Company
OPERATION TIME CARD—COLD SPRING SHOP
 FORM 1002
 Car No. or Machine No. 554 Gang Work Individual Work Total Previous Time On This Operation
 Operation No. M-126 13.4
 Operation Drill 7 - 11/32" holes Standard Time For This Operation
 & 1 - 33/64" hole 20.0
 Total Actual Time On This Operation
(200 pcs.) 16.1
 Time Gained
 Order No. 21895 3.9
 CHARGE NO. Premium (1/4 Time Gained)
S-4122 1.9
 Actual Working Time On This Operation This Day 2.7
 TOTAL 4.6
 START FINISH
.00 2.70
 Punch noon OUT and IN on reverse side
 Finished Unfinished Inspector's Approval Foreman's Approval
200

FORM 1018-2,18,19-3000 M-126
 Drill 7 - 11/32" & 1 - 33/64" Hole D-131

DATE	AM'T	STD. TIME	ACT. TIME	Efficiency	Remarks
8-12	40	4.0	3.1	.4	
5-3	50	5.0	5.7	0	
6-4	82	8.2	11.0	0	
7-13	200	20.0	11.4	4.3	
7-16	175	17.5	10.2	5.6	
7-27	225	22.5	26.9	0	
2-2	100	10.0	10.0	0	
2-19	11	1.1	1.1	0	
2-27	69	6.9	4.7	1.1	
4-15	2	0.3	0.9	0	
4-17	33	3.3	2.2	.5	
4-26	120	12.0	10		

FORM 1022 The Milwaukee Electric Railway and Light Company
STANDARD OPERATION RATE CARD Date 5-18-15
 Operation Fender Gate Hanger D-131 Operation No. M-126 Regular Rate
Drill 7 - 11/32" & 1 - 33/64" hole
 Standard Time 10.0 hrs. per 100 castings Operation No. M-126 Regular Rate
 Machine No. 554 Speed 200 R.P.M. Feed Hand
 Pattern No. D-131 Material C.S. Observation Sheet No. 4-350
 Drawing No. 41-176-E Item No. 36 Lot No. 21895

OPERATION SCHEDULE
 1 Set casting in jig
 2 Drill 7 - 11/32" holes
 3 Remove from jig
 4 Set casting in 2nd jig
 5 Drill 1 - 33/64" hole
 6 Remove from jig
 7
 8 Note: jigs No. M-126-D-131-A
 9 " " M-126-D-131-B
 10
 11
 12

Approved _____
 Special rates are to be used in connection with repeat orders upon special approval only. General Foreman IN CHARGE

Top left, front and back of the non-premium card used in checking up when time taken is longer than standard.

Bottom left, operation time card on which workmen record starting and finishing time on the one job.

Top right, observation sheet used in determining standard time and method, filled in for an actual case.

Center right, accumulative performance record for each job, showing comparison between different workmen and varying efficiency of the same man.

Bottom right, standard operation rate card from which workmen get instructions for doing job and standard time allowance.

Premium Wage Plan in Milwaukee Shops

**Résumé of Six Years' Experience with Bonus Pay for Standardized Jobs—
The System Is Now Applied to 50 per Cent of the Total Time
Worked—It Means Better Pay to the Workmen and
Lower Maintenance Costs to the Company**

BY J. H. LUCAS

Superintendent of Rolling Stock the Milwaukee (Wis.)
Electric Railway & Light Company

SUBSTANTIAL extra pay for industrious and efficient workmen, a saving to the company of some 25 per cent on the payroll, a more expeditious handling of work in the shops with consequent smaller organization and an invaluable accumulation of recorded information on detail car maintenance work are among the more important of many advantages accruing from the extensive use of a premium or bonus system of paying shop employees in Milwaukee. It has proved to be so eminently successful after six years of experience that neither company nor employees would consider a return to the old flat pay plan which was displaced. This premium system of wage payment was first initiated in the rolling stock department of the Milwaukee Electric Railway & Light Company in 1912, in connection with the washing of cars at carhouses, and it was tentatively experimented with on different classes of work during this and the following year. In 1914 it was definitely decided to extend the plan to the company's main repair shops. The plan was well started some time before the writer became associated with the organization and all credit for the pioneering work belongs to my predecessors and to many of the loyal workers of all ranks, who have supported the movement and who are now, if not at first, its most enthusiastic champions.

Beginning with a few men and some of the more simple and easily standardized pieces of work, the application of the premium system has been extended by steps from the paint shop to the armature room and to the forge shop, machine shop and carpenter, pattern and foundry departments, in order, and lastly to the motor and truck repair division. It has been tried out and found adaptable to practically all phases of the great variety of work handled by a street railway shop, including the running maintenance, repairs and renewals and new manufacture and construction. We have covered all classes of operations, from the painting of cars, the manufacture of car and small machine parts, the construction and installation of new equipment, changing wheels and motors, rewinding armatures and even to the repairing of wrecked cars. It will be noted from the accompanying curves that at the present time 76 per cent of the working force is engaged part of the time on premium work and that nearly 50 per cent of all the man-hours time in the shops is for work done against standard time allowances and in a standard manner. The figures taken into account in computing the percentage of working forces and hours worked on the premium system are total figures which include the supervisory time as well as the time of the productive workers. Considering this, it can be seen that the premium system is a major and very important factor in our shop operation. It is so large a factor that we should be able readily to determine that the plan is a

detrimental one or a very good one; that is, it either costs us money or it saves money. We shall endeavor to show that the latter is the case. For in the last analysis, the important question that the practical man wants to have answered is, "Does it pay?"

A GENERAL OUTLINE OF THE SYSTEM

The premium system employed in our shops consists, first, in making a detailed time and method study for each job, to determine the standard method and the time required to do a certain piece of work. A stop watch is used for this purpose in most cases. A typical time study of a machine shop drill press operation is shown with the reproduction of the "observation sheet" herewith. The number of observations made (ten in this case) varies with the importance of the work. Our experience has shown that great care must be exercised and close scrutiny given in making the time study and before determining upon the standard unit of time or before issuing the "standard operation rate card" (Form 1,029 reproduced herewith) for regular use in the shop. In the machine shop, for example, it is necessary to take into consideration the type of machine to be used, speed, feed, material, quantity on the particular order, etc. We have found that special care in establishing a standard rate is well repaid, for it enables us to adhere rigidly to the rule that, once established, a rate is never changed except as made necessary by improved methods or improved machinery for doing the work. In other words, a workman can proceed to develop his maximum capacity without fear that he will be penalized by a reduction of the standard time if he makes good premium earnings. This rate cutting has been one of the chief objections raised by workers to the premium and piecework systems in general in the past, and the reason for rate cutting lies primarily in insufficient consideration of all the production factors at the time the rate is determined. The details of the method, men, machines and means of doing a piece of work should be thoroughly studied, regardless of the time required to do this, and the standard can then be set close enough so that the company can afford to give the worker his share of the results of his ability and skill in bettering the time. When experience assures the men of a "square deal" they gain confidence in the plan, and this makes for a better measure of co-operation than is commonly found.

The men who make the time studies and determine the methods to be followed become very expert and command a good rate of pay and are worth it. Even such jobs as repairing wrecked cars, which at first thought would not seem to lend themselves to standardization or an accurate estimate of the amount of labor which should be required, are now often handled on a

premium basis in our shops, for analysis has determined that most of our damaged cars come within one of several classes of wrecks, either a one-post, two-post or three-post wreck, etc. The time-study man observes the extent of the wreck, carefully examines the car-body members to be replaced and, from past experience and study, is able to estimate with remarkable precision the amount of time that will be involved in making the repair. The workmen who are then given this job note the time allowed and immediately set out to beat that allowance, and they use their heads and conserve their time, for it means money to them to do so.

Any man working on a standard job is given one-half the time saved in completing the standardized operation. That is, where a man does a ten-hour job in eight hours he receives one hour additional pay, or pay for nine hours for eight hours' work. The division of the savings on a "fifty-fifty" basis between the man and the company is considered fair and equitable by both parties. The company's saving is partially used, it is understood, to defray the expense of employing time-study men and of providing the necessary standards and clerical help, in order to give the workman the opportunity to increase his day-rate earnings.

In the operation of a system like this the use of the unit system of timekeeping is a necessity. Instead of assigning daily time cards to employees the time of each man spent on each job during the day is recorded on an "operation time card" (Form 1,002 reproduced herewith).

Under the old system of timekeeping still used in many places, a time card is given to the workman on which to record at the end of the day, according to his best remembrance, each job he has done during the day and the time it took him to do it. In most cases, he is expected also to enter the charge account number for the various jobs which he worked on. The disadvantages of this system, of course, are very apparent. It takes the man away from productive work, requiring at least fifteen to thirty minutes of his time to do "figuring" at which he usually is not adept. Jobs which do not take very much time are slighted in his record, because he does not want to go into any more detail than he has to. In some cases, a special timekeeper or checker has the duty of checking the work record with the man and his foreman and the assignment of the charge. But in neither case is the record returned anywhere nearly as accurate as with the unit job system, which we use in our premium system.

With this plan, the time card being worked on specifies one item of work. When the man changes his job, he also changes his time card. With the unit job system, the foreman determines in advance what the man's next job is to be, instructing his clerk to make out a time card showing the charge, standard operation number, the man's name, etc., and this card is placed in a rack, located adjacent to the departmental time clock, where the workman obtains it when he is ready to start work on the next job. The card on which a man is working is always turned in at night and a new card issued in the morning, as the card is a daily record only. As he takes a new card he punches the time recorder clock, which records in a decimal system the time at which work is begun on the particular job. When that job is completed he punches "out," thus printing in the time of completing the job, and at the same time he punches the new slip "in," which records the time at which he starts work on the new job to which that card assigns

him, there being no loss of time between operations. The workman is not intrusted with any duties in connection with the timekeeping or record work other than merely punching the clock.

A "performance record" (Form 1,018 reproduced herewith), which is maintained in the main office of the shop, is of great value in checking up on the progress made over a long period of time. When an individual does the same job several times it is assumed that his efficiency should improve and that the time required to do the work will be reduced. This is not always the case, however, and variations from this natural tendency are followed up to determine the cause.

This performance record also makes possible a comparison of various men in doing the same piece of work. We have found cases where the time taken to do a certain piece of work, over a period of months, was remarkably similar, as far as it concerned a certain group of men, and that when this job was given to some one outside of the "ring" a considerably better record was made. The group in question had succeeded in deceiving the foreman to the extent that he thought they were doing very well, and, inasmuch as they were keeping within the standard, special attention had not been called to what was evidently an effort to control the amount of earnings on the job in question. This conniving would have some effect on the gross earnings made by the men, which would then be used as an argument for an increased day rate. A little "shake-up" as a result of this investigation and the assignment of new men to the job results in some saving in the net cost of doing the work.

It happens now and then that the time consumed in a given job is in excess of the standard time. When a record of this kind comes through, a "non-premium card" (Form 1,036 reproduced herewith) is made out by the timekeeper and sent to the general foreman's office, from which an investigation is started to determine why more time was taken than should reasonably be allowed. The "stock" reasons printed on the back of the form reproduced and shown in the reproduction are those used in connection with the work of the machine shop, and they differ, of course, for the other shops. This checking up on the reasons for exceeding the standard time, we find, has a decidedly good effect on the men in general.

FUNCTION OF THE FOREMAN

In our method of applying the premium system, the foreman has been made an important functionary. We have arranged a bonus plan so that he profits from the extension of the system. It is to his advantage, in this way, to co-operate to the fullest extent in furthering the establishment of standard rates and seeing to it that they are used after being established. All our foremen now like the premium system, though some did not like it at first.

The foremen have found, however, especially during the last few years, that this system is a great help to them, as it lightens their burdens of detailed supervision and thus enables them to give more time to the broader aspects of their jobs, such as planning of the work, devising improved methods, etc., in which they develop as leaders rather than drivers of men. The premium system supplies the incentive to reward and the check-up for failure that keeps the man on the job without some one standing over him.

The premium rates are arranged for, in the first

place, largely on the authority of the foreman in the department. He has a time-study man assigned to work with him, and since his earnings from the bonus system depend on the percentage of net working time that is worked on premium in his individual department, he is interested in pointing out to the time-study man any new possibilities of jobs to be standardized. He is therefore also interested in approving these standards as correct after the time-study man has completed his work and in passing them on to the general foreman for approval.

From this procedure the responsibility for the proper operation of the rate after it is standardized rests in great measure with the foreman, and we find that we now get rates that are remarkably accurate and standards that are fair in their returns to both men and the company. Under this bonus plan the foreman does not profit from any excess earnings that the men may make, and as the performance records are subject to scrutiny the foremen give a good deal of care and attention to the rates before they recommend them as standard.

The foreman soon finds that the system is of assistance to him because the standard rate-card file is much more dependable than his memory as to methods of doing a job, or his pocket notebook if he kept one. Most of our foremen now use the records extensively in assigning work. If his assistant quits the foreman has an easier time in breaking in a new man. All he has to do is to hand him the standard job card on any particular piece of work and say: "This is the way to do it and this is the time it should take, if done right." The assistance afforded by these records is not as greatly needed for the day-to-day recurrent jobs and with a steady, competent gang of workmen as it is for the infrequent and varying jobs, such as wrecks, for example, which are rarely twice alike in the same week, but which do occur in almost exactly similar detail several times in a season. Even with this infrequent kind of job, as I mentioned before, if a regular crew were on the job, there would be no need to depend on the cards and records. But the effect of labor unrest (in many cases it seems like "labor rest") and the changing help from day to day has been generally felt, I am sure. The most trusted workmen were called to the colors, and the struggle to keep things going right and to hold to standards of maintenance with many new and frequently incompetent workmen seemed hopeless indeed. That was a time when the detailed records of jobs already standardized came in mighty handy. The card gave the gang leader or the machinist his instructions in definite form. Instead of telling the boy (or girl) we had to put on the job to drill fender gate hangers, we handed him (or her) a card showing exactly what was to be done and in what sequence. (See cut of standard operation card.) Here were clear, concise instructions which the new employee could carry out with the minimum amount of coaching from his foreman. This also applied, of course, to the old, experienced hands. As the time which the job should take appeared on the card, the employee could tell whether or not he was producing work economically, and the incentive of extra pay was there to urge him to do his best.

GOOD WORKMEN LIKE THE PREMIUM SYSTEM

Our men like and appreciate the premium system because it is of mutual profit to the company and to them. It gives them an opportunity to work under better conditions, for they are better satisfied to re-

ceive recognition for the actual labor they perform than to be without identity, as under the former system of flat day rates of pay. By making a man responsible for the performance of a definite task and setting a standard of attainment for him, his love of achievement, his desire for the good opinion of his superiors and his fellow workers and his personal interest all impel him to meet the standard and better it. The instinct of competition with fellow workers is usually very strong, and the friendly rivalry which is plainly in evidence is a powerful spur to accomplishment. A good man likes to beat the record of the other fellow, and incidentally it means money in his pocket to do so. The responsibility is a steadying and good moral influence, contributing to self-development. Promotion and wage increases are based on performance records, and they afford further recognition for merit and accomplishment.

The study that has been given to individual jobs has also resulted in the remedying of inefficient shop conditions and has served to increase the general plant efficiency. More attention is being given to planning and scheduling of work through the shop. Materials are delivered to machines and work places in advance of the time they are needed, and instead of having high-priced mechanics running all over the shop to secure some little bolt or screw, this is done for them more expeditiously and at lower cost by some lower-priced laborer. Thus undisturbed in his job, the workman is enabled to devote his entire energies to production, and by increasing his production to find additional money compensation.

WHAT DOES IT PROFIT THE COMPANY?

Getting back to the question originally raised of whether it is all a pretty theory or a real profit to the company, the answer is best found by referring to our individual records of jobs. The example shown on the forms reproduced with this article, which is typical of practically every operation standardized, shows a net reduction of productive shop labor cost, after the job was placed on premium as compared to the records of cost before the job was standardized. Referring to the observation sheet reproduced, it is seen that the average time taken to drill fender gate hanger castings previous to setting the standard time was 9.75 minutes per casting for the ten observations. The standard set as 6.0 minutes per casting was a reduction of about 40 per cent, and yet, as the operation time card shows, this standard time has been equaled or bettered eight times out of twelve jobs. The most serious failure is explained on the back of the non-premium card as "incompetent, new man," and even in this case the time taken by the workman was not as much as the average time required before standardization.

We are certain that 33½ per cent is a conservative figure for the average saving in time for standardized work over unstandardized. And since approximately one-half of the working time of the shop is on the premium plan, the net reduction in the payroll from this source is seen to be 16½ per cent. To be added to this is a saving equal to 10 per cent of the total payroll hours, which is obtained from the company's one-half share of the time saved by workmen earning premiums. This brings the total profit to the company up to more than 25 per cent of what the payroll would be without the premium system. This "income" or "saving" or "credit entry," or whatever one may wish to call it, is

not affected by fluctuations in the rate of wages, as is the case with piecework and similar systems, for this plan is based on time units which do not vary, rather than on monetary values. This saving of one-fourth in the payroll or number of labor hours used for the output of the shops is really too low a figure to represent the returns to the company, when the productiveness of the average worker on flat pay basis in the immediate past is taken into account. I do not hesitate to express the opinion that our shop force and payroll would have had to be one-third to one-half larger in number and cost during the past year had we been operating under the flat day-rate wage system.

There are other accruing advantages to the company. On Dec. 31, 1920, we had 5,471 regular standard operations for repetitive jobs and 3,832 special standard operations for non-recurrent special jobs, approximately 10,000 carefully constructed records of labor performance effective and in use in our shops. This quantity of valuable data is being used and augmented daily and we would hesitate to place a monetary value on it. It is an asset to the organization that perhaps does not appear on the balance sheet, but is nevertheless the result of six years of planned, attained and recorded progress which we feel is of immense value, about correctly appraised in the words of some one who said: "Five years of this . . . will accomplish more than twenty years of rule-of-thumb information locked under the hats of shifting employees."

STANDARDS BEING SET FOR EVERY JOB

Due to the extreme care which it was necessary to exercise in the observations preparatory to the establishment of the standard time for various operations, the extension of the premium system, particularly at first, was a gradual and slow procedure. This is well illustrated in the chart referred to early in this article, showing the growth of the system since 1914. As every one in the organization has become more and more

Head time-study man.....	1
Time-study men in various departments.....	5
Chief inspector	1
Inspectors in various departments.....	6
Stenographer.....	1
File clerk	1
Total	15

familiar with the details of the plan and the time-study men have become more skilled, the expansion of the system to new work has been more rapid, until now we are reaching standards for the very intricate and infrequent jobs. It should be mentioned also that there are many corollary savings to the company, resulting from expediting the movement of work through the shops, the more exact costs returned, the checking up on odds and ends of the work, etc. These are small matters in themselves, but in the aggregate they make entries on the credit side of the ledger of considerable importance, for "a penny saved is twopence earned."

Against the credits to the premium system noted in the past few paragraphs must be charged the expense incurred for the larger supervisory, office and inspection forces required. The number of employees used in these capacities for the operation of our premium system, with a shop force averaging between 500 and 600 men, is approximately shown in table above.

I question whether the time of the inspectors should be charged against the operation of the premium system.

But there has been so much criticism directed against the various incentive methods for increasing production, because it is alleged that they reduce the quality of the work and increase the number of equipment failures, etc., that we have debited the premium system with the cost of the inspection department. Some would consider it necessary in any event. The net result is an increase of 2.5 to 3 per cent in the payroll to offset the 25 per cent decrease explained above.

There is no question in our minds but that the premium system does pay.

System Prevents Mistakes

The Numbering and Lettering of Axles, Gears and Pinions Makes Easy the Distinguishing of One from Another and Is of Great Assistance in Keeping Stock and Service Records

BY C. R. MCMAHON

Master Mechanic Des Moines (Iowa) City Railway

SOME difficulty is experienced in electric railway shops, especially by new men, in being able to distinguish the different types of axles, gears and pinions. Two different types may sometimes look almost alike, even to having the same number of teeth in a gear or pinion, for example. To alleviate this situation, the writer has installed the following system of numbering these pieces of equipment and it has been found to work out very satisfactorily.

Each of our different classes of motors has been assigned a letter, such as A, B, C, etc. All axles, gears and pinions are stamped with the corresponding letter and, in addition, a number. For example, the first axle for use with G. E. 57 motors is marked 1-A, the gear is marked 1-A and the pinion 1-A. The next one of each would be marked 2-A, etc. For the next type of motor, the axle is marked 1-B, gear 1-B and pinion 1-B, and the next one of each of the same type would be 2-B, etc. Two axles for different type motors may thus have the same number but a different letter, and the same system exists with gears and pinions. If an axle, gear or pinion is removed from a car, it is only necessary for the shop man to replace it with a new one having the same letter, and it is sure to be right. This system of lettering and numbering is also a great help in the keeping of stock and service records.

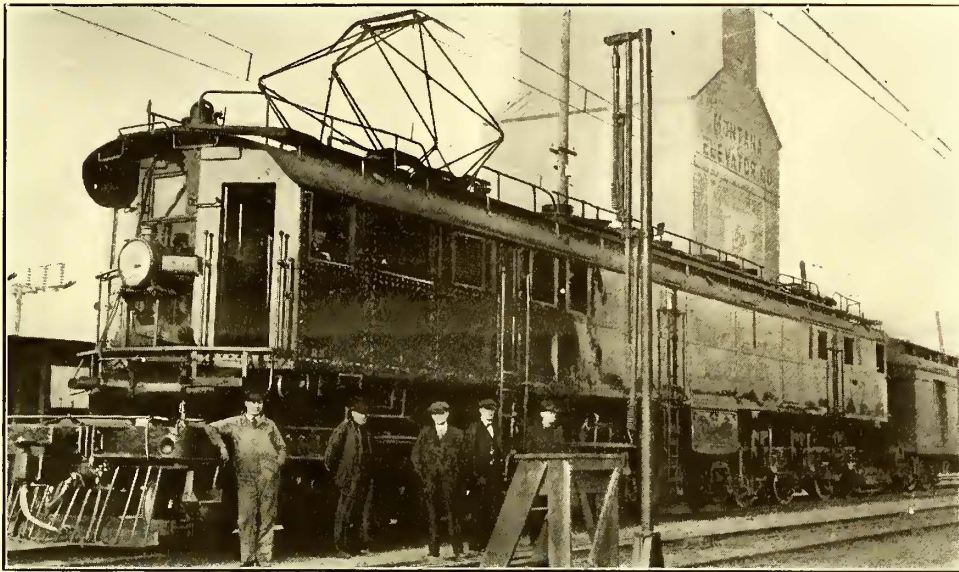
Axles are numbered on both ends by stamping. The gears are numbered either by soldering a brass plate on the web or by placing a piece of galvanized sheet iron around a spoke and fastening it with a rivet. The number is then stamped on the brass plate or the sheet iron strip.

RECLAIMING ARMATURE BEARING HOUSINGS

The armature bearing housings of solid frame motors frequently become worn so that they fit loosely in the motor housings. This condition may be readily overcome when a bearing is in for rebabbiting by forcing a steel pin through the bearing in a manner to expand it. This pin should be made just large enough to expand the bearing the proper amount to fit the particular housing, which means that it is necessary to have a different pin for each size of bearing. The pin should be made somewhat in the shape of a cartridge. It is not advisable to try to expand bearings to take up an extremely worn condition, for there is danger of cracking them.

Shop Notes from Deer Lodge

Chicago, Milwaukee & St. Paul Railway Shops at Deer Lodge, Mont., Maintain the Locomotives on the Rocky Mountain and Missoula Divisions—The Routine Procedure and Some Special Problems Are Covered in This Article—Practical Studies Under Way Continually for the Elimination of Weaknesses that Develop in Equipment



LOCOMOTIVE AT HEAD OF PASSENGER TRAIN ON THE MILWAUKEE

THE electric locomotives for the Missoula and Rocky Mountain divisions of the Chicago, Milwaukee & St. Paul Railway are maintained in the repair shops at Deer Lodge. The two divisions stretch from Harlowton on the east to Avery on the west, Deer Lodge being at the mid-point. At Deer Lodge are extensive shops, formerly used in steam locomotive maintenance, and here the division master mechanic, E. Sears, is located.

On the two divisions which join at Deer Lodge there are employed in freight service thirty-two General Electric locomotives of the type described in the issues of this paper for June 5, 1916, page 1072, and Oct. 21, 1916, page 888, and in passenger service ten Westinghouse locomotives of the type covered in articles in the issues for March 23, 1918, page 559, and March 13, 1920, page 510.

The passenger engines are operated through the entire 440 miles as a regular thing and the freight locomotives are similarly scheduled in some cases. This fact is mentioned by way of contrast with steam locomotive practice, which required the changing of locomotives on entering each 110-mile steam division of the railway.

CONSTANT INSPECTION KEEPS DOWN MAINTENANCE COSTS

The general method of looking after the locomotives is as given below. Special stress is put upon the intelligent upkeep of the equipment, involving a practical knowledge by operators and inspectors of the principles of the apparatus in their charge. To this end copies of a handbook of rules and regulations for the government of enginemen and inspectors are furnished to all of these men. This furnishes the answers to practically all questions apt to come up and contains an

extensive set of questions by which the knowledge of the men can be gaged.

As to inspections, after every trip made by the locomotives there is a casual inspection requiring the services of a man and a helper for from one and one-half to two hours. Every six days the freight engines are ordered in on account of oiling, bringing into the shops seven or eight per day.

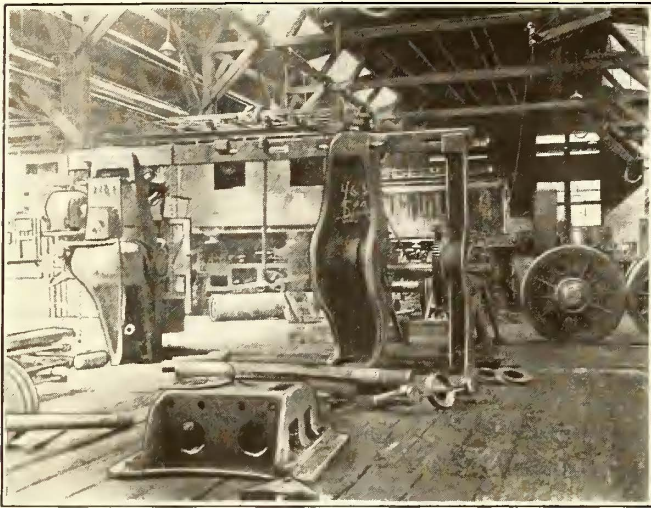
Passenger motors are inspected at the end of each trip like the freight machines. Oil gaging is done at the terminals, but all packing is done at the shops. Bearings are repacked every three months.

Every 3,500 to 4,500 miles the locomotives are given a thorough, daytime inspection, requiring the following force of men: One for the traction motors and pantographs, one for the testing and setting of relays and two for work on controllers, interlocks and other operating devices in the cab.

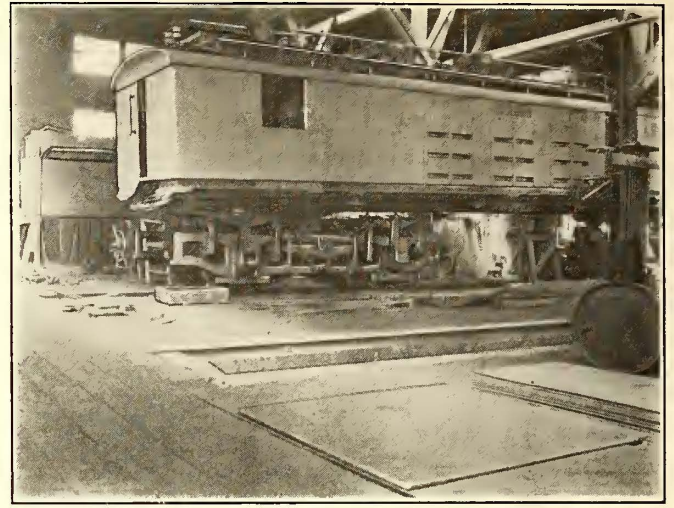
FLANGE WEAR DETERMINES WHEEL LIFE

In addition to the above there is a wheel inspection every week. The hardest wear on the locomotives comes on the wheel flanges and the main journal bearing liners; hence special attention is concentrated on flange and lateral wear. In checking flange wear a square steel gage, suitably notched on the four sides, is used, giving four regular flange contours. As thin flanges ultimately determine the scrapping point of the wheels they are watched with great care, and the wheel rims are turned until they reach a thickness of $1\frac{1}{4}$ in. for the General Electric and $1\frac{3}{8}$ in. for the Westinghouse locomotives. There is yet $\frac{1}{4}$ in. to go in these cases before the tire is said to be worn out.

The general foreman turns in each week a report for each locomotive examined showing the condition of the flange of each wheel by gage number (1, 2, 3 or 4).



SHOP VIEW AT DEER LODGE—BIG WHEEL PRESS
IN FOREGROUND



LOCOMOTIVE CAB RAISED FROM TRUCK FOR
TRUCK OVERHAUL

Lateral clearance for each main journal is also reported, as well as the clearance between the motor brushholders and the risers of the commutator.

A weekly report is also made of tires turned, by locomotive and wheel numbers, and of lateral wear taken up. An inspection of the records for a week just previous to the writer's visit to the shops showed the larger part of the flanges to be coming within the range of No. 3 gage, the lateral clearance to be running from 1 in. to $1\frac{1}{2}$ in. and brushholder clearance about $\frac{1}{8}$ in.

During a similar week forty-four flange defects were corrected and twenty-four cases of excessive lateral wear were cared for.

After the close of the railroad's fiscal year, ending with June, the mechanical department makes up a detail record of the cost of maintenance of all parts of the locomotive in detail. The report covers labor and materials for the following items: Pantographs, motors, control, lights, motor-generator sets, heaters, fuses, motor brushes, miscellaneous brushes, locomotive body, trucks and wheels, air brakes, compressor, flange oilers, sanders, brakeshoes, draft gear, speed recorders, headlights, oiling, regeneration, heating boilers, testing, supervision, painting, meters, lightning arresters, gear grease, gears and pinions.

At Deer Lodge, as in all railway shops, there are practical studies under way continually for the elimination of weaknesses that have developed in equipment or for

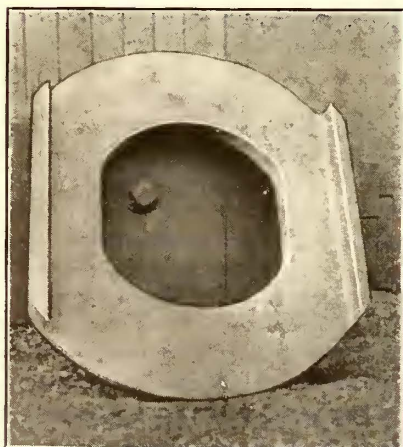
the improvement in practices for the sake of operating economy.

One of these is in connection with the bearing liners which limit lateral play of the motors on the axles. The liner is carried on the inside end of the journal box. It consists of a cast-iron washer faced with a brass or fiber plate. To prevent turning of these liners they are now being cast with two parallel lugs which project over the journal box. Photographs are reproduced herewith to show this construction.

Excellent results are being secured with the type of motor bearing shown in still another illustration. This is a cast-iron bearing made of "Hunt-Spiller" metal, with spiral grooves, $\frac{1}{4}$ in. deep, filled with babbitt. The babbitt used is 4X nickel babbitt. These bearings have made as high a mileage as 60,000.

In "spotting" locomotives about the roundhouse 220-volt current is used with the earlier locomotives, the circuit being plugged in on the ground side of the controller to two motors. The machine is then operated from a stationary controller. On the new locomotives provision is made for putting the spotting current on all of the motors through the regular controller by means of a single-pole double-throw switch provided for the purpose.

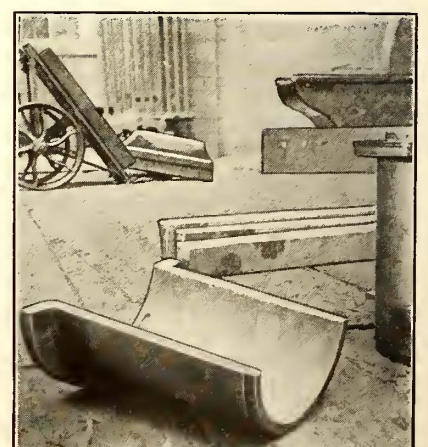
Realizing the importance of extreme care in the handling of the high-voltage equipment on the electric locomotives, the railroad has issued strict instructions



NEW FORM OF BEARING LINER WITH
LUGS TO PREVENT TURNING



JOURNAL BOXES WITH NEW WEARING
PLATES IN POSITION



BEARING OF HIGH GRADE IRON WITH
BABBITT-LINED SPIRAL GROOVES

regarding safety precautions. The following quotations are taken from the rule book and illustrate this point:

CAUTION

No repair work or corrections shall be attempted, except by those duly authorized, who will first see that all switches controlling the circuit on which work is to be done are open. Before undertaking any work in connection with the electrical apparatus or wiring, they should ascertain just what is to be done in order to do it with as little delay as possible, and at the same time use care for protection of themselves and others.

When repairs are made on the road, all high voltage wiring and electrical apparatus must be treated the same as though it were energized even though the collectors are down, until the man in charge has been notified that work is to be done on it. Ropes are provided for holding the pantographs down and both pantographs and trolley pole should always be tied down when work is to be done on any of them, the wiring between the pantographs and main switch, or lightning arrester, when the locomotive is standing under the trolley wire.

RULES GOVERNING EMPLOYEES IN OTHER THAN TRAIN SERVICE

First—Every employee whose duties are in any way connected with the operation or maintenance of the electric and air-brake equipment used on electric locomotives will be required to have a knowledge of the apparatus with respect to its operation, and safety to himself and others. He will be subject to examination covering same.

Second—Only authorized employees shall work on or about the air-brake and electric equipments.

Third—Only authorized employees shall move electric locomotives.

Fourth—Shop employees and inspectors on the road or at terminal shall not work on or about the electric apparatus on electric locomotives until after the pantagraph and trolley pole have been lowered or the trolley wire de-energized.

Fifth—In case of failure of the automatic devices on the pantagraph, and it becomes necessary to operate the pantagraph, this shall not be done until after the main and auxiliary switches are opened. The pantagraph must then be operated with the insulated pole provided for this purpose.

Sixth—Preparatory to working under a locomotive employees shall first open the main switch.

Seventh—Employees working on or about electric locomotives shall protect themselves by the use of a red flag by day and a red light by night.

Eighth—In case of accident to an employee the nearest company physician shall be immediately notified and all aid rendered in accordance with instruction chart on "First Aid to the Injured." The office of the district master mechanic must be notified immediately of all accidents.

Welding Steel Wheel Flanges Successfully

E. B. GUNN, superintendent and master mechanic Western Ohio Railways, Wapakoneta, Ohio, has had unusually good success in building up worn steel wheel flanges by means of electric welding. During the two and one-half years that this practice has been followed 200 wheels have been welded with only three failures. From 40,000 to 50,000 miles on the average is obtained from these wheels after welding. The method followed by Mr. Gunn is somewhat different from that employed in many shops, and this may account for his greater success. His process was fully described in the ELECTRIC RAILWAY JOURNAL, issue of July 17, 1920, page 129.

Charting Conditions of Air-Brake Equipment

Description of an Air-Brake Test Using a Recording Pressure Gage to Indicate the Condition of the Equipment and Provide a Permanent Record for Future Use

BY KENNETH R. LEWIS

ONE of the things which vex an air-brake foreman most is to have a car returned for giving trouble but a short time after its equipment has been overhauled, tested and put in supposedly perfect condition. In order to insure that the equipment was in the best condition possible after being overhauled, the following

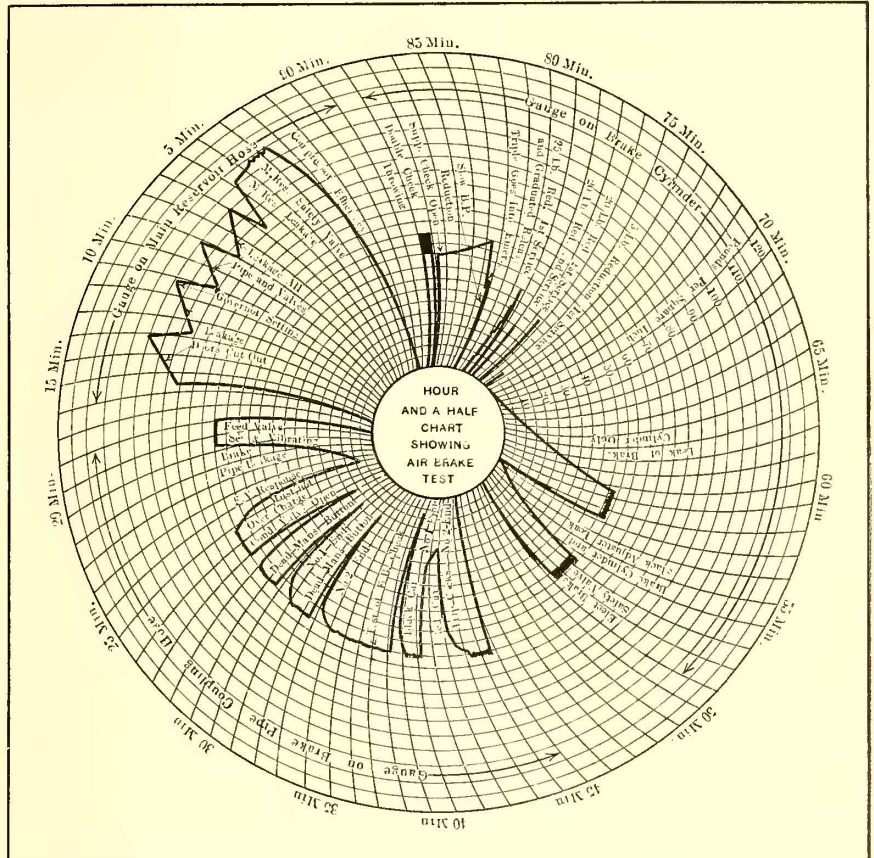


CHART OF AIR PRESSURE IN BRAKING SYSTEM DURING TEST

air-brake test was devised to give a positive indication of the conditions of the various pieces of apparatus and to provide a permanent record to be filed for future reference.

