

# Electric Railway Journal



Consolidation of STREET RAILWAY JOURNAL and ELECTRIC RAILWAY REVIEW

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## Railways Clear Streets for City Competition

WE TOOK occasion last week to direct attention to a great community benefit performed by electric railways in winter. This is the clearing of the parts of the streets occupied by the car tracks for the movement of cars. No other user of the highway is called upon to do this, but all benefit from what the electric cars do in clearing off the snow.

A striking example of the value of this service to other vehicles has been given during the past two weeks in Brooklyn. It will be remembered that last year a number of bus lines were started in that borough under the authority of the city to give what was said at the time to be needed additional service. After the recent storm these lines would have had great difficulty in operating if it had not been that the B. R. T. and other electric railway companies in Brooklyn had cleared off the snow from the streets having trolley tracks. In consequence the municipal buses changed their routes in several cases so as to coincide with streets having tracks. Our worthy mayor thunders against the electric lines, but even he will have to admit that without the cars the buses in Brooklyn would have had a hard time this past week.

## The Surface Railway Is an Engineering Machine for Snow Removal

THE more we study this service of the railways, the broader and more comprehensive the whole situation appears. A big fact is overlooked or not appreciated. In addition to its function of transporting passengers, the surface railway, as a whole, is a huge machine, upon which the large urban center (where heavy snowfall occurs) depends to keep its commerce moving and, more important, to preserve its health. In our larger cities, we live by mechanical methods; the very functioning of the city as a whole is like a big engineering machine. We have outgrown the day when individual or even collective human labor alone can overcome a real snow storm and we must depend upon engineering and mechanical methods. It is only when an unprecedented storm such as has recently overcome the northeastern part of the country actually conquers the machine, that we realize the machine, namely, the street railway, exists. In the most accentuated case—New York—in normal storms, the surface lines, which attack the problem at the first flake of snow, can keep the arteries open so that, say, 75 per cent of the city's normal food, coal, garbage and commercial hauling can go ahead. At this point, the city departments start to work and gradually clear away the rest of the snow. But, without the machine, no human force could keep paths open. As a community interest, therefore, and irrespective of ownership, management, rates or cost

of any kind, this machine should be kept equipped and ready to do its work.

As indicated by figures on another page, the records of the Weather Bureau show no storm in the New York district so great in precipitation as that of last week. The machine, in this case, was choked, and slowly, one by one, its parts—cars, plows and sweepers—succumbed. The underground trolley proved a weak point. Specific equipment for this unpredicted situation did not exist. The people have therefore an interest in seeing that the railways are in a position to develop and maintain for service adequate snow-fighting equipment to fit their particular installations.

We believe that the electric railway engineers, who can appreciate this engineering viewpoint of the whole situation, should, by proper publicity with the assistance of other and disinterested engineers, establish this conception of the service of the railways in the collective mind of the community.

## The Era of Steam Railroad Electrification Is Due to Open Soon

STEAM and electric railway men who appreciate the enormous economies which are to be accomplished through the electrification of our steam railroads are apt to be impatient at the slowness of the transition from steam to electric motive power. They remember how the horse and cable street railways were electrified almost overnight, and, while they know that nothing of this kind can occur in the heavy traction field, they would like to see a little more speed in the substitution of the electric locomotive for its steam predecessor.

There is very little parallel, however, between these two electrifications. As soon as the electric street railway car had been made an operating success, the question of electrification became merely one of the rate at which equipment could be manufactured and installed. In the heavy traction field, the electric locomotive is confronted by a formidable rival, to which the finest designing skill is being constantly applied. This rival can only be displaced as the "powers that be" become convinced of the ability of the electric locomotive to get more tonnage over the track in a given time and at a lower unit cost.

To the nation as a whole the most cogent argument in favor of electrification is the conservation of our store of coal. In time public sentiment will compel widespread electrification of steam railroads for this reason. To the railroads themselves, however, the matter must be one of dollars and cents, because when they return to their owners they will have greater difficulty than ever in meeting operating expenses and paying a reasonable return upon the money invested in them. They will not be able to attract the capital necessary for new equipment unless they are allowed rates which

will insure a fair margin of profit. We believe, however, that in due course the railroads will be in a sufficiently stable financial condition to permit the carrying out of a reasonably rapid electrification program. Good electrical apparatus can be furnished as rapidly as demanded, and amply full data as to the reliability of electric operation are now available to the open-minded, wide-awake railroad manager.

At the meeting of the Schenectady section of the A. I. E. E. held last evening, A. H. Armstrong, chairman of the electrification committee of the General Electric Company, read a comprehensive paper on the present heavy electric traction situation. This will be found abstracted at considerable length elsewhere. The particular point in this paper to which we wish to direct attention is his contention that a new standpoint from which to view transportation as a whole is necessary. The advent of the successful locomotive puts a new transportation tool into the hands of railway managers. They cannot get the best results with this unless they gradually change their whole plan of operation to utilize its characteristics. To do this will require great foresight and vision on the part of these managers. Up to the present time the railroads have not shown much initiative in the line of studying the electric locomotive and adapting their plans to it. The initiative so far has had to be taken by manufacturers of electric equipment and independent electrical engineers. They have had to overcome a lot of inertia and even opposition. The big day will be ushered in when the railroads begin seriously to plan to make the most of the electric locomotive.

### We Progress Through Practical Investigations

THOSE connected with the operation of electric railways find that the investigation of causes for troubles and failures and the devising of a means for overcoming them and preventing their repetition form a large part of their work. Such investigations frequently include a large amount of research work, and the knowledge gained often is of far-reaching effect on future designs of equipment. Tests undertaken with a definite object in view sometimes result in uncovering effects of a totally different nature. These may be caused by extreme conditions which seldom occur, but the effects become of prime importance when serious detentions to service result and the equipment is damaged or destroyed.

Some rather astonishing results for abnormal current peaks are given in the article in this issue on "Transformer Action of Tapped-Field Railway Motors." In ordinary operation the maximum current reached with this equipment did not exceed 350 amp. per motor, but when contact was broken or established with the third rail while the train was passing through gaps a maximum of 1,280 amp. per motor was reached. Control equipments were severely overloaded as a result, and much damage was done before the real cause was determined and a remedy applied.

In previous analysis of the operation to be expected from the control equipment it was assumed that when a gap in the third rail was passed the circuit would be opened immediately by the line relay dropping out and causing the control equipment to return to its "off" position. In actual operation it was found that the voltage did not drop to zero immediately, so that the

line relay stayed in and held the control circuits closed. At the same time, due to a momentary decrease in current through the current limit relay, the control equipment actually notched up while the train was passing through the gap. Due to this unexpected operation of the control equipment, abnormal conditions which otherwise would have happened but very seldom became frequent. The tests described led to a speedy solution of the difficulties so that for this particular equipment they are a thing of the past, but the principles illustrated are constantly cropping up. The consideration of such occurrences as this should be of considerable help to those who may at some future time have similar problems to deal with.

### Intelligent Selection of Materials a Factor in Economy

IN PREPARING specifications for rolling stock, as well as other features of the physical plant of the electric railway, superintendents of equipment and engineers have need of a comprehensive knowledge regarding the materials which are to be used therein. It sometimes happens that materials are specified which, while desirable in many ways, are really not the best for the intended purpose, and occasionally the specifications call for material that is very difficult to get and not really necessary. In view of this general situation, the editors of the *ELECTRIC RAILWAY JOURNAL* reached the conclusion that the readers of the paper would like to have in comprehensive form some practical articles on the subject of the materials that go into the makeup of an electric railway car. They asked Norman Litchfield to prepare these articles because he had had practical experience in car construction from both sides, and because he looks at the matter from the engineering point of view.

The first article in the series, on lumber, is printed this week, and others on steel, electrical insulation, bearing metals, paints and varnishes respectively will follow in reasonably rapid succession. We believe that one result of careful reading of this series will be a better mutual understanding between railways and manufacturers as to what kind of stuff should go into a car. The articles might well be made the basis for discussion, as obviously there must be some difference of opinion in a field so vital as this one. One valuable effect of the articles will be that they will direct attention to the standard specifications of materials which most nearly represent the consensus of opinion of the experts in the several lines of production.