The apparatus used for making the test consisted of a 12-in. recording pressure gage registering up to 125 lb. per square inch and making one revolution in one and one-half, three or six hours, depending on the gearing used. The usual tests required about one hour to complete, so for these tests the slowest speed was used in order that the chart could be more easily read. Each car was tested after its equipment had been repaired and overhauled, and cars which had been in collision or in trains which had run by signals in operation were tested immediately after the occurrence and the records filed for use in case there should be a claim necessitating definite information at some later time regarding the condition of the brakes on that particular car.

Before this method of testing was inaugurated, it

seemed to be a habit of motormen to claim brake failure as the easiest explanation in case of trouble on the road. After a few such cases had been tested, and the charts produced as evidence that the equipment was in satisfactory condition, these men ceased to blame the equipment and admitted that they had misjudged the stopping distance. The test also proved an excellent check upon the workmanship of the repair men in overhauling.

When this method of testing was first started, a majority of the cars tested after being overhauled were rejected for excessive leakage or improper working of the valves and required additional work to put the equipment in proper condition. When the men learned that poor workmanship could not get by, the equipment was turned out in much better shape and passed all tests without difficulty. Flat wheels and brake troubles that previously had been mysterious, and which could not be directly located in the old way of testing by applying and releasing the brakes and watching the brake cylinder, showed up immediately on the chart.

The accompanying diagram shows a sample chart that was made up as a guide for the man making the test and was used for comparing and checking other charts as they were obtained from cars under test. The following instructions for making the test were also supplied to the men:

INSTRUCTION FOR TESTING AIR BRAKE WITH RECORDING GAGE

Connect the gage to the main reservoir and place the brake handle in release position.

1. Start the test with the main reservoir empty. Close both door and control-pipe feed valves. Ground the synchronizing wire so that the governor will not operate to cut out the compressor. Cut in the compressor switch and allow the compressor to pump up pressure until the safety valve opens. The gage chart will show compressor efficiency; also the setting and operation of the safety valve from this test.

2. As the main reservoir pressure is building up, check the car gages at both ends of the car at several pressures to see that their indications correspond to the pressures indicated by the recording gage. If not, they should be properly set.

3. Remove the ground from the synchronizing wire so that the governor will cut out and stop the compressor. Then let the recording gage operate about one minute to register the main reservoir and reservoir pipe leakage and the leakage back through the compressor check valves.

4. Cut in both the door and the control feed valves, and after all piping and valves are charged up and the brakes released allow the compressor to operate normally one or two cycles. The gage chart will then indicate the governor setting and, from the time and rate of reduction of pressure after the governor cuts out, the rate of leakage of all valves and piping combined will be recorded.

5. Repeat the last test with the door feed valve cut out in order to record the leakage without door engines and piping cut in.

GAGE ON BRAKE PIPE

Remove the recording gage and tap it on the brake pipe coupling hose.

6. With the brake handle in the release position, allow the gage to register one or two minutes so that the chart can record the feed valve setting and vibration. Meanwhile check the brake-pipe hands on the car gages at both ends to see that they are properly set.

7. Make a 5-lb. brake-pipe reduction and then lap the brake valve handle. The recording gage will then indicate the rate of brake-pipe leakage. Should the pressure increase instead of decrease, this indicates a leaky brake valve.

8. When the brake pipe has been reduced to a low pressure, return the brake valve handle to the release position.

The recording gage will indicate the response of the feed valve or show up any restriction in the piping. Note that pressure does not build up higher than the feed valve setting as would be caused by a binding or sticky feed-valve piston.

9. Pull the conductor's valve from the other end of the car in order to test the rope for strength. The test chart will indicate whether the reduction of brake pipe is enough to cause an emergency application of the brakes with the brake handle in release position and whether there is a restriction in the piping.

10. Operate the "dead-man's button" on the No. 1 end of the car, then after closing and when the brake pipe is again fully charged, operate the dead-man's button on the No. 2 end of the car. The gage chart will indicate that the brake-pipe reduction is heavy enough to apply the brakes in emergency with the handle in the release position on the brake valve.

11. With the brake pipe fully charged, make several heavy applications of the electro-pneumatic brake in order to record the fact that the check valve does not leak. Any reduction of brake-pipe pressure shown on the chart indicates a leaky check valve in the line ahead of the electro-pneumatic brake tap.

12. With the brake handle in the release position test out each automatic trip valve allowing time between tests for brake pipe to recharge.

GAGE ON BRAKE CYLINDER 5-IN. PISTON TRAVEL

Remove the recording gage and tap it on the brake cylinder.

13. Apply the electro-pneumatic brake until full pressure is reached and the safety valve operates long enough to record the setting pressure.

14. After a full electro-pneumatic brake application, place the brake handle on the electric lap position for two or three minutes. The gage chart will indicate the combined brake cylinder and slack adjuster leakage.

15. Release the electro-pneumatic brake and take up the slack adjuster to give a 4-in. piston travel and repeat last test. The gage chart will then indicate the brake-cylinder leakage without the slack adjuster leakage.

16. Fully release the electro-pneumatic brake, then turn the snap switch to the "off" position. Allow the gage to register for one minute in order to show the leak if any that takes place through the electro-pneumatic brake-application valve.

17. Make a 5-lb. brake pipe reduction, first service position. The gage chart will indicate whether the triple valve operates properly on slight reduction.

18. Make a 20-lb. reduction, first service position, to indicate on the gage chart that the brake cylinder pressure given is correct for this reduction. Release the brakes.

19. Make a 20-lb. reduction, second service position, to show that the triple valve does not go into the emergency position. Release the brakes.

20. Make a 25-lb. reduction, first service position, and then graduate the release, allowing time between graduations for the chart to record the pressure at each step. To pass the test, the chart should show at least three graduations of the brake cylinder pressure.

21. Place the brake-valve handle in the first service position and leave it there until the pressure is reduced to zero. The gage chart will indicate length of time required for the triple to go into emergency position.

22. Leave the brakes in the emergency position several minutes so that the gage chart will show how the brake cylinder pressure is maintained after an emergency application.

23. Move the brake-valve handle several times from electro-pneumatic to automatic position in order to show on chart the operation of the double check valve from side to side.

The above instructions, of course, apply particularly to but one class of equipment, and these would need revising for other types. However, by following through these tests and comparing with the chart, the user can make any changes necessary for other types of equipment.

Since the inauguration of this method of testing the number of defects causing detentions to service has been materially reduced.

Arc Welding and Motor Maintenance

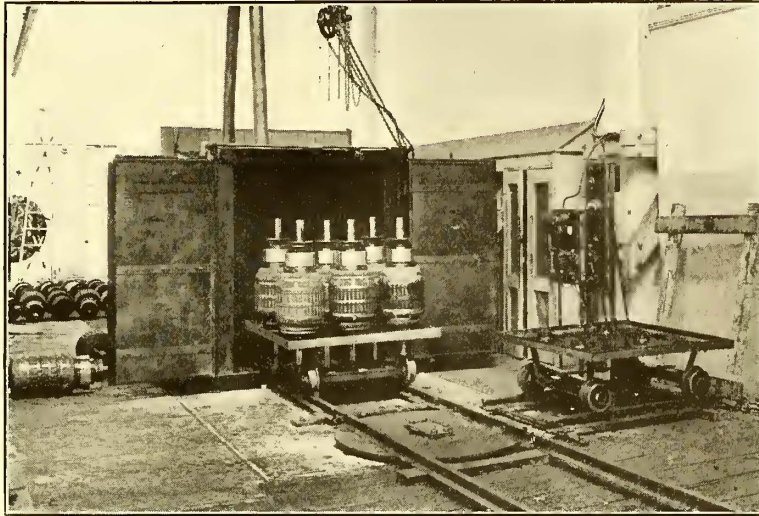
Equipment Men of the Electric Railways of Ohio, Pennsylvania and West Virginia Gather for Semi-Annual Exchange of Experience—Considerable Doubt of Economy or Safety of Welding Wheel Flanges Develops—Motor Maintenance Talk, Illustrated with Stereopticon Slides, Given

THE Association of Electric Railway Men, which comprises the equipment men of the electric railways in Ohio, Pennsylvania and West Virginia, held a meeting in the offices of the Richland Public Service Company, Mansfield, Ohio, on Dec. 7, 1920. There were about forty-five in attendance, a number of whom stayed over to visit the Mansfield plants of the Ohio Brass Company and the Westinghouse Electric & Manufacturing Company on Dec. 8. A full day of informal discussion, led off by a talk on electric arc welding by A. M. Candy, Westinghouse Electric & Manufacturing Company, and illustrated with stereopticon slides, and another illustrated talk on railway motor maintenance by J. S. Dean, also of the Westinghouse company, occupied the equipment men on Tuesday. They were the guests of H. A. Cowgill, general superintendent of the Richland Public Service Company for luncheon, and of the Ohio Brass Company for dinner and a theater party Tuesday evening.

Mr. Candy's talk on arc welding occupied the entire morning session, and it proved of great interest to the master mechanics. The substance of this talk, together with many of the illustrations used, were published in the issue of the *ELECTRIC RAILWAY JOURNAL* for January 15, 1921. In general he endeavored to show the scope of electric welding work and explained with illustrations some of the technical aspects of the subject, such as the effect of polarity, the effect of long and short arcs, of too high current, too low current, etc., and gave a brief description of the several systems of welding and their relative efficiency.

In the discussion which followed Mr. Candy's talk I. E. Church, Pittsburgh (Pa.) Railways, told about welding some flexible couplings, made up of two halves with twenty-eight holes in the head in which as many 1½-in. pins engaged. The holes became worn, some of them as much as to 2 in. in diameter. These were filled up by electric welding and the holes rebored with very satisfactory results.

The discussion then turned to the subject of welding worn flanges on car wheels. It developed that there was considerable difference of opinion as to the advisability of welding flanges, particularly for use on high-speed interurban cars, from the standpoint of safety. There was also expressed a good deal of doubt



BAKING OVEN AND TRANSFER TRUCK

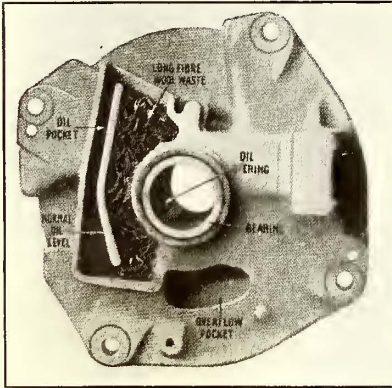
as to the economy of building up flanges by welding on any class of car wheels. One master mechanic said that he had had varying results in trying to weld flanges. One operator would make a job such that the flange could be turned readily in a lathe. The metal deposited by another would be so hard that it could not be machined at all and could only be dressed up by grinding. The latter flanges, however, never have worn out, he said. He doubt-

ed the advisability of using built-up flanges on high-speed cars for he had found that there was a tendency for the flange to check. This has been overcome to a certain extent by welding one layer of metal and then permitting this to cool before building up further, and so on until the three or four layers necessary are completed.

W. H. Goodenough, Mansfield, Ohio, said that he had found it desirable to build the flange up with one layer about one-eighth of the way around the wheel and then go back and start the second layer, thus permitting a certain amount of cooling between layers. However, he said that the welding of axles and wheels had been discontinued because he had had six cases of broken axles, all of which had been electrically welded. He also said that when the welded wheels came back for reshaping it is possible to turn only the tread, and the only means they have available for shaping the flange is a portable grinding outfit.

F. R. Phillips, Pittsburgh Railways, explained that his company was planning to build up flanges on city car wheels by means of an automatic outfit which assured a constant length arc and constant current during welding. He pointed out that the Pittsburgh company now employs sixteen arc welders and nine or ten gas welders, and that plans for a more extensive use of welding processes for reclamation work are being formulated. He said that both electric and gas welding are used because some jobs can be done more economically with one than the other. Referring to the cost side of welding flanges on wheels, he said that before the war a study was made to determine the exact cost of this work, and it was found that with the then prevailing prices for wheels it cost \$2 more to reclaim a wheel than to buy a new one. He thought that as wheel prices increase the opportunity for welding becomes more favorable. He contended, however,

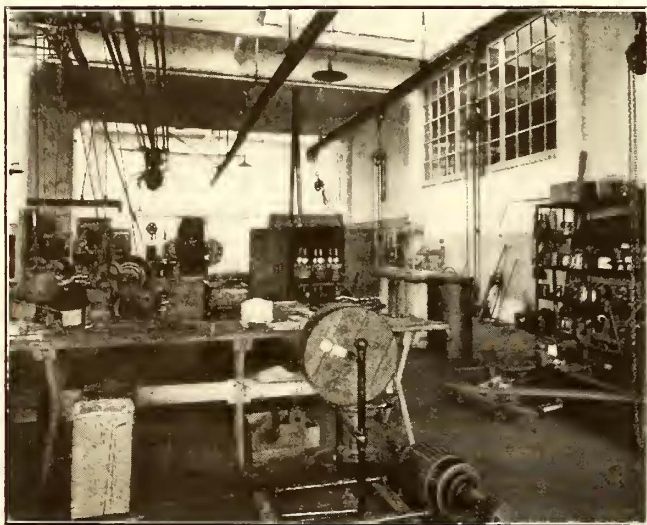
that with lowering wheel prices, unless the cost of labor is very much reduced, it will not be economical to weld. He said he had had ten years' experience in this welding work and that he was learning new things about it every day. One of these things is that it is possible to carry the idea of reclaiming by welding entirely too far. For example, he has found that it costs more to fill up and rebore the holes in the hangers for Bemis trucks, as they become worn, than it does to buy new hangers. George H. Kelsay, Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, said that he had experimented with building up flanges, but had found that they chipped off readily and showed other weaknesses and he doubted very much the value of the results obtained. He



SECTION THROUGH ARMATURE HOUSING, SHOWING SYSTEM OF OIL WASTE LUBRICATION

had not yet been able to bring himself to the point that he was willing to be responsible for the use of wheels thus reclaimed on high-speed cars.

One man said that his company had fifty Peter Witt type cars equipped with 26-in. wheels on which it was impossible to get even one turning, and the life of the wheels was therefore very short. He had been able to lengthen the life materially by building up the flanges and was now buying an automatic welding outfit for this purpose. These cars, he said, run at 50 m.p.h., and there has been no difficulty with the welded wheels. Mr. Phillips interjected that his company has been



GENERAL VIEW OF SHOP AND DIPPING AND BAKING OUTFIT

experiencing this same short-life difficulty with the small diameter wheels, but that he is not welding them because of the molecular change which takes place in the metal and he did not want to take a chance on such wheels.

A. B. Creelman, Youngstown (Ohio) Municipal Railway, stated that he had such poor results from the

welding of axles and armature shafts that he had not attempted wheels. He said excellent results had been obtained from welding motor caps and various other reclamation work about the shop, but he was very skeptical of the economy and safety of welding flanges. He said that one might get away with it, but that one serious accident due to a defective wheel would offset more saving than could be realized in years. He said he had experimented with building up thin flanges and had used his best welder. Some 34-in. wheels on which the flanges were very thin were built up to standard by welding 6 or 8 in. at a time and permitting it to cool. After the wheel was done, he said, you could take a machinists' hammer and knock out a piece of flange with ease. He said it might be possible that in this case the flange had been too thin to form sufficient body on which to start welding.

Some one pointed out that the steam railroads are doing some welding of flanges for freight engines, but are not doing any of this for passenger engines. He said they had not felt they could take a chance and had taken the position that welding of flanges on wheels used in high-speed service was placing too much confidence in one man—the welder.

Another man said he had found that the labor involved in welding and turning wheels was so great that there was no economy in it. Still another member testified that he had some wheels welded and rewelded and that large pieces broke out of the flange both after the original weld and after rewelding. He thought this might possibly be due to running the cars over girder groove rail in the city.

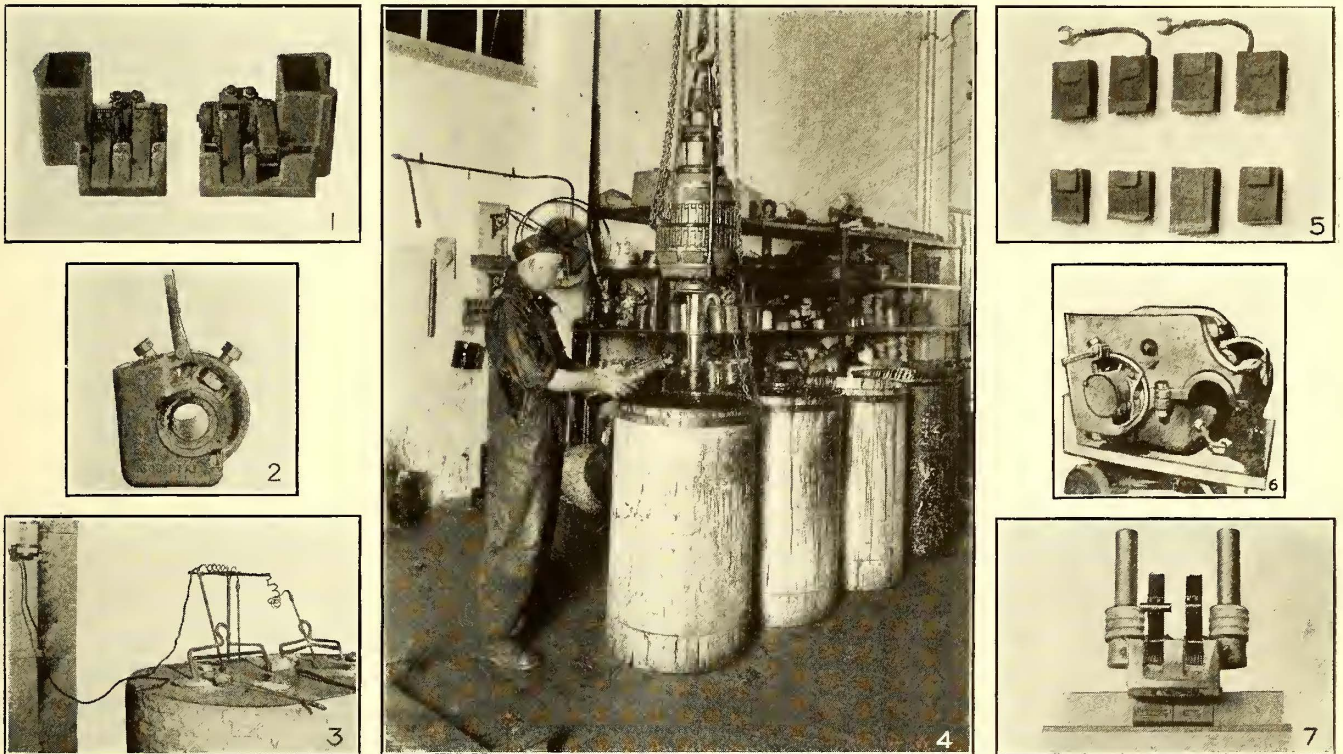
One of the men present referred to the method of welding flanges used by E. B. Gunn, master mechanic Western Ohio Railway, Wapakoneta, Ohio, whereby the worn wheel is turned as near to proper contour as possible without cutting away an undue amount of the tread in order to cut out the groove at the throat. This groove on the inside of the flange is then filled up by means of electric welding, rather than to build up practically an entire flange without turning the tread at all. This practice saves perhaps $\frac{1}{4}$ in. or more on the tread that would otherwise have to be turned off, and at the same time provides a large body of solid metal in the flange to support the welded metal. The speaker thought that this scheme might account for the apparent success attained by Mr. Gunn. The latter's method of welding wheels was fully described in a paper by him in the July 17, 1920, issue of the *ELECTRIC RAILWAY JOURNAL*, page 129.

One member had made a careful cost study of the case where one wheel of a new pair developed a thin flange after it had been in service only a comparatively short time. In such a case, if the wheel is caught before the flange is worn too thin and built up by welding, and the pair put in the lathe and both wheels turned at the same time, it is possible to save about \$10 over the cost of pressing off the worn wheels and pressing on new ones, taking into account the time involved, scrap value, etc., versus the extra wear derived from welding and the labor involved in that. He said that if the flange is worn too thin, however, the wheel is lost. This rapid wearing of one wheel is frequently due to the pair being not properly matched for diameter. Mr. Kelsay and Mr. Phillips confirmed the comment that the checking of wheels for diameter cannot be intrusted to the manufacturers, but must be done in the railway shops.

P. J. Wood, Buffalo and Lake Erie Traction Company, upon being asked for his experience, said that he was having very good success with built-up flanges. He has been following this practice for eight months, using simply a resistance type welder and trolley current, and has had no trouble. The flanges built up in this manner are not turned, but are put in service just as the welder leaves them. Mr. Wood said that after the wheels have been back in service for a short time the flange wears smooth and you cannot tell where the weld was made. He considered that there was no object in spending time to machine the flange after welding, for if the welding is well done it very quickly smooths out and there is no danger at all. These wheels are used on high-speed interurban service.

Several of the equipment men expressed astonishment that the wheels were permitted to go back into

welding and electric welding of bonds. A representative of the Ohio Brass Company answered that he knew of one road which had installed 60,000 steel tip bonds with the gas weld process and had found the installation most satisfactory. As to the relative merits of the two methods of welding bonds, he said that there was no particular advantage, but that gas welding had been used largely thus far because it had been on the market longer, though he said the arc welding process will supplant the former. He believed this to be the case mainly because of the fact that electric railways always have power at hand, whereas it is sometimes very difficult to secure acetylene gas. This is comparatively easy now, but it was very difficult during the war. The question then becomes one of whether a company wants to go to this trouble or to make use of the energy it has directly at hand. He said that



1.—New type insulated point brush-holder for 49, 56 and 68 railway motors
 2.—Through bolt type housing—Split frame motor.
 3.—Pyrometer to measure temperature of babbitting metal.
 4.—Dipping armature, showing armature clamping details.

5.—Side wear on carbon brushes with and without pigtails.
 6.—Old style 101-B motor adapted for use of through bolt housing shown in No. 2.
 7.—The effect of long and short brush-holders, contact tips on top carbon wear.

service without turning or smoothing up of the welded surface and denoted the feeling that such wheels would be much more likely to climb the rail. As to the cost of welding, Mr. Wood said he did not know the cost, but that the life of the wheels had been increased 25 per cent.

Mr. Creelman concluded the discussion on welding rail flanges by saying that it seemed to be just a matter of taking a chance, and if you got away with it it was all right.

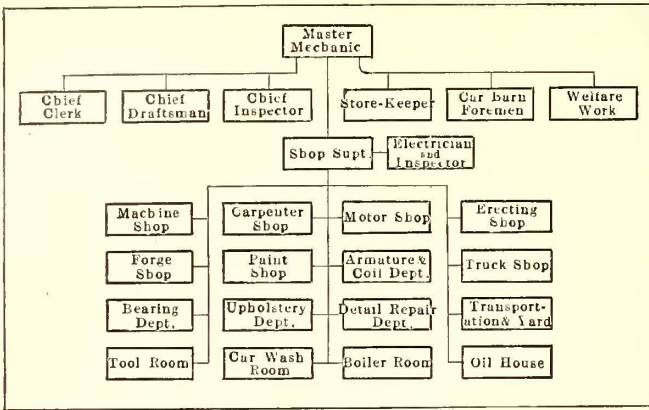
A portion of the talk by Mr. Candy had been devoted to the subject of welded rail bonds. He said that for this purpose one might as well forget anything but a steel tip or steel face bond for welding by the electric arc process. It is so difficult to weld the copper to the rail that it is impractical.

Some one raised the question as to how successful welded bonds have been and the relative merits of gas

the Ohio Brass Company is putting on the market a portable motor-generator set for electric welding of bonds, which is being made for this company by the Wilson Electric & Bonding Company, New York.

Mr. Phillips commented that it is easier to break in a gas welder than an arc welder. He added that lack of skill is the reason for more failures of arc welds than anything else, and he thought this was largely the result of the very scant instruction usually given men who are put on this kind of work.

Mr. Church spoke briefly of this problem of training welders. He said that one could take two apparently equally good men, give them the same training and one would make a good welder and the other would be no good at all. He had found that if a man were of a nervous temperament he would never make a good welder. He said it takes a slow, steady, conscientious man to make a good welder, though he may have less



ORGANIZATION CHART

intelligence than another who is more active and excitable. He spoke of one man who had been welding only a month and was already doing excellent work. Others who have been doing welding work for more than a year get hard spots which cannot be machined, causing broken lathe and planer tools, etc. He considered that the operator is an exceedingly important factor in electric welding work.

Answering a question, Mr. Candy said that the job of welding thin cast-iron sections is a very difficult one with the electric arc process. Cast iron is a weak structure to begin with, and as welding progresses the cooling strains set up are very likely to crack the metal at some place other than at the point of welding. The best way to do this kind of welding, he said, is to pre-heat the piece just as it would be handled for gas welding.

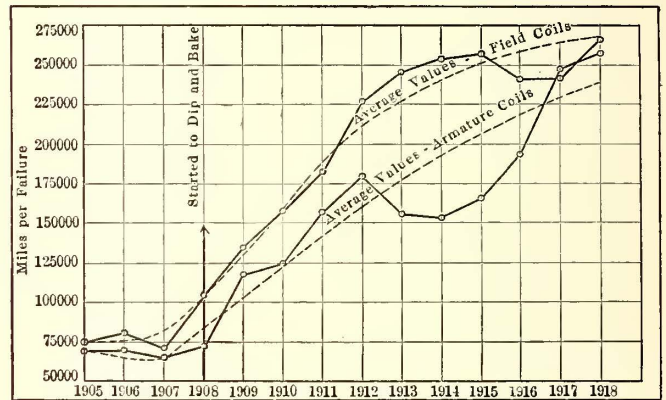
ARC WELDING NUTS ON BOLTS

In answer to another question on the use of arc welding for fastening nuts on bolts to keep them from working loose, Mr. Candy said that the Chicago, Rock Island & Pacific Railroad has used this method extensively. A spot weld is made between one face of the nut and the adjacent surface, or between the nut and

the bolt. He said this was the only case of this practice that he knew of and he did not know its value.

In welding special trackwork Mr. Candy said that it was his opinion that best results could be obtained through the use of the graphite electrode process if men are available who know how to use this process.

Mr. Candy then endeavored to answer the question as to what is the most economical electric welding equipment. He explained that when using a metal electrode the voltage across the arc should be about 20 volts. If a 500-volt source of energy is being used, this means that it is necessary to dissipate 480 volts in resistance, or that only 4 per cent of the energy consumed is used in the welding work. If welding is being done with a 110-volt supply, then 90 volts must be dissipated in resistance, or only 18 per cent consumed in useful work. If a motor-generator set delivering 60 volts is used, this means that 40 volts will be dissipated in resistance and that 33 1/3 per cent of the energy will be used in the motor-generator set and in the arc. If the machine is 75 per cent efficient, then the over-all efficiency is about

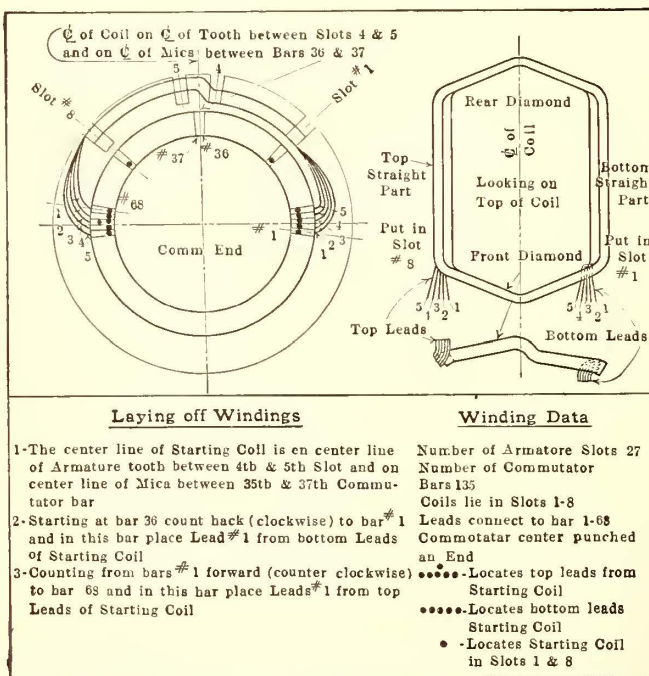


DIPPING AND BAKING CURVE SHOWING EFFECT ON LIFE OF WINDINGS

23 per cent. With the one-man type motor-generator welding outfit which is designed for inherent regulation to take care of the variation in length of arc, the over-all efficiency obtained is from 50 to 60 per cent. This is therefore probably the most efficient machine.

J. S. Dean, Westinghouse Electric & Manufacturing Company, then gave a talk, illustrated with stereopticon slides, on many phases of the maintenance work on electric railway motors, many interrogations being answered as he went along. A great many of the pictures shown were from the shops of the International Railway, Buffalo, N. Y. Among these was an organization chart of the Buffalo mechanical department, some of the shop-record forms, equipment for dipping and baking of armatures and a number of other pictures, some of which are reproduced herewith. In general, Mr. Dean's talk was a sketch of the maintenance practices followed on various roads which have brought good results and the varying experiences in motor maintenance problems.

Speaking of the method of preparing armatures followed at Buffalo, Mr. Dean said that all armatures newly wound or repaired are dipped and baked. If an armature does not come in for repair otherwise, it is brought in anyway every two or two and a half years for dipping and baking. In Buffalo the armatures are dipped with the pinion end of the shaft down, immersing the armature up to the commutator neck. The lower end of the shaft is protected from the varnish by a sleeve which is fitted with packing at the upper end.

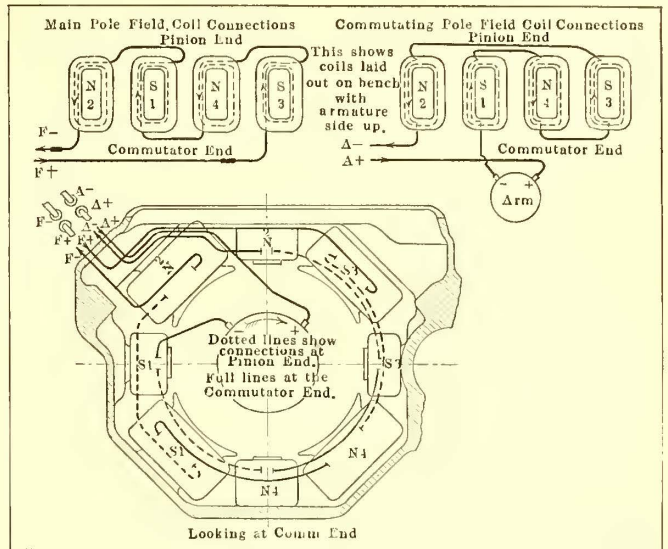


ARMATURE WINDING LAYOUT—RAILWAY MOTOR

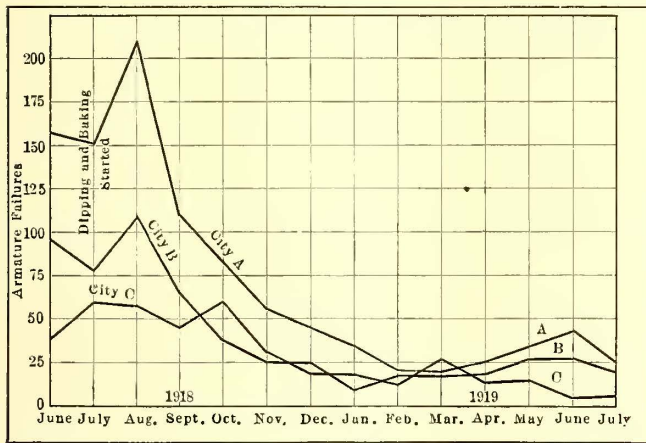
Some companies roll the armatures in the varnish instead of dipping them, in order to avoid having to protect either the armature or the pinion end of the shaft. Mr. Dean could not say whether this method was as satisfactory as the dipping method, but he felt skeptical about it. He also mentioned that P. V. C. See, Northern Ohio Traction & Light Company, Akron, Ohio, is considering the possibility of spraying armatures instead of either dipping or rolling.

Turning to the matter of drying armatures after dipping, Mr. Dean said that it had been proposed to spin them in a lathe, but he thought this might throw out too much of the varnish.

Some companies are considering the desirability of dipping and baking the motor frame as well as the armature, that is, putting the whole frame with the field coils in place through this process, instead of simply treating the field coils separately. The idea is



WIRING AROUND FRAME DIAGRAM—RAILWAY MOTOR



DIPPING AND BAKING CURVE SHOWING EFFECT ON ARMATURE FAILURES

that there is a possibility of damaging the coils in installing them after baking.

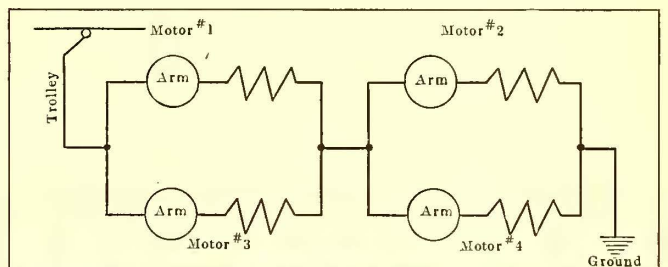
Some one asked about the value of using air-drying varnish instead of dipping and baking. Mr. Dean replied that this was undoubtedly better than nothing, but not as good as the dipping and baking process. Yet he mentioned that he knew of one company that was dipping its armatures but not baking them, on the theory that they were baked on the road. One of the members interjected that the air-drying varnish would give so little penetration that it would result in only a surface treatment and would be of little value. Another man commented that the big problem in armature maintenance was the commutator leads, saying that the coils do not burn out except as the result of lightning. He thought one of the big problems was to get the leads thoroughly packed so that they will be held firmly in place and particularly well insulated.

Mr. Dean spoke briefly of banding armatures and said that some companies do not band them, except perhaps for the core bands, until after the armatures have been dipped and baked. This probably permits more varnish to penetrate into the cambric and around the leads.

Endeavoring to answer the question of whether or not it pays to dip and bake armatures, Mr. Dean showed curves from two different companies. One of these showed a distinctly upward trend, since the process of dipping and baking had been started, of increasing life of armatures. The other curve was drawn up to

show the number of armature failures, and this showed a decided drop.

Speaking of the problem of securing correct armature winding, Mr. Dean said that the common practice of the armature winder was to take note of how the armature upon which he was working seemed to be wound, and then follow this in putting in a new coil. He said this was not always a safe thing to do and it sometimes led to a mistake. A damaged armature upon which he may be working may have been wound wrong before. To make the armature winder's work more certain, Mr. Dean showed some charts which the Westinghouse company has had prepared. These show in a simplified manner the method of laying off windings in different type motors. A separate chart has been drawn for each motor, and the armature and field instructions for the same motor are also separated.



Test No.	Motors	Control Positions	Amperes per Motor				Line Amperes
			1	2	3	4	
1	All motors cut in	Full parallel	53	53	53	53	212
2	All motors cut in Brushes out of #3	Full series	96	48	0	48	96
3	All motors cut in Brushes out of #3	Full parallel	64	64	0	64	192
4	No.1 and No.3 cut out No.2 and No.4 cut out	Full series	0	80	0	80	160

Conditions of Test

- a - Test car special and no passenger load.
- b - Ammeter was connected in series with car circuit breaker.
- c - Rail clean and dry.
- d - Trolley voltage high 575 to 585 volts.
- e - All observations were taken on a grade at the same location for each test.

Remarks

- a - Commutation of motors sparkless.
- b - Wheels did not slip.
- c - Slightly increased noise.
- d - Car speed during tests 2 and 3 about normal.
- e - Motorman unable to tell whether one motor was cut out by operation of the car.

TEST DATA OF UNBALANCED MOTOR OPERATION

They have found it desirable to have separate charts for the fields and armatures because different men do work on these separate parts of the machine. A pair of these charts is illustrated herewith on pages 540 and 541.

Mr. Dean spoke of the fact that few companies test the fields of motors for polarity. He said a field coil may easily be connected up in the wrong way and that it is very difficult to find this out unless a test is made before putting the motor into service. While a wrong field connection will reduce the speed of a car, the motorman may not notice this readily. He said it is therefore desirable to subject all motors to a load test under low voltage and take note of the speed before putting the motor back in service.

One of the members asked what would be the result of reversing the interpole connections. Mr. Dean said until recently he would have said that under those conditions it would be impossible to operate a motor, for the interpole, wrongly connected, would increase the armature reaction instead of compensating for it and

acts as a choke and tends to cut down the flash. However, for any internal motor trouble it does not make any difference which way the connection is made.

COMPOSITION OF SOLDERING ALLOYS

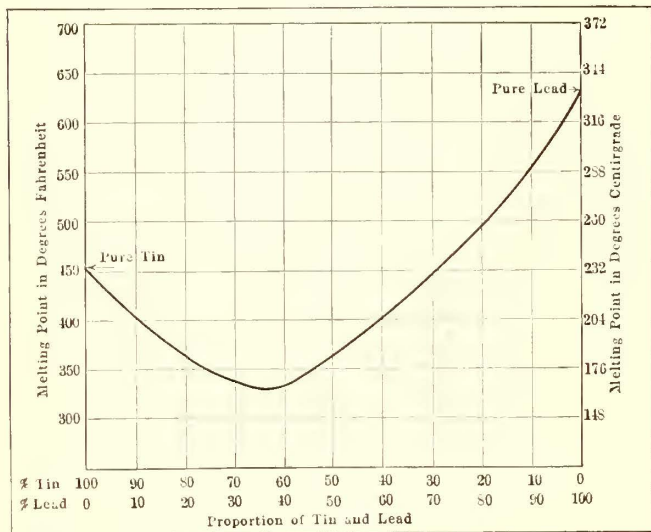
At this point an interesting curve was pictured on the screen showing the effect on melting point of varying combinations of lead and tin to make soldering alloys. Mr. Dean pointed out that for purposes of soldering commutator leads a soldering metal containing 15 per cent lead and 85 per cent tin gives the best results. For soldering fields the best alloy is 60 per cent lead and 40 per cent tin. He cautioned against getting too high a percentage of tin, saying that its very high affinity for copper causes it to eat into the copper. For soldering armature bands he recommended the use of pure tin solder, saying that it would give a 10 to 15 per cent longer life than a lead solder.

Mr. Creelman said the Boston Elevated Railway had very good success in the use of pure tin for soldering commutator leads. He said the solder would eat away the soldering iron and caused a great deal of trouble in this respect, but once the leads were soldered, the melting point was so high that the solder never melted out in a flashover.

The subject of armature coils becoming loose under the bands was brought up and it was found that one company had overcome this trouble by eliminating the special insulation usually placed over the coils and underneath the bands. It seems that this insulation sometimes works out and leaves the coil loose. This company did away with the band insulation by putting a heavy enough insulation on the coil itself to protect it from the bands, which were then wound tight against the coils. Under this scheme no difficulty has been found in keeping the coils tight.

Mr. Dean then turned to the subject of babbitting bearings and presented some curves to show the results of bringing the babbitting metal to too high a temperature, of pouring it too cold or too hot, etc. He said that it is extremely important that the temperature of the metal be carefully controlled in order to get good results, and stated that the proper temperature for pouring is between 460 deg. and 480 deg. C. These figures apply to either a tin or lead base metal, except that the limitations of temperature are not so close on a tin base. He showed a picture of the automatic control of the temperature of the babbitting metal used in the Westinghouse Electric & Manufacturing Company's plant. A number of the members present commented that they were never able to get as long life out of bearings poured in their own shop as they did out of the original bearings which came from the manufacturers' plant, and it was concluded that this matter of proper control of temperature probably gave the explanation. Mr. Church of the Pittsburgh Railways said that the life of bearings had been doubled or perhaps tripled on his system through the installation of a temperature indicator, which simply kept the workman advised of the temperature though it did not control the temperature.

The discussion then turned to the method of oiling modern motors provided with oil wells. Mr. Dean urged the railway men to make sure that the oil was poured into the well to feed up through the waste from the bottom and not poured over the top of the waste. He said that it was only a waste of oil to pour it on the top and that this accounted for the oil-streaked streets



CURVE SHOWING MELTING POINT OF TIN LEAD SOLDER

would so buck the fields that a flashover would result. However, recently in Seattle there was a good deal of trouble with motors overheating and it was discovered that the cause was reversed interpoles. The trouble here did not show up in any radical way, but simply produced overheating.

A question came up as to the proper way to connect the motor circuits, whether the field should be connected to trolley and the armature to ground, or vice versa. Mr. Church, Pittsburgh Railways, said that they used to connect the armature to trolley and the fields to ground and had a good many armatures fail from lightning. They then reversed the connections and had less loss of armature but more trouble with the fields. He thought it was just a question of whether it was better to burn out armatures or field coils. He considered that it was easier to replace a field coil, and so the practice in Pittsburgh is now to connect the field to the trolley. He also thought that there was less likelihood of a flashover if the connection is from trolley to field, for this places less voltage across the armature.

Mr. Kelsay added that any external disturbance is likely to have less effect upon the motor if the connection is from trolley to field, for the field coil then

and for oil getting inside the motors. Mr. Church, Pittsburgh, thought it was desirable to pour a little of the oil on top of the waste, for he had found that otherwise the bearings have a tendency to turn black, indicating that they are not getting quite enough oil. He was of the opinion that it is better to have a little excess and thereby be sure of enough. Mr. Creelman thought it was a good idea to put some oil on top of the waste, as it forms a kind of seal from the air, which causes a better rise of the oil up through the waste from the bottom of the well. Mr. Dean contended that too much oil was used as a rule and that oilers should be instructed to keep away from pouring any on top of the waste.

RELATION OF PRESSURE TO BRUSH WEAR

Taking up the subject of what is the proper brush pressure to use, Mr. Dean said that under ordinary practices 5 to 6 lb. per square inch is about right. Under bad track conditions, however, it is often found that 7 or 8 lb. is better. Where this had been recommended in a few cases, he said that the brush manufacturers had objected on the ground that it wore the brushes down too fast. He said he found that brush wear was more likely to be due to too little pressure than too much, for it comes more from burning than it does from friction. He remarked that it is a very good idea to give the brush-holders a very little light oil now and then, for particles of carbon worked into the joints and made them stiff and "screechy."

Mr. Dean then showed some interesting pictures of brushes which had been tested for side wear. He said that it had been practically impossible to determine the cause of this side wear, which is more or less trouble to nearly every property. The tests seemed to indicate practically the same wear whether the brushes were shunted or unshunted, and the grade of carbon, curiously enough, does not seem to make any difference either. He has observed, however, that the side wear seems to be more noticeable on ventilated motors than on the non-ventilated type and he has an idea that the dust and dirt drawn into the motor may have a good deal to do with the side wear of the brushes. He said that the Public Service Company of New Jersey had filled the ventilating ports of some of their motors with hair to catch the dirt and while they had cut down the brush wear they had also cut the rating of the motors, for samples of the hair sent to the Westinghouse factory showed that it became so thoroughly matted or clogged with dirt and dust that it stopped all ventilation. This concluded Mr. Dean's talk.

TROLLEY BASE TENSION DISCUSSED

The question was raised as to what tension is generally used on trolley bases on interurban service. The answers given showed that it varied from 30 to 36 lb. on the different properties represented. The pressure for city cars was said to be 25 lb. on the average.

W. H. Bloss, Ohio Brass Company, commented that he had observed that the companies which were using the lightest pressure were the ones that were buying the least overhead material. He commented also on the fact that the pressure used on many interurban cars is far too severe for city overhead construction. He said he was surprised that no one had said that the pressure he used was more than 36 lb., for he had found it to run 40, 50 and 60 lb. Where such cars come in over city tracks the high trolley pressure is hammering out

all the overhead special work very rapidly. He said that this pointed to the desirability of using a type of base which would compensate for the height of the wire and not put unwarranted pressure on the low wire in order to make the trolley operate satisfactorily under high wire. The trolley bases which automatically increase the pressure as the angle to the roof increases and decrease the pressure as the angle decreases are desirable, for they take care of high wire at crossings and avoid overpressure on low wire.

Mr. Kelsey brought up the subject of using full bronze bearings instead of babbit bearings. He said he is trying them out on account of the large number of bearing failures that have been occurring on his railway. The bearing housings are being redesigned so that the thickness of the bronze shell can be cut down. Later on if the shell gets loose the housing can be bored out and a larger size shell used. He spoke also of a recent scheme of using a bronze bearing without turning it. He referred to bearings manufactured by the American Crucible Products Company, which are so treated and cast that they are smooth enough outside to give a good fit in the housing and smooth enough inside so that they do not need to be turned for the bearing surface.

HOT BEARINGS RESULT FROM CARELESSNESS

E. M. Williams, chief engineer of this company, who was present, was called upon. He said that most hot bearings are the result of carelessness, that any bearing is all right as long as it is properly oiled, but the test of the bearing comes when oiling is neglected. He explained that with a babbit-bearing metal if the temperature rises to 350 deg. the bearing is gone, while a bronze bearing such as made by his company will withstand a temperature of 1,200 deg. without melting. This metal had the further advantage that lubrication is provided in the metal, so that it contains considerable natural lubrication. Another interesting point made was that babbit bearing tends to run hot before the bearing is run in the first time. The impregnation of graphite into the bronze metal, however, takes care of this initial wearing in. Mr. Kelsey showed a bronze bearing of this type which had run hot, causing a film of metal to melt out of the bearing, exposing a new surface of the natural lubrication in the bearing which permitted the car to continue its run, the heated bearing not showing up until the inspection at the end of the run.

Mr. Creelman, Youngstown, said that he had been able to get much better results from solid babbit bearings than from the babbit-filled shell-type bearings. He said the reason the railways never get as good life from bearings rebabbitted as they do from the original bearings received from the factory is that a perfect thermal weld between the babbit and the cast-iron shell is not secured, and this leaves a slight space in between the two metals.

Some discussion followed on the value of automatic slack adjusters for brakes. All of the makes on the market came in for favorable comment when installed under proper condition, although it seemed to be the opinion that none of these is adaptable to all kinds of trucks. It was very clearly brought out that there is a great field for the slack adjuster, for it was stated that if one is installed which works properly it is possible to cut the inspection force in half and the period of inspection can be lengthened.

Maintenance of Portable Electric Drills

To Obtain the Best Performance and Longest Life from the Various Parts Regular Inspection and Repair Should Be Carried Out with the Same Thoroughness as with Other Electric Motors

BY E. L. CONNELL

Chief Engineer Van Dorn Electric Tool Company, Cleveland, Ohio

THE portable electric drill is essentially an electric motor, and it should be given the same protection and consideration as is usually given to such apparatus. The small sizes in common use are equipped with a universal motor which drives through the chuck and train of gears, so as to reduce the speed to from a fifth to a twenty-fifth of that of the armature. Electric power is ordinarily supplied through a flexible cable, and the motor is controlled by a switch conveniently located on the handle of the drill.

ARMATURE SHOULD BE GIVEN THE BEST POSSIBLE ATTENTION

The armature is the most delicate part of any motor, and this is the part that should be the first examined if the machine shows signs of distress. Often a motor is burned out through neglect promptly to repair trouble which develops in the armature. If severe sparking takes place between the brushes and commutator, the machine should be taken out of service at once and given a thorough inspection. The motors of electric drills are subject to the usual "diseases" of electric motors, which may be detected in the usual way. Grounds can be located with a magneto ringer, and if no ground is detected in the armature, the field, switch and cable connections should be tested. An open circuit in the armature will be shown by burning between the commutator bars, to which the open coil is connected. A short circuit within a coil will burn out the "shorted" turns and a "short" between commutator bars will overheat the bars so "shorted." A short circuit between commutator bars may sometimes be repaired if discovered before the coil is burned by removing the foreign substance between the bars, but an open or short-circuited coil requires a rewinding. If the armature is built with open slots and with form-wound coils, repairs can often be made economically by the average repair man with coils purchased from the manufacturer. If the armature is built with semi-closed slots, it will probably be best to return it to the maker for rewinding.

The brushes used in such motors are chosen by the manufacturers after exhaustive tests to obtain the best performance and longest life. It is, therefore, imperative that only such brushes as are approved by the maker of the machine be used. A brush made from any material which happens to be convenient may ruin the motor. Some of the effects produced from improper brushes are overheating from friction, sparking or high resistance. If the material used in the brush is too hard, the friction and wear on the commutator will be excessive, and if it is too soft, the mica may wear high between commutator bars and cause chattering and destructive sparkling. If the resistance of the brush is too low, there will be an excessive short-circuit current which will cause sparking and overheating of the commutator and armature coils, while if too high the normal current may overheat the brush and cause rapid wear.

It is best to examine the brushes before the expiration of 200 hours of actual running time, and it will be a help to clean the commutator with fine sandpaper several times during the life of the brush. The tension on the brushes should be uniform and just sufficient to prevent arcing on a smooth commutator. A tension of at least 4 lb. per square inch of brush contact is usually necessary. Should the commutator become rough, the armature should be removed and the commutator refinished by taking a very light cut in a lathe.

Fields are not apt to fail frequently, but they are occasionally burned out through the operation of the tool after the armature has become defective. A short-circuited field coil will cause overspeeding or flashing when the switch is closed. The best field coils have windings treated with an impregnating varnish, and this feature is considered extremely important by the manufacturers.

Grease-lubricated tools provide a maximum of cleanliness with a minimum amount of attention. It is considered good practice to replenish the grease supply as often as the tool is cleaned or inspected, which on account of brush wear should not exceed 200 hours of service.

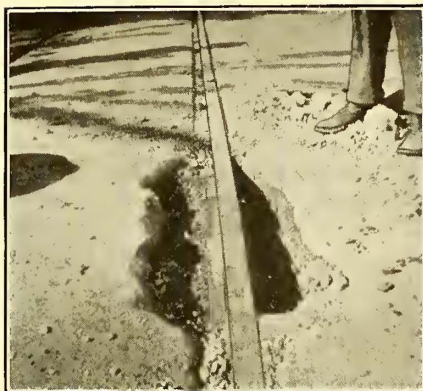
The cable connection is very often abused by using it to drag the tool around. Some cables are, of course, better than others, but all require reasonable consideration. When a tool is to be used in one position for long periods, the tool and cable should be suspended from above with a counterweight. The machine is then always accessible and free from cable abuse.

Sometimes, when used in drilling sheet metal, the lip of a drill will catch as it breaks through, thus stalling the machine. This trouble can be prevented by grinding the drill especially for this work. The angle of the point should be reduced to give a longer point, and the sharp angle at the cutting edge should be ground off slightly to give the same results as would a smaller angle of the spiral flute to the axis of the drill. The standard angle used is 59 deg. Proper grinding may also help to prevent "grabbing" in soft material and will allow high feed pressure without chipping the cutting edges in very hard material. For drilling in wood the type of drill necessary will depend upon the condition and kind of wood and depth of the hole. In the drilling of green wood the hole should be cleared several times if the depth of the hole is many times its diameter.

Repair Shop Like a Hospital

IN THE Feb. 26 issue of the *Electrical World* James Dixon likens a repair shop to a hospital. He says a winding room ought to be antiseptic and therefore should be entirely removed from all machine shop operations and shut off by a wall. A chip of metal in the insulation of a motor that is being repaired is like a germ in an open wound, sure to cause trouble later. The same idea applies with full force to commutator work.

Mr. Dixon carries the thought further by stating that in a hospital the patients who are cured are not left lying around in the operating room. So neither should repaired machines or parts be kept lying around the shops where other repair work is being done. A suitable storeroom, separate but accessible, with proper crane service, racks and protection from dirt, should always be provided for raw materials and finished work.



AT LEFT, OPENING IN CONCRETE PAVING MADE IN ORDER TO REPAIR JOINTS. IN CENTER, HEAVY CHAIN AND RAIL GRIPS USED IN LIFTING LOW JOINTS. AT RIGHT, CHAIN AND JACK ASSEMBLY IN POSITION TO LIFT RAILS

Concrete Paving Repair by Novel Method

Old Removed Asphalt Pavement Melted Up to Fill Holes—Cheap, Quick and Apparently Successful Method of Repair Made Possible Through Use of Waste Material

BY R. C. MILLS

Vice-President Sioux Falls (S. D.) Traction System

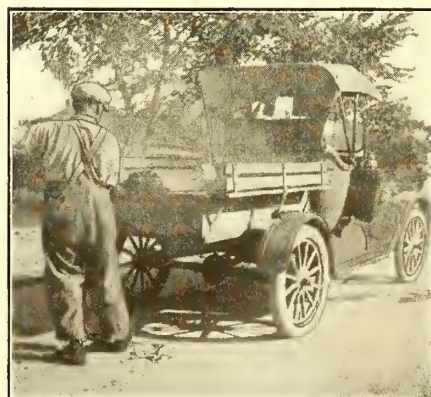
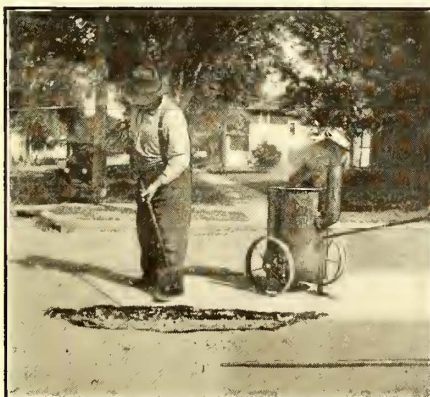
LAST summer we repaired five blocks of concrete paving between our tracks on the main business street of Sioux Falls, making use of a method which was rather inexpensive and apparently successful from the standpoint of both appearance and service.

This pavement, laid in 1914, was a mixture of sand, crushed granite rock and cement extending in a monolithic slab from the bottom of the ties to the top of the rail, a depth of 14 in. The track construction has remained solid and there has been no trouble from loose or working rails or joints, but the continual abrasion of the motor trucks and steel-tired vehicles had worn deep ruts along the flangeways and, in some places, along the sides of the track construction. Cup-shaped holes as large as a dishpan had been worn out at various points along the center of the track. The pavement was therefore in a very unsightly and dangerous condition for vehicular traffic, and as a result it was several times sarcastically referred to by one of our local papers as resembling the shell holes of the battle fields of Europe.

In 1919 we attempted to repair some of the worst places by trimming up the holes and relaying granite blocks grouted in with concrete. This was found to be a very laborious and expensive undertaking, particularly that part of the work involved in preparing the holes for laying the blocks. We first tried cutting out the old concrete with chisels and mauls, but could not hold men on the job and finally gave this method up. Later, air hammers with bull points were used to drill holes close together and down the depth of the blocks to be laid, breaking out the intervening concrete with bars and wedges. This method was also too slow and expensive and was given up, and the remainder of the street left in bad condition until last summer, when our other work was sufficiently well taken care of to permit of taking up the repair of this pavement.

OLD PILE OF ASPHALT BECOMES ASSET

Having a quantity of old asphaltic concrete pavement on hand which had been removed from our tracks in the residence district, we constructed a furnace in the



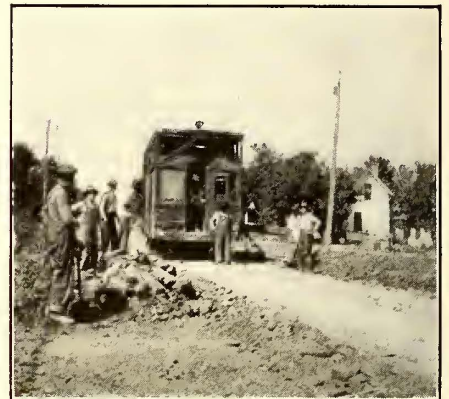
AT LEFT, HOW THE OLD ASPHALT PAVEMENT WAS MELTED UP. IN CENTER, PAINTING THE OPENING IN THE PAVEMENT WITH HOT TARVIA AS A BINDER BETWEEN THE ASPHALT AND CONCRETE. AT RIGHT, METHOD OF HAULING AND SPREADING THE ASPHALT TO FILL THE OPENINGS

ground near the street to be repaired and covered it with a sheet of boiler plate about 7 x 10 ft. in size, on which to melt up the old asphalt. The process used in filling the holes in the pavement and along the flange-ways was first to clean out the holes to be filled with a wire brush and then paint the whole surface with hot tarvia. Before this had a chance to cool the melted asphalt mixture was poured into the hole until it was slightly more than filled. Hot tampers were then used thoroughly to compact the mixture, and while still hot the surface was liberally sprinkled with a dry mixture of half sand and half cement.

The work of repairing the holes by this method progressed very rapidly and the entire job was completed within two working days. In making this kind of repair it is very essential that street sprinkling be discontinued for at least twenty-four hours before attempting to put in these patches, as the concrete must be absolutely dry, and the hotter the day the better the finished results. No attempt was made to protect

to withstand a terrific strain. In rehabilitating the joints, the angle bars are of course removed from the rails before this lifting device is put in place. The rails are then hoisted to an elevation sufficient to place shims of the desired thickness on top of the ties. If the old angle bars are worn or defective in any way they are replaced with new ones, to insure a good tight smooth-running joint. We have used this method for several years and have always found it very satisfactory.

The succeeding pictures show our method of melting the asphalt, painting the opening with hot tarvia as a binder between the asphalt and the concrete, hauling, spreading and tamping the hot asphalt in place. There should have been one more picture showing the patch after it had been smoothed out with a hot paving iron and the finished surface sprinkled with a sifted mixture of half sand and half cement. After this is done, the surface is left as smooth as the rest of the pavement and the sand and cement soon work into the



AT LEFT, TAMPING THE ASPHALT SOLID INTO THE OPENING. CENTER AND RIGHT, A WORK CAR, EQUIPPED WITH SIDE OUTRIGGER TO DRAG PLOW, FACILITATES EXCAVATION FOR NEW TRACK

the patches from traffic, which was permitted to pass over them as soon as laid, with no apparent damage.

It may be that winter traffic and excessive cold may cause some failures in this repair work, but we are satisfied that we have a cheap and rapid method of repairing concrete pavement, and if some defects do appear in these patches within the next few months it will be a small matter to touch them up or make renewals.

Possibly this method of making repairs is not new to other roads, but we have never read of it. The credit for our job is due J. K. Gibson, our superintendent, who watched some repairs being made by the city on asphalt pavements and conceived the idea that the same method would work out in repairing holes in concrete. While we were at first skeptical, we are now very enthusiastic over the results obtained, and our pile of old broken-up asphalt becomes an asset in making future repairs.

PICTURES SHOW HOW WORK WAS DONE

Several accompanying pictures illustrate the methods used in making the rail joint and pavement repairs. The first view shows a low joint, around which the concrete paving has been broken out in readiness for raising the joint. The second and third pictures show the chain and screw jack assembly with which the rails are raised at the joint. It will be noticed that the chain and rail grips are very heavy, as they have

asphalt under the effect of traffic and leave the patch hardly discernible from the remainder of the pavement.

EFFECTIVE MEANS OF EXCAVATING TRACKWAY

The last two pictures show the method we used last summer for plowing up the roadway on both sides of a single track, preparatory to the installation of a diamond point passing switch. An extra heavy, well-ironed breaking plow was attached to a 10-in. x 10-in. timber which was fastened as a side outrigger on a work car. The position of the furrow with respect to the track was adjusted by sliding the heavy chain which pulled the plow back and forth on the outrigger timbers. The street on which this job was done had been covered with cinders two or three years previously which had become very hard and compact. I doubt if six horses could have handled this plow, and we accomplished more with this improvised outfit in three hours than could have been accomplished by sufficient teams in a day's time.

The American Engineering standards committee has been enlarged recently by the addition of representation from the United States Department of Agriculture, from United States Department of the Interior, from a group representing the American Gas Association, the Compressed Gas Manufacturers' Association and the International Acetylene Association and from the American Electric Railway Association.

Determining Forces in Brake Rigging

With the Air Pressure in the Brake Cylinder or the Force Applied to the Handle of a Hand Brake as the Starting Point, the Author Shows How the Forces Which Are Developed in All Members of a Foundation Brake Rigging Are Computed

By H. M. P. MURPHY

IN AN article published in the Feb. 19 issue of the ELECTRIC RAILWAY JOURNAL I gave the principles of operation and methods of calculating forces for the most common types of handbrakes used on electric cars. In this article the forces developed with air brakes will be considered and then the calculation will be followed through the various levers and rods constituting a foundation brake rigging to give the force acting on the brake beams at the wheels.

In computations of the forces developed in a foundation brake rigging of a car with air brakes, the initial force used is that exerted by the brake-cylinder push rod. This force depends on the air pressure in the cylinder and on the size of the piston. In dealing with brake-rigging problems it is customary to use certain standard air pressures. Those most commonly used are 50 and 60 lb. per square inch.

In order to provide a direct means for determining the total force exerted on the push rod of any standard cylinder, the accompanying table has been compiled and should prove of much value in this connection. In exceptional cases, where the use of the table is not pos-

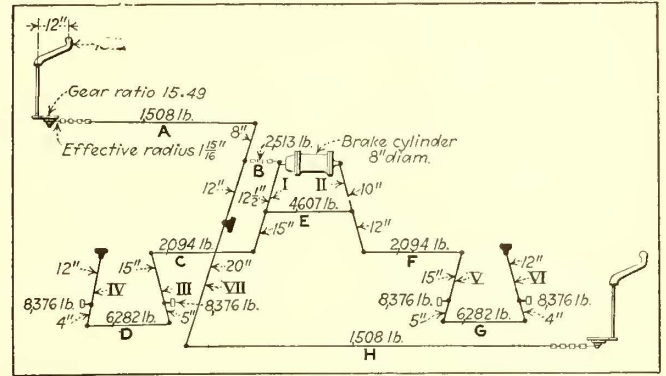


FIG. 1—BRAKE LEVERAGE DIAGRAM FOR DOUBLE-TRUCK CAR WITH INSIDE-HUNG BRAKESHOOES

inch, thus, $78.54 \times 50 = 3,927$ lb., which is the desired force.

In order to give a clear idea of the general arrangement of the several parts, and of the methods of connecting the levers, etc., of standard forms of air-brake riggings, Figs. 1 to 3 have been prepared, and will be analyzed carefully in the following examples, which also serve to illustrate a few of the practical uses of the "Leverage Rule" given in the first of this series.

It is important to note here that, in the examples about to be given as well as in all subsequent problems, the "upper" and "lower" end points of levers referred to simply indicate the relative location of these points in the figures concerned and have no reference whatever to their actual location when the rigging is installed on cars or locomotives.

AIR-BRAKE RIGGINGS AND EXAMPLES

Let us first consider a brake rigging of the type illustrated in Fig. 1. This is a common form of electric car brake rigging with inside-hung brakeshoes. Let it be required to find the forces delivered to each of the four brake beams, when an 8-in. diameter brake cylinder and an air pressure of 50 lb. per square inch are employed, the dimensions of the various levers being those indicated in the diagram.

To solve this problem, it is first necessary to know the total force exerted by the cylinder push rod. This may be calculated or it may be found more easily by aid of the table, which gives the desired value as 2,513 lb. That is, a force of 2,513 lb. acts on the upper end of the cylinder live lever I. Now to find the forces delivered to the brake beams of the left-hand truck, it is obvious that the force on the tie rod C must first be found. This may, of course, be accomplished by aid of the "Leverage Rule." Thus, consider the middle point of lever I as the fulcrum, then

Desired force =

$$\frac{(\text{Known force}) \times (\text{Lever arm of known force})}{\text{Lever arm of desired force}}$$

TABLE OF BRAKE-RIGGING DATA							
Diameters of Brake Cylinders and Areas of Pistons							
Diam. in Inches:	6	8	10	12	14	16	18
Area in sq.in.	28.274	50.265	78.540	113.10	153.94	201.06	254.47
Total Forces in Pounds on Cylinder Push Rods							
Cyl. Pres. Lb. per Sq.In.	Diameters of Cylinders in Inches						
	6	8	10	12	14	16	18
50	1,414	2,513	3,927	5,655	7,697	10,053	12,724
55	1,555	2,765	4,320	6,221	8,467	11,058	13,996
60	1,696	3,016	4,712	6,786	9,236	12,064	15,268
65	1,838	3,267	5,105	7,352	10,006	13,069	16,541
70	1,979	3,519	5,498	7,917	10,776	14,074	17,813
75	2,121	3,770	5,891	8,483	11,546	15,080	19,085
80	2,262	4,021	6,283	9,048	12,315	16,085	20,358
85	2,403	4,273	6,676	9,614	13,085	17,090	21,630
90	2,545	4,524	7,069	10,179	13,855	18,095	22,902
95	2,686	4,775	7,461	10,745	14,624	19,101	24,175
100	2,827	5,027	7,854	11,310	15,394	20,106	25,447
105	2,969	5,278	8,247	11,876	16,164	21,111	26,719
110	3,110	5,529	8,639	12,441	16,933	22,117	27,992

sible, the desired total push-rod force may be computed directly in the following manner:

To find the total force exerted on any brake-cylinder push rod, multiply the decimal fraction 0.7854 by the square of the inside diameter of the brake cylinder (in inches) and multiply this product by the specified cylinder air pressure (in pounds per square inch). The "square of the diameter" means, of course, the product obtained by multiplying the diameter by itself. As an example of this method, let it be required to find the force exerted by the push rod of a 10-in. brake cylinder when the cylinder air pressure is 50 lb. per square inch. To solve this problem, first find the square of the diameter of the cylinder, which is $10 \times 10 = 100$, then multiply the decimal fraction 0.7854 by this number (i.e., 100); this gives 78.54. Finally multiply this last quantity by the cylinder air pressure of 50 lb. per square

*This is the third of a series of articles on forces developed in the brake rigging. Others appeared in the Jan. 15 and Feb. 19 issues of this paper.

Force on rod C =

$$\frac{(\text{Force on push rod}) \times (\text{Lever arm of force on push rod})}{\text{Lever arm of force on rod C}}$$

$$\text{Force on rod C} = \frac{2,513 \times 12\frac{1}{2}}{15} = 2,094 \text{ lb.}$$

To find the force exerted on the brake beam attached to the truck live lever III, it is necessary merely to consider the lower end point of this lever as the fulcrum and again to apply the "Leverage Rule," thus:

$$\text{Force on brake beam of lever III} = \frac{2,094 \times 20}{5} = 8,376 \text{ lb.}$$

Also, to find the force exerted on the brake beam attached to the truck dead lever IV, the force on rod D must be found. This may be done by aid of the "Leverage Rule" by considering the middle point of lever III as the fulcrum; thus:

$$\text{Force on rod D} = \frac{2,094 \times 15}{5} = 6,282 \text{ lb.,}$$

or the force exerted on rod D could have been found

or the force exerted on rod E could have been found from the fact that the middle force is always equal to the sum of the two end forces, consequently we can obtain this value from,

$$\text{Force on rod E} = (\text{Force on rod C}) + (\text{Force on push rod}) = 2,094 + 2,513 = 4,607 \text{ lb.}$$

Also to find the force exerted on rod F, consider the upper end point of the cylinder dead lever II as the fulcrum, whence,

$$\text{Force on rod F} = \frac{4,607 \times 10}{22} = 2,094 \text{ lb.}$$

Then to find the force delivered to the brake beam of the truck live lever V, consider the lower end point of lever V as the fulcrum and apply the "Leverage Rule," thus:

$$\text{Force on brake beam of lever V} = \frac{2,094 \times 20}{5} = 8,376 \text{ lb.}$$

Next to find the force acting on rod G, consider the

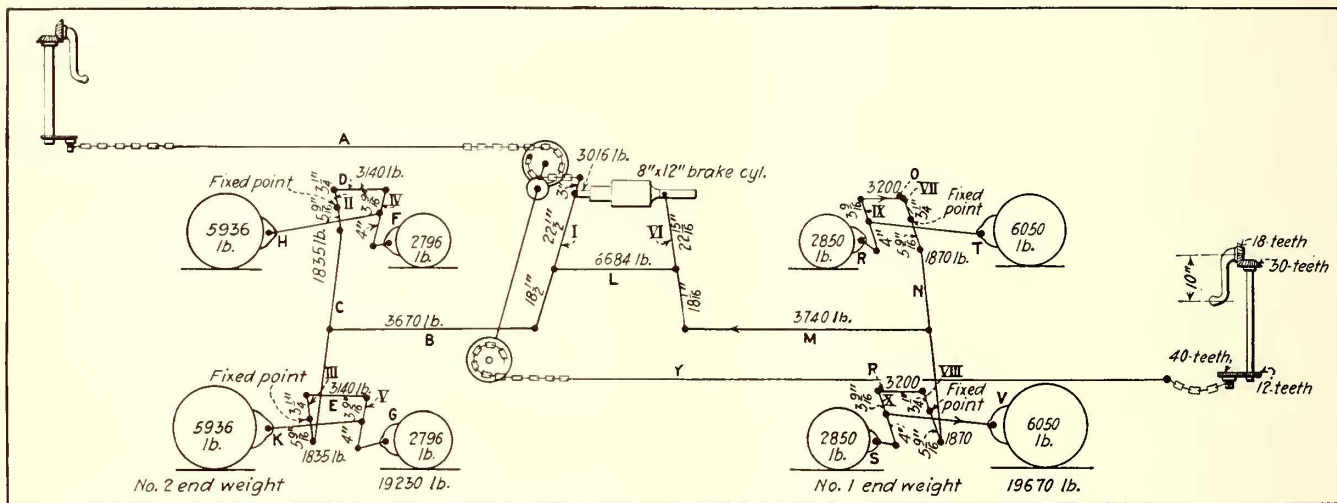


FIG. 2. BRAKE LEVERAGE DIAGRAM FOR CAR WITH MAXIMUM TRACTION TRUCKS

from the fact that either end force is equal to the middle force minus the other end force. Applying this principle we have:

$$\text{Force on rod D} = (\text{Force on brake beam of lever III}) - (\text{Force on rod C}) = 8,376 - 2,094 = 6,282 \text{ lb.}$$

Of course, these methods are equally accurate, and the latter is much the easier one to use, but usually it is well to employ both and thus check the computations. With the force on rod D found, in order to find the force delivered to the brake beam attached to lever IV it is necessary only to consider the upper end point of the truck dead lever IV as the fulcrum and to apply the "Leverage Rule," thus:

$$\text{Force on brake beam of lever IV} = \frac{6,282 \times 16}{12} = 8,376 \text{ lb.}$$

Now to find the forces delivered to the brake beams of the right-hand truck, the force exerted on the tie rod E must first be found. This may be done by considering the lower point of the cylinder live lever I as the fulcrum and applying the "Leverage Rule," as follows:

$$\text{Force on rod E} = \frac{2,513 \times 27\frac{1}{2}}{15} = 4,607 \text{ lb.,}$$

middle point of lever V as the fulcrum, whence:

$$\text{Force on rod G} = \frac{2,094 \times 15}{5} = 6,282 \text{ lb.}$$

or

$$\text{Force on rod G} = (\text{Force on brake beam}) - (\text{Force on rod F}) = 8,376 - 2,094 = 6,282 \text{ lb.}$$

Also to find the force on the brake beam of the truck dead lever VI, consider the upper end point of lever VI as the fulcrum, whence:

$$\text{Force on brake beam of lever VI} = \frac{6,282 \times 16}{12} = 8,376 \text{ lb.}$$

This completes the solution of the problem, the forces delivered to the four brake beams having been found. It should now be observed that all of these forces are equal (8,376 lb.), as they should be when the weight of the car is evenly distributed on the eight wheels. It will, moreover, be noted that in the course of the preceding solution the values of the forces acting on levers I, III and V were checked by a double calculation. If it is also desired to check the values of the forces acting on levers II, IV and VI and at the same time to find the forces exerted on the fixed centers of these levers, it is merely necessary to apply the "Leverage

then to compute the value of the force acting on rod *E*, which is 3,140 lb., and with the middle point of lever *V* as a fulcrum the force acting on the brakeshoe *G* is found to be 2,796 lb. By adding these values together we find the pressure on shoe *K* as 5,936 lb. Thus the pressure on shoe *F* is seen to be the same as that on shoe *G* and that on shoe *H* is the same as that on shoe *K*.