### The Price of Newspapers Is Raised When Necessary

THE Foxy Grandpa of American journalism, William Randolph Hearst, who is always doing things for the dear "peepul," has raised the price of his Sunday edition from 6 cents to 10 cents. He is averse to living on last year's beefsteak. Did he conduct a campaign of education before raising the price? He did not. Mr. Hearst knows the value of publicity. He also knows its drawbacks. He tells the Interborough it cannot charge more for fare, but he does not tell himself that he can't charge more for his own product. He just says: "Willie, you ought to have more money for your product." And Willie, the great traction baiter, sets about to get it by raising the price of his paper 67 per

cent. In the light of present events it may seem that the Interborough Rapid Transit Company was somewhat lavish in the payment of dividends. But it didn't know. It couldn't know. It is a corporation subject to all the limitations which beset human judgment, but subversive to an omnipotent Mayor. It did at least explain that you can't use again the water that has gone over the dam.

Not so Mr. Hearst. That some of his readers will find their champion has feet of clay is more than certain now. There is a type of human whose intelligence you can insult with impunity. Mr. Hearst has certainly capitalized this knowledge. Whether this same type of human will stand an insult to and an assault on his pocketbook remains to be seen. The answer will be read not in the stars, but in the circulation figures. Liars may figure, but these figures do not lie. One million copies of the Sunday New York *American*, which is Mr. Hearst's boasted circulation, for fifty-two Sundays at four cents over the present price is \$2,080,000. For our own part, and to paraphrase Brann, it appears to us that if all the milk of human charity in Mr. Hearst were churned the product would be limburger cheese.

### They'll Hang Themselves at This Rate

**I**N THE NEWS columns of this issue we reproduce a piece of sales copy which is being spread broadcast by an Ohio motor truck company through its distributors. It is pathetic. The copy comprises a series of statements so extravagant in their claims for the advantages of motor bus transportation that we cannot understand why the truck company is wasting its time trying to sell trucks. Why doesn't it use its energies in establishing one of these wonderful bus line systems in every city which now has a street railway. We thought that character of salesmanship and advertising was a thing of the past, but it need not worry us. Motor buses sold on the basis of such claims will only bring discredit to bus ventures and perhaps afford the quickest way for such bus manufacturers to hang themselves.

There is not much object in our reiterating here the answers to the various statements which motor truck companies may circulate. Most railway men know the answers. But is there not a lesson to be drawn from such publicity? Does it not emphasize the desirability of the street railway companies getting out at every favorable opportunity some true publicity matter regarding the comparative costs of gasoline motor bus and electric street car operation, more particularly the latter? This would not disillusion such persons as the publicity man in point, for a truly scientific study would not register in his mind, but it would go a long way toward preventing such unworthy motor truck publicity from gaining any substantial hold on the populace.

In all of this we do not hesitate to recognize that there are places in which the motor bus can be used to advantage. This has been pointed out in various issues of this paper. From this we know that even when installed in places where they fit, buses cannot make any profit on a 5-cent fare, except for a very short haul. Even at a 10-cent fare the margin of profit is not what would induce a stampede of would-be investors. Nor do any of these estimates of cost take into account that in some future day the municipalities are going to get tired of paving streets for the benefit of a private bus corpora-

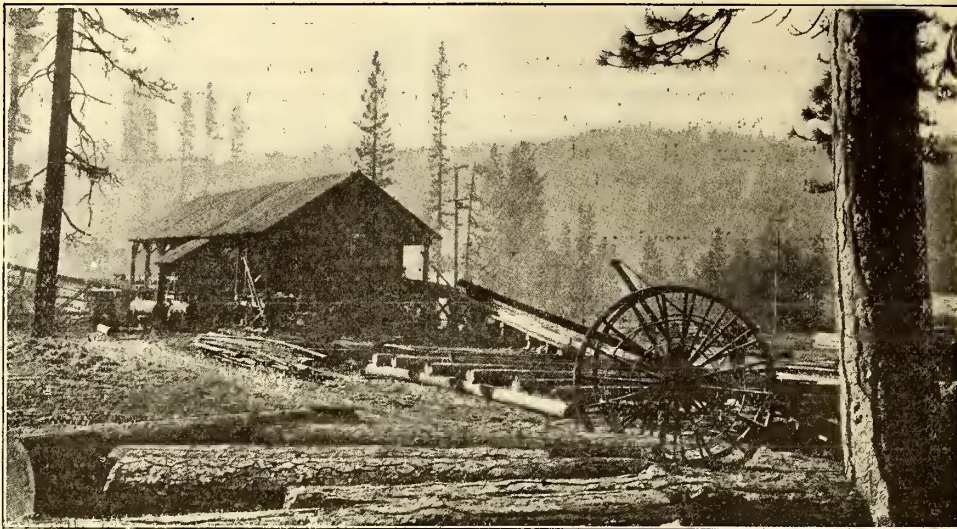
tion. That requirement will surely come, for as soon as bus companies show signs of making money (if they can), some ever-present champion of the "pee-pul" will create an agitation about spending public funds to provide a right-of-way for the private bus company.

### Make the Railway a Home Institution

**I**N these days of high interest rates and large bankers' commissions, there is every reason for an electric railway to secure money for necessary improvements from local investors, when such a course is possible. The local lender has many reasons for favoring the trolley system in his city. He can watch his investment, and if he is interested in other business enterprises in the city he usually has a direct interest in seeing that the local company has sufficient capital to provide good service and extend its lines. Finally, where such securities can be sold directly by the company to the ultimate holder the commissions which otherwise would have to be paid to the bankers can be saved and divided between company and purchaser.

We have observed with pleasure, therefore, increasing examples of direct sales of railway securities to local interests. Two recent examples have been the sale last fall by the Milwaukee Electric Railway & Light Company of \$3,600,000 five-year notes and the financing with local capital of its latest purchases of safety cars in Terre Haute by the Terre Haute, Indianapolis & Eastern Traction Company. This week, news of another probable case of the same kind comes from Springfield, Mass. There the Chamber of Commerce is seriously considering the appointment of a special committee of merchants, manufacturers and employees to assist in the sale by the Springfield Street Railway at popular subscription of an issue of \$300,000 6 per cent bonds. This is the sum which President Clark V. Wood of that company estimates to be necessary to build certain extensions and carry out improvements which the recent growth of the city has shown to be desirable.

For many years the more seasoned electric railway bonds were considered by investors to be among the choicest securities. They represented ownership of a community necessity, the corporations were not so large but their operations could be easily watched, their accounts were a matter of public record, so could be studied without difficulty and their earnings were less affected by bad times than those of many other industries. Within the last two or three years, because of the depreciation of the nickel, electric railway securities have fallen into disfavor with investors, but with the growing recognition of the necessity for higher fares and their grant by the authorities there is no reason why these securities should not recover their original high standing. The advantages mentioned still hold. In addition, three other important principles have become established. One is that the authorities realize that higher fares must be charged when the expenses of providing the service increase; the second is the general recognition now of current depreciation as a proper operating charge, and the third is that both company and commission appreciate that electric railway lines cannot be continually extended without an increased fare for at least the long distance riders. Railway securities, therefore, are really in a much stronger position now than ever before.



THE LUMBER CAMP IS AN IMPORTANT AUXILIARY TO THE ELECTRIC RAILWAY

# Railway Car Materials—Wood

Some Practical Suggestions for Those Who Are Responsible for the Purchase and Upkeep of Electric Rolling Stock

BY NORMAN LITCHFIELD

## *The Characteristics of Wood*

**I**N CONSIDERING wood as a structural material it must be remembered that, unlike stone, iron and steel, which are lifeless mineral substances, wood is a living, organic material. As such its desirability is determined not only by its inherent characteristic make-up, but also by its manner of growth, its freedom from defects acquired during growth, its freedom from moisture and its resistance to decay. A further influence is the size, to which the tree grows and the extent to which the trees are found in our forests.

Much interesting detail is found on the structure of woods in the bulletins of United States Forestry Division, one of which states:

"The structure of wood affords the only reliable means of distinguishing the various kinds. In the growth of the tree, each year a new layer of wood is added which covers the old wood in all parts of the stem and limbs. Thus the trunk grows in thickness throughout the life of the tree by additions (annual rings) which are accurate records of the tree.

"Thus a cross-section of a yellow-pine log shows a center of whitish pith, and a great number of concentric rings. A zone of wood next to the bark, one to three inches or more wide, and containing thirty

### Foreword to the Series

The materials of construction have received consideration at length in many text-books, but these of necessity cover a wide range and are apt to include a mass of detail from which it is sometimes difficult to select the facts which are fundamental, and in which the user of car material is particularly interested. In these books the more practical features from a railway and shop standpoint are not always brought out as forcibly as they might be. It appeared, therefore, that a series of practical notes on the principal materials used in railway cars might be of interest and value.

The subject is especially timely now on account of the difficulty of obtaining materials of any grade, which makes it doubly necessary that the user should have as clear an idea as possible of the essentials which constitute good material and further that he should carefully steer clear of demanding excessively particular requirements which may increase the price of the material or make it more difficult to obtain.

With these ends in view a series of articles covering several aspects of the subject has been prepared which it is hoped will be of interest to the readers of the *ELECTRIC RAILWAY JOURNAL*.

to fifty or more annual rings, is of lighter color; this is the 'sap wood,' the inner and darker part of the log being the 'heart wood.' These concentric rings are cross-sections of so many thin layers of wood. Each such layer forms an envelope around its inner neighbor, and is in turn covered by the adjoining layer without, so that the whole stem is built up of a series of thin hollow cylinders or, rather, cones. Examining the rings more closely, it is noticed that each is made up of an inner, softer light-colored, and an outer or peripheral, firmer and darker colored portion. Being formed in the fore part of the season, the inner light-colored part is termed the 'spring wood,' and

the outer, darker portion 'summer wood,' of the ring. Since the latter is very heavy and firm, it determines to a large extent the weight and strength of the wood.

"When the log is sawed into boards, the yearly rings are represented on the faces of the middle board by narrow, parallel strips. On the faces of the boards nearest the slabs (tangential boards) the several years' growth should also appear as parallel, but much broader strips."

To sum up, therefore, the main points in regard to the inherent structure of the tree, we may say that

the greater the amount of "summer wood" the stronger the wood, and that the greater the amount of "heart wood" in the stick or plank, the greater the strength.

#### MOISTURE MAKES WOOD WEAK

The amount of moisture in wood materially affects the strength thereof, the strength being about twice as great when it is dry as when it is green or wet. It apparently makes little or no difference whether this moisture exists naturally in the living cells of the wood or whether it is soaked up from external sources by capillary attraction in the cavities in the cellular structure.

To reduce the moisture to an amount to render the wood fit for use, it must be dried, either by seasoning under cover out of doors, or by heating in a kiln. The outdoor process requires months, or even years, before the wood is at its best. Kiln-drying has to some extent had a bad name in the past, but this has been due to the unsatisfactory results occasioned by poor equipment or poor handling in the kiln, for if there is proper equipment and if the work of drying is done as it should be, the results are just as good as those secured from air drying. The equipment, however, is expensive, the modern kiln being an elaborate affair, fitted with means of varying the temperature and humidity of the air, and for recording them. Careful manipulation is required to prevent checking, warping and shrinkage. This will be more readily understood by the following explanation of the causes of checking, etc., given in the forestry bulletin already referred to:

"When a short piece of wood fiber is dried it shrinks, its walls grow thinner, its width, the thickness of the fiber, becomes smaller and the cavity or opening larger, but the height or length remains the same.

"In a similar piece of fiber with a thinner wall, the effect is the same, but if the wall is only half as thick the total change is only about half as great. If a piece of wood is made up of fibers some of which have thin, and others thick walls, then the row of thick-walled cells shrink much more than the row of thin-walled cells, the piece becomes unevenly shrunk or warped, and the force which led to this warping continues to strain the interior parts of the piece in different directions.

"In a timber the width may have shortened at the end while a short distance from the end the original width is still preserved. This tends to produce a bending of the parts toward the center of the piece, but the rigidity of the several parts of the timber prevents such bending, and the consequent strain leads to their separation, the end surfaces of the timber being 'checked.' The faster the rate of drying at the surface, the greater is the difference in the moisture of the different parts, and hence the greater the strains, and consequently the amount of checking. Hence the necessity for an adequate equipment to regulate the drying conditions, and care in handling."

The foregoing shows the importance of knowing the amount of moisture the lumber contains, and it becomes necessary to determine what may be considered a reasonable minimum content to expect. "Absolutely dry wood can not be obtained inasmuch as chemical destruction sets in before all the water is driven off. It may be considered that air-dry wood contains 8 to 10 per cent of moisture." Some specifications call for as low as five per cent moisture, but this is a far lower figure than is at all necessary for general practice, and it

may be said that a reasonable grade is covered by from twelve to fifteen per cent moisture content.

The defects common to lumber are well covered in the A. S. T. M. standard definitions of terms relating to structural timber. These cover knots of various kinds, the general nature of which is known to all and needs no further comment; pitch pockets, which are "openings between the grain of the wood containing more or less pitch or bark; pitch streaks, a well-defined accumulation of pitch at one point in the piece; wane, bark or the lack of wood from any cause on edges of timbers; shakes, splits or checks in timbers which usually cause a separation of the wood between annual rings; rot, dote and red heart, any form of decay which may be evident either as a dark red discoloration not found in the sound wood, or the presence of white or red rotten spots."

#### KINDS OF WOOD USED IN CAR CONSTRUCTION

The chief two classes of trees contributing car timber are the needle-leaved conifers, such as pine and fir, and the broad-leaved trees such as maple, oak, cherry, mahogany, ash, etc.

Of these, yellow pine and Douglas fir are used chiefly for long structural timbers, flooring and sheathing boards, and until recently, oak and ash for the shorter members, and mahogany, cherry, etc., for trim.

Yellow pine is the most widely used structural timber. The term covers a wide variety of trees. The chief authorities to which the reader may look for more detailed information on this subject are the "Standard Lumber Specifications" of the M. C. B. Association, those of the American Society for Testing Materials and those of the Southern Pine Association, covering Southern yellow pine lumber, yellow pine car material and yellow pine timber.

The last-named specifications form a comprehensive guide to the selection of grades and are given in great detail. They call attention to the fact that "recognized defects in yellow pine are knots, knot-holes, splits (either from seasoning, ring hearts or rough handling), shake, wane, red heart, pitch pockets, torn grain, loosened grain, seasoning checks, sap stains, crooks and defects caused by manufacturing."

Until comparatively recent years it was customary to classify yellow pine as "long-leaf," "short-leaf" or "loblolly" pine, etc. But this was a confusing method, as was pointed out by Prof. J. B. Johnson in his book on the materials of construction thus: "The characteristic indications of these two species of pine (long leaf and short-leaf) become so merged that it is impossible to distinguish them when mixed in a consignment. If the 'short-leaf' comes up to the 'long-leaf' in specific gravity it would not be necessary to distinguish them, as they would then be of equal strength and value. The average weight per cubic foot of dry long-leaf pine is 38 lb., while that of short-leaf pine is only 32 lb. But as the lighter specimens of 'long-leaf' may be no heavier than the heavier specimens of 'short-leaf,' this is not an absolute guide." He then goes on to say that "the most nearly absolute criterion is the place of growth. The long-leaf and short-leaf pines do not grow together to any great extent."

But this was not altogether a practical means of grading timber, and has given way to a system based on the density of the wood, which originated with the United States Bureau of Forestry and was later adopted by the American Society for Testing Materials

and the Southern Pine Association. It is now in general use.

This system does away with the terms "long-leaf," "short-leaf" and "loblolly." A pamphlet issued by the Southern Pine Association states: "The new rule provides two classes: Dense Southern yellow pine and sound Southern yellow pine. Dense Southern yellow pine includes the best pieces of what has hitherto been known as long-leaf pine, and excludes the occasional pieces of inferior quality for structural purposes. It also includes those pieces of short-leaf pine, Cuban pine and loblolly pines which, because of their density and high percentage of summer wood, are equal in strength to long-leaf pine, as shown from numerous tests by the United States Forestry Service, and many other well-known authorities."