To find the forces delivered to the brake of the right-hand truck, consider the lower end of the cylinder live lever *I* as the fulcrum. Then

$$\text{Force in rod } L = \frac{3,016 \times 41}{18\frac{1}{2}} = 6,684 \text{ lb.},$$

and with upper end of cylinder dead lever *VI* as a fulcrum,

$$\text{Force in rod } M = \frac{6,684 \times 22\frac{1}{2}}{41} = 3,740 \text{ lb.}$$

The force at each end of the radius bar *N* will then be one-half of 3,740 lb. or 1,870 lb., and

$$\text{Force in rods } O \text{ and } P = \frac{1,870 \times 5\frac{9}{16}}{3\frac{1}{4}} = 3,200 \text{ lb.}$$

From this we obtain:

$$\text{Force at shoes } R \text{ and } S = \frac{3,200 \times 3\frac{9}{16}}{4} = 2,850 \text{ lb.}$$

and

$$\text{Force at shoes } T \text{ and } V = 3,200 + 2,850 = 6,050 \text{ lb.}$$

By comparing the corresponding shoe pressures for the two trucks it is seen that they are not the same, those for the right-hand or No. 1 truck being greater. This was found desirable for this car as the car weight for No. 1 end was 440 lb. greater than that for No. 2 end. The reasons for having different shoe pressures for wheels with different weight pressures on the rails will be taken up in another article to appear later under the heading "Percentage of Braking Power."

FORCES IN RIGGING WITH CLASP BRAKES

As an additional example consider the brake rigging illustrated in Fig. 3. This is a common form of "clasp brake" used on heavy electric passenger cars having four-wheel trucks. By "clasp brake" is meant that type of brake in which each wheel is provided with two brakeshoes on opposite sides. Let it be required to find the force delivered to each of the eight brake beams when a 16-in. diameter cylinder and an air pressure of 50 lb. per square inch are employed.

The table gives the total force acting on the push rod as 10,053 lb., then by applying the "Leverage Rule" and considering the middle point of the cylinder live lever *I* as the fulcrum

$$\text{Force on rod } B = \frac{10,053 \times 18\frac{1}{2}}{20\frac{1}{2}} = 9,434 \text{ lb.}$$

This force in rod *B* acts on the radius bar *C* of the right-hand truck and the force at each end of this radius bar is one-half that in rod *B* or 4,717 lb. and acts on the rods *D* and *E*.

By considering the upper end of lever *II* as the fulcrum, then,

$$\text{Force at lower end of lever } II = \frac{4,717 \times 9\frac{1}{8}}{18\frac{1}{2}} = 2,470 \text{ lb.}$$

and the force at the brakeshoe *F* is obtained by considering the lower end of lever *VI* as the fulcrum. That is

$$\text{Force at brakeshoe } F = \frac{2,470 \times 25\frac{1}{2}}{7\frac{1}{2}} = 8,398 \text{ lb.}$$

and

$$\text{Force in rod } H = 8,398 - 2,470 = 5,928 \text{ lb.}$$

The force at the brakeshoe *L* can then be obtained by considering the upper end of lever *VIII* as the fulcrum. That is

$$\text{Force at brakeshoe } L = \frac{5,928 \times 20\frac{1}{2}}{14\frac{3}{8}} = 8,453 \text{ lb.}$$

Next let us return to the top truck live lever *II*. The force acting at the upper end of this lever and in the tie rod *N* can be found as 4,717 — 2,470 = 2,247 lb., and

$$\text{Force at lower end of lever } IV = \frac{2,247 \times 9\frac{1}{2}}{10\frac{3}{4}} = 1,985 \text{ lb.}$$

$$\text{Force at brakeshoe } P = \frac{1,985 \times 25\frac{1}{2}}{7\frac{1}{2}} = 6,749 \text{ lb.}$$

$$\text{Force in rod } R = 6,749 - 1,985 = 4,764 \text{ lb.}$$

$$\text{Force at brakeshoe } T = \frac{4,764 \times 20\frac{1}{2}}{14\frac{3}{8}} = 6,793 \text{ lb.}$$

Similarly the shoe pressure for the lower pair of wheels of this truck and for the left-hand truck can be calculated. The dimensions of similarly located levers are the same in all cases so that corresponding pressures will be the same.

It should be noted that the shoe pressure on the trailer wheels is less than on the motor or driver wheels. The reason for this will be fully explained in a following article in which the subject of braking power will be discussed.

The three examples given cover the most common types of electric car brakes. A careful solution of these will give familiarity with the leverage rule and also show that the use of this rule is absolutely unlimited in its scope regardless of the design of the rigging, providing that the three forces acting on the levers concerned are parallel to each other.

New Auto Emergency Truck in Los Angeles

A NEW auto emergency truck with a telescoping tower and a full equipment for handling accidents and traffic blockades has just been put in operation by the Los Angeles (Cal.) Railway. This railway uses several of this type of emergency auto trucks, but the new one is the fastest and most fully equipped of any they have in use.



NEW AUTO EMERGENCY TRUCK

The truck carries a dolly for removing autos which break down on the car tracks and block traffic and also such equipment as hose bridges used at fires, tow lines, fire extinguishers and other complete apparatus for emergency electric car repair. The truck chassis was purchased and the body, tower and much of the equipment were made in the railway company's shops. The truck is of 2-ton capacity.

Cleaning Trucks for Overhaul

Large Lye Vat, Into Which Whole Truck Frames Are Immersed, Makes Repair Work Quicker and More Thorough—It Has Proved Itself Such a Valuable Aid that It Has Paid for the Initial Cost Several Times Over—Workmen Like It, as It Makes Their Work Easier and Cleaner

By HENRY S. DAY

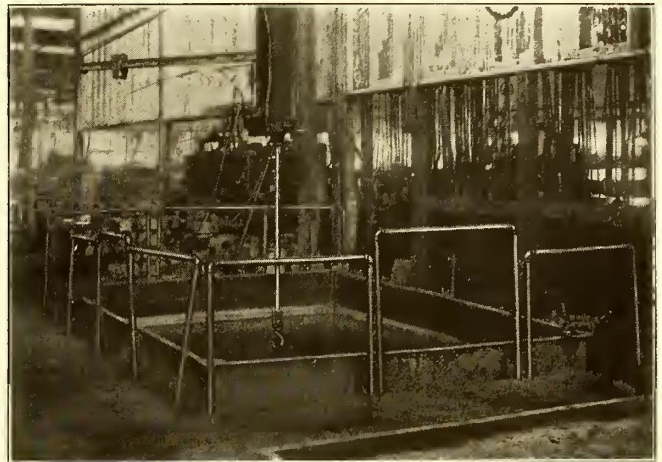
Equipment Engineer Kansas City (Mo.) Railways

THE idea of cleaning dirty and greasy metal by means of hot lye is not new, but the application of the idea on a large scale has generally been confined to locomotive repair shops on steam roads. Small tanks for cleaning small parts are generally part of the equipment of the average electric railway shop, but what follows has to do with a tank of sufficient capacity to dip a complete truck. This tank has now been in use for about a year and has proved such a valuable aid in the overhauling of trucks that it is believed the details will be interesting to other railway men.

The equipment comprises a watertight steel tank in which the solution is heated by a steam coil, a crane or hoist for moving the trucks and other equipment into and out of the vat, and a basin where the parts can be thoroughly rinsed with clean water in order to remove all lye.

The tank is made of sheet steel $\frac{3}{8}$ in. thick, 14 ft. long, 10 ft. wide and 6 ft. deep and is installed at one side and close to the tracks on which trucks are stripped down for overhauling. The tank is set down in a concrete pit and blocked up on the floor of the pit so that the bottom of the tank pitches toward one corner and with the top of the tank extending 18 in. above the shop floor. At the low corner connection is made to a sewer through a 4-in. pipe fitted with a gate valve. This pipe is given considerable drop to aid drainage when the tank is being cleaned.

The contents of the tank are steam heated, and for this purpose 280 ft. of 2-in. iron pipe resting on steel cradles laid flat on the bottom was installed. By the use of a number of these cradles, the pipe is sufficiently trussed so that whatever equipment is being cleaned can be let down to rest on the pipes without injuring them. The distance from the bottom of the tank to the top of the pipes is 18 in., which furnishes an ample sediment cellar. The coil in the tank is connected to the boiler, which supplies steam at about 60 lb. pressure,



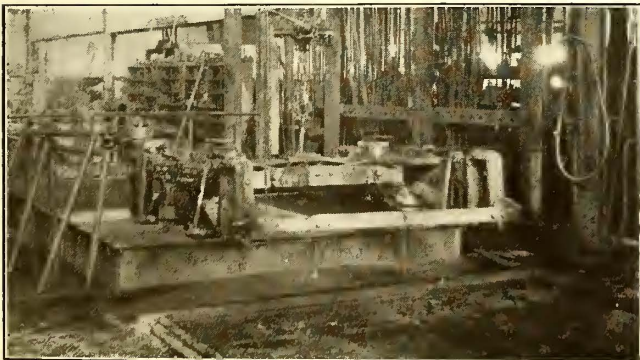
LYE VAT IN KANSAS CITY RAILWAY SHOPS SHOWING AIR HOIST, AND GUARD RAIL SECTIONS IN PLACE

keeping the solution in the vat between 150 and 200 deg. F., which has been found hot enough. At times steam will be given off at the surface, but not in sufficient quantity to bother the workmen in the immediate vicinity or to make it necessary to install a ventilator in the roof over the vat.

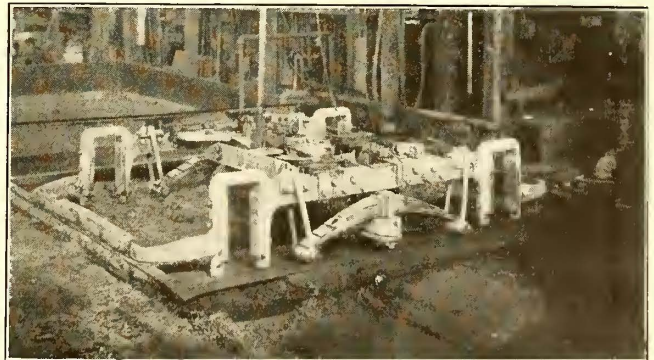
The tank holds 45,000 lb. of water, and about 450 lb. of flake caustic gives a 10 per cent solution, which has been found strong enough to clean the average truck in from one to one and one-half hours. In our particular case, this was found to be fast enough, but of course a stronger solution would work faster if this were necessary.

Flake caustic is used in preference to the powdered form because there is no objectionable dust when charging the tank and the cost is about the same.

It was of course necessary to guard against persons falling into the lye, and as a fixed rail would be more or less in the way of the operatives, the guard rail was made of a number of "U" shaped sections of pipe



TRUCK LIFTED OUT OF VAT AND PLACED ON BASIN READY FOR RINSING OFF THE LYE

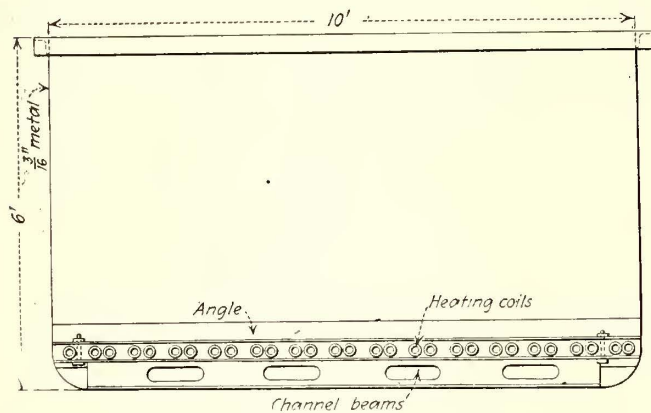


GUARD RAILS REMOVED TO PERMIT READY HANDLING OF TRUCK TO RINSE BASIN SEEN AT THE RIGHT

which are set into pipe sockets in the cement retaining wall. This method gave thorough protection around the edge and at the same time made it easy and quick to remove one or more sections when in the way. The projection of the steel tank 18 in. above the floor level also gave further protection and did not add any interference in lifting heavy bodies out of the solution.

The rinsing stand was installed adjacent to the vat. This consisted of a cement basin 9 ft. x 9 ft., built with the center 8 in. below the edges and connected to an 8-in. drain pipe, the opening into the drain being covered with a steel perforated strainer.

Both the vat and rinse stand are served with a 5-ton



CROSS-SECTION OF TANK SHOWING SUPPORTS FOR HEATING COILS IN THE BOTTOM

crane having an 18 ft. boom equipped with an air hoist. On account of lack of space under the traveling crane serving the truck shop it was necessary to install the lye vat to one side, and it was feared at the start that considerable time would be lost transferring truck frames and other heavy bodies from the traveling crane to the small jib crane, but this has not proved the case.

Trucks due for overhaul are run in on the repair track, which is next to the vat. After the gear pans and motors are removed, the frames are lifted from the wheels by the traveling crane and dropped within reach of the lye vat crane. Without the making of any attempt to remove any dirt, grease or oil, the whole frame is lowered into the lye and allowed to remain from one to two hours. It is then transferred to the rinse stand and washed off with a hose. During the stay in the vat the metal becomes the same temperature as the water and is hot enough, when it comes out, to dry off the rinse water, so that the truck frame is turned over to the repair man with steel clean and perfectly dry.

Immediately after a truck is received from the rinse stand, an inspector examines it and quickly and easily finds small cracks or fractures that have just started which would probably have been missed had the truck not been washed. These he marks with chalk and a portable welding outfit follows him and makes repairs. Loose bolts and rivets are also much more easily found. It is at this point that a very considerable saving in time takes place in the reassembly and in making repairs. Repairmen looking for worn or loose parts find them quickly, and wrenches stay where they are placed without slipping off. Parts sent to the machine shop are ready to work on without first scraping or cleaning away oil and dirt.

By actual comparison it has been found that a truck that has been through the lye vat is assembled in from 10 to 15 per cent less time than one that has not. Before

the lye vat was installed it was the method, after a truck was overhauled, to have one workman with a scraper and stiff brush clean the truck and then paint it. This required about one day's time and a gallon to a gallon and a half of paint, for the dirt that could not be removed soaked up most of the paint. With the cleaned truck, 2 quarts of paint cover the truck liberally, and by applying with a small hand air sprayer fifteen minutes is ample time and the truck is thoroughly and evenly painted.

Since the installation of the lye vat in January, 1920, some 700 or 800 trucks have been washed, besides many thousand smaller parts, such as motor frames, housings, journal boxes, air compressors, etc. Air compressors and parts of like weight are let down into the solution by the hoist and secured to the edge of the tank or pipe rail by a locating chain. Smaller parts are placed in steel baskets. All dirty scrap brass and copper is also washed, eventually saving much time in sorting and grading.

The vat is operated by one laborer, who devotes most of his time to its operation, but when not so occupied he is used on the truck floor.

As a rule, the truck floor in most shops is the dirtiest place in the shop, but with a lye vat this is not so. Most of the dirt and grease goes into the vat and there are practically no slop and no fumes at all. A certain amount of evaporation takes place, but the addition of water keeps the solution at the desired level. This particular vat was operated from January to June without replenishing the caustic and the tank has been cleaned out only twice in one year. This was done by opening the gate valve, allowing the solution to run into the sewer and running clear water through the tank until all sediment had disappeared.

A feature that has been of no little value is that the workmen like it as it makes their work easier and cleaner, and there has never been any of the criticism that generally goes with equipment which is admittedly installed to speed up production.

There are, of course, a number of ways of building a tank of this kind and the writer has had experience with a vat that was merely a cement basin let into the floor, but believes the steel tank is better. It is also desirable, if possible, to place the tank under the same crane that serves the truck floor, but as already stated the present installation could not be arranged in that manner, though it is giving excellent results and has already paid for the initial cost several times over.

Adjustable Winding Machine

THE Comstock Manufacturing Company, Wilkes-Barre, Pa., is placing on the market an adjustable head winding machine having three speeds. It is driven through a cone friction clutch and worm gear and is controlled with a foot lever. Either right or left-hand winding can be taken care of, as the machine has a face plate on each end of the shaft.

Another product of the company is an adjustable armature coil press which can be used for either hot or cold coil pressing. Either gas or steam heat can be used for hot pressing and the coil is pressed with one movement of a cam lever. The amount of pressure secured can be adjusted by nuts on hook bolts. The platens on the press are adjustable to suit any coil up to $\frac{3}{4}$ in. square. Extra platens are used when different lengths of coils are to be pressed.

Equipment and Its Maintenance

Short Descriptions of Tools Used Together with Mechanical and Electrical Practices of All Departments to Supplement the Preceding Longer Articles

Steel Trolley Shortens Trolley Wheel Life

Experience of the Louisville (Ky.) Railway with 9,400 Ft. of Steel Wire Which Was Installed in the Fall of 1913 Is Not Satisfactory

BY FRANK H. MILLER

Vice-President in Charge of Engineering Louisville (Ky.) Railway

IN 1913 the Louisville Railway had occasion to renew a section of 9,400 ft. of trolley wire on Fourth Avenue, which is one of the main residential streets of the city. For this purpose round steel trolley wire, size No. 000, was purchased and installed in the fall of that year.

The cost of this steel wire at that time was 6.5 cents, while the cost of hard-drawn copper was 16 cents a pound, delivered in Louisville. The construction used was of the ordinary span-wire type on wood poles with 100-ft. spacing and making use of 12-in. clinch ears. The 9,400-ft. section on which the steel wire was erected is in the middle of the line in question. The daily mileage over this steel wire is 1,030 motor car-miles, while the daily mileage over the entire Fourth Avenue route is 3,558 motor car-miles. The trail car mileage on Fourth Avenue amounts to 400 a day. The steel trolley wire is paralleled by a 1,000,000 circ.mil feeder cable with feed taps every 1,000 ft., so that the question of conductivity was a negligible consideration.

This line loops through the business section of Louisville and extends out into the residential district. The downtown end is equipped with Phono electric trolley, the center section with the steel wire and the suburban end, which branches and extends about 3.5 miles outside the city limits by two separate routes to a public park, is equipped with copper trolley. The life of trolley wheels on this southern or suburban section of the line is considerably less than the average mileage in the city,

due to the high speed, exposure to sleet and greater proportion of trailers run.

The experience of this company with the steel wire is indicated by the two tabulations printed herewith. In the following table is shown the average mileage obtained from 6-in. trolley wheels during the years 1916 to 1920. The first five items in the table show the average mileage on five representative lines, while the sixth item shows the average mileage obtained from the combined figures of the twelve city lines. These averages are compared with that obtained on the Fourth

TABLE I—MILEAGE OBTAINED FROM 6-IN. TROLLEY WHEELS

	Miles
Line A.....	9,202
Line B.....	11,323
Line C.....	11,964
Line D.....	13,559
Line E.....	16,786
Average for twelve city lines, including Fourth Avenue.	13,053
Fourth Avenue Line.....	8,766

Avenue line with its 9,400-ft. section of steel overhead, from which it is seen that the average mileage per trolley wheel is some 4,300 miles less than the average for the entire system.

In the other tabulation is shown the amount of wear that has taken place on the steel wire itself, as indicated by micrometer readings made recently, the ears having been removed to take the measurements. The measurements indicate the amount of wear after seven years' service of the density noted above. Corresponding with each figure given is a symbol denoting whether the trolley wheel was usually taking power or coasting at the various locations named.

There have been only two breaks in this steel trolley wire during its life. One of these occurred during excessively cold weather in January, 1918, when the temperature was 15 deg. F., and the other occurred in January, 1920, from unknown cause.

The steel wire causes a brownish rusty deposit on

TABLE II—WEAR ON STEEL TROLLEY WIRE IN LOUISVILLE, KY.
(Diameter New 0.412 In.)

Location		Horizontal Diameter	Vertical Diameter	Under Ear		Remarks
				H. Dia.	V. Dia.	
S. B. wire 100 ft. S. Broadway.....	P	0.367	0.359	0.393	0.298	Wire bright on top and sides
N. B. wire, 100 ft. S. Broadway.....	C	0.387	0.373	0.407	0.389	
S. B. wire 100 ft. N. Breckinridge.....	C	0.385	0.371	0.412	0.389	
N. B. wire 100 ft. N. Breckinridge.....	P	0.387	0.367	0.370	0.271	
S. B. wire 150 ft. S. Breckinridge.....	P	0.335	0.307	0.331	0.307	
N. B. wire 150 ft. N. Breckinridge.....	P	0.367	0.348	0.403	0.324	
S. B. wire 100 ft. S. Kentucky.....	P	0.317	0.264	0.338	0.248	
N. B. wire 100 ft. S. Kentucky.....	C	0.361	0.343	
S. B. wire 250 ft. N. Oak.....	C	0.327	0.271	Center of span Center of span
N. B. wire 250 ft. N. Oak.....	P	0.325	0.272	0.403	0.299	
S. B. wire half way between Oak and Ormsby.....	P	0.377	0.306	.....	.....
N. B. wire half way between Oak and Ormsby.....	P	0.350	0.301	.....	.....
S. B. wire N. S. of Magnolia.....	P	0.334	0.255	0.267	0.212	Worn badly. Splice here.
N. B. wire N. S. of Magnolia.....	P	0.337	0.277	.....	.....
S. B. wire 100 ft. S. of Magnolia.....	P	0.349	0.305	Wire bright top and sides.
N. B. wire 100 ft. S. of Magnolia.....	C	0.357	0.316	0.409	0.365	
S. B. wire 50 ft. south of railroad crossing a street.....	P	0.340	0.288	Center of span. Center of span.
N. B. wire over railroad crossing a street.....	C	0.331	0.264	.....	.....
S. B. wire 100 ft. North of Avery.....	C	0.375	0.342	
N. B. wire 100 ft. North of Avery.....	C	0.381	0.360	.....	.....

P Indicates probability trolley wheel taking power at location indicated.
C Indicates probability trolley wheel coasting at location indicated.

the roofs of the cars and at night a line of fire follows the trolley wheel when it is taking power from the wire.

These considerations, including the shortening of the life of the trolley wheels, have led to the decision that when this wire is renewed, which we now expect will be in the fall of 1921, it will not be renewed with steel wire.

Labor-Saving Devices in the Way Department*

An Outline of the Ways in Which Costs Can Be Kept Down in Track and Paving Work, Together with Data as to Actual Saving Which Has Been Accomplished

BY CHARLES H. CLARK

Engineer Maintenance of Way the Cleveland (Ohio) Railway

ONE of the first machines a railway should purchase is a derrick. In a maintenance department yard a mast derrick is, of course, the cheapest. A derrick with a 25-ft. boom, mounted on a car, will handle 60-ft. rails, a $\frac{3}{4}$ -yd. clamshell and pieces up to 5 tons in weight.

The Cleveland Railway has two derricks of the above-mentioned type and also a 60-ft. mast derrick with a 70-ft. boom and a stiff-leg derrick with a 70-ft. boom. The last-named derrick operates on a special track 800 ft. long and is used to pile sand, coal, rails, special trackwork, cinders, etc. The same railway also has a 60-ft. hammerhead, full-swing, gantry derrick operating on a special track 800 ft. long. This carries a $2\frac{1}{2}$ -yd. Lakewood bucket and covers two unloading spaces 50 ft. wide and 800 ft. long. By its use a carload of coal can be unloaded in twenty minutes. The company also has a locomotive crane, standard gage, with a 50-ft. boom, which can be used on any track in the yard where there are no overhead wires. To facilitate the use of this crane all wires are carried in a protected trough alongside the track.

A derrick with a 50-ft. boom can be used to pile material high, saving trackage and yard space. Granite blocks on our property are sometimes piled 25 ft. high, which could never be done by hand.

Another useful device on an electric railway property is a stone crusher, which will save tons of old stone otherwise useless. Old paving stone can be crushed for from 40 to 50 cents per yard. In normal times crushed stone would cost \$1.25 to \$1.50 per yard. A crusher also saves the expense of hauling crushed stone to a dump and unloading it.

There are further opportunities for saving in connection with cement. Cement bags as dumped at the mixer usually contain some cement, which we save by means of a bag cleaner which we constructed. A test showed that 1,000 bags weighed before cleaning 1,313 lb. After cleaning they weighed 606 lb., so that we saved 707 lb. of cement and the freight on this weight of bags shipped back to the mill. The saving in freight more than paid for the cleaning. We also lessened the expense of piling cement in the storehouse by the use of a belt conveyor and electric trucks.

Sand driers are a source of expense to a large road. We have used a large rotary drier for about seven years, and with it two men can dry from 100 to 150 tons of sand per day. On the Cleveland Railway we also

use a portable sawmill on a flat car for sawing up old ties into blocks used for blocking up tracks and also for emergency heating purposes.

SOME NOTES ON TRACK CONSTRUCTION

In the design of structure for car tracks economies are possible. With solid concrete construction, steel ties embedded in concrete are less expensive than wooden ties with tie plates. With the former there is less excavation and less concrete. For construction work temporary tracks can be laid on the sides of the street where there is sufficient room. Eighty-pound T-rail can be laid on the pavement on $1\frac{1}{2}$ -in. boards, with tie rods and gas-pipe spreaders to maintain gage.

In Cleveland most of the trackwork consists in relaying tracks, involving the taking up of the pavement. This we do with a pavement plow which will loosen 7,000 sq.ft. in three minutes. Concrete track foundation also has to be broken up. Instead of using picks, hammers and bars as formerly, we now break it up with a special machine that will do the work of 100 men. After breaking out the foundation, we cut up the old rails

COSTS OF TRACK LABOR AND MATERIAL, CLEVELAND RAILWAY, 1914 TO 1921

Date	Rate per Hour	Labor Applied	Material	Total
Jan. 1 1914	\$0.19	\$1.35	\$2.49	\$3.84
Jan. 1 1915	19	1.12	2.70	3.82
April 1 1915	22 $\frac{1}{2}$			
Feb. 1, 1916	25	1.47	2.64	4.11
April 1, 1916	27 $\frac{1}{2}$			
April 1, 1917	30	1.85	3.14	4.99
June 1, 1917	32 $\frac{1}{2}$			
Aug. 1, 1917	35			
July 1, 1918	42 $\frac{1}{2}$	1.95	3.72	5.67
Jan. 1, 1919	42 $\frac{1}{2}$	2.21	3.88	6.09
Jan. 1, 1920	50	2.24	4.56	6.80
Jan. 1, 1921	40			

with an oxyacetylene torch, with which two men can cut more rails than can twenty working with chisels.

In excavating, the electric shovel can be used where space is available. In Cleveland, after the excavation is complete, the rails are laid on the ties, the old material is hauled away in work trains and new material, such as gravel, crushed stone, sand, cement, etc., is brought in. The joints are then riveted with a pneumatic riveter, which heats rivets under 100-ton pressure and can drive eight of them in less than four minutes. The tops and bottoms of the plates are then electrically welded with a machine specially designed for seam welding. Most of the reaming and drilling is done with "Chicago Pneumatic" track-drilling machines. High-speed steel is used in all drills and reamers. Two men with one of these machines can do the work of ten with hand ratchets.

When the track is ready for concreting, the concrete mixer comes into play. We first used these mounted on wheels alongside the track, but now we have them mounted on car wheels with a distributing boom 30 ft. long. We formerly required twenty-four men to run and feed the mixer, but now use only eleven. We have also increased the number of batches mixed per day by 20 per cent by the use of a loading device attached to a 30-ft. conveyor.

We have not as yet been able to pave with anything but concrete with a machine, but are using with good success grouting machines made by the Lakewood Engineering Company. Another great labor saver is an automatic dump car, the top of which is only 5 ft. 3 in. above the rail. It will hold 18 cu.yd., can be loaded by hand and requires no assistance in unloading.

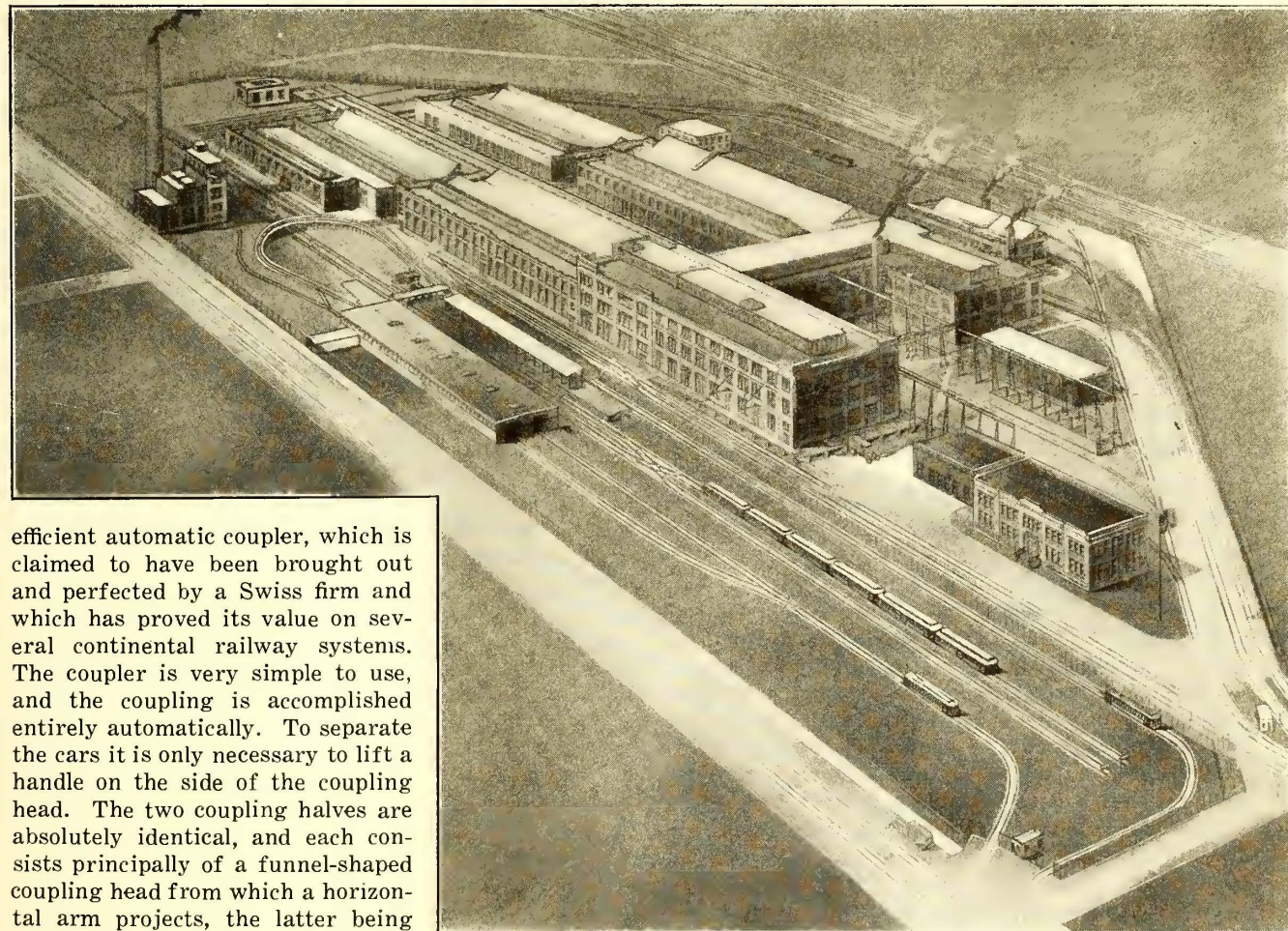
*Abstract of paper presented before joint convention of Illinois Gas Association, Illinois State Electric Association and Illinois Electric Railway Association, held at Chicago, Ill., March 15 and 16, 1921.

Finally, I wish to call attention to a small item in labor-saving devices, but an important one, the common dirt shovel. We buy the best chrome-nickel steel shovel we can find. While these cost twice as much as the common ones, they last four times as long and do not wear down to a small spoon-like tool. We use an identification mark of three holes drilled in the blade.

The accompanying table shows what labor-saving devices have accomplished with us since 1914. Then we were paying a base rate of 19 cents per hour; track labor cost \$1.35 per foot and material \$2.49. These prices do not include paving the coupling material. Since then the cost of labor and material has advanced greatly. Wages per hour have increased 163 per cent, while total labor has increased only 64 per cent. Material costs have increased 78 per cent.

Automatic Electric Car Coupler

THE adoption of the plan of coupling together motor cars and the successful use of trail cars on several of the tramway systems in Great Britain, says the *Electric Railway & Tramway Journal*, has directed particular interest toward the subject of a really practical and



PERSPECTIVE VIEW OF SHOP PROPOSED BY BOSTON ELEVATED RAILWAY TO COST \$5,000,000

efficient automatic coupler, which is claimed to have been brought out and perfected by a Swiss firm and which has proved its value on several continental railway systems. The coupler is very simple to use, and the coupling is accomplished entirely automatically. To separate the cars it is only necessary to lift a handle on the side of the coupling head. The two coupling halves are absolutely identical, and each consists principally of a funnel-shaped coupling head from which a horizontal arm projects, the latter being provided with a hole at the end. At the narrow end of the coupling head is a locking device, the principal part of which is the coupling bolt. The automatic coupling is provided with a boss on the side of the coupling head, on which the cables for the electric brakes can be fixed if required. The coupling head is attached to the car, just as in the old type coupling, by means of a rod provided with draw and buffer gear.

New Shops for Boston

Boston Elevated Railway Plans to Spend \$5,000,000 for the Construction of a New Consolidated Set of Shops if the Massachusetts Legislature Will Lend State's Credit

THE trustees of the Boston Elevated Railway have just made public plans for the construction of a new consolidated set of shops at Everett, at a cost of nearly \$5,000,000, and the entire abandonment of the several antiquated and scattered shops which have been in service for the last thirty or more years. This announcement was made by Edward Dana, general manager for the trustees, at a hearing before the committee on street railways of the Massachusetts Legislature, which has under consideration a bill lending the State's credit to the company.

The general layout and type of construction proposed for the new Everett shops is best illustrated by the accompanying photographs of the plans which the officials of the Boston Elevated Railway submitted to the Legislature. It is proposed to handle all repairs, except such minor ones as are always done at carhouses, in the new shops, including rapid transit as well as surface cars. The location chosen is at the Everett terminal

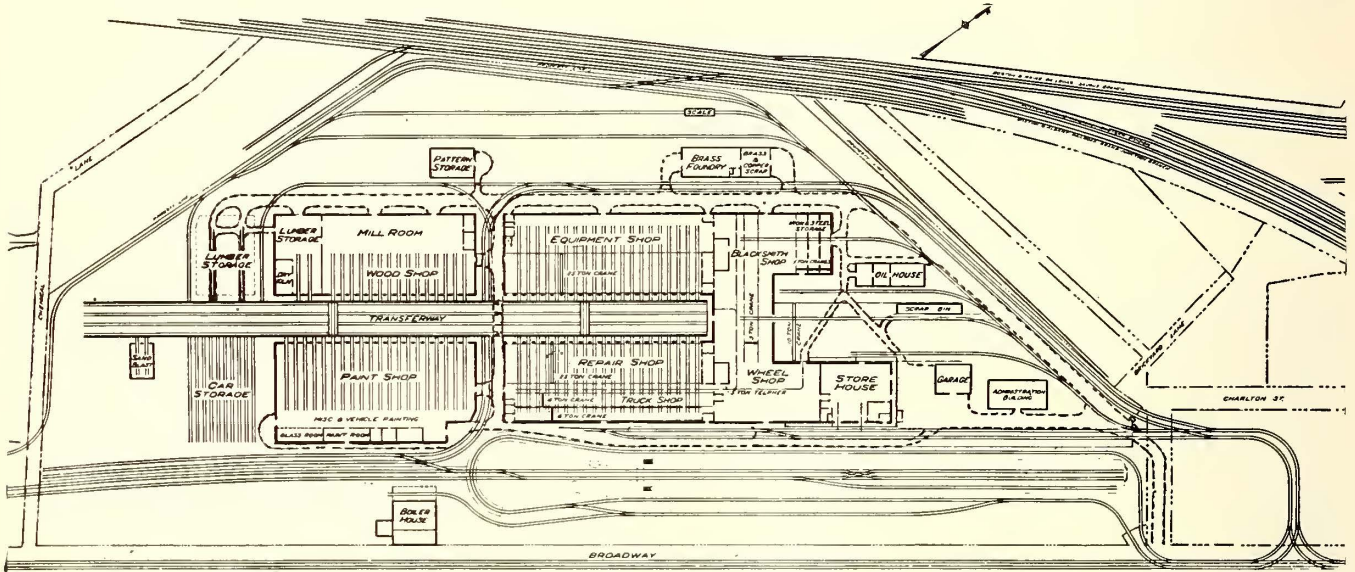
of the elevated line, about one mile north of Sullivan Square.

The necessity for a complete new shop layout has been apparent to the elevated officials for a number of years, but owing to the severe financial conditions they were unable to proceed along the desired lines.