According to the rule as given in the A. S. T. M. specifications, "Dense Southern yellow pine shall show on either end an average of at least six annual rings per inch and at least one-third summer wood, or else the greater number of the rings shall show at least one-third summer wood, all as measured over the third, fourth and fifth inches of a radial line from the pith. Wide-ringed material excluded by this rule will be acceptable, provided that the amount of summer wood as above measured shall be at least one-half. The contrast in color between summer wood and spring wood shall be sharp and the summer wood shall be dark in color, except in pieces having considerably above the minimum of requirements for summer wood. . . . Sound Southern yellow pine shall include pieces of Southern pine without any ring or wood requirements."

It will be seen that this rule gives a definite and practical means of determining whether a stick of timber is suitable for any given purpose.

Under these two general classes, four grades have been established: (a) No. 1 common, (b) square-edge and sound, (c) merchantable, (d) select structural. Of these four grades, the first three may be either dense or sound pine, while in the select-structural grade only dense pine is permitted.

The various grades are further distinguished by their relative freedom from defects and by the percentage of heart which they contain, as shown briefly in Table I, shows only the main differences. For details the specification should be consulted.

It should be noted that the word "timber," as herein used, refers to the larger sticks suitable for use as

industry in itself, material is thoroughly covered by the specifications of the M. C. B. Association, which were adopted also in 1915 by the Southern Pine Association. The chief divisions and sub-division are as below:

(a) "B and better"	{ Siding Lining Roofing	(b) Select	{ Siding Lining Roofing
(c) No. 1 common	{ Siding Lining Roofing	(d) All heart	{ Decking Flooring
(e) Heart face	{ Decking Flooring	(f) No. 1 common	{ Decking Flooring
(g) No. 1 common heart	{ Sills Framing	(h) No. 1 common	{ Sills Framing

"B and better" is a grade which admits certain slight defects which are noted in detail in the specification.

"Select" comprises the culls from "B and better," which do not have defects beyond certain ones as specified.

"No. 1 common," siding, etc., is a still lower grade, which is intended to be worked from fencing stock.

"All heart" admits certain small defects, and is required to be all heart on both sides and both edges.

"Heart face" admits the same defects as "all heart," but only requires that the face side of the piece shall be all heart.

"No. 1 common," decking and flooring, is a lower grade without heart requirements.

"No. 1 common heart," sills and framing, is "square-edge and sound" pine, admitting certain small defects, but requiring that "measurement of the girth at any point throughout the length of the piece must show at least 75 per cent heart wood."

"No. 1 common," sills and framing, is a lower grade without heart requirements.

The foregoing list of grades has been given in order to indicate how thoroughly the matter is covered by existing standard specifications, so that any desired quality may be obtained by ordering by name. This is preferable to attempting to formulate a list of qualities which possibly would not clearly define that grade and might force the mill to supply a grade better than necessary for the matter in hand, and the excess cost of which the user would, of course, pay.

Some idea of the importance of these points may be obtained from the statement that "No. 1 common" costs only about 70 per cent as much as "B and better."

TABLE I—GRADES OF YELLOW PINE TIMBER

	Dense or Sound	Sap Wood	Wane	Knots	Shakes, Etc.	Heart
No. 1 common timbers	D or S	Any amount	1½ in. one corner, ½ length, etc.	Sound and pith of various sizes	Shakes ½ length of piece, etc.	.....
Square edge and sound	D or S	Any amount	Free	Free from injurious shakes and knots	Free from injurious shakes and knots	.....
Merchantable	D or S	.....	Not to exceed ⅓ of face and ¼ length on one corner	Free from injurious shakes and knots	Under 9 in., ⅓ or more	.....
Select structural	D	See specifications	.....	.....	.....	85 per cent heart, girth measurement

beams, columns, etc. The word "lumber" applies to the smaller pieces cut from the large timbers and designed for use in boards of one variety or another, or small-dimension pieces such as ordinary floor beams, joists, scantlings, etc.

For ordinary building lumber there are various grades, based on their use, such as those for finishing, siding, flooring, ceiling, facing, dimension and heavy joists, etc., each of which is as a general thing divided into subgrades.

For freight cars, the building of which is a large

The division of the lumber into various grades as above noted is determined "by the number, character, position and location of the defects visible in any piece." It is to be noted, however, that the admissible defects are not intended to represent the average lot, but simply "the coarsest pieces such grades may contain." The application of any specification should be tempered with judgment and common sense, and the grading rules very rightly contain this word of caution: "No arbitrary rules for the inspection of lumber can be maintained with satisfaction. The variations from any given rule

are numerous and suggested by practical common sense, so that nothing more definite than the general features of different grades should be attempted by rules of inspection."

In order to avoid waste, the designer should select as nearly as possible those dimensions which can be obtained from stock sizes, and he should therefore familiarize himself with these dimensions, including thickness, width and length.

**THE STRENGTH OF YELLOW PINE TIMBER**

United States Forestry Division tests in cross-bending of dense yellow pine weighing 38 lb. per cubic foot, show the following results:

Characteristic	Lb. per Sq.In.
Ultimate strength.....	12,600
Yield point.....	10,000
Crushing end wise.....	8,000
Crushing across the grain at 3 per cent deformation.....	1,260
Shearing along the grain.....	835

The safe unit stresses at 18 per cent moisture, as recommended in Bulletin No. 12 of the Forestry Division, are as follows: Modulus of strength at rupture, 1,550 lb. per square inch; crushing strength end-wise, 1,000 lb.; crushing strength across grain, 215 lb. It is to be noted that no mention is made of the tensile strength, as the timber will always fail in some other way, usually by shearing. The crushing strength across the grain is based upon a crushing of three per cent of the cross-sectional height of the piece.

*Distribution of Lumber in Freight Car.*—For the average car, a fair distribution for Southern pine would be as follows: Sills, dense Southern pine; plates and stringers, square-edge and sound grade; framing, square-edge and sound or No. 1 common; siding, B and better; lining, No. 1 common; roofing, No. 1 common, and flooring, No. 1 common.

**NOTES REGARDING OTHER WOODS**

*Douglas Fir.*—The increasing scarcity of high-grade yellow pine has brought more into general use what is commonly called "fir." This is in reality the Douglas spruce which grows in Oregon and other western states. It is about the weight of short-leaf yellow pine and has a strength between that of the latter and long-leaf yellow pine. Different varieties are red, yellow and silver fir. Existing standard specifications are those of the West Coast Lumber Manufacturers' Association. The divisions of car material are as follows:

- |  |               |
|--|---------------|
| (a) No. 2 clear and better "V. G." (vertical grain)                  | } Car siding, |
| (b) No. 2 clear and better "F. G." (flat grain)                      |               |
| (c) No. 2 clear and better mill run as to grain                      |               |
| (d) No. 3 clear—box car lining, etc.                                 |               |
| (e) No. 2 clear and better "V. G."—car decking, etc.                 |               |
| (f) No. 2 clear and better "F. G."—car decking, etc.                 |               |
| (g) Select common decking, a lower grade with no grain requirements. |               |
| (h) No. 1 common decking, a lower grade with no grain requirements.  |               |
| (i) Select common—car sills, framing, etc.                           |               |
| (j) No. 1 common—car sills, framing, etc. (lower grade).             |               |

*Oak.*—In passenger-car construction, until recently, the end sills, buffer timbers and main cross bearers were usually of oak, as for these members it is desirable to have a material which is strong and stiff, and furthermore one of a hard and tough nature which will form a secure foundation for parts which are bolted thereto, such as draft-rigging, etc. This is necessary to prevent the occurrence of elongated holes which may be caused in members having bolted to them parts

which are subject to heavy strains and shocks. As the pieces are short, as a general rule, and of not excessive section, oak lent itself very favorably for such purposes. At the present time, however, it is practically impossible to obtain oak for these purposes, and for this reason, where metal draft sills, etc., are not used, recourse is had to yellow pine or fir.