The present shops of the company were frankly characterized as "inadequate and inefficient" by Edward Dana when addressing the members of the Legislature on the subject. Moreover, the present shops, at Albany Street, Bartlett Street and Sullivan Square, are several miles apart, necessitating a division of supervisory forces and a duplication of shop equipment and store-room supplies. The Bartlett Street shop was originally used for horse-car repairs, and has been continued to the present day with only minor changes and repairs. The Albany Street shop is nearly as old. Lighting and other working conditions affecting shop employees are so bad as to have a very evident effect on production. The Elevated officials submitted a number of photographs with their report, illustrating the almost un-

a great deal of the work being done by artificial light, in many cases portable electric lights being used. On account of the limited space available for repairs it is necessary to put various classes of workmen together on one car in order to get the car in order as soon as possible, which means that frequently carpenters, pipe fitters, wiremen and painters will be found at work around the same car. In some cases the tracks in present shops are on 10 ft. 6 in. centers, with numerous wooden columns in between. As the present large types of cars are 8 ft. 8½ in. wide this leaves only a few inches between the building sufficient and the side of the car.

The plans have been made on the basis of providing at the present time facilities adequate for the next ten years, with arrangements so that future extensions



THIS IS A PLAN OF THE PROPOSED SHOPS OF THE BOSTON ELEVATED RAILWAY

believable congestion of machinery and facilities existing at the present time.

The estimated cost of the new Everett shops is approximately \$5,000,000 at present prices, but to offset this proposed expenditure savings are estimated aggregating \$708,850 per annum. It is also expected that prices will be materially reduced before the final consummation of these plans.

Nearly one-half the estimated annual saving is based on the expected reduction in the number of cars out of service at any one time and the shorter time that will be necessary to hold each car out of service for repairs or overhauling, due to the greater rapidity with which work can be conducted. It is figured that this will be equivalent to a gain of 100 cars at an average value of \$12,000 each. By means of the higher standard of maintenance that will be possible under the new conditions it is believed that a 50 per cent reduction will be made in the number of car failures, with a great resultant saving in lost time of crews, pull-in mileage, loss of fares and other items. The total savings on account of these conditions is figured at \$332,500 per year.

The balance of the anticipated economies is as shown in the accompanying table.

It is believed by the management that the estimate of 10 per cent saving due to greater efficiency of labor under better working conditions is conservative. Attention is called to the fact that the present shops, particularly at Bartlett Street, are very poorly lighted,

after that time can be made as required without disarranging or interfering with the routine work of the shops.

The buildings are to be of a modern fire-proof type of construction, provided with every up-to-date safety and labor-saving device, as well as appliances and facilities for the convenience and comfort of employees.

ANTICIPATED ECONOMIES TO BE EFFECTED IN THE NEW SHOPS AT BOSTON

Increase in efficiency of labor due to better working conditions, estimated 10 per cent	\$200,000
More efficient separation and specialization of work	30,000
More efficient supervision	16,000
Labor-saving machinery and handling equipment	25,000
Reduction of hauling materials between shops	30,000
Consolidation of work on new equipment	12,000
Consolidation of stores	7,000
Reduction of force by consolidation of machine shops	12,000
Reduction of force by consolidation of truck shops	6,000
Reduced cost of heating	2,000
Reduced fire hazard and insurance	10,000
Reduction miscellaneous labor, watchmen, messengers	7,000
Rentals eliminated on Goodyear Building	15,000
More economical handling of lubricating, fuel oil	4,350

The general plans are the result of long and detailed studies by the management. As long ago as 1916 the site for the shops was chosen and since then the plans have been under way. Much of the planning has been done by John Lindall, superintendent of equipment. Many of the largest and most modern shops of steam and electric railways have been visited, and consideration has also been given to the best developments in car-building plants and automobile factories.

Comments on Reducing Shop Costs*

Shops and Shop Organizations, Responsible for a Large Share of the Operating Costs, Should Be Thoroughly Looked Into to See How They Can Contribute to the Reduction of Expenditures

BY J. M. BOSENBURY

Superintendent Motive Power and Equipment Illinois Traction System, Peoria, Ill.

MUCH talk is indulged in nowadays about the serious financial and physical condition of the electric railways throughout the country and all are agreed that something must be done to save the industries from a calamity that has seemed inevitable. Therefore, it behooves all persons engaged in the business to study thoroughly their particular branch of it and see what they can contribute to bring about a change for the better.

Gross revenues have been good, but the appalling increase in operating expenses has dwindled the net down to, and in some instances beyond, the disappearing point. As the shops and shop organizations which maintain the cars and equipment of electric railways are responsible for a large portion of the operating expenses, it is well to look thoroughly into existing shop organizations to see what they can contribute toward reducing their expenditures.

This subject is a difficult problem to deal with in a general way because of the vast difference in the size of shops, which range all the way from the larger city shops with millions of dollars invested in real estate, buildings, machinery and equipment, employing many hundreds of men, handling hundreds of cars each day and expending millions of dollars per annum, down to the modest little shed without machinery or equipment, employing two or three men and handling two or three cars per day. But since all shops of whatever size are working to the same end, which is proper maintenance of cars and equipment at a minimum cost, any helpful suggestions that can be made will in a measure be applicable to all concerned.

WAR BROUGHT MANY TROUBLES

As is the case with many other industries, war conditions brought about most of the electric railway shops' troubles by attracting steady, satisfied, skilled mechanics and foremen to other lines of employment at unprecedentedly high wages and less exacting requirements. The war period also led to greatly increased prices for raw materials and manufactured repair parts necessary for the maintenance of cars and equipment.

A large number of the industries thus affected have been able to close down their shops and wait for better conditions, but the electric railway shop must keep on working at all hazards without stopping even for a single day.

It is true that war work long since ceased and the men formerly engaged therein have had to return to their old places or seek new ones, but these men have not forgotten their high wages and the easy times they enjoyed nor are they content to adjust themselves to present-day conditions and requirements without a struggle. This phase of the situation is quite easily observed by making a tour of inspection of shops and listening to the conversations that casually drift to one's ears. It is quite evident that some of the contributing

causes of expensive shop work entering into the high costs of maintenance of cars and equipment are: Large labor turn-over, causing small output per man-hour, and incompetent men, due to lack of proper training and sometimes due to physical incompetency. There are even those who are wilfully incompetent and whose sole object is to do as little as possible and still stay on the job. Again we find men working under the handicap of not having been properly informed of the task before them. In other instances we find slow progress being made on account of workmen attempting to use improper materials or on account of the lack of spare parts, which entails much more time to do the task at a greater expense than if proper materials were available.

In an effort to better these conditions, it will be well for the chief executives of shops to investigate thoroughly the various heads of departments, supervisors and foremen to whom is intrusted the detail planning of the work as well as the supervision of the workmen and also the training of new men who enter their employ with the idea in mind of ascertaining their fitness for the duties intrusted to them. For example: A man may be a good supervisor but a poor workman, or he may be a poor supervisor and a good workman. Again, he may be both a good supervisor and a good workman, and yet be unable to impart his knowledge to others in a manner that will bring about the best results.

COMPETENT FOREMEN ARE SCARCE

Competent supervisors and foremen can, to a certain extent, overcome the effect of inefficient workmen, but such men seem to be scarce at the present time. Supervisors and foremen need training and preparation for their positions as well as the workmen who go through their apprenticeship courses to become competent mechanics.

The selection of supervisors and foremen should receive serious consideration. They should be men whose personal records of past performances as workmen warrant their promotion, after which they should be trained and tried out at the same time by placing them temporarily in authoritative positions in the absence of the regular incumbents, which gives them an opportunity of being instructed and coached in the duties of supervising and managing by those whose positions they fill temporarily. Then if they have ambition, ability and loyalty, they will soon demonstrate their qualification. If they do not qualify, they can be returned to the ranks without complications.

Hence, the supervisors selected to do the detail planning of the work, direct the workmen and train men for shop work should be those who are best qualified for and adapted to that particular position. That is, they should be competent to plan and execute, they should be men who understand the human machine, as well as the mechanical machine, and they should be able to impart their knowledge to others. They should have a real interest in the company and the company employees under their charge. Once an employee has been placed under their charge, the supervisors should be able to bring about a state of mind in that man that will induce him to give the company the best there is in him.

In order to enthuse workmen, it should be pointed out to them that the electric railway is not a passing industry, as many people would have them believe. Electric urban and interurban transportation will be with us for a long time to come and there is a future and not far

*Abstract of paper presented before Illinois Electric Railway Association in Chicago, March 16, 1921.

distant time when steam railways must electrify, so that men now being employed or new men who will be employed in electric railway shops will have as much of a future ahead of them as in any other industry. It should be pointed out to them that many of the present executives came up from the ranks and there are opportunities for others.

As the electric railway shop is one of the few industries that offer year-round employment for the men, with good working conditions and good compensation, the difficulties experienced in the last few years should begin to disappear and the electric railway shops should be able to attract and train good men into an organization that will compete favorably with many other industries in getting results at a minimum cost.

The same causes which were responsible for labor conditions up until a short time ago were also responsible for the shortage of material with which to make proper repairs and also for the excessive cost of same, but now that these conditions are fast disappearing, the shop executive has an opportunity thoroughly to overhaul his shop organization and get his equipment and maintenance cost down to a reasonable level.

MAINTENANCE COSTS UNDULY HIGH

In this connection, it may be well to state that in examining a large number of operating statements and comparing department costs, the cost of maintenance of equipment in a great many instances has increased in percentage more than any other department.

While war conditions did a great amount of harm to electric railway shops and organizations, they also brought about many new things that can be used advantageously in the industries. New materials were developed, old materials were improved, new processes were worked out and proved a success, new factories with improved machinery were constructed, and in many instances these industries, materials, developments and machinery are waiting for some one to come along and use them, and it is certain that in connection with the maintenance of cars and equipment there is room for improvement in materials now in use, and room for improvement in the processes of their manufacture, all tending to a reduction in cost and increase in life.

Maintenance of equipment in many instances has been held down to running repairs for so long that at the present time much work must be done and much material used to bring the equipment back to its normal condition. A company is judged more by the cars it operates, which are before the eyes of the public every minute of the day, than by any other thing. The electric railway shops and their organizations can be a big factor in bringing about better conditions all around by overhauling their equipment, making it safe, sightly and comfortable.

Inspection of equipment at regular intervals, usually on a mileage basis, when carried out systematically, is one of the biggest factors in preventing breakdowns in service, pull-ins, heavy repairs and high maintenance costs.

Of course, while inspection is being made, running or minor repairs should be made, all movable contacts should be cleaned, trolleys put in order and all bearings properly lubricated. In fact, the inspection should be so thorough and done by such competent men that after the car is turned out there is reasonable assurance it will run until the next inspection date without failure in service.

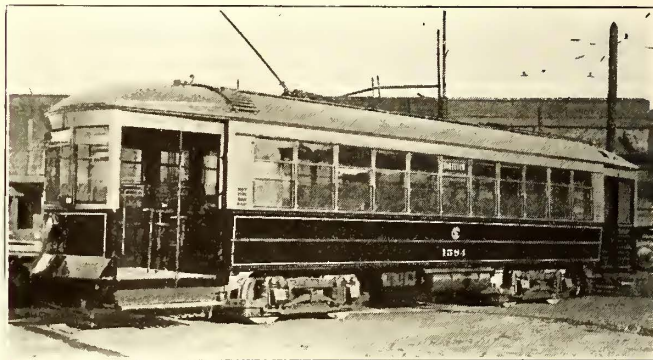
The electric railway car is the only piece of equipment of a highly complicated character that is operated by a man who has no interest in it excepting starting and stopping it, while another man has charge of the maintenance of the car and is held responsible at all times for its proper performance, and is the one censured in case of failure in service. Therefore, this person should lay down a comprehensive inspection schedule and get cars in at the proper time and by so doing cut repair bills to a minimum.

Chicago Brightens Up

**Dark Green Color of Cars Gives Way to Red and Cream—
Brighter Color Makes Cars Look Bigger and Also
Should Reduce Accidents from Collision**

CHICAGOANS have recently been startled by the appearance on the street of bright yellow and red street cars. The stay-at-homes thought a car from some strange parts was lost in Chicago, while the gadders thought they were in some other city. For since 1907 Chicago street cars have been painted a very somber green and it has been a very satisfactory color from the maintenance standpoint.

The new management, however, decided, after rather



HOW NEWLY PAINTED RED AND CREAM CHICAGO CAR APPEARS TO THE CAMERA

extended investigation and trials of various colors and combinations, to repaint all cars red up to the window rail and with a cream color for the superstructure, except for a red drip rail.

There were several reasons for the change. One was purely the psychological effect on the public, both as an indication of a new management and because the brighter color gives the impression of more cars. The bright yellow taxicabs for which Chicago is famous demonstrated this theory. The bright paint makes the cars look bigger and more numerous. Furthermore, the visibility of the colors selected is an important factor in avoiding collisions. The dark green color has a low visibility and several accidents have been traced directly to this fact. The maintenance of the yellow and red, particularly the former, will probably be slightly more expensive than the old green hue, but the other advantages will offset this, it is felt. At present the cars are being put through on the regular overhauling and painting schedule of about eighteen cars a week, but this will probably be increased to about thirty a week shortly. At the time of this writing about 100 of the repainted cars are on the streets. The accompanying picture of one of the newly painted cars shows the reaction of the new colors on the photographic plate.

Third Rail Gaging Device

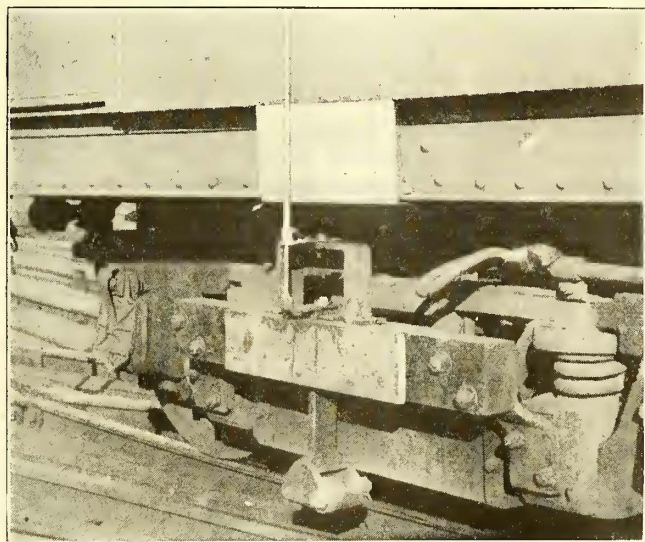
Variations of Third Rail from Its Correct Elevation Under Service Conditions Quickly Obtained by a Device Mounted on Car—Complete Survey of 180 Miles of Track in Fifteen Hours

BY W. A. BURNHAM

Assistant Superintendent Shops and Equipment Chicago Elevated Railways

IN CONNECTION with maintenance work, the Chicago Elevated Railways recently found it desirable to develop an indicating gage which would show the height of the third rail relative to the running rails under service conditions. On the elevated system the third rail insulators are mounted on the ends of the same ties that support the track rails and the proper position of the third rail is $6\frac{1}{2}$ in. above the top of the running rail.

It was believed that the weight of passing cars might be causing a considerable variation in the difference



THIRD RAIL ELEVATION GAGING DEVICE INSTALLED ON CHICAGO "L" CAR

in elevation of running rail and power rail, perhaps furnishing an explanation for some breakages of the current collecting shoes and sleet removing devices attached to the car trucks. Accordingly, a car was fitted with two indicating gages, as shown in the accompanying illustrations, and properly pivoted to make a correct indication on the curves. This device consists of a fixed brass tube attached to the truck below all springs, to represent the position of the track rail, and a round steel-end rod sliding inside the brass tube and fixed at its lower end to a hardened steel roller which bears on the top of the third rail and indicates its height.

With the roller set a standard distance of $6\frac{1}{2}$ in. above the top of the running rail, a zero mark was made on the fixed tube and sliding rod, just outside one of the car windows. A scale reading in inches both ways from this zero mark on the fixed tube then indicated directly to observers inside the car, as it was operated along the track, whether the third rail was higher or lower than the standard setting and how much. Further to simulate service conditions scrap iron was placed in the car to represent passenger load.

With a car fitted with two such devices, one on each

side, a complete survey of all third rail on 180 miles of track was made in fifteen hours. The survey furnished exact information of the conditions of the power rail relative to the third rail shoe under service conditions. It was found that the movement of the rail and tie under certain track conditions materially increased the relative height of the third rail with respect to the running rails and was the cause of some of the breakage of contact shoes.

Maintaining Ball Bearings

Some Data for the Life and Cost of Maintaining Ball Bearings on GE-258 Motors Show that They Are Cheaper to Maintain than a Sleeve Type and Their Life Is Generally Satisfactory

BY H. E. KROUSE

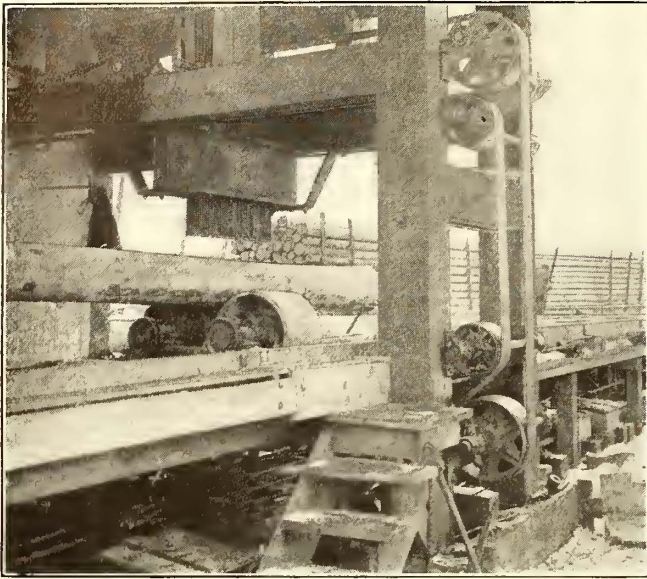
Master Mechanic Trenton & Mercer County Traction Corporation, Trenton, N. J.

SINCE the advent of the GE-258 motor in connection with safety car equipment, questions regarding the service obtained and the cost of maintaining the ball bearings in this motor have been frequently asked. Results of several years' experience in maintaining this type of motor have led me to believe that ball bearings are ideal for this type of motor. An analysis of results obtained shows that they are cheaper to maintain than sleeve bearings and that their life is generally satisfactory. These conclusions are drawn from results obtained in continuous service on 19-ton cars for more than three years and on Birney safety cars for more than two years.

The life of any type of motor bearing depends to a great extent on lubrication and cleanliness. The ball bearing is better protected than the sleeve bearing and is less liable to have foreign substances mixed with the lubricant. One of the greatest economies in connection with the maintenance of ball bearings is found in the fact that it requires only a small amount of lubricating grease to keep them properly lubricated. We have been lubricating our ball bearings but once for every 6,000 to 7,000 car-miles, or where lubrication is done on a stated period rather than a mileage basis about once in every ten to twelve weeks. During the last ten months the lubrication of the ball bearings on 160 GE-258 motors has cost us on an average of but \$15 a month for both lubricant and labor. During this period we have not had a single bearing failure. A few pinion end bearings have been removed for defective balls, after having made an average of 140,000 car-miles. These bearings were removed during the overhauling of motors which had been in constant service for three years.

The majority of these bearings, however, were found to be in good operating condition, which led us to believe that the average life of the pinion end bearings on initial installations should exceed 175,000 car-miles and the commutator end bearings should average at least 250,000 car-miles with proper care and favorable conditions.

Our lubrication is done with a fool-proof grease gun which has a capacity of 2 gal. of grease and which is very positive in its action. This large capacity is desirable, as it makes reloading of the gun unnecessary while lubricating from fifteen to twenty cars each having two motors. The type of gun which we use is manufactured in several sizes by the Runyen Manufacturing Company of Grand Rapids, Mich.



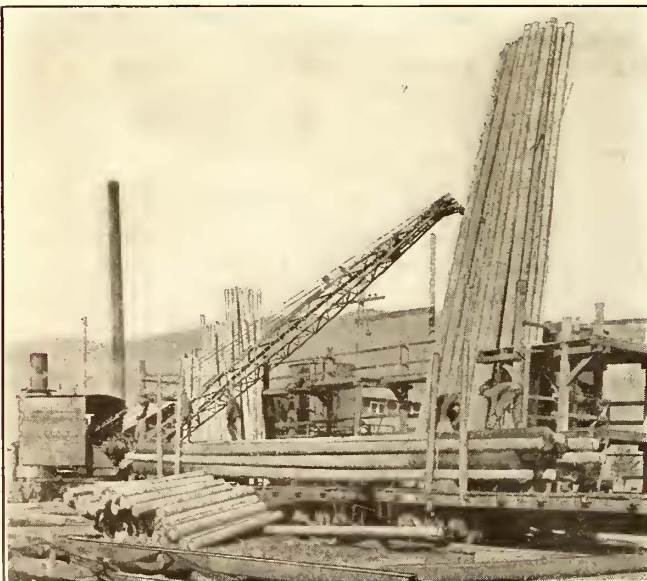
PERFORATING MACHINE IN OPERATION AT SANDPOINT, IDAHO, IN CONNECTION WITH THE TREATMENT OF CEDAR POLES WITH CREOSOTE

Puncturing Poles Before Impregnation

A Machine Designed to Puncture the Sapwood of Red Cedar Poles at the Butt Has Been Placed in Operation Which Assists Materially in Insuring Complete Impregnation

AN IMPROVED puncturing machine designed to puncture the sapwood of red cedar poles at the butt to permit a thorough impregnation by creosote has recently been put in operation by the Western Cedar Preservers Company at Sandpoint, Idaho. This machine is said to represent a long step forward in the preservation of cedar poles. It assures a full sap penetration with either green or seasoned poles treated by what is known as the "B" method. This consists of immersing the poles for from four to twelve hours in an oil bath heated to from 212 to 230 deg. F., followed by a cold oil treatment of from two to six hours.

The puncturing is done by forty-two iron bars 4½



LOADING POLES AFTER TREATMENT UPRIGHT IN AN 11-FT. TANK

ft. long, 3 in. wide and ¾ in. thick, which weigh approximately 37 lb. each. A detachable point holder on each bar makes possible the regulation of the depth and spacing of the puncture. At present, chisel-shaped points are in use, each ½ in. long and spaced so that a complete penetration will be obtained if the oil travels 1½ in. lengthwise of the pole and ¼ in. crosswise.

Each bar works independently of all the other bars in order to take care of the irregularities of the pole. These bars are raised by cams and drop by gravity. The machine is constructed so that the operator can regulate the distance the bars drop by simply raising or lowering the hoist on which the pole rests. The pole is transported under the bars by live rolls and then raised into position by hoists. The part of the pole to be punctured is supported on two oscillating wheels, 24 in. in diameter and 18 in. wide. These wheels are so constructed that no matter what position the pole is in or what taper it may have it will have a full 18-in. bearing surface on the two wheels.

Discussing the results obtained, W. M. Leavitt of Spokane, manager and secretary of the company, said in a paper read before the American Wood Preservers at their seventeenth annual convention in San Francisco this past January: "The time at which complete impregnation may be observed varies from the time the pole is removed from the treating tank up to two months after the time of treatment. In a properly punctured pole we have not, however, had a single instance where we did not eventually secure a complete impregnation to the depth of the puncture providing the puncture did not enter the heart wood."

Cut Pole Repair Cost

STEEL poles have a habit, after being in place for several years, of rusting and rotting at the base where they enter the ground. Various methods have been used from time to time to strengthen or repair such poles. One method has been to fill the inside with concrete to a distance of 2 or 3 ft. above the ground and reset the pole in concrete. This method the Cincinnati Traction Company has used to some extent in the past. Another method which this company has used more extensively is to set a new pole in place of the one to be repaired, cart the old pole to the shops and swage on a new sleeve purchased to fit the lower section of the old pole. Under this latter method of treatment, the cost per pole repaired varied from \$16 to \$26.

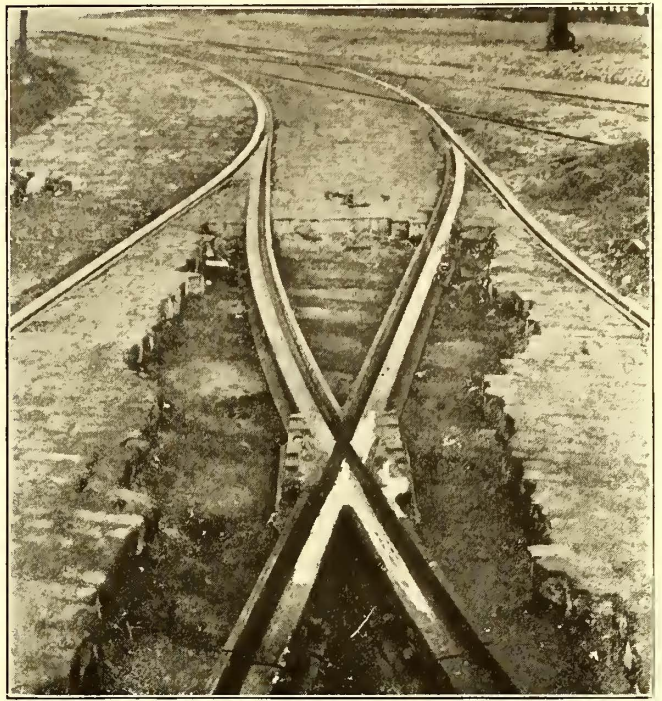
About two years ago the company started repairing such poles in a new way and at a great reduction in cost. A large amount of old pipe, in scrap pieces, was bought up, in size 1 in. larger (measured by inside diameter, pipe size) than the lower sections of the poles. This was cut up into 24-in. and 30-in. lengths. When a pole is to be repaired the cross-arm and other "trim-



SLEEVE REINFORCEMENT OVER RUSTED PORTION OF STEEL POLE

mings" are removed from the top, the sidewalk is cut away and the base exposed 12 or 15 in. below the ground. Then the section of pipe, as a sleeve, is dropped over the pole, the longer sections being used for the more seriously rotted poles. There is left a space of about $\frac{1}{8}$ in. between the pole and the inside of the sleeve. Metal wedges are inserted to maintain this even all the way round and grouting put in, filling the space and being finished off with a little slope at the top to drain off moisture which runs down the pole. In some cases these sleeves were arc welded at the top. When the grouting has set, the pole is then secured by filling in at the base, as before, and the trim put back on.

The appearance of the repaired pole is shown in the accompanying illustration. This also shows how little disturbance is necessary in the sidewalk. The most interesting part, however, is the cost. F. J. Venning, superintendent of overhead, who furnished the information for this article, stated that during the past two years 650 poles had been repaired in this manner at an average cost of \$6.50. This is quite striking in comparison with the former cost of \$16 to \$26.



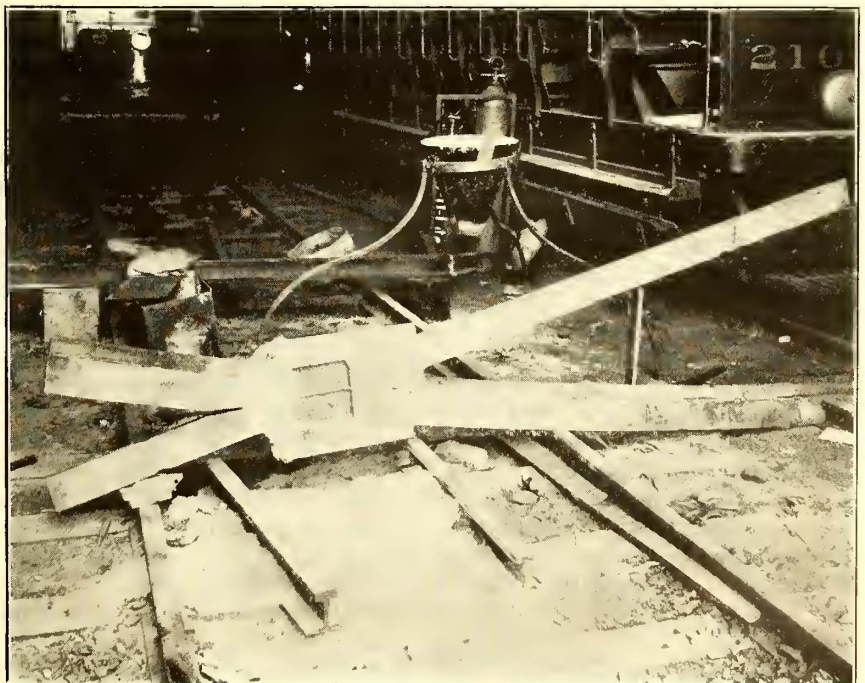
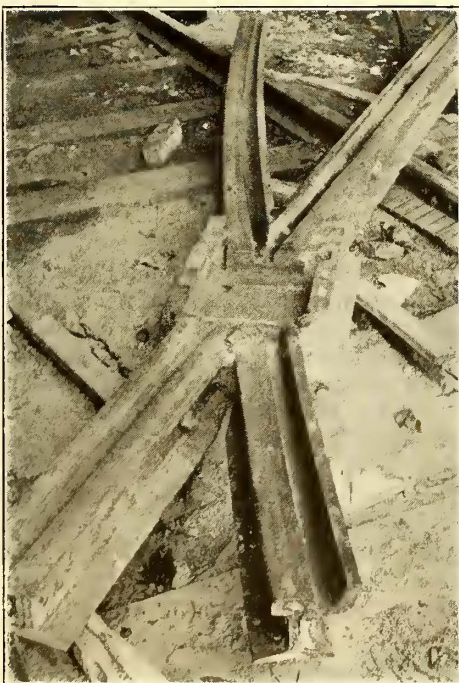
REPAIRED PART IN PLACE READY FOR SERVICE

A Device to Prevent Rail Creepage

A NEW development has been made in the method of retarding creepage of rails by anchoring a number of ties to the joint tie. For connecting the ties together a new device called the "Trak-ankor" is being manufactured by the Track Specialties Company, New York City. The device consists of a flat steel bar punched with spike holes to be attached to the joint ties and the preceding four or six ties, depending upon the severity of the creepage. In order to bunch the joint ties, tighten the gage of track, or cause other track ills due to rail creepage, ties with this device must drag six or eight ties instead of two as with the usual type of anti-creeper. Based on 2,880 ties, spaced 22 in. apart, and 364 rails per mile, the cost per mile for the "trak-ankor" would be \$273.

Repairing Box of Manganese-Insert Frog

THE accompanying illustrations show a somewhat unique application of thermit welding in repairing the cast-iron box of a manganese-insert frog installed near the carhouses of the Union Street Railway, New Bedford, Mass. This box was broken just at the edge of the manganese steel center as a result of car traffic. In carrying out the repairs the frog was removed from the pavement and the manganese center was taken out. The end part of the cast-iron box outside the fracture was cut away with hammer and chisel, to provide space for the new metal. That part of the end of the cast-iron box which remained was then thermit-



TOP AND BOTTOM VIEWS OF THE WELDED BOX

welded in the usual manner to two rails on the same side. Top and bottom views of the complete weld are shown in the illustrations and give a fair idea as to the extent of the operation. The welding of this frog required two days of time and 85 lb. of thermit.

After the welding operation had been completed, the excess metal on the weld was removed and the manganese plates were again inserted in the cast-iron box and secured to the box by means of spelter. The repaired part was then reinstalled in the street. An additional illustration shows it in place ready for service.

Method of Signal Maintenance in Chattanooga

Analysis of Signal Troubles and Failures for Year 1920 as Compared with 1919 Shows Substantial Decrease, Which Can Be Attributed Directly to Improved Maintenance

THE annual report of the signal department of the Chattanooga Railway and Light Company, Chattanooga, Tenn., gives a comparison of the signal performance of the year 1920 with that of the previous year. The railway company has twenty blocks, comprising forty Nachod signals, of the trolley contact variety used for single-track opposing movements and permitting following movements through the same block.

The signals give indications by lights and disks, have oil-immersed relays and contactors of the wiping type without moving parts. Most of them were installed ten years ago. In giving a summary of its activities in 1920 the signal department reports that during the year nearly all of the signals had been repainted, two blocks of type MD signals were converted into type CD and eight blocks of type MD converted into type C, all this work having been done by the signal department.

Moreover, the relays in these signals were adjusted to operate on low voltage, such as occasionally happens on the line on which they are installed. Four old-style relays were overhauled, rewired and converted into the latest type. Five other relays were overhauled and adjusted. Thirty overhead trolley contactors were taken down and replaced with ones that had been previously repaired and painted, and these in turn were repaired and painted. Twelve poles having signals mounted thereon were rewired in conduit.

The department also installed and maintained Cheat-ham track switches. Four of the latest type for heavy duty were installed with drains to the sewer and are reported as working satisfactorily.

The total yearly signal movements of all signals in 1920 was 1,709,820 and in 1919 1,745,950, a movement being considered as one passage through a trolley contactor. The average yearly movements per block were 85,490 and 96,986, respectively, in 1920 and 1919, the average daily signal movements per block being 234 and 264 respectively. The numbers of movements per failure were 11,954 and 11,336, being a gain of 618 movements during 1920, which indicates improved maintenance. There were also thirteen fewer failures in 1920.

The accompanying table shows an analysis of signal failures for the two years. In explanation it may be stated that every kind of trouble reported is counted a

failure, and it is stated that the car crews are not a bit lax in reporting trouble.

Under the heading "Line wires" is included all trouble with the line wires, whether open-circuited, crossed with each other, or crossed with other wires; 9.1 per cent of all failures were from this cause, while in 1919 this percentage was only 5.1. Blown fuses result mostly from lightning storms. "Relay trouble" covers everything involving the signal-box mechanism, such as bad coils, contact fingers and interior wiring. The troubles, together with setting and clearing contactors, are the only ones properly chargeable to the signal devices themselves and amounted to only 23.1 per cent of the failures in 1920, as against 33.4 per cent in 1919. From this it will be seen that more

ANALYSIS OF SIGNAL FAILURES

Trouble Found	1920		1919	
	Number	Per Cent of Total	Number	Per Cent of Total
Line wires	13	9.1	8	5.1
Pole wiring	19	13.3	10	6.4
Blown fuses	16	11.1	29	18.6
Lamps out	34	23.8	15	9.6
Relay trouble	22	15.4	24	15.4
Setting contactor	4	2.8	9	5.8
Clearing contactor	7	4.9	19	12.2
Bad grounds	7	4.9	9	5.8
Miscellaneous	1	0.7	20	12.8
No trouble found	20	14.7	13	8.3
	143	100.0	156	100.0

than three-quarters of the signal failures in 1920 were brought about by external conditions and did not arise from the signals themselves.

These figures for 1920 show that a failure due to the signal mechanism occurred in one block on an average of about once in 220 days, which emphasizes the thoroughness of the maintenance program.

A daily signal report blank is used by the railway company. This report is dated and has separate sections for the dispatcher's report of the trouble and the signal department's report on its correction. The dispatcher's report has the following column headings: Division, Signal location, Reported by, Received by, Time received. The signal department's report is headed Time received, Date O.K., Time O.K., Nature of trouble, Signed by.

Aid in Solving Maintenance Problems

THE Westinghouse Electric & Manufacturing Company, in its plan of service to the electric railways, issues, from time to time, maintenance information under the name "Railway Operating Data." These data are prepared by practical engineers from the experience they have gained in visiting railway shops in all parts of the country. These data sheets contain information on all the varied maintenance problems that the operating man has to deal with. The subjects range from "Dipping and Baking of Railway Motors" and "How to Babbitt Motor Bearings" to "Installation of Air Piping to Prevent Freezing" and "Systematic Inspection of Car Equipments."

The railway operating data are first published in the *Electric Journal*. There is generally one subject and sometimes two or three covered in each issue. After the data have appeared in this manner, they are issued in loose leaf form by the railway department of the Westinghouse company, and the complete set, which at the present time comprises fifty individual articles, can be obtained free on application to any district office of the company.

Association News

Secretary Burritt Resigns

THE special meeting of the executive committee, mentioned in the issue of the *ELECTRIC RAILWAY JOURNAL* for March 12, was held last Tuesday at association headquarters to consider further the question of association finances. As a result of the meeting a letter was sent to all member companies by President Gadsden advising that E. B. Burritt had presented his resignation as secretary-treasurer, and that this resignation had been accepted. J. W. Welsh, special engineer of the association for the past two years, was appointed acting secretary to serve until further action is taken by the executive committee in the appointment of a permanent successor to Secretary Burritt.

Mr. Gadsden was asked if he cared to make a statement on the situation. He replied that as soon as the auditors of the association had finished their audit a complete statement of the situation would be sent to all members of the association. The books of the association are being audited under the direction of M. R. Boylan, general auditor of the Public Service Railway of New Jersey, who has audited the books of the association annually for a number of years. Mr. Gadsden said that so far the audit seems to show that the shortage may be in the neighborhood of \$50,000 and that the defalcations were made by the bookkeeper, Gibson, through cashing vouchers which had been signed in blank by Secretary Burritt, when he expected to be absent from town. Gibson, as stated in the last issue of this paper, has been arrested, and in view of the failure of Secretary Burritt to safeguard the funds, it became necessary for the executive committee to accept his resignation.