The chief varieties are "white" and "red," the white being the better, as it is stronger, tougher and less porous than the red.

Safe unit stresses for white oak with 18 per cent moisture, as given by the Forestry Division, are: Modulus of strength at rupture, 12,000 lb. per square inch; crushing strength end-wise, based on crushing of 3 per cent of height, 800 lb.; crushing strength across grain, 400 lb.

*Ash.*—For window posts, carlines and other minor framing parts of small cross-section, and to a certain extent for finish, ash was commonly used. It is tough grain, but this also is practically out of the market.

*White wood.*—For panels and the like, white wood, so called, is commonly used. It is also known as yellow poplar, although its correct name is tulip wood.

*Maple.*—Where an exceedingly hard, close-grained, long-wearing surface is desired, such as in passenger car floors, or the so-called "mat strips" used on top of floors, maple is the most satisfactory material.

**DURABILITY OF WOODS**

The durability of woods depends largely on climatic conditions, and the protection of the piece from the weather. Good long-leaf yellow pine, in passenger-car sills, where protected by sheathing, has been known to last for thirty years or more without any apparent impairment of strength. Some attempt has been made to give car timbers a preservative treatment of creosote, but for ordinary purposes this does not seem to be necessary, and entails considerable hardship in the handling of the material in the mill.

**CONCLUSION**

In conclusion the writer would emphasize the facts that existing standard specifications cover the field of structural lumber materials very well, and that any desired quality can be obtained by selection of the proper standard grade. Furthermore, by exercise of judgment a grade may be picked out that will be entirely satisfactory and reasonably priced, whereas an attempt to specify this and that quality may prove a hardship to the manufacturer and expensive to the purchaser.

**Welfare Work of Engineering Council**

A conference of the Engineering Council with the governing bodies of its member societies was held in New York on Jan. 23. At this meeting it was resolved that the amount contributed for Engineering Council by each founder society is to be \$5,000 for 1920 in place of \$3,000 now provided, and that the A. S. T. M. will contribute \$1,000 instead of \$600. It was also resolved that, subject to the discretion of the governing boards of the societies represented, they should issue appeals to their members for contributions of \$2 each in all grades except juniors and student members for the support of Engineering Council so as to enable it to continue its public welfare work for engineers. The next conference will be held in Chicago on April 20.

# Renewing Railway Crossings and Special Work

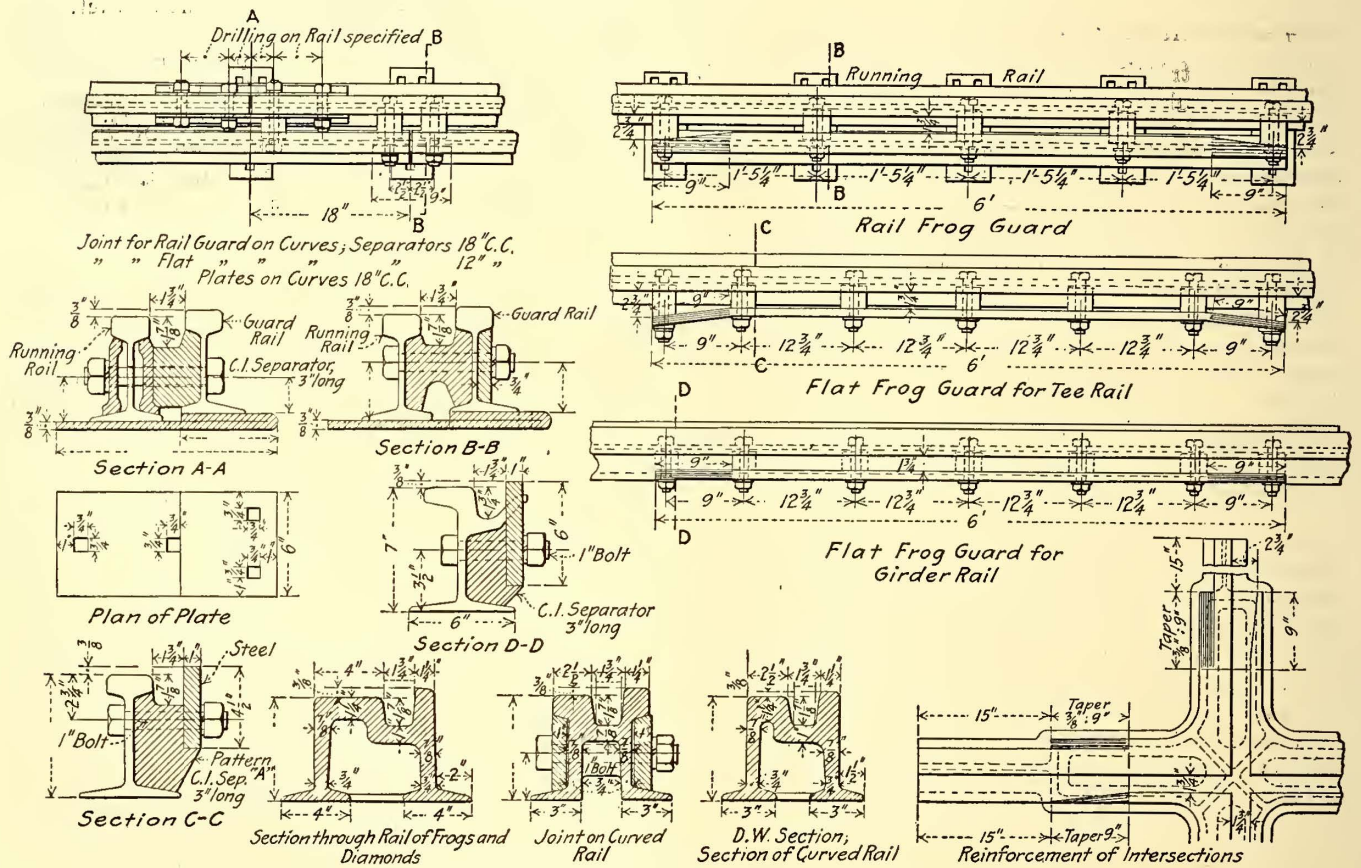
The Experience of the Pacific Electric Railway, Los Angeles, Cal., in Maintaining Many Railway Crossings, Cross-overs and Special Work Layouts on Its Lines Is Described

By CLIFFORD A. ELLIOTT

Cost Engineer Pacific Electric Railway, Los Angeles, Cal.

SINCE the year 1908 the practice of the Pacific Electric Railway has been to use 6-in. 72-lb. T-rail, Lorain Steel Company's section No. 331, for all special work required with similar section T-rails in paved streets, and to use a 7-in. 91-lb. T-rail, Pennsylvania Steel Company's section No. 382, for special work where 7-in. 127-lb. grooved girder rail, Pennsylvania

On this same line there are several curves constructed of 7-in. 127-lb. grooved girder rails, not of the manganese type. There have also been in service since the year 1911 several large solid manganese special-work layouts on another line where traffic is very heavy. As many as 1,200 trains per day have passed over this special work, the cars being principally of a large heavy



MANGANESE STEEL SPECIAL WORK CONSTRUCTION

Steel Company's section No. 404, is used. The connections at the ends are made with taper rails, or cast-steel compromise joints.

The 6-in. 72-lb. T-rail and 7-in. 91-lb. T-rail for special work in paved streets are used only where traffic does not justify the expense of solid manganese construction. Where manganese construction is used, all ends are shaped to conform to the abutting rail ends and connections are made with continuous joints.

Since 1913 the company has had some 7-in. 91-lb. T-rail solid manganese curves in service for certain curved connections on its Los Angeles city lines. This type of construction is giving excellent results. These curves are very sharp, located where traffic is congested, and, due to the short radius, are provided with guards.

interurban type. These curves are constructed of 7-in. and 7 1/2-in. solid manganese rail, and the leads on the straightaway portion are of rolled manganese rail. These layouts, after eight years' service, are still in good condition. A large number of the company's crossings in Los Angeles are of combination gage type to provide for both the Pacific Electric Company's cars having standard gage and those of the Los Angeles Railway with 3 ft. 6 in. gage.