When asked what the effect of these losses on the association would be Mr. Gadsden said that the executive committee had already assurances from a sufficient number of large interests in the association to be sure that when the amount of the shortage was determined there would be no difficulty in having it underwritten. This would mean that the amount so advanced to the association could be paid off by it over a series of years without in any way hampering the essential functions of the association. Continuing, President Gadsden said:

"We propose to take advantage of this situation to have a thorough examination made of the work of the New York office for the purpose of increasing its efficiency and decreasing its expenses, but we do not propose to let what has happened interfere in any way with the usefulness of the association in any essential features. Such changes as are made will be for the purpose of increasing efficiency and not merely for economy. One suggestion which the executive committee has received within the last week and which will probably be adopted is that in the future the offices of secretary and treasurer will be permanently divorced. The question of the selection of the new permanent secretary should have the serious thought of the entire industry. The executive committee will meet probably some time in April to select a new secretary. In the

meantime suggestions of the best man to fill the vacancy will be welcome."

Mr. Burritt, the retiring secretary, was appointed to the office in 1913, succeeding H. C. Donecker, who resigned to become assistant general manager of the Public Service Railway of New Jersey. Prior to 1913 Mr. Burritt had been connected with the Washington Railway & Electric Company for a period of about six years.

Connecticut Company Section Holds Largest Meeting

THE Connecticut Company held its thirty-eighth meeting in New Haven on March 3. The Silver Street freight house, which has just been remodeled for use as a freight terminal, was used as an assembly hall. Here luncheon was served at 6:30 p.m. to 315 members and guests, an attendance which sets a new record. The men from Hartford, Meriden, Middletown, Bridgeport and Waterbury were brought in special cars.

The new president, Frank P. Harlan, opened the meeting, introducing Lucius S. Storrs, who was warmly welcomed. Mr. Storrs said that the employees of the company should be thoroughly posted on company matters. He began his talk with a history of the company from its incorporation in 1905 up to the present time. Some comparisons of earnings, expense, etc., were displayed on a large chart for 1917, 1918, 1919 and 1920, including the figures covering payrolls, coal, material, accidents, power purchased, etc. Mr. Storrs explained to the employees the bills before the present Legislature for relief from various burdens so that they might be prepared to answer questions and give facts and figures when the occasion required.

Vice-President J. K. Punderford spoke next, thanking the men for the good work done in removing snow after the storm of Feb. 20. Another speaker was John W. Colton, formerly executive assistant to Mr. Storrs and now on the editorial staff of the *Hartford Times*. He stated his belief that the Connecticut Company is in need of the proposed legislative relief.

New Arc-Welding Machine

A NEW electric arc-welding machine, especially intended for rail bonding and trackwork, but also adaptable for general repair and shop welding, has been brought out by the Wilson Welder & Metals Company. The machine was designed at the request of the Ohio Brass Company, which acts as sole selling agent.

A fundamental principle of this machine consists in providing uniform heat per unit area in the weld by means of a short arc automatically controlled. With this machine the potential across the arc is but 18 volts, and with this voltage it is impossible for the operator to hold a long arc. Current control is provided by means of a solenoid operating in conjunction with a carbon pile.

During welding the regulator automatically maintains the current at a practically constant value regardless of line variations. The short circuit current is held to about 10 per cent of the welding current. Heat is controlled within 4 per cent.

The dynamotor is wound for two voltages. One winding is for operation on from 350 to 650 volts direct current and the other winding on 150 to 350 volts direct current.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Uncompleted Track Bought

City of Detroit Acquires Lines Never Completed by the Detroit United Railway

An agreement was reached as to the price which the city of Detroit will pay for the stretch of the Detroit United Railway's track on Harper Avenue between Gratiot Avenue and Montclair the last day allowed by Federal Judge Denison in his order. The Judge, in deciding the case, issued an order that two arbitrators be appointed, and in case they could not agree as to the price a third arbitrator was to be appointed.

RAILWAY TAKES LEGAL ACTION

The track on Harper Avenue was never completed by the Detroit United Railway owing to the action of the City Council in rescinding the day-to-day agreement under which it was being constructed by the company. When the city proceeded to have the Department of Public Works remove the track from the street in order to make provision for the Municipal Railway, the company started proceedings in the federal court in February to prevent the tearing up of the track. Judge Denison of the District Court of Appeals ordered the city to post a sum of \$50,000 as a guarantee to cover the sum settled upon by the arbitrators. The \$50,000 was supplied out of the Municipal Street Railway bond issue.

Prof. Henry C. Riggs of Ann Arbor was appointed arbitrator by the Detroit United Railway. The city officials selected William H. Maybury. The track, approximately 4,800 ft. long, was valued by the Detroit United Railway at \$47,191. The value finally agreed upon by the arbitrators, or the amount to be paid by the city, was \$40,686. In deciding the amount to be paid for the concrete base upon which the rails were laid, the arbitrators allowed the Detroit United Railway 50 per cent of the cost. The city contended that only 15 per cent should be paid.

ST. JEAN LINE WILL NOT BE DENIED TO THE CITY

It has been further indicated by the Detroit United Railway that the crossing of the company's Mack Avenue track by the municipal cars on the St. Jean line will not be opposed. This is in accord with the company's announcement that crossings of its tracks will not be opposed provided the plans are submitted previously to its engineers for approval. The company's engineers and engineers for the city Street Railway Commission are to confer regarding the crossing at Mack and St. Jean

Avenues. The present crossing was installed by the city under police protection while E. J. Burdick, general manager for the Detroit United Railway, was marooned on Belle Isle. In case the engineers do not reach an agreement for modification of the order issued by Judges Hart and Johnson restraining the city from crossing the company's tracks, the matter will be arbitrated.

The case is still pending which involves the request of Corporation Counsel Clarence E. Wilcox that the court pass on the city's rights to cross the company's tracks. Judges Hart and Johnson, in the Wayne County Circuit Court, ruled that the Mack Avenue crossing should not have been made by the city until after a hearing had been held on the company's temporary restraining order.

U. S. DISTRICT COURT ORDERS HARPER AVENUE TO CITY

The present proceeding with respect to the Harper Avenue track is in accordance with an order made by the United States District Court requiring the Detroit United Railway to turn over to the city the property of the company on Harper Avenue and Montclair Avenue constructed under the day-to-day agreement of 1919.

City Paid—Injunction Denied

Federal Judge Edward E. Cushman on March 4 filed a written decision in the United States court denying the motion for a temporary injunction by the Puget Sound Power & Light Company to tie the hands of the city officials in the Seattle railway bond case. Attorneys for the Power & Light Company stated when the case was called in the United States District Court that they abandoned the motion, and Judge Cushman's decision followed.

The motion was directed against the city of Seattle, Harry W. Carroll, city comptroller, and Ed. L. Terry, city treasurer, to enjoin them from applying the receipts from the municipal railway to maintenance and operating costs, or to anything other than payment of interest due on March 1, and to meet interest and principal on the \$15,000,000 railway bond issue.

The treasurer filed an affidavit in the federal court stating that he had paid \$375,000 due in interest on March 1, after filing of the motion which has now been denied. Judge Cushman's decision stated that the motion is denied without prejudice, because the interest was paid, and because of the action of attorneys for the plaintiff in abandoning the motion.

Albany Strike Before Court

Employees Bring Action Under Statute Passed by Last Legislature—First Case of Its Kind

Application was made on March 11 by the Albany and Troy unions to Supreme Court Justice Wesley O. Howard of Troy, N. Y., for a peremptory order directing the United Traction Company to proceed to arbitrate the strike controversy.

The unions, in arguing the petition, will demand that the company be compelled to live up to an arbitration agreement incorporated in a contract made with the men which does not expire until June 30 of this year.

HEARING SET FOR MARCH 19

Harry B. Weatherwax, vice-president of the United Traction Company, was served with a notice of the action. Application for the order will be argued on March 19. The application was made under chapter 275 of the laws of 1920, enacted by the 1920 Legislature and signed by former Governor Alfred E. Smith.

It is the first time the law has ever been invoked in an industrial dispute, though it has been held constitutional by the Court of Appeals in a case involving a mercantile dispute.

It will be contended that the expiration of a memorandum of agreement as to wages, which is a part of the major contract containing an agreement to arbitrate "any controversy" that might arise, did not void the major contract itself, and that that contract is now in effect.

The unions base their plea for a court order to force arbitration of the controversy on two sections of a contract made between the organizations and the company, "on or about the first day of July 1920."

OPPOSITION TO ARBITRATION EXPLAINED

The company has based its opposition to arbitration of the present strike controversy on a memorandum of agreement entered into on July 30, 1920, in which was incorporated a schedule of wages and compensation for different classes of workers.

Chapter 275, known as the arbitration law, was passed by the Legislature of 1920 and became a law April 19 by approval of Governor Smith. The law provides that "A provision in a written contract to settle by arbitration a controversy thereafter arising between the parties to the contract, or a submission hereafter entered into of an existing controversy to arbitration, pursuant to the code of civil procedure, shall be valid, enforceable and irrevocable."

One-Man Cars Attacked

Bills Against This Type of Rolling Stock Introduced in Massachusetts, Connecticut and Iowa

Backed by the American Federation of Labor the street carmen's unions in Massachusetts are making a vigorous effort to have the operation of one-man cars prohibited in the commonwealth by means of legislative enactment. At a public hearing held by the legislative committee on street railways the proponents of a bill to abolish these cars brought up all the usual arguments, stressing principally the alleged danger to the public which is claimed by the labor leaders to be the prime reason for their stand against them.

NEW CARS DEFENDED

Opposition to the bill was registered by nearly every railway in the state. The strongest plea against this bill was registered by the trustees of the Eastern Massachusetts Street Railway. This company is now operating more than 80 per cent of its mileage with one-man cars and Chairman Homer Loring of the Board of Trustees made it plain to the committee that it was a case of one-man cars or no cars at all. He characterized the bill as "an act to compel street railways to hire needless men against the best interests of the car riders, who are demanding lower fares."

So satisfactory are the one-man cars of the Eastern Massachusetts Street Railway from the standpoint of economy that Mr. Loring expressed the opinion that if they had been introduced to the present extent about two years earlier the number of abandoned lines in Massachusetts would not have reached the present unfortunate size.

"The one-man car," said Mr. Loring, "is the salvation of the street railway industry. To prohibit its operation would impose great hardships upon thousands of people on the Bay State system who would lose their railway service entirely if the one-man cars were taken off."

CONNECTICUT BILL FAILS

Advantages of the long double-truck one-man cars which the Connecticut Company has remodeled and put into operation at Meriden, Conn., were set forth by J. K. Punderford, vice-president and general manager, at a hearing before the Public Utilities Commission at Hartford on Feb. 17. The hearing was held in response to a petition signed by a number of residents, alleging that the new long one-man cars were "unsafe, impractical and very inconvenient." The petition was presented by Frank O'Meara, Hartford, representing the street railwaymen's union of Connecticut. Most of the witnesses called were motormen and conductors.

The Connecticut House has since rejected the trolleyman's bill calling for a crew of two competent operators for trolleys on single track lines and on cars weighing in excess of 10 tons, no

qualified motorman to do any duties of a conductor while the car is in motion.

A bill will be presented in the Iowa Legislature prohibiting the use of one-man cars in cities of more than 25,000 population, according to President Charles E. Rogers of Local No. 312, Street & Electric Railway Employees of America.

SIX CITIES AFFECTED

The proposed bill is of interest at Davenport from the fact that the Tri-City Railway has unofficially suggested the adoption of the safety car as a means of cutting operating expense and solving the traction problem along another avenue than that of fares.

Other cities in Iowa with more than 25,000 population are Sioux City, Waterloo, Cedar Rapids, Clinton and Ottumwa.

B. J. Denman, president of the local traction lines and vice-president of the United Light & Railways Company, believes that any one-man bill will fail of passage. Mr. Denman said:

It is probably along the lines of the anti-safety car bills which have been introduced in the Legislature for the last five years. Menace to use of safety cars through legislation is not a serious one. I am confident that the cities now using safety cars will put up a strong fight for their retention.

Indeterminate Franchise Bill Before Governor

The indeterminate permit bill, which extends until July 1, 1923, the time during which public utilities in Indiana may surrender their franchises for indeterminate permits and come under the jurisdiction of the Public Service Commission, is now before the Governor for signature.

Three Indianapolis utilities, the Indianapolis Street railway, the Citizens' Gas Company, and the Indianapolis Water Company, have not surrendered their franchises, and will be in a position to act under the new law. Officials of the water company said no decision had been reached in regard to surrendering the franchise, and officials of the gas company said no action has been taken on the proposition. It is understood the railway will take advantage of the provisions of the law.

E. I. Lewis, chairman of the Public Service Commission, said the rate situation of no Indianapolis or other utility would be changed by the surrender of a franchise and acceptance of jurisdiction of the commission. He pointed out that under a decision of the Supreme Court the commission has granted emergency rate relief to the Indianapolis Street Railway and that the water and gas companies have petitions pending before the commission. The result, therefore, of the surrender of a franchise would be merely to place the public utility under the jurisdiction of the commission in other matters.

About sixty companies, operating approximately 100 utilities, which did not surrender franchises under the old law are in a position to act under the present legislation.

Municipal Relief Granted

Council of South Bend, Wash., Exempts Electric Railway from Paving Obligations

An excellent example of progressive municipal legislation is found in the City Council of South Bend, Wash., passing an ordinance on Feb. 9, 1921, granting exemption from paving along its tracks in that city to the Willapa Electric Company, a Sanderson & Porter property.

The preambles contained in this ordinance reflect a broad view of paving obligations imposed on electric railways. They are as follows:

The City Council of the city of South Bend, Washington, do ordain as follows:

Whereas, the Willapa Electric Company is the assignee and owners of the franchise rights and properties granted to the Twin City Railway under Ordinance No. 368, which was passed by the Council of the city of South Bend, Washington, on Jan. 3, 1911, and approved by the Mayor of said city on said date; and

Whereas, the existence and operation of street railways are vital to the welfare and life of every city; and

Whereas, street railways can no longer operate and earn a fair return on their investments if cities require them to expend funds for paving which is solely used and worn out by the public in general and not by the railway; and

Whereas, it is now universally conceded that exemption from paving burdens is essential to protect the street railway industry from bankruptcy, and such exemption is recommended by the Federal Electric Railways Commission and also by the Public Service Commission of the State of Washington, for both of said commissions find that moneys expended for paving are ultimately paid by the patrons of the street car company, for it is the fares of these patrons from which the street railway must receive its funds in order to conduct its business and to pave the streets, and it is unfair to place this indirect tax and burden solely upon those who ride on the street cars; and

Whereas, the city of South Bend, Washington, desires to protect existing investments made in good faith and thus encourage expansion and new and additional investments; therefore

Resolved, That Sections 2 and 3 of Ordinance No. 368, which was passed by the Council of the city of South Bend, Washington, on Jan. 3, 1921, and approved by the Mayor of said city on said date, be amended.

The sections of the original franchise amended by this ordinance were those which required the railway to pave with the kind of material used by the city.

\$5,000 Prize Goes a-Begging

Last May the London County Council, London, England, offered a prize of £1,000 for the ideal tramcar. The competition was advertised all over Great Britain and the Colonies, in the United States, and in France. Some seventy-six proposals were sent in; the examiners have now reported on them. They say that not one of these efforts deserves the £1,000 prize:

The bulk of the candidates have deemed it sufficient to send in one or more rough sketches, with incomplete descriptions of varying length. In these cases, no attempt has been made to work out the proposals, and, where it has been found possible to develop them, they have soon proved to be impracticable of application. There is a conspicuous dearth of proposals in respect to the electrical equipment and trucks or bogies. So much so that, in a majority of cases, a complete lack of electrical and mechanical knowledge is apparent with regard to these most important features of car design.

Moreover, many competitors have made suggestions incompatible with the local regulations, and even with the physical conditions.

\$600,000 Terminal Planned

Expenditures Will Be Carried Out in Interest of Interurban at Indianapolis

Plans were submitted to the Public Service Commission of Indiana on March 14 by the Indianapolis Street Railway for a central interurban freight terminal, to be constructed on the site now occupied by the Terre Haute, Indianapolis & Eastern Traction Company freight house at Kentucky and Oliver Avenues, at a cost of more than \$600,000. Accompanying the plans were drafts of proposed contracts between the street railway and the interurban companies entering Indianapolis, which provide for relieving the local company from supplying freight facilities and placing the freight business entirely in the hands of the interurban companies.

A THREE-YEAR PROGRAM

The entire project is to be completed in three years and all freight will be handled at the central terminal after that time. The terminal facilities at the Traction Terminal station and adjacent buildings would be devoted exclusively to passenger and express service.

The plans submitted for the approval of the commission call for taking over the terminal of the Terre Haute, Indianapolis & Eastern Traction Company by all the interurban companies and the construction of additional facilities under three proposed projects.

The first project proposed for the construction of the new terminal calls for an addition to the present structure of 7,230 sq.ft. of floor space and 2,400 sq.ft. of platform. This work, together with the construction of two additional tracks and driveways, will involve an expenditure of \$82,674.

The second project submits proposals for the construction of the west end of an outbound freight house and the completion of track projects. This proposed section of the freight house will have 7,230 sq.ft. of floor space in the building and 4,800 sq.ft. of platform. This project involves an expenditure of \$67,344.

OTHER ROADS CONSENT

The third project calls for the completion of the second outbound freight house, an entire inbound freight house and driveways. The inbound freight house will have a floor space of 22,500 sq.ft. and the remaining section of the outbound freight house will have floor space of 9,300 sq.ft. in the building and 5,400 in platform. The total expenditure involved in the third project is \$205,830.

A. W. Brady, president of the Union Traction Company of Indiana, stated that he was authorized to say that the interurban companies have tentatively consented to the project and have agreed among themselves on the basis for proceeding with the proposed work.

Robert I. Todd, president of the Indianapolis Street Railway, submitted a letter to the commission explaining the

financial arrangements in the new contracts proposed for the companies. Mr. Todd said that the proposed readjustment of the freight contracts will result in about \$28,000 a year additional income for the company.

Franchise Revision Urged at Richmond

Recent checks made by the Virginia Railway & Power Company in Richmond show that about seventy-five jitneys operate off and on throughout the day and that during the "rush hours" this number is increased to around 125. Mr. Wheelwright, president of the company, says the loss in revenue to his company in this way is considerable and may be expected to increase.

He regards the jitney as a general menace to the main transportation

Italian Commissioners Will Inspect American Electrifications

The Italian-American Electric Company, representing all the Italian power companies, in connection with the Italian State Railways, is sending to the United States and Canada a railway electrification committee consisting of Guido Semenza, Milan, consulting electrical engineer; Gian G. Ponti, engineer, Municipality of Turin; Curzio De Regibus, Bologna, engineer, State Railway Service, and Ferdinando Casnati, Milan. The commissioners expect to arrive about April 23 on the Imperator. It is proposed to visit the following electric installations: Norfolk & Western; Pennsylvania; Baltimore & Ohio; New York, New Haven & Hartford; New York Central & Hudson River; Long Island; Hoosac Tunnel; London-Port Stanley; Canadian National Railways; Michigan Central; Chicago, Milwaukee & St. Paul; Butte, Anaconda & Pacific; Great Northern; Southern Pacific; California Central; Pacific Electric; Salt Lake-Garfield and important interurbans. The members of the commission will also study various city rapid transit systems.

system of any community, and in a statement to the newspapers quoted from the opinion rendered by the Massachusetts Public Service Commission in the case of the Union Street Railway a few months ago which stated the situation very clearly. This decision, similar to many others, held that as between rival systems of transportation, it is reasonable and proper that the one which of itself is best adapted to furnish the form of service suited to urban conditions should survive.

Mr. Wheelwright said that if the same requirements were made of jitneys as are made of the street railway, the latter could take care of itself in competition for the traffic, but with a parasite eating away its short-haul traffic, the street railway cannot be expected to extend its service. This situation, he said, emphasizes more strongly than ever the necessity of prompt action on the part of the City Council on the petition of the company for a new franchise which has been pending since last autumn.

New York Bill Advanced

Senate Rejects All Amendments—Assembly Advances Measure—Final Passage Likely March 22

All suggested amendments to the so-called Miller traction bill were voted down on March 16 and the measure looking toward the extension of relief to the railways of Greater New York was passed in its original form by the Senate by a vote of thirty-three to eighteen. In the Assembly the bill was advanced to a third reading and placed in a position for final passage on March 22.

The debate on the bill grew acrimonious at times. The principal objection to its passage as voiced by the opposition was to clothing the proposed new commission with power to put into effect temporary rates pending more extended study of the problems before them. Another provision that has been the subject of attack is the one in the section on unification of the lines which makes acceptance of the recommendations of the commission optional with the companies and obligatory on the city. The valuation provision has also been under fire. It provides for a valuation conducted under direction of the commission, such valuation as finally determined to be the basis for allowances to the railroads under the readjustment plan. The objection to this is that no means for review are provided.

The action of the Senate on March 16 makes certain that the transit bill will be in the Governor's hands for approval next week. It should become a law within a fortnight. The Governor has already made it known that he will give the opposition another inning and will fix a date for a public hearing when the bill reaches him. It is not expected, however, that he will delay his approval of the measure more than a few hours after the formality of this final hearing.

New Washington Terminal in Use

The Washington, Baltimore & Annapolis Railway is now using its new terminal at Twelfth Street and New York Avenue, Washington, D. C. The streets at that corner lend themselves particularly to a convenient arrangement which allows the cars to make the circle of the terminal building. The loading platform is on the company's own ground. This does away with the troublesome congestion which could not be avoided when the large interurban cars were forced to take on passengers in the street. The terminal building provides ample space for the ticket office, two large waiting rooms and a commodious newsstand, with numerous offices on the upper floors.

One of the features of the new terminal is the commodious platform space, where several cars can take on and discharge passengers simultaneously. In addition there are two sidetracks which may be used for the accommodation of cars being held in reserve.

Settlement at New Orleans Urged

No estimate has yet been made of the probable valuation of the railway property of the New Orleans Railway & Light Company, reports to this effect to the contrary notwithstanding. Receiver O'Keefe on March 6 published a statement in the local papers in which he vigorously denies the published statement attributed to Commissioner Maloney of the City Public Utilities Committee, that the company's own estimates showed the railway property to be valued at \$45,000,000. Mr. O'Keefe has written a letter to Commissioner Maloney that no figures had ever been given out by him to indicate such an estimate.

As the responsible head of the company, Mr. O'Keefe declared in the letter to the commissioner: "I have neither furnished nor authorized any figures." He says that the engineering experts employed by the company had valued the property at \$55,000,000.

Hugh McCloskey, chairman of the citizens' advisory committee on public utilities appointed by Judge Rufus E. Foster of the Federal District Court, is appealing through the local press to the public for such constructive suggestions and helpful advice as they might be able to offer, in written communications. Each particular suggestion, it is announced, will be fully studied by the committee in special charge of the subject matter. A prompt settlement of the problem, it is urged, is imperative.

Radial Finding Expected Soon

The finding of the commission appointed to inquire into the feasibility and financial prospects of a system of publicly owned hydro radials for Ontario is expected to be presented shortly. In a statement on the subject Premier Drury declared that the government will be governed by the report and the facts brought out. He said:

If our consideration of the matter is such as to make it appear that the government is not warranted in pledging the credit of the province to the enterprise, we would not, however, stand for a moment in the way of the municipalities undertaking to go ahead on their own responsibility, with the one proviso that, with the facts before them, the electors should again vote on the matter.

Effect of Transportation on Real Estate

"Transportation is probably the greatest artificial agency in lowering, enhancing and distributing real estate values. Whatever depreciation it may cause is offset by appreciation of new sections which it opens up." This is the connecting link between transportation and real estate as explained by W. R. Warner, real estate agent of the Interborough Rapid Transit Company, at a recent Y. M. C. A. lecture in New York. The subject of the discourse was "Transportation as It Affects Real Estate." Mr. Warner outlined very briefly the historical development of transportation from the early days of stage coach to

the present era of elevated and subway lines, showing that progress was the direct result of adequate means of transportation. Probably the greatest owners of real estate in the country are railroads. As proof of this statement Mr. Warner said that the Interborough Rapid Transit Company owned about \$40,000,000 worth of real estate besides its strictly railway property. This has been secured through incidents of operation in the acquiring and abandonment of lines. As an example of lack of progress because of inadequate transportation facilities he cited modern China.

Dorchester Transit Study Continued

The Massachusetts Legislature has passed a resolve directing the Department of Public Utilities and the Boston Transit Commission to continue, jointly, the investigation of proposed rapid transit extensions of the Boston Elevated Railway in the Dorchester District of Boston. Details of the report of the commission to the Legislature were published in the ELECTRIC RAILWAY JOURNAL, Feb. 19, 1921. Several proposals are under consideration, including plans to utilize and electrify existing steam railroad branch lines in connection with the rapid transit service of the elevated.

Municipal Ownership and Jitney Bills in Iowa

Iowa cities will have the right to own and operate railways if a bill introduced in the Iowa Senate becomes a law. The bill is fathered by H. W. Byers, former corporation counsel for the city of Des Moines and at the present time in charge of the city's legal cases in connection with its difficulties with the Des Moines City Railway.

The bill as prepared by Mr. Byers gives cities the right to take over and operate railways in times of strikes or other public emergencies and authorizes cities to fix rates of fares for companies operating within the city limits and grants to the municipality power to prescribe the character of the service to be furnished. By the terms of the bill rates of fare may be fixed for a period of twenty-five years in cities where companies operate without franchises. Where a franchise is granted such time limit is fixed at ten years. Any plan for municipalization must be approved by a majority vote at a general election.

Motor buses and jitneys will be under stricter regulations in Iowa by the terms of a bill introduced in the House. The measure provides for a license fee of \$100 for each motor bus and truck operated for hire and places the complete jurisdiction and control of the vehicles under the regulation of the State Board of Railway Commissioners. The bill further provides that operators of such vehicles for hire will be required to give bonds of \$7,500 for the first vehicle and \$2,500 for each additional vehicle.

News Notes

Careless Smoker Caused St. Louis Fire.—Investigation has disclosed that the fire which destroyed the De Balivere carhouse of the United Railways, St. Louis, Mo., on Jan. 3 started in a window slot where, doubtless, a smoker dropped a cigar or a cigarette stub which smoldered for several hours before the car itself burst into flames.

Amalgamated Paper Reprints Journal Article.—The *Union Leader* of March 12 has reprinted the article entitled "Service-at-Cost Plan an Incentive to Co-operation," which W. D. Mahon, president of the Amalgamated Association and member of the Federal Electric Railways Commission, wrote for the ELECTRIC RAILWAY JOURNAL in the issue of Feb. 12.

Wage Agreement to Stand.—Division No. 689 of the Amalgamated Association has decided not to reopen the wage agreement with the Capital Traction Company, Washington, D. C., this spring. Business Representative John H. Cookman says that the underlying cause for such action is not the present lowered cost of living, but the belief that the reduction in living costs will continue.

Roads and Road Transport Considered.—The first annual conference of the Institute of Transport was held in Manchester on Jan. 27 and 28. It was attended by nearly 500 persons. Though tramways are included within the scope of the institute, no papers on the subject were presented. The topics dealt with were roads and road transport, railway locomotive workshops, and canals.

Motor Buses May Replace Street Cars.—The Wisconsin Railroad Commission has announced that it will hold a hearing on the request of the Milwaukee Electric Railway & Light Company to substitute motor bus service on the Tippecanoe branch of the Howell Avenue line in Milwaukee. In its petition the company stated that the track on the branch in question is in poor condition, that reconstruction will cost \$37,000, and that the branch has never paid expenses.

Men Not to Press Wage Demands.—The employees of the London (Ont.) Street Railway, who had demanded an increase of wages from 48 cents to 52 cents an hour, have decided to continue work at the present scale. The road has been under the management of the Ontario Railway & Municipal Board for the past year as the result of a series of strikes for more pay. The board has been paying the men a bonus of 1 cent an hour when the earnings of the company warranted it.

Inspection in Interest of Hydro Commission.—Engineers of the Ontario Hydro-Electric Power Commission are inspecting the right-of-way, rolling stock and equipment of the Chatham, Wallaceburg & Lake Erie Railway, with a view to adding the road to the system of hydro radials of the province. The municipalities along the line of the railway have urged the commission to take the line over. For the past few years it has been owned by the MacKenzie & Mann interests.

Employees of Municipal Line Receive Increase.—The New York City Board of Estimate increased the wages of municipal trolley employees on Staten Island on Feb. 25. The old scale for motormen and inspectors of 50, 55, 60 and 65 cents an hour has been raised to 57, 62, 67 and 72 cents. Foremen, linemen and carhouse foremen have been raised from 75 cents to \$1; foremen of track laborers from 60 cents to 75 cents and \$1; track repairers to 55 and 60 cents.

Want Pay Reconciled.—Conductors and motormen employed by the Alton, Granite & St. Louis Traction Company, East St. Louis, Ill., have opened negotiations to obtain the same rate of pay as men employed by the East St. Louis & Suburban Railway. C. B. Thomas, counsel for the receivers, said a conference would be held soon at which all questions concerning the receivership would be decided. Employees of the Suburban are paid 60 cents an hour, while the traction men get 59 cents an hour.

Trustee Control Attacked in Massachusetts.—The committee on street railways of the Massachusetts Legislature has granted leave to withdraw on two bills aimed at the trustees of the Eastern Massachusetts Street Railway who are operating the road under a public control act of the Legislature. One bill called for an investigation of the conduct of the property by the trustees, and the other bill sought to remove the road from the control of the trustees and return it under the general law to the ordinary regulation of the Department of Public Utilities.

City Loses in Des Moines Case.—The city of Des Moines, Ia., has lost its right to appeal from the decision of Judge Martin J. Wade in the 8-cent fare order. The appeal was heard by the full bench of the United States Circuit Court of Appeals at Kansas City on March 4 and was thrown out by reason of the fact that the city had not made the railway employees' union a party to the appeal. The union was an intervenor in the original proceedings and city attorneys overlooked this fact in filing the appeal. Attorneys for the city now admit that their only program is to wait for a decision from the Supreme Court of Iowa in the Ottumwa street railway case.

Another Canadian Electrification Proposal.—Proposals have been made for the electrification of the line of the Canadian Pacific Railway between New Westminster and Coquitlam, B. C., and

the operation of this branch by the British Columbia Electric Railway. The line is about 8 miles long. Overtures made by the board of trade of New Westminster have met with rejection by the British Columbia Electric Railway on the ground that the company cannot undertake further capital expenditures at present and owing to the fact that other interurban lines operated by it do not indicate that the venture would be profitable. The Canadian Pacific Railway is required to meet all main line trains at Coquitlam and even this service is unsatisfactory to New Westminster people. There is a considerable mileage of freight yards in New Westminster which would come under the electrification scheme.

Blame Fixed for Trolley Collision.—Coroner John J. Phelan recently handed down a decision in the matter of fixing the responsibility for the collision on the lines of the Connecticut Company at Shelton, Conn., which resulted in ten fatalities and the loss of two cars. Besides holding the crew of the southbound car responsible the coroner also blamed Stephen T. Palmer, Shelton town clerk and judge of probate, who was taking home a five-gallon can of gasoline. Chief Engineer E. I. Rudd, in his report to the Public Utilities Commission, found that the number of deaths was caused by "asphyxiation and burns resulting from the sudden ignition of gasoline which escaped from a five-gallon can on the front platform of the southbound car." It was also found that the dead motorman failed to throw signals. The coroner said that the matter should be handled by the Public Utilities Commission in order that a like disaster may be prevented in the future.

Programs of Meetings

Southwestern Electrical & Gas Association

The Southwestern Electrical & Gas Association will hold its 1921 convention at the Hotel Galvez, Galveston, Texas, on May 18-21.

American Society of Mechanical Engineers

The spring meeting of the American Society of Mechanical Engineers will be held in Chicago at the Congress Hotel from May 23 to May 26. Sessions are planned by the Professional Sections on Aeronautics, Fuels, Management, Material Handling, Machine Shop, Power, Forest Products and Railroads.

Ontario Safety League

The monthly meeting of the executive committee of the Ontario Safety League was held at the King Edward Hotel, Toronto, on March 8. The meeting received a report of the subcommittee on the annual meeting. This report calls for a two-day safety convention to be held in Toronto on April 27 and 28.

Railway Supply Manufacturers' Association

After a thorough study of the entire situation both among the manufacturers composing the Railway Supply Manufacturers' Association and the railroad executives the executive committee of the Railway Supply Manufacturers' Association has unanimously decided to postpone the June, 1921, R. S. M. A. exhibit at Atlantic City. The decision was prompted by the fact that railroad and general business is depressed and that the desire exists everywhere to curtail expenditures in every possible direction. The association further gives notice that in view of the fact that it has postponed the exhibit and will dispose with its annual meeting and in no way be officially represented at the meeting of the mechanical division and purchasers and stores division of the American Railway Association it will not be necessary for any manufacturer to plan to have representatives present at meetings of the railroad officials.

Boat Trip for C. E. R. A.

The summer boat trip of the Central Electric Railway Association is assured. The committee in charge of arrangements, of which S. D. Hutchins is chairman, has just completed negotiations with the steamship company whereby a three-day or five-day cruise on the Great Lakes will furnish the setting for the regular summer meeting of the association. In order to secure the steamer *South American* for the usual trip from Toledo to Chicago, the committee had to contract for the round-trip from Chicago to Toledo and return as there was no other party desiring the boat for the east bound trip as in former years. This was done in anticipation that many members would be glad to extend the cruise two days by taking the boat at Chicago and the enthusiastic manner in which this plan has been received by the few who have been approached seems to bear this out.

The steamer will leave Chicago Sunday morning, June 26, and proceed without schedule stops to Toledo, arriving there Tuesday morning, June 28, about 8:30. It will leave there at 10 o'clock the same morning and arrive at Detroit at 3. The cruise from there will be routed through Lake Saint Claire, Saint Claire River, Lake Huron, Saint Mary's River, the Soo Locks, Mackinac Island, across Lake Michigan into Greenbay, Sturgeon Bay and thence to Benton Harbor and Chicago. The boat will arrive at Benton Harbor at 8:30, July 1, and at Chicago at 1 p.m.

The tickets for the trip including meals and berth and war tax will cost \$70 for the round-trip from Chicago, \$35 from Toledo to Benton Harbor and \$37 from Toledo to Chicago. The details will be issued by the association headquarters in a bulletin now being printed. Reservations should be made with John Benham, International Register Company, 15 Throop Street, Chicago, who is secretary of the committee.

Financial and Corporate

Cleveland Dividend Not Earned

Only \$910,000 Available to Pay Interest and Dividend Charges of \$2,100,000—Increase of Stockholders

Gross receipts of the Cleveland (Ohio) Railway during 1920 exceeded those of 1919 by \$1,895,609, or 12.10 per cent. Operating expenses, which included an allowance for depreciation, in 1920 were \$4,961,252, or 34 per cent more than in 1919. Taxes were lower by 13.75 per cent and interest was higher by 4.89 per cent. These figures were shown in the report of President John J. Stanley at the recent annual meeting of the stockholders.

The president's report showed that rates of fare were changed twice in 1920. The rate was 5 cents cash, six tickets for 25 cents, 1 cent for transfer to May 11, when it was changed to 5 cents cash, 1 cent for transfer. This continued until Nov. 14, when the rate was raised to the maximum 6 cents cash, nine tickets for 50 cents, with 1 cent for transfer.

The following table shows the average fare at each of the three rates that were in effect during the year, the passenger receipts per day at each rate, and the percentage of increase in October over April and in December over October:

Month	Fare	Increase Per Cent	Revenue	Increase Per Cent
April.....	4.74	.....	\$43,825	.....
October.....	5.30	11.81	48,063	9.67
December.....	5.95	12.26	51,938	8.06

The differences, however, were not due entirely to the changes in the rates of fare, for the number of fares increased by 1.47 per cent in October over April, and were 3.86 per cent fewer in December than in October.

NUMBER OF STOCKHOLDERS INCREASES

Stock of the Cleveland Railway at the close of 1920 was held by 5,531 holders, an increase of 237 over 1919. Of the stockholders 3,485 lived in Cleveland, 1,433 resided elsewhere in Ohio than Cleveland, 504 in other states and territories of the United States, and nine in foreign countries.

One quarterly dividend payment at the annual rate of 7 per cent was made during the year, but on account of suit brought to enjoin the election and decided in favor of the city by Common Pleas and Appellate Courts, the company could not continue to pay dividends at 7 per cent, and the last three payments were at the rate of 6 per cent per year.

At the referendum election on April

27 Clevelanders voted on proposals to construct subways in the downtown congested district for the benefit, or at least for the use of the company. The proposition was defeated by a vote of 28,895 to 14,092. At the same election, the proposal to authorize the issue of \$15,000,000 of city bonds for the construction of the subways was defeated by a vote of 30,107 to 13,099.