In providing guard rail for curves of 150 ft. radius or less, all work is performed at the time of fabrication in the company's shop. On curves of larger radius the curving and fitting is done in the field. Where light equipment only is operated, 1-in. x 4 1/2-in. flat steel guard rail is used, with cast-iron separators spaced



12 in. center to center and with 7/8-in. x 6-in. or 1-in. x 6-in. machine bolts. Where heavy equipment is operated rail guards of the same section as the running rail are used, and separators are spaced 18 in. center to center.

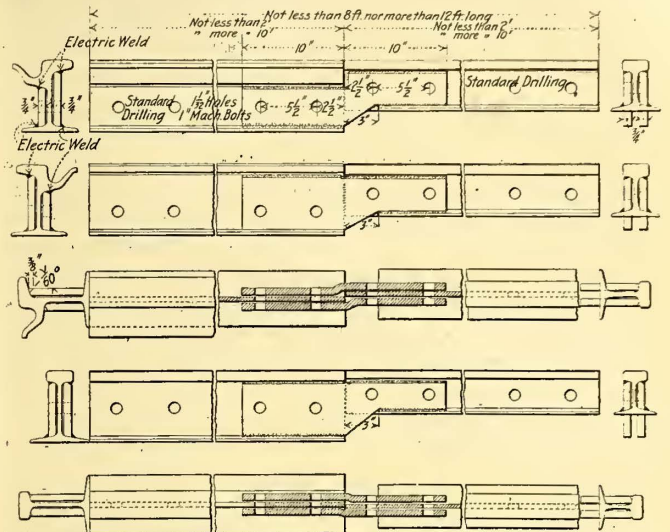
The use of grooved girder rails for track special work is not favored here, as it is not considered economical. It is possible, however, to use a grooved girder guard rail to advantage for single rail crossings, but a crossing of this type is too light for the heavy class of equipment operated by this company. Therefore, to obtain satisfactory results the company is obliged to use double- or three-rail construction. This consists of T-rails for the riser, running and guard rails with heavy steel base plates. Heat-treated machine bolts of 1 1/2-in. diameter are used.

The steel base plates are ordered either from the mills or are made up in the company's shop after the crossing arrives. Two convenient sizes used are 1/2 in. x 10 in. x 24 in. and 3/4 in. x 18 in. x 18 in. Plates of the former size weigh 34 lb., and those of the latter size 69 lb. These steel plates are inserted under all four corners of each unit of the crossing.

Where the company's own design of taper rail is used, it is built up in the field by the use of a portable arc-welding machine. Extra metal for reinforcement is added at the point where the heavier section of rails join the lighter section. The freight equipment of the Pacific Electric Railway is all M. C. B. standard and its interurban passenger and express cars weigh from 60,000 to 107,000 lb. without load. The electric locomotives of the company weigh from 60,000 to 132,000 lb., and freight trains having from five to forty loaded cars of 100,000 lb. capacity are operated with these locomotives. Steam roads on the Pacific Coast lines are operating some of their heaviest engines and equipment

straight track so as to be clear of crossings and special work and to permit of convenient maintenance.

All bolts, after thoroughly tightening, are welded at the point of the toe of the bolt and the nut. This practice insures a rigid construction and lessens track-bolt-tightening maintenance at least 50 per cent. Rock



STANDARD TYPE OF TAPER-RAILS

ballast thoroughly tamped is placed 8 in. to 12 in. beneath the base of timbers of crossings and in and about the timbers flush with their top. The use of concrete foundation beneath railway crossing timbers in city paved streets to guard against water pockets is not practiced, due to the great expense involved and the lack of desired resilience for the special work.

Redwood or treated pine timber 8 in. by 10 in. is used for light traffic crossings, and 10 in. by 12 in.

RENEWALS AND LIFE OF SEVERAL TYPES OF CROSSING

Types of Crossing	— Number of Renewals —		Life Based on Actual Service
	Street Railway Line	Interurban Line with Steam Road	
Manganese steel center.....	4	1	Four street railway crossings had average life of 4 1/2 years. One interurban with steam road crossing had life of eight years.
Rolled manganese running rail in steam road portion only.....	8	..	Five crossings—average life five years. Three crossings still in service after seven years' use.
Cast manganese running rail.....	..	1	
Shop built ordinary steel rail.....	7	38	Twenty-eight interurban with steam road, average life four years. Some interurban with branch steam road with but two trains per day have life of seven years. Crossings on main steam road lines have but one year average life. Four street railway crossings have average life of 6 1/2 years. One street railway crossing has average life of nine years. One street railway crossing has average life of one year.
Shop built titanium treated rail.....	..	2	
Hard center built up.....	15	2	Fifteen street railway crossings—average 5.4 years. One crossing maximum life ten years. One crossing minimum life two years. Two interurban with steam road—average life 7 1/2 years.
Solid manganese.....	18	29	Nine interurban with steam line—average life four years. One crossing with maximum life of eight years. One crossing with minimum life of one year. Thirteen street railways with interurban—average life seven years. One crossing with maximum life of eight years. One crossing with minimum life of six years. Five street railways with interurban—average life eight years.
Anvil face—manganese corners.....	..	1	
Manganese double-web type.....	1	..	
Bound Balkwill patent type.....	..	3	
Cobb shockless patent type.....	1	..	

over these lines. It has therefore been the policy of the Pacific Electric Railway to give extensive study to the type of special work in its tracks. The tendency in recent years is toward the use of a heavier type of crossing and special work than was previously used. The depth of crossings and special work layouts is 7 in. and compromise joints are carried well out into the

redwood timber for heavy traffic crossings. During the period from 1908 to 1919 approximately 131 important crossings were renewed on this system. Fifty-four of these crossings are on street railway lines, while seventy-seven are crossings of interurban lines with steam road lines.

The figures for average life given in the accom-

panying table apply only generally, but for the same type of crossing and equal traffic conditions the average life of a shop-built crossing for a street railway line is four years, while that of the solid manganese type is eight years. Due to the distance of Eastern manufacturers from the Pacific Coast and the high freight rates prevalent, the material cost of solid manganese crossings is double that of a crossing fabricated in the company's own shop. The company's engineering department has a most efficient organization with ample equipment to repair most of its special work by electric arc welding. But if we consider that from six to nine months are required to secure the solid manganese crossing for replacement, our experience shows that considerable expense and difficulty result from trying to keep the old shop-built crossing in service before the improved type of crossing arrives from the East and is in place. In the majority of instances, when a crossing fails it is generally as a whole, and while the failure of one arm of the crossing may permit its individual replacement with an emergency repair part that can be provided by the company's shop within a week's time, yet this renewal can only be considered temporary until permanent relief is obtained by complete renewal.

With a solid manganese crossing, failure occurs only when the metal chips off in certain portions, when the arms show evidence of being battered down or when fissures occur in the corner. These minor failures are easily built up by arc welding at minimum expense. The life of the crossing is thus prolonged for a year to eighteen months, which allows ample time for securing a new crossing of the same type for replacing.

Our experience indicates that the use of solid manganese material is economy. This conclusion is based on first cost and maintenance of main line crossings located in paved streets or where the track is curved and the uncovering and replacing of the surface for repairs and renewals is an important factor. The yearly saving, with allowance made for interest on additional investment, maintenance and depreciation, amounts to from 25 to 50 per cent. In open track, where traffic is heavy, the average yearly cost of manganese material compares favorably with other types, and its use involves less frequent interruptions to the service for the making of renewals and repairs.

Manganese inserts for special work have not proved entirely satisfactory to the Pacific Electric Railway. Most of the company's manganese layouts are of solid construction with double-web design. The company has also obtained good results from a type of manganese construction known as "rail-bound manganese," where manganese is placed only at the wearing part, resting on  $\frac{3}{4}$ -in. steel bases and securely bolted to the rail.

The New York local council of the National Safety Council will organize and conduct schools for safety supervisors and foremen, workmen's mass meetings and conferences for industrial executives. The promotion of public safety, school safety and educational safety will be a distinct service of the Safety Institute in that city and will be carried on in the Metropolitan District under the direction of the Institute, the National Safety Council co-operating. The Safety Institute will soon be moved to the arsenal building in Central Park, which is being remodeled to provide accommodations for the various schools of the Council.

## The Burning of Pulverized Fuel

**J**OLTS may not be pleasant to take, but their after effects sometimes have value. The war and its aftermath of labor and other troubles have given us quite a few hearty knocks which among other things have had a tendency to set us thinking along new lines. For example, before the recent fuel shortage, a great many power plant men had about arrived at the conclusion that the ultimate solution of the problem of extracting B.t.u. from coal and putting them into steam had been found in the modern stoker-fired boiler furnace. Since the fuel shortage of a couple of years ago, however, much thought has been expended on the possibilities afforded by other fuels and on the burning of the fuels now in use more effectively. In this connection some attention has been given to the use of pulverized coal, and an article in a recent issue of the official organ of the American Society of Mechanical Engineers, sums up in an interesting way the possibilities of this fuel. The committee on power generation of the American Electric Railway Engineering Association is very properly going into the subject in some detail this year.

Researches made by the United States Bureau of Mines some years ago showed that coal dust mixed with air in proper proportions is highly explosive. The burning of pulverized coal, therefore, is very much like the burning of gas or oil. The coal, reduced to a fine powder, so fine in fact that 85 per cent of it will pass through a 200-mesh screen, is blown by air pressure into the furnace where combustion takes place very much the same as in a gas jet.

The advantages claimed for the burning of coal in this manner are several. In the first place all of the combustible portion of the fuel is said to be burned. Secondly, it appears that all grades of coal, including peat and lignite, can be burned with approximately the same efficiency. As a matter of fact the low-grade fuels are in some respects superior to the higher grade ones since the effect of impurities to lower the furnace temperatures which with good fuel are high. Again, a pulverized coal fire like one fed from gas or oil admits of ready control. This feature is a matter of major importance in electric power station service where the demand on the boiler is likely to be subject to severe fluctuations.

As a combustion of pulverized bituminous coal may give furnace temperatures in excess of 4,000 deg. F. it is not hard to imagine that furnace operating and design problems abound. Other limitations of this method of burning coal are found in the operation and maintenance of the pulverizer and other accessory equipment in the fact that the ash resulting from combustion is sometimes difficult to collect.

In the matter of over-all efficiency, test records show that for a wide range of boiler types and sizes the efficiencies range from 75 to 80 per cent. In other words, while the efficiency of a small pulverized-coal-fired boiler is likely to be on a par with that of a large well-designed stoker-fired unit, the efficiency of large units is not greatly superior to that of stoker-fired units. Pulverized-coal-fired boilers will find a place in the electric power station due to their superior flexibility of control and their ability to use poor fuel rather than because of their higher efficiencies. While the development of this type of boiler furnace is in its infancy the results so far secured are so promising that power station men should keep in close touch its future

# Why Electrification Is an Economic Necessity\*

## High Load Factor, Fuel Economy and Service Capacity of Electric Locomotive Equipment Are Salient Factors in Making Reasonably Rapid Replacement of Steam Locomotives an Economic Necessity

By A. H. ARMSTRONG

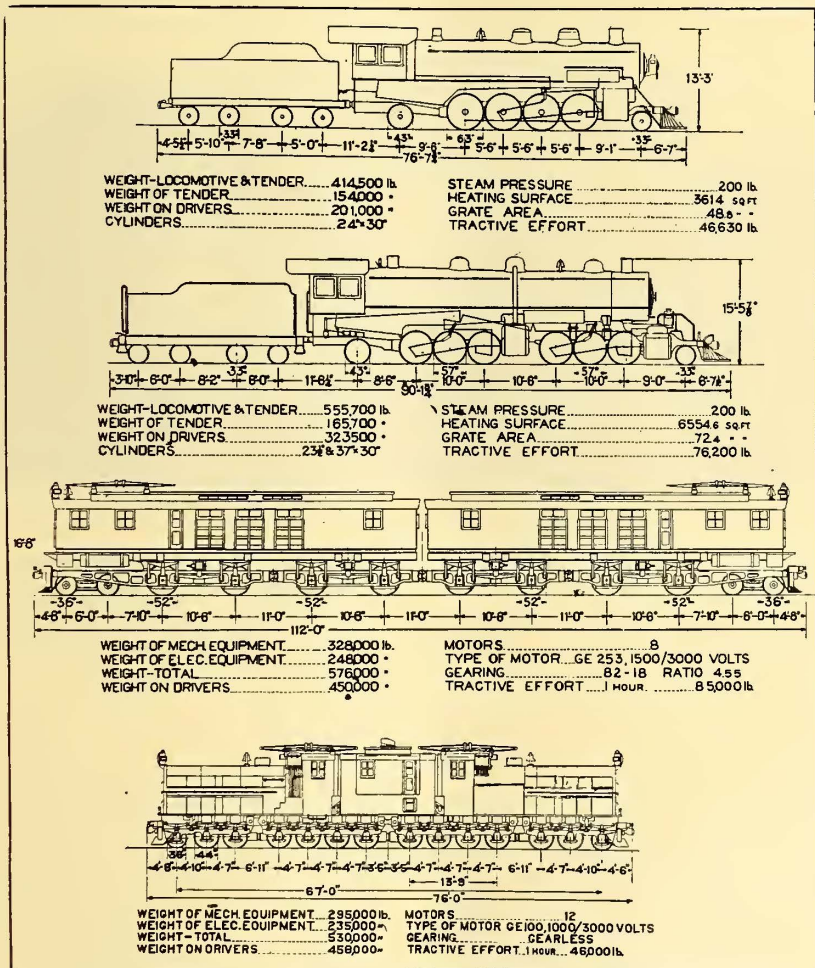
Chairman electrification committee, General Electric Company, Schenectady, N. Y.

**A**MONG the many lessons brought home to us during the war period, not the least was that there is something inherently wrong with our steam railroads. During the three generations of the development of the steam engine we have become accustomed to look upon it as properly belonging to the railway picture, and but little thought has been given to its wastefulness and limitations, around which railway practice of today has gradually crystallized. During the winter of 1917 and 1918, our railways fell down badly when the need was the greatest in our history. It is true that the cold-weather conditions were unprecedented and the volume of traffic abnormal, but the weaknesses of steam engine haulage were disclosed in a most startling and disastrous manner. In marked contrast to the joining steam engine division, the 440-mile electrified section of the Chicago, Milwaukee & St. Paul Railway continued to do business as usual all through that trying winter. The electric locomotives brought both freight and passenger trains over the electrified tracks in schedule time or better; in fact, it was quite customary to make up on the 440-mile electric run fully two hours of the time lost by passenger trains on adjoining steam-engine divisions. Other electrified roads contributed similarly attractive records.

The reliability and permanency of the comparison between steam and electric locomotive haulages is suf-

ficiently guaranteed, therefore, by the results of several years of operation to justify the drawing of certain conclusions regarding the merits of the two types of motive power. The following analysis of the railway situation is offered for the purpose of exposing the fact that railroading today is in reality steam engine railroading, and the general introduction of the electric locomotive will permit fundamental and far-reaching

changes in the method and cost of hauling freight and passenger trains. The writer is not proposing the immediate electrification of all the railways in the United States, as many roads of lean tonnage would produce no adequate return upon the large capital investment required. The accompanying table of total operating statistics (See Table I) is offered simply as a measure of the magnitude of the problem confronting us in the future. In this country we have already installed electric power stations, during the past thirty years, equal to twice the estimated capacity required for the electrical operation of every mile of track in the country today. Refer-



PRINCIPAL TYPES OF STEAM AND ELECTRIC LOCOMOTIVES USED ON THE CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY

ring to Table I, on page 374, it will be noted that this gives a sub-division of the tonnage passing over the tracks of our electric railways.

The first four items in Table I, representing 85.56 per cent of the total ton-miles made during the year 1918, may be regarded as fundamentally common to both steam and electric operation. The last four items, however, are seriously affected by introducing the electric locomotive to the extent of completely eliminating items

\*Abstract of paper read before the Schenectady section of the American Institute of Electrical Engineers, Feb. 20, 1920.