During the year the company had a controversy with motormen and conductors in regard to work and wages. They demanded a wage of 90 cents an hour, or 50 per cent more than the maximum wage they were then receiving. After a series of conferences between the trainmen, city officials and company heads, the trainmen accepted President Stanley's offer of 70 cents an hour during the first three months of service, 73 cents during the next nine months, and 75 cents thereafter, with a six-hour minimum day. A new con-

tract was signed, fixing the wages at these rates until May 1, 1921.

In concluding his report, President Stanley said:

All authorities seem to agree that prices are coming down. Many prices have already come down. Copper and tin, exclusive of freight, are below the average prices of those metals in the ten years from 1905 to 1914. According to the Bankers' Commodity Price List the average price of all commodities on Dec. 1 was \$501.75 compared with \$564.01 a month before, \$662.66 a year before, and \$358.77 on Aug. 1, 1914. Coal is down. Wage reductions throughout the country range from 5 per cent to 60 per cent, a great majority being from 20 per cent to 25 per cent in December, and they may go lower. This means, in addition, that many men are out of work, which of course hurts the street railroad business.

Predictions as to future business—building, industrial and commercial—vary. Our own big problem at this time is how to obtain funds to pay for needed extensions, additional rolling stock and other improvements. Our franchise provides that we may not pay more than 6 per cent for money to stockholders, bondholders, banks or any other persons. During the last few years money has been and it now is worth more than 6 per cent. As long as other people are willing to pay more than this rate for all obtainable money we cannot hope to get what we need. As long as investors can get a higher rate on other good securities they are not strongly tempted to buy our 6 per cent stock at par, and so, as Sir Robert Fiske said of Baring, the great European banker and lord of the British Treasury, our treasurer "sits on an empty chest by a pool of bottomless deficiency fishing for a budget" for betterments.

INCOME ACCOUNT THE CLEVELAND RAILWAY, BASED ON ACTUAL EXPENDITURES

	1920	1919	Per Cent Change
Passenger revenue*	\$17,072,999	\$15,223,060	+12.17
Other transportation revenue	130,668	101,344	+28.90
Other railway operations	178,691	134,830	+32.53
Total operating revenue	\$17,382,358	\$15,459,234	+12.44
Way and structures	\$2,109,294	\$1,550,532	+36.04
Maintenance car equipment	1,949,887	1,452,257	+34.27
Maintenance power plant	59,021	45,062	+30.98
Power-operation	1,652,874	1,151,114	+43.59
Conducting transportation	7,042,945	5,069,703	+38.92
General and miscellaneous	2,252,030	1,714,468	+31.35
Obsolete property	498,000	619,663	-19.63
Total operating expenses	\$15,564,051	\$11,602,799	+34.14
Net operating income	1,818,307	3,856,435	-52.80
Taxes	1,082,185	1,254,637	-13.75
Operating income	\$736,122	\$2,601,798	-71.70
Non-operating income	174,196	201,711	-13.64
Gross income	\$910,318	\$2,803,509	-67.53
Interest and dividends	2,101,239	2,003,253	+4.89
Surplus (d)	\$1,190,921	\$800,256	-249.00

(d) Deficit. * Including employees fares.

STATISTICAL INFORMATION THE CLEVELAND RAILWAY

	1920	1919	Per Cent Change
Miles of track operated	412.71	393.68	+19.03
Revenue car miles—			
Motor cars	33,634,735	31,289,194	+7.50
Trail cars	5,791,397	5,267,780	+9.94
Interurban cars	1,462,086	1,458,721	+0.23
Express and freight, mail, newspaper and chartered cars	203,022	218,741	-7.19
Total	41,091,240	38,234,436	+7.47
Revenue passengers carried	327,840,438	291,419,501	+12.50
Transfers collected	120,156,602	109,129,292	+10.10
Total revenue rides	447,997,040	400,548,793	+11.85
Employees fares	817,409	787,018	+3.86
Dead heads	2,111,228	1,473,009	+43.33
Total rides	450,925,677	402,808,820	+11.95
Rides per car mile	10.974	10.535	+4.16
No. of trip's run	7,957,178	7,378,521	+7.83
Rides per trip's run	57	55	+3.64
Passenger revenue—			
From cash fare passengers	\$15,970,086	\$14,235,374	+12.19
From transfers	1,057,437	944,353	+11.97
Total	\$17,027,523	\$15,179,727	+12.17
Average fare in cents per revenue passenger*	5.19	5.21	-0.38
Average fare in cents per ride	3.78	3.78	0.00
Operating revenue per mile of track	\$42.117	\$39,268	+7.26
Operating ratio	89.2	75.0	+14.2
Taxes, per cent of operating revenue	6.24	8.12	-1.88

* Including employees fares.

Receiver Seeks Court's Advice

Desires Instruction with Respect to Preservation or Further Disintegration of Lines of New York Railways

Job E. Hedges, receiver of the New York (N. Y.) Railways, has appealed to the United States District Court for the Southern District of New York for instructions with respect to the preservation or further disintegration of the railway system now operated by him. The appeal was made on March 9. It was heard on March 14. The court directed the receiver to take no further action until May 2.

THE New York Railways system has already disintegrated to so large an extent that this has resulted in the public paying in many cases 7 cents or 10 cents for rides which had previously cost 5 cents. Unless some relief is granted, it is, in the opinion of the receiver, unavoidable that there will be a further disintegration of the system now operated by him.

The surface car lines in Manhattan would thus be split up into their component parts so that operated routes instead of being laid out for the convenience of the public and in accordance with the natural direction of travel would be laid out in accordance with the accident of antiquated franchise grants.

INCREASED EXPENSES TO PUBLIC

According to Mr. Hedges this would result in a number of railroads charging 5 cents or more for a short haul. In this connection he said:

It may be that the Broadway line will be operated in two or more sections, and the Lexington Avenue line, which now runs from the Harlem River to the Battery, will be separate companies, each running a short distance only. The result will be a hodgepodge of street car lines operated independently at greatly increased expenses to the traveling public.

In facing the problems of the future of the street surface railways in Manhattan the number of people who use these lines should be considered. For the fiscal year ended June 30, 1919, there were, including transfer passengers, a total of 310,642,480 passengers on the lines of the New York Railways system alone.

Of these 204,381,002 rode on up and down town lines and the balance on cross-town lines. About one-third of the total rides were taken in the rush hours. It is inconceivable that the public would desire to have these passengers forced to use the already overcrowded subways.

Mr. Hedges' summary in part showing present conditions of property of the New York Railways from the date of receivership, March 20, 1919, to present, is as follows:

	At Appointment	At Present
	Receiver	Time
Avenue lines	9	5
Crosstown lines	11	6
Total track mileage operated	151	73
Total free transfer points	287	18
Total 2c. transfer points	...	70

LEASES SURRENDERED AND PROPERTY RETURNED TO OWNERS

Eighth Ave. Railroad.....Aug. 1, 1919
Ninth Ave. Railroad.....Oct. 1, 1919
N. Y. & Harlem Railroad.....Feb. 1, 1920
The surrender of these leases, continued the summary, cut off entirely the upper West Side service of the Broadway-Columbus, Broadway-Amsterdam and Sixth and Amsterdam lines. It removed from the system the Eighth Avenue, Ninth Avenue, Fourth and Madison Avenue and the Eighty-sixth Street crosstown lines, with resulting discontinuance at all but six points of exchange of transfers between those lines and lines remaining in the New York Railways system.

LINEs TEMPORARILY DISCONTINUED

Avenue C, storage battery line, Sept. 21, 1919.
Spring and Delancey Street, storage battery line, Sept. 21, 1919.
Sixth Avenue Ferry, storage battery line, Sept. 21, 1919.
Chambers and Duane Street, storage battery line, Sept. 21, 1919.
Canal Street, crosstown line, Dec. 1, 1919.
One Hundred and Forty-fifth Street, crosstown line, July 11, 1920.
Operation of Seventh Avenue—Brooklyn and Fourteenth Street crosstown lines over Williamsburg Bridge ceased, March 7, 1920.
Transfers from Staten Island ferry boat ceased Sept. 15, 1919.
Transfers with Fifty-ninth Street, crosstown line of the Third Avenue Railway system, ceased Jan. 30, 1921.

FUNDED DEBT

(Interest defaulted—foreclosure suits pending.)
Principal, \$18,063,539, New York Railways thirty-year first real estate and refunding mortgage 4 per cent gold bonds, annual interest \$722,541.
Principal, \$20,609,487, New York Railways thirty-year adjustment mortgage 5 per cent income gold bonds, if earned.

UNDERLYING MORTGAGE BONDS

Principal, \$5,000,000, Lexington Avenue & Pavonia Ferry Railroad first mortgage 5 per cent bonds, annual interest \$250,000.
Principal, \$3,000,000, Columbus & Ninth Avenue Railroad first mortgage 5 per cent bonds (foreclosure about to be instituted), annual interest \$150,000.
Principal, \$350,000, first mortgage 5 per cent bonds South Ferry Railroad, annual interest \$17,500.

Effective Aug. 17, 1919, the wages of all employees were raised, increasing the payroll at the rate of about \$1,500,000 per year as the system was then constituted.
Effective July 18, 1920, a further increase in wages added upwards of \$450,000 more per year to the payroll as the system was then constituted.

The aggregate increase in the payroll of the system as at present constituted over the same system at the time of the receiver's appointment is approximately \$1,575,000 per year.

The rates of wages of employees have been increased 35 per cent since the beginning of the receivership, and the rates of pay, as compared with pre-war times, have been increased by considerably over 100 per cent.

OPERATING INCOME AND EXPENSES COMPARED, DECEMBER, 1920, WITH DECEMBER, 1913

	Rate in cents per mile		Per Cent
	Dec. 1920	Dec. 1913	Inc'se
Operating income	65.65	39.27	67.18
Operating expenses and taxes	72.51	28.19	157.22
Net result	+6.86	+11.08	+161.91
Payroll cost, included in operating expenses	39.79	14.13	181.60
	†Loss.	‡Gain.	*Decrease.

TAXES

Total accrued liability for taxes, including penalties and paving charges, payable to state or city, unpaid as of Dec. 31, 1920.... \$3,156,029
Total taxes or other charges levied or imposed in 1920 by state or city 1,563,047

TAXES IN CENTS PER CAR-MILE

United Railways (San Francisco).... 1.86
Philadelphia Rapid Transit Co..... 2.19
New York Railways..... 4.92
Claims against New York Railways in addition to claims on mortgage bonds.
(a) Claims for accidents prior to receivership unpaid:
Claims admitted \$1,350,695

Claims disputed or in process of adjustment	\$377,949
Amount claimed in pending suits for which no claim has been filed	1,079,713
(b) Contract and other claims unpaid:	
Admitted	\$227,874
Disputed or in the process of adjustment	114,633,905

DEFICITS

	March 21, 1919, to Dec. 31, 1920	Aug. 1, 1920, to Dec. 31, 1920
Deficit from operating	\$1,386,158	\$240,215
Deficit after including non-operating income and outgo, but before deducting any interest on bonds or other requirements	1,479,213	195,279
Deficit after charging interest actually paid on certain bonds	2,819,243	467,239
Deficit after charging interest in default on underlying bonds and on New York Railways first real estate and refunding bonds in hands of public	4,596,631	933,240

VALUE OF PROPERTY STILL RETAINED BY RECEIVER

Cost of pre-war prices, less depreciation	\$55,173,996
Cost at June, 1919, prices less depreciation	85,887,426
Assessed value of real estate alone	20,255,700

The summary of the report is concluded with a statement of the jurisdiction over fares as exists at present. The receiver says that he has under consideration the surrender of the leases of the following lines: Broadway and Seventh Avenue, Sixth Avenue, Christopher and Tenth Street, Bleecker Street and Fulton Ferry.

California Tax Bill Passed

Extravagant State Administration Calls Upon Corporations to Pay—Governor Glad People Rule

The California State Legislature on March 5, after passage through the Senate, finally passed through the Assembly by a vote of fifty-four to twenty-six the King tax bill to raise a \$15,000,000 deficit in the state budget for the next two years. Governor Stephens signed the King bill the same day.

The new law will increase rates of taxation against numerous larger corporations. The tax rates of the utilities, for instance, will be increased by about one-third. The money thus realized, it has been explained by the State Board of Equalization, will be used to meet increased costs of state administration. Opponents of the bill held that the proposed increase in taxation could be avoided by resort to economies in the administration of public affairs. On March 7 one large light and power corporation made application for an increase in rates as the only means available to it for meeting the added tax burden.

In commenting on the passage of the King tax bill Governor Stephens said: "Thank God. The people have won a great victory. They still rule California."

Further consideration is to be given to economies suggested by the utilities' representatives while debating against the bill during the legislative

sessions. Paul Shoup, vice-president of the Southern Pacific Company and president of the Pacific Electric Railway, was invited to address the assembly on what economies he could suggest toward reducing state expenses, and ex-Governor Frank K. Lowden of Illinois was to tell the California State Legislature how he reduced expenses in the conduct of the affairs of Illinois. Max Thelan, formerly president of the California State Railroad Commission, will also address the legislators on possible reductions in the proposed \$81,000,000 budget for the next two years.

Mr. Thelan proved to the Legislature that \$8,000,000 could be saved without cutting anyone's salary, dismissing any employees of the state, or abolishing any of the state's commissions or agencies. He held the floor on several occasions during the debate on the King tax bill and offered to show the legislators and the Governor that such a saving could take place.

Attorney General Webb has said that the measure may not be legal. This opinion is shared by many prominent lawyers and the measure may be attacked in the courts.

The proposed legislation was reviewed in the *ELECTRIC RAILWAY JOURNAL* for March 5, page 464. It was stated at that time that public service corporations considered the bill an unfair measure as they were already taxed more in proportion to value than other property. The utilities also advanced the plea that additional taxation would force them to advance their rates in order to show earnings which would attract capital.

\$86 Profit in Seattle in January

According to the report prepared by the Seattle Municipal Railway officials the number of passengers riding on Seattle's Municipal Street Railway in January—in which month increased fares went into effect—decreased 897,299 compared with the month of December. The total number of fares for the month was 6,625,924, as against 7,523,233 in December. This was a decrease of 11.9 per cent.

Operating under the 8½ cent fare, the Municipal Railway in January showed a net gain of \$12,783, despite the marked slump in passenger traffic. This net profit includes all interest charges and \$56,719 depreciation. Further economies were put into effect in January. The payroll was trimmed, service was reduced and other operating costs were cut.

The total expenses for wages and operation were \$376,216 in January. Interest charges and depreciation further increased this total to \$505,553. Revenues were \$518,337, leaving a gain of \$12,783 without deducting a month's bond redemption charge. With this charge allowed there was a net gain of \$88.64. Revenues increased \$35,842 over December, and operating expenses decreased \$16,152.

Present Value Theory Rejected

Texas Court Rejects Special Master's Finding—Galveston Value Fixed at \$1,500,000

The Galveston (Texas) Electric Company has lost its fight for a 6-cent fare. In the United States Court for the Southern District of Texas, Judge J. C. Hutcheson, sitting at Houston, has handed down an opinion refusing to enjoin the city of Galveston from enforcing its ordinance directing the company to discontinue collection of 6 cents from street car patrons and to collect the old fare of 5 cents. In rendering his decision, Judge Hutcheson ruled contrary to the finding of Judge Henry J. Dannenbaum, master in chancery.

THE court gives two basic principles upon which it holds that rate controversies rest:

1. The principle which adheres in sovereignty.

2. The provisions of the fourteenth amendment, which guarantees equal protection of the laws and which inhibits the deprivations of property without due process of law.

Some of the salient points of the court's written order follow:

Both parties agreed that the property ought to have cost \$1,715,825 on the basis of prices prevailing at the time it and its various units were constructed. The company contended that this value should be appreciated by a sufficient percentage factor to make the agreed value actually conform to present-day value of the plant. The city contended that the agreed value should have been taken as the basis of the value for rate-making purposes of the depreciable property, less a reasonable and adequate deduction for accrued depreciation.

The view of the master is adopted that the prices obtaining at the time of the valuation were transitory.

The master's allowance of \$530,000 for development cost or going concern is disallowed, because:

A court in a rate case has nothing to do with any increment to the actual value of the plant by the successful operation of it, nor in a case of valuation, where the cost of the plant and its historical development is determined, does the court add anything to its capitalization for rate-making purposes for its unsuccessful years, nor deduct anything for its successful years. In short, when going concern is stripped of its involvement and obscurity, its attractive names and titles, it presents itself on the one hand as good will, or an effort to capitalize errors and misfortune.

The statement that ". . . the constitution guarantees it (the plaintiff) a fair return upon the value of its property" is denied with the assertion that the constitution protects against legislation which would deprive the company of the right to charge rates adequate to produce a fair rate of return. Says the court:

It certainly can not be that the courts intended, in declaring that the rights to a fair return could not be abridged, to create a more favored class out of public utility concerns, so as to allow them to receive their 8 per cent free of income tax while all other persons in the vicinity who receive the same per cent have to pay it.

From the agreed historical reproduction cost of the property actually in service of \$1,715,825, disallowing the grade raising, brokerage and engineering costs, the court takes the base value of the property as \$1,573,544. To

the base value 33½ per cent of depreciable items is added, deducting \$282,000 for the item of working cost, real estate and additions to the property since Jan. 1, 1915, the value of the depreciable items on the basis of historical reproduction cost is set by the court at \$1,291,325.

Appreciating these items as the master did by 33½ per cent or \$430,441, the court reaches a total of the present-day value of depreciable items of \$1,721,766. Then restoring the items aggregating \$282,000 the undepreciated value of the plant is given by the court as \$2,013,985, which closely approximates that of the master which was \$2,167,805. Deducting the accrued depreciation of \$520,000, adding nothing for going concern, the court values the plant at \$1,493,985, for rate-making purposes. The net return of \$73,082 on the \$1,500,000 valuation is approximately 5 per cent, and less than the law regards as fair.

However, the court finds that for the last six months since June 30, 1920, the property has been producing revenue at the rate of \$618,000 per annum, as against the return of \$548,477, which the master took as the basis of his report, and unless properly chargeable operating costs and maintenance have increased the earnings will be adequate to save the ordinance from the confiscation charge, for deducting the ascertained total of expenses, including the depreciation allowance, namely \$475,395, from the estimated operating total of the fiscal year ending June 30, 1921, there is a net revenue of \$142,605, or approximately 9½ per cent of the valuation.

The Galveston Electric Company sought an injunction against an ordinance passed by the Board of City Commissioners in 1919. The previous city administration permitted the company to charge 6 cents, effective Sept. 19, 1918. The present city administration, through ordinance, reduced this to 5 cents, effective June 5, 1919, so that the 6-cent fare was in effect less than four months. With the filing of the suit came the naming of the master in chancery, Henry J. Dannenbaum, who recommended that the rate of return was "insufficient and confiscatory." The master found that for the year ended June 30, 1920, the company earned 1.86 per cent on the value of the plant, but the court shows an earning of 9½ per cent on a valuation of \$1,500,000, instead of the suggested valuation of \$2,167,805.

Mitten Management, Inc., Organized

Mitten Management, Inc., has been chartered to engage in the business of managing, or acting as managers, of the affairs and operations of public utilities. The corporation is also authorized to carry on the business of consulting, industrial and contracting engineering in all its branches, including the construction, organization, operation and management of industrial plants and other business undertakings.

The personnel of the organization is as follows: President, Thomas E. Mitten; vice-presidents, C. J. Joyce, W. C. Dunbar, G. A. Richardson, P. J. Mitten and H. G. Tulley; secretary and treasurer, A. G. Mitten; assistant secretary and treasurer, R. F. Tyson. The directors are T. E. Mitten, C. J. Joyce, W. C. Dunbar, G. A. Richardson, P. J. Mitten, H. G. Tulley, and A. A. Mitten.

Mitten Management, Inc., whose offices are at 1520 Spruce Street, Philadelphia, last month closed a contract whereby it undertakes the management of the entire city and interurban railway properties of the International Railway, Buffalo, N. Y.

Security Holders Accept Reorganization Plan

The plan for the reorganization of the traction properties at Providence, R. I., into the United Electric Railways has been accepted by the bondholders of the United Traction, Rhode Island Suburban, Pawtuxet Valley and Cumberland Street Railways and by the United Traction stockholders.

Under the plan those security holders who have never deposited their stock or bonds with their protective committees have a further period, up to March 20, during which they may come into the reorganization by depositing their securities with the proper depository.

The next step in the reorganization will probably be for the joint reorganization committee to declare the reorganization plan and agreement adopted and in operation. Steps will then be taken, it is understood, to press foreclosure proceedings on the various properties.

The terms of the proposed reorganization were reviewed in the *ELECTRIC RAILWAY JOURNAL* for Feb. 19, page 381.

\$1,305,553 Earned by Iowa Interurbans

The forty-second annual report of the Board of Railroad Commissioners of Iowa contains statistics for the year ended Dec. 31, 1918. The status of the interurban companies, capitalized at \$77,640 per mile, for the above period follows:

	1918	1917
Number of companies.....	14	14
Mileage—single track.....	512.13	510.69
Gross earnings from operation	\$5,408,175	\$4,096,597
Operating expenses.....	4,102,622	2,707,527
Net earnings from operation..	1,305,553	1,389,070

Financial News Notes

Sale of Real Estate Postponed Again.—The sale of the New York (N.Y.) Railways real estate under the orders of the court according to the provisions of the first real estate and refunding mortgage has been adjourned until April 6.

Electric Line Removed.—The structure of the Babylon (L. I.) Railroad is being removed and shortly there will be no trace of this Long Island electric line which extended from Amityville to Babylon. The road suspended service on May 15.

Change in Name Announced.—Announcement has been made that the Public Utilities Company, Evansville, Ind., has changed its name to the Southern Indiana Gas & Electric Company. The company operates 68 miles of electric railway.

Threat of Suspension at Middletown.—Officials of the Walkkill Traction Company, Middletown, N. Y., have threatened to "scrap" the railway and stop operations unless relieved of paying for repaving the streets between its tracks. The company has suggested that the city of Middletown obtain an enabling act to relieve it of this expense, which it protests it cannot afford.

\$6,154 Loss in Month on Tacoma Line.—In the January report issued by City Comptroller John M. Roberts of Tacoma, Wash., the operating revenue of the Tacoma (Wash.) Municipal Railway is given as \$9,139, some \$2,000 less than receipts last year, largely due to reduced working forces of tide-flat industries. Operating expenses, including a \$2,000 depreciation charge and insurance charges, were \$11,839, leaving an operating deficit of \$2,700. Interest on bonds, tax charges and other items of \$3,397 bring the total deficit to \$6,154. The deficit for the four years of operation now amounts to \$166,522, which includes depreciation and other charges.

Successor Company Being Formed.—The Northern Rhode Island Railway, Providence, R. I., is being formed for the purpose of acquiring the Chepachet branch of the Providence & Danielson Railway. This branch has not been operated for a number of months. It is the purpose of the new company to lease its plant for operation to the United Electric Railways. The Chepachet line has always been dependent for its power upon the Narragansett Electric Lighting Company. In the bill to incorporate the new company there is a section giving to it the power to manufacture power for its own use and for sale to private consumers in the

towns of North Providence, Johnston, Smithfield, Gloucester and Burrillville.

Approval of Refunding Sought.—Expenditures of \$421,900 for improvements of the gas, electric and railway utilities at Evansville within the next two years is planned by the Public Service Corporation, according to company officials who appeared before the Public Service Commission recently. The commission was asked to authorize the sale of \$1,736,300 of securities to refund maturing obligations and to meet proposed expenditures. Officials predicted the securities would have to be sold at 80 cents on the dollar. The bonds would bear 6 per cent interest and mature in 1929.

Springfield Has Surplus.—Clark V. Wood, president of the Springfield (Mass.) Street Railway recently reported on the company's showing for 1920. Travel was very heavy as evidenced by an increase of 6,000,000 passengers carried over the previous year. The equipment of the company was increased by the addition of twenty new one-man cars and additional trackage laid. As for the revenue of the company Mr. Wood states that an advance has been made over 1919, the early months of the year before the business depression was felt, showing the best increases. The mild winter and lack of heavy snowstorms saved the railway heavy expense.

Bill Reported for Successor Company.—The committee on railroads of the Connecticut Legislature has reported favorably on a bill incorporating the Eastern Connecticut Railway to purchase all the present line of railway now owned by the Shore Line Electric Railway through Norwich, Preston, Ledyard, North Stonington and Stonington to the Connecticut-Rhode Island line at the Pawtucket River and connecting with the tracks of the New York, New Haven & Hartford Railroad company at Brewster's Neck. The capital of the company is \$50,000 with the right to increase to \$500,000. The incorporators are: Robert W. Perkins, Norwich; Edward M. Day, Hartford, and Charles B. Whittlesey, New London.

Cincinnati Conferences Being Arranged.—Preliminaries are being arranged for the conferences to be held by the Ohio Traction Company and the Cincinnati Street Railway in connection with the refinancing and possible reorganization of the properties as requested in a letter to the companies from Williams C. Culkins, street railway director. The Ohio Traction Company, holding company of the Cincinnati Traction Company, has appointed a committee consisting of Louis J. Hauck, C. J. Livingood and Walter A. Draper, with W. Kesley Schoepf as ex officio member. The Cincinnati Street Railway has appointed a committee consisting of C. W. Dupuis, George Lewis and B. L. Kilgour, ex officio. The committees will have their first conference on the return to the city of W. K. Schoepf, president of the Cincinnati Traction Company, who is in the East.

Traffic and Transportation

More Five-Cent Zones

Many Brooklyn Riders Now Paying Two or More Fares Under Old Franchise Grants

The zone system is to be applied to nine more surface lines operated by Lindley M. Garrison, receiver of the Brooklyn Rapid Transit Company. This means that approximately two-thirds of the 150,000 passengers carried daily by these lines will pay 10 cents for a ride instead of 5 cents.

COMMISSIONER'S VIEWS EXPLAINED

Authority for this action has been obtained by Mr. Garrison by a decision of Public Service Commissioner Alfred M. Barrett that he would not extend the order suspending the new tariffs filed by the surface line companies. The order expired at midnight on March 12. A long statement, explaining Mr. Barrett's position, was made public. This says that the action of the commissioner is based on the recent decision of the Court of Appeals which sustained the contention of the Brooklyn City Railroad that it had the right to charge a double fare for through riders on the Flatbush Avenue line, and the success of other trolley companies in similar litigation. On this point Mr. Barrett said:

The effect of these decisions was to leave the Public Service Commission without power to increase rates and in certain cases without power to prevent a company from itself increasing them.

RECEIVER INSISTS ON ZONE PLAN

That Receiver Garrison intended to insist upon his right to establish the zone system on the surface lines under his control was made clear in an argument before Federal Judge Mayer on Feb. 14. It was indicated at that time that the old city of Brooklyn would constitute one fare zone and that each one of the towns which now compose the city would constitute an additional fare zone.

The new schedules were filed by Mr. Garrison on Dec. 14 last and later they were suspended by an order of the commission until Jan. 12 and then until March 12. In the meantime, the commission held many public hearings, the result of which, according to Commissioner Barrett, was to prove "conclusively that the companies were all losing money at the present rate of fare, and their legal representatives stated on the record that unless they were allowed to charge additional fares upon the zone system they would be compelled to close down the operation of the lines."

Justice Manning of the Supreme Court in Brooklyn refused on March 15 to issue an injunction to the city restraining Lindley M. Garrison, as receiver of the four surface line compa-

nies of the Brooklyn Rapid Transit system, from putting into effect immediately the double fare charge authorized by Mr. Barrett. Instead, he issued an order requiring Mr. Garrison to show cause, at 2 o'clock on March 18, why the injunction should not be issued.

Ten-Cent Fare on Interurban

Passengers riding on interurban cars within the city of Cleveland, Ohio, began paying 10-cent fares on Dec. 26, 1920, with 1 cent additional for transfer to any intersecting city lines except where the right of free transfer is stipulated in suburban grant. This fare is the result of the action taken on Dec. 8 by the Cleveland City Council in adopting a resolution designating the cars of the Cleveland & Eastern Traction Company, the Cleveland & Chagrin Falls Railway, the Cleveland Southwestern & Columbus Railway, the Lake Shore Electric Railway, and the Northern Ohio Traction & Light Company as special cars and express passenger cars.

The right to do this is contained in section 23 of the renewal grant of April 7, 1919, authorizing the company to operate express passenger service and other special cars at rates to be fixed from time to time by the Council of the city of Cleveland not lower than the rate in force in the city.

Under the terms of the contract made with the interurban railways in November, 1897, to continue for twenty-five years, the Cleveland Railway is entitled to collect and retain (except in two cases where a division is made with the interurban companies) all of the fares collected by it on the interurban cars in its territory; it pays the wages of the crews while the cars are under its control, and it pays the interurban companies 2 cents for each mile run by their cars on its tracks. Under these contracts the company will receive all of the 10-cent fares except in the two cases mentioned, in which a division must still be made with the two interurban companies.

The Cleveland Railway does not anticipate that this legislation will increase the number of riders, although it may increase the amount of revenue. Passengers coming to the city may leave the cars of the interurban company at the junction of the tracks of those companies with the tracks of the Cleveland company and ride in on the city cars at whatever rate of fare may be in effect. The same is true on outbound trips, when passengers may ride to the limits of the urban fare before boarding the interurban cars.

The report of the railway for the year ended recently is reviewed elsewhere in this issue.

Eight Cents in Denver

Court Holds City Broke Franchise Contract by Allowing Temporary Six-Cent Fare

Patrons of the Denver (Col.) Tramway commenced paying an 8-cent fare on March 15. Metal tickets are sold in quantities of two or multiples thereof at the rate of 7½ cents each. The half-fare rate for children between the ages of six and twelve was increased to 4 cents with metal tickets sold in quantities of four and multiples thereof at 4¾ cents each.

The higher rates of fare were announced by Receiver Stenger under a decree issued by Judge Robert E. Lewis of the United States District Court, District of Colorado, wherein the 6-cent fare was held to be confiscatory and the city of Denver was enjoined from enforcing the collection of same and from interfering with the collection by the receiver of the higher rates.

The fare increase action is the result of proceedings instituted by Mr. Stenger on Feb. 11, at which time application was made to the court for permission to increase the adult fare rate from 6 cents to 10 cents and the children's rate from 3 cents to 5 cents. The case came up for hearing on March 1 and following the closing arguments on March 10 Judge Lewis immediately rendered his opinion granting the receiver permission to increase the fares. The Judge declared that it was not within his power to set the rate of fare to be charged, but that Mr. Stenger in his capacity as an officer of the court has the right to raise fares. The court allowed, however, that it would restrain Mr. Stenger to what it considered a reasonable figure and established 8 cents as the maximum fare which could be charged at this time.

FRANCHISE WAS NEVER A CITY CONTRACT

Judge Lewis, in rendering his opinion, stated that he did not think the tramway franchise ever constituted a contract with the city. Of one thing he was certain and that was that if there ever was a contract between the city and the company the existence of same came to an end when the city in the exercise of its governmental powers passed an initiated ordinance for a 6-cent fare and thereby changed the rate of fare from the rate contained in the franchise.

Application by the city of Denver for a stay of execution pending appeal was denied. The City Attorney thereupon gave notice that the case would immediately be appealed to the United States Circuit Court of Appeals. Pending final decision receipt slips showing rate of fare paid will be issued.

Judge Lewis, in signing the decree on March 12, declared that the city charter provisions under which the city of Denver regulates public utility rates by initiated ordinance are unconstitutional because they deny due process of law.

More Five-Cent Fares

Boston Elevated Reduces Fare 50 per Cent on all Main Surface Routes from Everett Station

The Boston (Mass.) Elevated Railway plans to establish a new system of fares on March 26 on all surface routes operating in the cities of Malden and Everett. Heretofore fares have been 10 cents with free transfers at all intersections to connecting routes.

LOCAL FARES FIVE CENTS

Under the new plan all local fares will be 5 cents, and transfers heretofore issued will be eliminated except to shuttle cars that will be operated on parts of two routes that formerly ran through to Everett station.

The fare to Boston and other points reached from the rapid transit lines will still be 10 cents with universal transfers as heretofore.

Seven routes will be operated to the Everett elevated station. Shuttle cars will take the place of two former through routes and service on the end of another will be discontinued.

Under this system the pay-leave plan will be operated on inbound trips to Everett station. Passengers leaving cars before reaching that point will pay 5 cents and all those entering the station will pay 10 cents the same as if they entered the station from the street. Passengers originating on shuttle cars will use a valued continuation ticket either in full or part in payment of fare.

Passengers on outbound trips boarding cars in Everett station pay nothing for fare on the surface lines. Passengers, however, boarding cars on the street pay 5 cents on boarding the car. Continuation tickets are issued by conductors when the passengers leave the car at the two junctions from which shuttle cars operate.

During the night when elevated trains are not in operation surface cars will run through to Sullivan Square or Boston. On these cars 10-cent fares will be charged to all passengers at the time of boarding. The fares to Everett station cars will be the same during the twenty-four hours of the day.

TRUSTEES WILL MAKE REPORT

In spite of the fact that the trustees are proceeding with the establishment of 5-cent fare lines as indicated above when short riding occurs or may in the opinion of the management be developed, the Massachusetts Legislature has seen fit to take a hand in the problem and has passed a resolve directing the trustees to investigate and report on the advisability of establishing a 5-cent fare on certain lines operating from Dorchester and South Boston localities into the business section of Boston where a 10-cent fare is now charged.

During the course of the debate, the act under which the trustee method of control was established in 1918 was bitterly attacked, and charges were made that certain members of the Legislature then in session profited by pur-

chase of Boston Elevated stock just before the act was passed. Numerous amendments were offered in an attempt to include other localities in the proposed investigation, but were all defeated. It was claimed that the trustees had ample authority for making such an investigation without the necessity for specific legislative enactment, but nevertheless the bill was passed by a large majority. A report is required on or before April 15.

The trustees have already established two 5-cent fare lines, one operating in from South Boston and the other from Charlestown.

Six-Cent Fare Asked in Indianapolis

Company Claims One-Cent Transfer Charge Insufficient to Meet Increased Expenses

A 6-cent fare and a 2-cent transfer charge, with provision for the sale of twenty tickets for \$1, were asked in a petition for an emergency increase in rates filed by the Indianapolis Street Railway with the Public Service Commission on March 14. The present fare is 5 cents, with a 1-cent transfer charge and no provision for the sale of tickets at a reduced rate.

The petition states that the 1-cent transfer charge, which has been in effect since Dec. 20, 1920, is insufficient to meet the increased operating costs and fixed charges of the company, which caused a petition for emergency relief last fall. Due to a decrease in the number of revenue passengers since Dec. 20, 1920, the company will face a cash deficit of more than \$300,000 on May 1, without providing for betterments or improvements, the petition states.

The 1-cent transfer charge, which was originally established for an observation period of seventy-one days, was continued by the commission recently, pending further consideration of the case. In connection with the present petition, the company submitted a detailed financial statement, showing the revenues obtained under the operation of the 1-cent transfer charge and indicating the financial situation of the company.

Samuel Ashby, city corporation counsel, said that the petition was filed without the knowledge of city officials. He pointed out that the company was to have made a report on March 1 on the revenues accruing from the 1-cent transfer charge, but that upon the request of the railway the Public Service Commission later granted the company until April 1 to make the report.

The Indianapolis Street Railway is still operating under its city franchise. Under the terms of the Knapp law, which permits utilities to surrender their franchises and operate on an independent permit under the jurisdiction of the Public Service Commission, the company may abandon its franchise. This action cannot be taken until the 1921 statutes are published. The Knapp law contained no emergency clause.

Louisville Injunction Argued

Hearing in that City on March 17 on the Plea of the City Against Present Seven-Cent Fare

The United States District Court of Appeals set March 17 as the date for hearing the appeal case of the city of Louisville on the injunction granted the Louisville Railway to prevent collection of a 7-cent fare. A motion will also be filed by the city to require the railway to issue receipts pending final settlement of the case.

March 17 was set following the plea made on March 9 by J. S. Lawton, city attorney of Louisville, before the Cincinnati court. Churchill Humphrey, of the company, asked for an April assignment of the case, to give more time to working up material.

One of the first questions to be decided is whether the franchises under which the company is operating are contractual or regulatory.

There have been a good many jitneys on the streets in Louisville as a result of the 7-cent fare. Licenses are being issued to jitneys under the taxi ordinance instead of the jitney law. This results in some of them operating without even a surety bond. Many jitney operators are poor drivers, and accidents have been increasing at an alarming rate.

INCREASED FARES NOT REFLECTED IN REVENUES

Although the increase from 5 cents to 7 cents in fares in Louisville should figure about 40 per cent, actual increased revenues are only about 18.4 per cent according to company officials, due to loss of short hauls and competition from the jitney bus.

The Kentucky Railroad Commission has authorized the Louisville & Interurban Railway, owned by the Louisville Railway, to increase interurban fares 2 cents, to bring the haul within Louisville up to the city rate of 7 cents. Those who buy present commutation books will not be affected. The rate outside of the city remains at about 3 cents a mile.

The Louisville Railway has flatly refused to consider the suggestion of City Attorney Lawton that receipts be issued with 7-cent fares, so that refunds may be made in the event that the upper courts give an opinion against the company. The proposal was that each ticket strip contain a receipt, so that only buyers of strips would get receipts.

New Transfer System in Los Angeles

A new transfer to simplify the present system and speed up the loading of cars is to be introduced by the Los Angeles Railway April 3, according to an announcement made by G. J. Kuhrts, general manager. The new plan is expected to be of special benefit in traffic distribution as it will give car riders a wider choice of transfer points than exists at present, thus reducing the number of people boarding cars at busy intersections.

The new transfer will have a coupon attached. When presented on the second car the conductor will receive the transfer as at present, but if the passenger wants another transfer the receiving conductor will detach the coupon and return the body of the slip to the passenger and this slip will be good for the third ride. This plan will not affect passengers on shuttle cars as shuttle lines are considered as continuations of the main line with which they connect. A special type of transfer will be used for shuttle cars so a passenger will be entitled to full transfer privileges after boarding the main line car.

Different colors will designate whether the transfer was issued on an "in" or "out" trip.

Cars south and west bound through the business district will be designated as on the "in" trip and "out" trip will be north and west through the downtown zone. Three o'clock p.m. will be the dividing point between "a.m." and "p.m."

LOADING OF CARS WILL BE SPEEDED

When the new transfer is introduced April 3 it will not be necessary for a passenger to state the direction in which he wishes to travel on the second ride. He will merely say "transfer" to the conductor and will receive a slip.

Transfers will be good on connecting or diverging lines except at points specified on the back of the transfer. Under the wider choice of transfer points a passenger may board the second car at any point where it crosses, enters, or diverges from the line on which he paid the fare. Under the present system one point is designated and change from one line to another must be made at that one point only.

Through Railway-Omnibus Routing in London

The London County Council has decided to enter into an agreement with the London General Omnibus Company for through bookings between the tram-cars and the omnibuses. In principle this applies to all the tramway dead-ends in the central area, but as an experiment it is only at first to be tried at the tramway terminus at Victoria Station for twelve months. The through tickets between car and bus or *vice versa* will not apply to workmen's fares nor to the cheap midday fares. The company is, however, prepared to provide early morning omnibuses to connect with the workmen's cars run by the Council. That any step should be taken between the two big rival undertakings to promote co-ordination of traffic is noteworthy, because the County Council has hitherto stood aloof in proud isolation from the company.

The new scheme may be regarded as the outcome of two things. Some months ago, at the instigation of the Minister of Transport, conferences were begun between representatives of the two bodies with the object of traffic co-

ordination. Then in the autumn, when a committee of the House of Lords rejected a scheme of the County Council for powers to run omnibuses to link up the tramway dead-ends in central London, the committee suggested that the omnibus company might provide these services. It recommended negotiation on the subject. The first fruits are now apparent.

Transportation News Notes

Ten Cents in Vancouver.—The Public Service Commission of Washington has given permission to the North Coast Power Company, which operates the railway line in Vancouver, Wash., to increase fares to 10 cents. Eleven tickets will be sold for \$1. The old rate was 7 cents.

Protests Interurban Rise.—Protests against increasing the fare on the Daisy interurban from 7 cents to 10 cents were heard recently at New Albany, Ind., by a special examiner of the Interstate Commerce Commission. The Daisy line is operated by the Louisville & Northern Railway & Lighting Company.

Increased Rates in Effect.—The Trenton, Bristol & Philadelphia Street Railway has been granted permission by the Public Service Commission of Pennsylvania to increase its fares from 7 to 8 cents between Morrisville, Trenton and Torresdale and intermediate stations. Special car rates are also advanced.

Jitneys Succumb Under Regulation.—New jitney regulations put into effect at Providence, R. I., on March 1 resulted in 127 operators of these vehicles withdrawing from service. The conditions under which the jitneys have been permitted to run were tightened as one of the steps in securing the reorganization of the electric railways in Providence.

Jitney Regulatory Bill Passed by House.—The Connecticut House has passed a measure providing for regulation by the Public Utilities Commission of all jitneys, subjecting them to supervision as to routes and rates similar to that under which electric railways are operated. The measure requires buses to be provided with certificates from the commission which correspond to the franchises of the street car companies.

New Rate in Effect.—The Seattle-Everett Interurban Railway, Seattle, has recently put into effect a new rate schedule which effects an increase of 3 to 4 cents in fares between Seattle and intermediate points, but does not affect the one-way or round-trip fare to Everett. The fifty-ride monthly ticket sold to Everett commuters is abolished

and a thirty-ride ticket substituted. Commutation fares are not increased for the stations near Everett.

Ten-Cent Fare in St. John.—A 10-cent cash fare went into effect on the lines of the New Brunswick Power Company operating in St. John, N. B., on Jan. 10. Tickets are sold three for 25 cents, or fourteen for \$1. There is no additional charge for transfers. F. R. Ross, president of the company, following a meeting of directors, said that he hoped the new rates would re-establish the standing of the company's securities so that it could secure new capital for improvements.

Jersey Jitney Decision Appealed.—The Public Service Railway, Newark, N. J., has filed in the Court of Errors and Appeals an appeal from the Court of Chancery decision which held that the jitneys have rights in streets occupied by electric railways. The public Service Railway has thirty-six suits pending to restrain the jitneys of various municipalities from operating on streets in which the company has franchises, and the suit started a few days ago carried with it indirectly a decision that will rule each of these cases.

Akron Council Again Petitioned.—The Northern Ohio Traction & Light Company, Akron, Ohio, has again petitioned the City Council for permission to increase its fares. The company was granted a 5-cent fare in July, 1920, pending the drafting of a new franchise. The city and the company have been unable to agree upon the terms of a proposed new contract. The company in its letter to the Council states that in three months the income has failed to meet the actual operating expenses by \$96,837. The company further adds that the situation, which was serious six months ago, has now become grave, and in order to continue service material increases will be required.

Fake Claim Operator Caught.—On Jan. 23 a conductor on one of the Public Service Railway lines operating in Camden, N. J., reported that a negro giving the name of Charles Goddenues had slipped and fallen in a car. At the hospital the man said he was a fireman employed on the White Star Line. On the following day he presented a claim at the division claim office. The suspicions of the claim department were aroused and fraudulent records looked up. Therein appeared a notice from the Claim Agents' Association under date of November, 1917, warning of one Victor Lamott, alias several other names, colored. After further investigation a warrant was issued against this Public Service Railway claimant and he was arrested on a charge of attempting to obtain money under false pretences. He admitted that he had made claims against the Philadelphia & Reading road in Philadelphia, the Pennsylvania at Harrisburg, Pa., and at the Thirty-fourth Street Terminal, New York, the latter on Jan. 8 last. He was tried as Frank Smith and sentenced to six months in the Camden County jail.

Personal Mention

Workers Pledge Pay

Men Under B. H. Boyce Respond with Loans to Meet Railway's Interest Payment

Few men in any walk of life have had any greater tribute paid to them by their employees than has W. H. Boyce, general manager of the Beaver Valley Traction Company, New Brighton, Pa. Men there are who have received from their employees sincere tokens of esteem in the form of gifts of a personal nature or other memorials purchased through subscription, but Mr. Boyce has recently had his men put their personal funds at the disposal of the railway itself.

TEN DOLLARS FROM EACH EMPLOYEE

To meet the deficit each employee of the companies of which Mr. Boyce is operating head has agreed to loan the sum of \$10 from his semi-monthly pay on the first of four such payments, the total of which, with reduction of expenses, is expected to meet the immediate pressing obligations of the Beaver Valley Traction Company and Pittsburgh & Beaver Street Railway.

Mr. Boyce, at three department meetings of the employees, explained the exact financial condition of the traction interests and the response was spontaneously unanimous. Mr. Boyce gave an estimate of the probable deficit for March of \$4,441, and with a probable shortage, with all obligations met, by the last of April, of \$27,441, but that by deferring certain payments the shortage the last of April, which it would be necessary to make up in some manner, would be \$7,716.

It was declared that if each employee who is able would lend the company \$10 per pay for the next four pays, or \$40 each, it would be possible to meet the situation for the next two months. Employees making the loans were assured that they would not only be given a receipt showing the payments but would receive interest at the rate of 6 per cent when the money was paid back during the months of June or July. Several offers were made of amounts from \$80 to \$1,000.

183 VOLUNTEERS

Mr. Boyce has long had the reputation of being one of the ablest handlers of men in electric railway work. This vote of confidence in him, one of the very first of its kind, bears witness to the correctness of this estimate. Out of 187 employees 183 volunteered their pay, accepting Mr. Boyce's say so as a pledge for the return of their money. The four employees who were not able at that time to loan the amount requested said that financial troubles of their own prevented them from do-

ing as they wished. However, in all four cases the individuals made known to Mr. Boyce their sincere intention of loaning the desired amount as soon as circumstances would permit.

Mr. Pattison to Work on Electrification of Illinois Road

Hugh Pattison, until recently connected with the heavy traction department of the Westinghouse Electric & Manufacturing Company, engaged in making special engineering studies under the direction of F. H. Shepard, has resigned to accept a position with the Illinois Central Railway, in connection with the electrification of that road. At one time Mr. Pattison was engineering assistant to Frank J. Sprague, vice-president and technical director of the Sprague Electric Company, in New York. This association continued until 1903, during which time Mr. Pattison assisted in equipping and operating multiple-unit control on the Boston elevated and Brooklyn railroads. In 1905 Mr. Pattison joined the Westinghouse, Church, Kerr & Company, as an engineer, and from that time until 1911, during the electrification of the Pennsylvania tunnel into New York, he was assistant engineer of the electric work for George Gibbs, consulting engineer.

A little later he had charge of the electrification of the West Jersey & Seashore Railroad from Camden to Atlantic City. An experimental single-phase electric railway on the Long Island Railroad was also built by him and numerous locomotive tests on the West Jersey & Seashore Railroad were carried out under his supervision. He was graduated from Johns Hopkins University, electrical engineering course, in 1892.

New Commissioners Named

Governor Edwards of New Jersey announced on March 14 that he would, in accordance with the provisions of Chapter 36 of the new public utility bill recently passed over his veto, submit to the Senate the following names of membership of the new board: James A. Hamill of Hudson, formerly Assemblyman and Congressman for twelve years, whose term only recently expired; Joseph S. Hoff of Mercer, former Civil Service Commissioner, president of the National Bank of Princeton and of the Princeton Savings Bank; Harry Bacharach, twice Mayor of Atlantic City, at present president of the Marine Trust and director in several other mercantile institutions.

Two of the men named are Democrats and the other is a Republican. The term of Commissioner Hamill will be for six years, Commissioner Hoff for

four years and Commissioner Bacharach for two years. The new law provides salaries of \$12,000 for each member. The new commission will be ready to function upon its confirmation by the Senate.

Mr. Haynes Retires

Member of Indiana Commission Resigns to Take Up Law Practice in Indianapolis

Paul P. Haynes of Anderson, Ind., a member of the Public Service Commission of Indiana, has resigned his position, effective March 31, it was reported among Mr. Haynes' friends. It also is understood that Governor McCray has offered the position on the commission to George M. Barnard of Newcastle, and that Mr. Barnard will accept the place.

HIS ATTITUDE TOWARD UTILITIES

Mr. Haynes is serving his second term as a member of the commission. His present term would not have expired for about three years, but his friends have understood since late last year that he would resign some time in March of this year and engage in public utility and law practice in Indianapolis, after several months of special work for certain corporations in Mexico. James P. Goodrich, then Governor, reappointed Mr. Haynes last year to another four-year term. He is the youngest person ever to serve on the board. Mr. Haynes and Mr. Barnard, both lawyers, have been prominent in Republican politics.

Mr. Haynes has made an enviable reputation in the public utility field, the electric railway field, especially, because of the fair and common-sense stand he has taken regarding the utilities. He clearly stated his attitude at the annual meeting of the Indiana Public Utility Association, which was reported in the *ELECTRIC RAILWAY JOURNAL* for Jan. 22. At that time Mr. Haynes said that the interests of the public utilities and of the public are so inextricably associated that what is good for the public is good for the utility and vice versa; that when one prospers or suffers the other does likewise.

COMMISSION MADE POPULAR

He laid stress on six points which stated the whole utility question in a nutshell. These have been taken up and quoted widely in the industry as the things that must be brought home to the public before relief from the present dilemma can be gained. Some of the principal points made by Mr. Haynes why rates should not yet be reduced were that utility rates have not paralleled other prices during the period of inflation, that utilities, having earned less than a fair return on their fair valuation, should be permitted to recoup their losses, and that there is an immense amount of deferred maintenance to be taken care of.

Mr. Haynes contended that it is the duty of a commission to see that the utilities are not only solvent but that

they are maintained in a healthy condition. As a member of the commission he has done much to promote this view and his influence has deservedly had results in placing the commission in its correct relation with the public and the utilities.

Retires After Thirty-six Years with United Railways

Patrick Callaghan, foreman of the Fourth Division of the United Railway, St. Louis, Mo., has resigned after completing thirty-six years of service. The friends of the retiring foreman, numbering every man connected with the South Broadway station, arranged a surprise party to honor Mr. Callaghan. An elegant morris chair, purchased by voluntary contributions from all his fellow workers, was presented to Mr. Callaghan and a fund was unanimously pledged to buy his smoking tobacco for life.

Among those who spoke, paying tribute to the veteran foreman, was H. O. Butler, superintendent of transportation, who warmly congratulated Mr. Callaghan and mentioned his splendid record of service. He told the trainmen that he hardly knew the company had a Fourth Division, because both accidents and complaints were few, and he was very glad to compliment the trainmen on their efficient work.

D. F. Trotter, division superintendent, although it had not been his good fortune to have known Mr. Callaghan for the last quarter of a century as had some, said that during the year that he had known him their relations had been most agreeable. He added that it would be the trainmen who would suffer the greatest loss, because they were the ones who had received both his advice and counsel, which has been so freely and kindly given.

Manager Butler Discusses Atlanta's Railways

"Atlanta is plainly an up-to-date, splendid city with a traction system one of the very best." This is the opinion of F. L. Butler, new manager of the Georgia Railway & Power Company, Atlanta, Ga., and at one time manager of the Winnipeg Electric Railway, Canada. The new manager, assuming office on Feb. 7 last, delivered a diplomatic message in which he assured Americans of Canada's friendship for the United States. He compared Winnipeg to Atlanta, saying that they are alike in size and in the details of traffic. Mr. Butler made the following comments:

The rapid transit service of a city is one of the most important industries it has. A good transportation system is the backbone of a city's life. The visitor to a city surveys its street car service as the first means of judging the city. The city government should regard the transit condition as one of the most important matters of welfare to the city and its people.

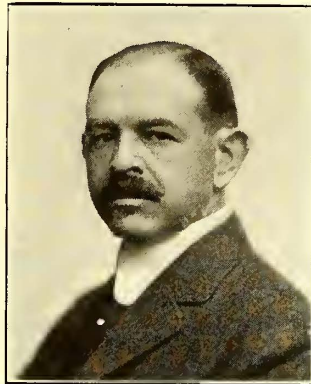
Investors studying a new town with the idea of locating there have to consider the street car service as the subject of first importance in deciding them. The question is more important to such an investor than the question of real estate values. In fact real estate values are largely based on the railway service the real estate possesses.

Mr. Harris Elected

Superintendent of San Francisco-Oakland Terminal Railways Becomes President of Pacific Railway Club

At a meeting in Oakland, Cal., on March 10 the Pacific Railway Club elected as its president for the ensuing year G. H. Harris, general superintendent of the San Francisco-Oakland Terminal Railways, Oakland, Cal. F. S. Foote, professor of railroad engineering, University of California, was elected first vice-president. Mr. Harris, in becoming president of the Pacific Railway Club, succeeds Dennistoun Wood.

An experience of over thirty years as a railway operator on various roads makes Mr. Harris well qualified to fulfill the duties as president of the club. Mr. Harris is a graduate in civil engineering and has been connected with the engineering departments of the Chattanooga, Rome & Columbia Railway; Briarfield, Blockton & Birmingham Railway; Southern Railway; Alabama, Georgia & Florida Railroad, and the



G. H. HARRIS

Georgia, Midland & Gulf Railroad. He left the employ of the last company in 1890 to superintend the conversion of the Birmingham system from mule power to electricity. At the completion of the reconstruction he became master mechanic, in which capacity he served until about 1902, when the office of superintendent of traffic was created. Mr. Harris was chosen to fill that position and continued as superintendent of traffic until 1904, when he was appointed manager of the railway department of the company. His title was subsequently changed to superintendent of the railway department.

In 1914 Mr. Harris became general superintendent of the San Francisco-Oakland Terminal Railways, in which position he had general charge of the transportation and maintenance departments. Since that time his responsibilities have been increased by the taking over of direct personal charge of several departments. Upon the resignation of A. W. MacPherson, chief engineer, Mr. Harris assumed active charge of all maintenance-of-way and structures work. Other branches of the work

directly under his charge are the electrical and mechanical departments. In recent years he has devoted more and more of his time to maintenance matters and is now the active head of all maintenance and operation for the company.

New Publications

Connecting Induction Motors.

By A. M. Dudley, engineering department, Westinghouse Electric & Manufacturing Company. 252 pages, cloth, 6 x 9 in., illustrated. McGraw-Hill Book Company, New York, N. Y.

In view of the widespread use of the induction motor, this presentation, from a practical standpoint, of the details of winding and connecting motors of this type is of timely interest and value both to students and to operating engineers.

Powdered Coal as a Fuel

By C. F. Herington, Second Edition. 388 pages, 124 illustrations. D. Van Nostrand Company, New York.

Coincident with the rise in price of coal, more attention and study have been directed toward the efficient burning of cheap fuels. By powdering, coals high in ash content can effectively be used. The author of this book has made extended studies in his subject in foreign countries where, perhaps, the methods and economies possible have been thoroughly investigated. He points out that the efficiency, flexibility and elimination of banking losses by the use of powdered coal under boilers indicate it to be a most promising fuel. Among others, he cites the power plant of the Milwaukee Electric Railway & Light Company as one successfully operated on pulverized fuel.

Financial Engineering

A text for consulting, managing and designing engineers and for students. By O. B. Goldman, consulting engineer and professor of heat engineering Oregon State Agricultural College. 271 pages, illustrated. John Wiley & Sons, Inc., New York City.

The complaint is often made, sometimes justly, that the engineer is more interested in his engineering than in the financial results of what he engineers. This criticism is less deserved now than formerly; in fact, a considerable part of engineering today consists in appraisals and the like, bringing the engineer in close contact with one phase of finance. The engineer will appreciate a book like this one by Professor Goldman, who has applied engineering principles in finance. He has carried engineering problems farther than usual, to the point of determining, not only the question "What will it do?" but also "Will it pay to do it?" He uses a term "restance" as a complete measure of what a service costs in the long run, defining this as "the equivalent cost of a permanent service." This quantity is used throughout. While somewhat mathematical in spots the book is not complicated. It is illustrated with numerous examples and graphs.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

Safety Car Price Reduced

The National Safety Car & Equipment Company, St. Louis, Mo., has announced a reduction in the price of the standard safety car to \$6,500 for a double-end car purchased on a cash basis. This new lower price has been made possible by the reduction in the cost of various equipment. The announcement also includes a plan for the purchase of new cars on the equipment trust basis or on a leasing basis.

Fiber Conduit Buying Not Very Strong

Stocks at Mills Are Capable of Handling Immediate Shipments and Production Is Continuing

Unlike usual buying conditions in the fiber-conduit field at this time of year, the present market is quite dull. Manufacturers at the same time have built up large stocks of this material to handle business which is expected to come in later in the spring and summer with request for quick delivery. No difficulty can be experienced now in shipping common sizes from stock. To continue this condition the mills as a whole are working virtually full time.

To be sure, some orders have been taken for good amounts for spring delivery, and the early break-up of winter is providing an added incentive to purchase at this time. Many power stations have plans ready for heavy extensions, but these are being held in abeyance till a later time. Certain parts of the Southwest, West and Central States have been in the market, with some amounts coming from the East.

In line with prices of other commodities, at least one mill has reduced its price in an amount ranging from 15 to 18 per cent. Up to date no other instances of a price drop have been found.

Rail Mills Have Fair Capacity Booked

Steam Roads Have Taken Good Capacity for First Half Year—Foreign Steel Prices Lowered

Rail orders from steam roads are in pretty fair volume in the rolling mills. This is particularly so for first half year mill capacity, although there is still some capacity for that period which can be booked. Girder and high T rails likewise are reported to have a fair schedule ahead. Much of the rail buying to date was done in December

and has been for shipment in specific months, some running into the second half. There is little for quick delivery, and generally speaking it would be with difficulty that even as low as thirty-day shipments could be made.

The Treasury Department has some money available for equipment needs but this will be relatively small compared with the roads' needs. Still there are some large orders reported about ready to be placed for spikes, quotations on which is given as 3.65 cents.

In the foreign market the Danish railways are reported in the market for about 6,000 tons of rails, 11,000 fish plates and 150,000 sole plates. A contract is said to have been awarded to Krupps of Germany for 10,000 laminated steel car wheels for the Argentine State Railway. Chilean State railways are looking for tenders on steel rails and accessories in an amount estimated at \$1,500,000. At the same time English, Scotch, Belgian and German steel mills have made recent cuts in their steel prices in an endeavor to get export trade.

Copper Sells at 12 Cents

Still Little of the Metal Is Changing Hands—Government Sells Scrap Brass

The copper market is down to a level lower than it has been at any time since 1914. In the outside market, sales in relatively small amounts are being made at 12 cents a pound, refinery. The sales at this figure are necessarily small because it is felt any considerable attempt to purchase in large lots would react for a rise in price. Buying interest is indeed light. This is to be expected under the low rate of production now carried on by electrical manufacturers. Only a few of the producers are willing to come close to these bottom figures, with a price of 12.25 cents, delivered, for spot. Most producers, though, are still holding for 12.75 to 13 cents, delivered, for the first half year.

Announcement has been made by the Government that it has sold 30,000,000 pounds of its 47,000,000 pounds of brass cartridge cases which have been offered several times. The Chase Companies, Inc., Waterbury, the Scovill Manufacturing Company, Waterbury, and the Bridgeport Brass Company, Bridgeport, Conn., each took 10,000,000 pounds. The price is a percentage of the market prices to be adjusted monthly. This probably will have a retarding effect on the scrap copper and brass market, which is now on a very quiet level.

Line Hardware Stocks in Good Supply

Utilities and Railways Not Covering for Spring Needs, Although Buying Is Expected to Pick Up in April

A survey of the pole-line hardware market reveals the fact that utilities are not anticipating their spring needs. Some business has been placed, but the market on the whole is quiet. Restricted buying power with both power companies and electric railways is largely blamed by manufacturers for the light demand. It is expected, however, that by the end of next month sales should have picked up considerably.

Producers are continuing production of hardware, though in some cases reserve supplies are not large. One company, in fact, reports being still as long as three to four weeks behind in its line hardware department. In general, however, stocks are more than ample for present needs, and on reasonable size orders consumers may count on stock to one-week shipments.

Prices have not changed since general reductions of from 5 to 7½ per cent were put into effect by leading manufacturers about the middle of February. This is the second general cut that has occurred, as decreases of from 5 to 15 per cent were made during December and early January. In some quarters the view is heard that present quotations have about reached bottom. Prices quoted by a representative producer f.o.b. Chicago are as follows: Carriage bolts, ⅜ in. x 4½ in., \$2.31 per 100; crossarm braces, 1½ in. x ¼ in. x 28 in., \$14.42 per 100; lag screws, ½ in. x 4 in., \$4.02 per 100; machine bolts, ⅝ in. x 12 in., \$10.65 per 100. New York prices are about 20 per cent higher than the above to allow for freight and warehouse charges.

Funding of Car Company Planned

Plans were submitted to the bondholders and stockholders of the Barney & Smith Car Company, Dayton, Ohio, by the directors on March 9 which call for funding the notes and current liabilities and financing the working capital requirements of the company through an issue of \$2,000,000 second mortgage 7 per cent bonds. Under the plan of the directors, which is approved by the stockholders' committee, all indebtedness would be funded, the receivership lifted and working capital provided.

At this time, it was pointed out, when conditions indicate a profitable resumption of business the company finds it-

self having a valuable plant, but being without working capital. Since the plant cannot be sold under foreclosure at anything near its value, the only alternative is for the bondholders and stockholders to provide working capital, so that it can be put to its only proper use. The property is subject to foreclosure on and after April 1, 1921, and to prevent this action the plan must be agreed to promptly.

A meeting of the directors will be held in Cincinnati on March 24, at which time the plans will be accepted or rejected. The directors of the company are C. H. Rembold, manager of the Cincinnati *Times-Star*; Attorney Lawrence Maxwell, Cincinnati; H. W. Lothmann, T. C. Simpson, Claude V. Black, E. E. Werk and E. F. Kimmel.

Advantageous Time to Cover Coal Needs

Favorable Prices, Good Deliveries and Possibility of Future Car Shortage—Calder Coal Bill Dies

Inactivity continues to feature the coal market. Consumers for the most part are apparently confident of filling their future coal needs easily enough, hence buying on the part of railroads, public utilities, etc., is for current needs only. On the other hand there is a belief among a considerable part of the coal industry that there is another period of car shortage and high prices on the way. Credence is lent to this belief by the increasing number of inquiries for contract quotations by consumers who are figuring on their year's needs.

According to the March 17 issue of *Coal Age* prices of bituminous coal, having followed an irregular downward curve ever since the middle of last August, are now about as low as can be expected, both for spot and contract delivery. Therefore the present would seem to be an advantageous time for utilities to protect themselves by not only contracting ahead for a good grade of coal at a reasonable price, but also by putting the greater portion of this coal supply in stock within the next few months.

Production, which has steadily declined from the middle of last December, is considered to have about reached bottom now. Total output up to March 5 for the present coal year ending April 1 is placed at 497,818,000 tons by the United States Geological Survey. This compares with 447,900,000 tons a year ago, when the interruption of production by the great strike drew so heavily on reserve stocks. It is more significant that the present yearly output is over 13,000,000 tons behind 1917-18, a year when requirements were large and output about equaled consumption.

In connection with the present coal situation it might be well to note that the Calder coal bill, which originally aimed at federal regulation of the coal industry, died a natural death through the ending of the Sixty-sixth Congress on March 4. The bill as reported to

the Senate was so amended that it bore little resemblance to the original draft, the provisions providing for publicity of information concerning the coal trade being virtually the only ones to remain.

Rolling Stock

Kentucky Utilities Company, Somerset, Ky., has purchased two standard safety cars from the National Safety Car & Equipment Company, St. Louis, Mo.

Boston (Mass.) Elevated Railway Company announces that it has decided to call for bids on ten one-man cars to replace rolling stock that was lost in the Amory Street carhouse fire on March 4.

The **Detroit (Mich.) Municipal Railway** has called for bids on 100 Peter Witt single-end, double-truck, center-exit cars with a seating capacity of fifty-six passengers. Bids will be opened on March 25.

Franchises

Monongahela Valley Traction Company, Fairmont, W. Va.—A meeting was recently held in Marietta, Ohio, in connection with a new franchise grant to the Monongahela Valley Traction Company which must be passed upon before April 7.

Indiana Service Corporation, Fort Wayne, Ind.—The Indiana Service Corporation is planning to double-track Pontiac Street, from Calhoun Street to Anthony Boulevard, a distance of about ten or twelve blocks. The franchise for the double tracks on this street has been approved by the Board of Public Works, and will be sent to the council for ratification. A large number of Pontiac Street residents have announced their intention of protesting the proposed double-track improvement.

Portland, Ore.—Multnomah County Commissioners have granted a conditional twenty-five-year franchise to J. B. Schaefer and other residents of Linnton for the construction and maintenance of a railway between Nicolai Street and Linnton, along the St. Helens Road. Under the county franchise, which becomes effective on April 6, a 10-cent fare may be charged. The permission is not complete without the consent of the city commissioners to operate such a line within the city limits. The franchise provides for the payment of 5 per cent of the net income from the operation of the railway to the county. A track running to Oilton, about three miles from Linnton, all electrified, is now owned by Hill interests, on which cars were formerly operated. It is stated that this line can be secured, and that about \$60,000 would be required to complete the proposed line from Nicolai Street to Linnton.

Power Houses, Shops and Buildings

Northern Ohio Traction & Light Company, Akron, Ohio.—The Northern Ohio Traction & Light Company has built a new substation in Massillon in which are installed two 500-kw. rotary converters.

The **Swiss Federal Railways**, it is reported from Berne, will require the expenditure of 300,000,000 francs in its electrification. The report continues that the Federal Council is negotiating with American bankers for a respective loan.

Columbus, Delaware & Marion Electric Company, Columbus, Ohio.—In an effort to relieve the acute power shortage in the vicinity of Marion, Ohio, the Columbus, Delaware & Marion Electric Company is constructing a modern electric generating plant at Scioto. Although 10,000 hp. is being installed provision has been made for doubling the capacity without building additional structures. Power needs of industrial and manufacturing plants will be taken care of in this plant.

Kansas City (Mo.) Railways.—The Kansas City Railways, which has been supplying some current in the downtown area for the Kansas City Power & Light Company, will relinquish this service in a few weeks. The light company has been using a decreasing amount of current, as it has put into service more and more of its own new equipment, and it will soon be ready to handle all its own current supply, necessary changes in distribution elements being about completed. When the service to the light company is discontinued changes are to be made in the railway's power plant, both in equipment and in operation. The company will continue to sell current to certain interurbans.

Track and Roadway

Connecticut Company, New Haven, Conn.—Paving improvements in the city of New Haven are awaiting track repairs by the Connecticut Company. Director Lane has stated that the city will go ahead with the work as soon as new ties and rails replace the worn-out equipment.

Miami Beach Electric Company, Miami Beach, Fla.—The Miami Beach Electric Company expects in the near future to build three new turnouts.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.—Improvements contemplating an expenditure of approximately \$600,000 will be made at the Terre Haute, Ind., power plant of the Terre Haute, Indianapolis & Eastern Traction Company. The Indiana Public Service Commission recently granted to the local utilities company an increase in lighting and power rates in Terre Haute and along with the increase an order was

entered directing the company to make certain changes intended to improve the service. The work to be done includes an addition to the power plant and the installation of additional equipment. Increase in power production, extension of service lines and placing of wires underground are among the items to be included in the improvement plan as now contemplated by the company.

Boston, Mass.—The Boston Transit Department has submitted to the Legislature a plan for the extension of the Boylston Street subway to Post-office Square. The new subway as planned will do two things: It will give Boston a central, easily accessible gateway which will handle commuters, and will avoid congestion at the Park Street subway station.

Michigan Railroad, Jackson, Mich.—A resolution has been adopted by the City Commission of Battle Creek that the Michigan Railroad should extend its Garfield line, which now reaches Central Street, along such stresses as is necessary to connect the line with the Maple Street line terminus. It is said that this part of the city is without suitable car accommodations. The commission will soon consider the proposed extension.

Trade Notes

The Mar-Sla Manufacturing Company, Youngstown, Ohio, recently organized and with a plant at Hubbard, Ohio, will deal in chemically treated switchboards.

The Dayton Mechanical Tie Company, Dayton, Ohio, has appointed J. J. Costello, 201 Devonshire Street, Boston, Mass., its representative in the New England states.

The Packard Electric Company, Warren, Ohio, manufacturer of transformers, has moved into its new quarters in the Printers' Crafts Building, 461 Eighth Avenue at Thirty-fourth Street, New York City. J. E. Erickson, manager for the New York district, is in charge.

The Jeffrey Manufacturing Company, Columbus, Ohio, manufacturer of electric locomotives, elevating, conveying and crushing machinery, announces the removal of its Denver (Col.) office from the First National Bank Building to 421 United States National Bank Building.

Stuckeman Brothers, 18 Ruth Street, Pittsburgh, Pa., manufacturer of small motor-driven air compressors and other specialties, has recently been incorporated with a capital stock of \$50,000, in order to facilitate expansion along other lines. W. F. Stuckeman is president.

Mitchell-Rand Manufacturing Company, 18 Vesey Street, New York, is distributing in the New York territory ebony asbestos wood for switches, panels and bases manufactured by Johns-Manville, Inc. A good assortment of stock will be carried in the company's warehouse to insure quick deliveries.

The Conveyors' Corporation of America, Chicago, Ill., announces that the Power Equipment Company, 131 State Street, Boston, has been appointed New England representative for its American trolley carrier and its monorail equipment for handling coal, ashes, etc., Colwell & McMullin, 79 Milk Street, Boston, are New England representative for the company's American steam ash conveyor.

W. W. Joy has joined the forces of the Advance Machinery and Supply Company, Denver, Col., as vice-president and sales manager. Mr. Joy, who is a graduate of Ames College, Iowa, and a member of the A. S. M. E., for the past three years has been special sales promotion representative for the Fisher-Governor Company, Marshalltown, Iowa. The Advance Machinery and Supply Company is sales representative for twenty-three manufacturers of steam and electrical specialties.

The Equitable Equipment Company has just been formed for the purpose of handling second-hand locomotives, cars, railway equipment, rails and rail accessories, machinery, etc. The new company, with offices at 411 Whitney-Central Building, New Orleans, La., is taking over the equipment, rail and machinery business of A. Marx & Sons, Southern Scrap Material Company and the Ship Supply Company. The firm will be under the direct management of O. D. Cleveland, who has been manager of the New Orleans branch of the General Equipment Company.

George Oliver Smith has recently joined the American Atmos Corporation, Pittsburgh, Pa., manufacturer of oxygen resuscitation and breathing apparatus, as vice-president and chief engineer. Mr. Smith comes to his new position from Henry L. Dougherty & Company as Supervisor of Safety. He organized the accident prevention department of that organization in 1913, and has since then had executive charge of all the accident prevention, as well as special sanitation and welfare activities of the company. Mr. Smith's first position was with J. J. White & Company, Inc., with whom he was associated for five years as junior engineer.

Osborne E. Quinton, treasurer of Holden & White, Inc., has resigned to become vice-president of the Central Hyde Park Bank of Chicago. Mr. Quinton's first connection with the electric railway field was as general representative of the Peter Smith Heater Company, of which concern he later became vice-president and general manager. In 1918 he severed this connection and with Walter E. Hinman took over the sale of the Jewel hot-blast stoves for electric railway use, produced by the Detroit Stove Works, together with some other specialties. In the spring of 1919 the firm of Hinman & Quinton was consolidated with Holden & White, Inc., and Mr. Quinton was elected secretary and treasurer of the latter company. When this company was sold to the National Railway Appliance Company in the fall of 1919 he was elected treasurer of Holden

& White, which continued in operation in conjunction with the holding company. He held this office actively until Holden & White was recently absorbed by the Hegeman-Castle Corporation. Mr. Quinton retains approximately a one-fifth interest in the National Railway Appliance Company, of which he is a director. He will also continue as vice-president of the Burry Railway Supply Company, manufacturer and distributor of Hartman center bearings, Perry side bearings and Peerless side bearings.

New Advertising Literature

Feed Water Filter.—The Griscom-Russell Company, 90 West Street, New York City, has issued bulletin No. 615 describing the G-R Multiscreen Filter.

Electric Buffer.—The U. S. Electrical Manufacturing Company, Los Angeles, has recently developed a new heavy-duty Johnson electric buffer.

Lubrication.—Lubrication of Steam Turbines, Part I, is the substance of the February issue of *Lubrication*, published by The Texas Company, New York City.

Bond and Signal Wire.—Copper Clad Steel Company, Rankin, Pa., has issued two folders covering "Copperweld" wire for signal service and "Copperweld" bond wires.

Tools.—The Goodell-Pratt Company, Greenfield, Mass., is distributing its "No. 14 Tool Book," in which it describes and illustrates over 2,000 sizes and kinds of tools.

Power Plants.—E. W. Clark & Company Management Corporation, Columbus, Ohio, has issued Booklet A, dealing with unit power plants and offering a plan for preliminary engineering recommendations.

Electric Equipment for Movable Bridges.—"Electrical Equipments for Movable Highway and Railway Bridges" is the title of bulletin No. 48034 issued by General Electric Company.

Battery-Charging Equipment.—The Automatic Electrical Devices Company, 120 West Third Street, Cincinnati, has issued bulletin 620, illustrating its various types of fixed resistance charging panels for industrial trucks and locomotive service. Bulletin 621 covers its "Unipanel," sectional battery-charging equipment for charging industrial trucks, storage-battery locomotives, and electric commercial vehicles.

Storage Batteries.—The Gould Storage Battery Company, 30 East Forty-second Street, New York City, has issued bulletin L-2, describing types L-149-A and L-149-B of Gould storage batteries for mining and industrial locomotives. Catalog V-7 covers its electric vehicle types of storage batteries with "Dreadnaught" plates. The company is also distributing two booklets giving instructions on the care and operation of the Gould locomotive batteries and Gould batteries in mine locomotives.