TABLE I—TOTAL TON-MILE MOVEMENT FOR ALL RAILWAYS IN UNITED STATES, 1918

Items	Per Cent	Ton-miles, Millions
1 Miscellaneous freight cars and contents	42.3	515,000
2 Revenue coal cars and contents	16.23	197,000
3 Locomotive revenue driver, weight only	10.90	132,300
4 Passenger cars, all classes	16.13	196,000
<hr/>		
Total revenue, freight and passenger	85.56	1,040,300
5 Railway coal	5.00	60,600
6 Tenders, all classes	6.50	78,800
7 Locomotive railway coal	2.39	4,700
8 Locomotive non-driving weight	2.55	31,000
<hr/>		
Total non-revenue	14.44	175,100
Grand total, all classes	100	1,215,400

6 and 7, reducing item 5 by possibly 80 per cent and item 8 by one half. Of the total of 14.44 per cent affected, therefore, it may be assumed for purposes of comparison that approximately 12 per cent, or 146,000,000 ton-miles, at present hauled by steam engines over our roads, will be totally eliminated with electric locomotive haulage. This ton-mileage eliminated is equal to over 20 per cent of items 1 and 2, representing the revenue-producing freight traffic on our railways. In other words, if all of our railways were completely electrified they could carry one fifth more revenue-pro-

TABLE II—RAILWAY FUEL, 1918

Total coal production, all grades, tons	678,211,000
Used by steam railways, tons	163,000,000
Percentage of total	24
Total oil marketed in United States, barrels	355,927,000
Used by steam railways, barrels	45,700,000
Percentage of total	5.8
Cost equivalent of oil at 3½ bbl. to the ton, tons	13,000,000
Total equivalent railway coal, tons	176,000,000

will point out some features of this extreme wastefulness which are inseparable from steam engine operation.

During 1910 exhaustive tests were made upon the Rocky Mountain Division of the Chicago, Milwaukee & St. Paul Railway to determine the relation existing between horse-power-hours of work done in moving trains and coal and water consumed on the steam engines in service. Table III gives the results of these tests.

These records were obtained during the portion of the runs on which the engines were doing useful work in overcoming train and grade resistance; that is, all stand by losses were excluded. The through run, however, included such losses in the magnitudes shown in Table IV.

Adding standby losses to the average of 7.86 lb. per



THE GRAND CENTRAL TERMINAL AREA, IN NEW YORK CITY, AS IT APPEARS TODAY

ducing freight tonnage with no change in present operating expenses or track congestion.

The greater part of the tonnage reduction effected by electrification is included in items 5 and 6, representing the railway coal movement in cars and engine tenders. The steam engine tender will, of course, entirely disappear, while the railway coal haulage will be largely curtailed by utilization of water as a source of power and the establishment of steam power houses as near the coal mines as an abundant supply of good condensing water and load demand will permit. While water power should be utilized to the fullest economical extent, the greater portion of the railway power must undoubtedly be supplied by coal, due to the unequal geographical distribution of water power available.

**STATIONARY POWER PLANT IS MOST ECONOMICAL**

Even with coal as the source of power, it may not be fully appreciated just how enormous is the saving made by burning fuel in large modern power stations under the most efficient conditions possible, instead of under the boilers of 63,000 engines, which by necessity must be designed and operated for service rather than for fuel economy. During the year 1918 the fuel used by railways is reported as in Table II.

A quarter of all the coal mined in the United States is consumed on our railways and the following analysis

horsepower shown by the preceding eight tests, the total actual coal consumed under the engine boiler in twenty-four hours divided by the actual work performed by the engine was found to be 10.18 lb. per horsepower at the driver rims.

**STEAM LOCOMOTIVE STANDBY LOSSES ARE HIGH**

As the result of this particular series of tests it was determined that standby losses raised the coal consumption during the useful work period by 30 per cent. It

TABLE III—COAL AND WATER USED ON ROCKY MOUNTAIN DIVISION C. M. & ST. P. RY.

	Pounds of Water per Horse-power Hour	Pounds of Water per Pound of Coal	Pounds of Coal per Horsepower Hour
Three Forks-Piedmont	39.6	5.08	7.75
Piedmont-Donald	35.4	4.70	7.54
Deer Lodge-Butte	39.7	4.85	8.31
Butte-Donald	40.4	4.86	8.74
Harlowton-Jenny	38.0	4.09	8.90
Jenny-Summit	44.2	4.65	9.48
Three Forks-Piedmont	41.4	6.51	6.37
Piedmont-Donald	40.2	5.63	5.78
Average of eight tests	39.86	5.04	7.86

TABLE IV—STANDBY LOSSES IN ST. PAUL STEAM LOCOMOTIVES

	Coal per Hour, Pounds
Fire banked in roundhouse	150
Cleaning fires for starting	800
Coasting down grade	950
Standing on passing track	500

TABLE V—COAL EQUIVALENT PER KILOWATT-HOUR, STEAM OPERATION

Coal per horsepower-hour at driver rims, pounds	10.27
Coal per kilowatt-hour at driver rims, pounds	13.75
Coal per kilowatt-hour at power supply on basis 55 per cent efficiency, pounds	7.56

TABLE VIII—ESTIMATED COAL REQUIREMENT FOR ALL RAILROADS, 1918

Total ton-miles	1,215,400,000,000
Watt-hours per ton-mile	40
Kilowatt-hours total movement	48,700,000,000
Coal required at 7 lb. per kilowatt-hour, tons	170,000,000

TABLE VI—ANALYSIS OF ROUND-UP COAL USED BY BUTTE, ANACONDA & PACIFIC RAILWAY

Fixed carbon, per cent	49.26
Volatile carbon, per cent	38.12
Ash, per cent	7.74
Moisture, per cent	4.88
B.t.u.	11,899

TABLE IX—COAL SAVING BY ELECTRIFICATION

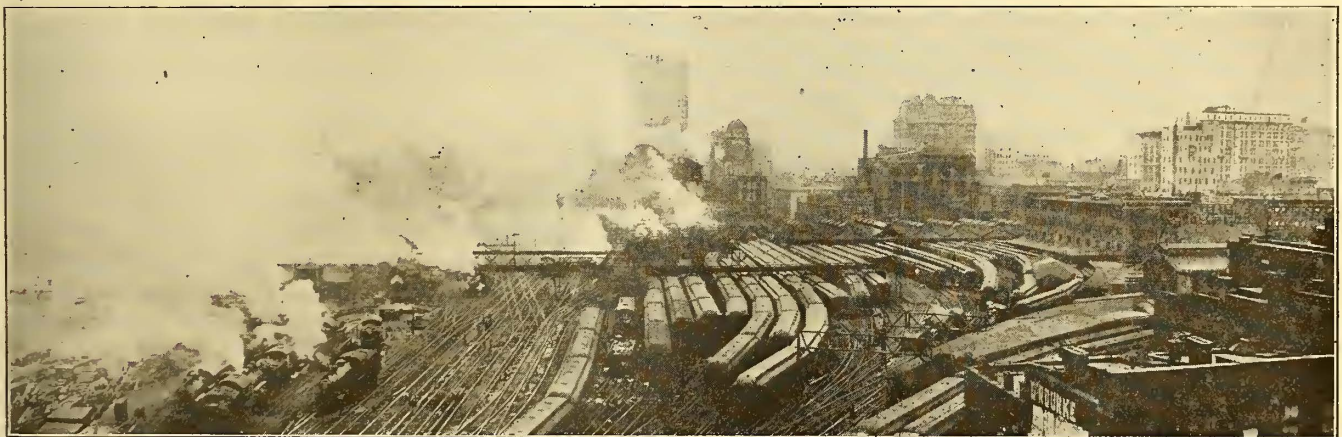
Total ton-miles, steam	1,215,400,000,000
Reduction by electrification	146,000,000,000
Total ton-miles electric	1,069,400,000,000
Kilowatt-hours, electric, at 40 watts	42,776,000,000
Coal on basis 2 1/2 lb. per kilowatt-hour, tons	53,500,000
Equivalent railway coal, 1918, tons	176,000,000
Saving by electrification, tons	122,500,000

should be appreciated in this connection, moreover, that this value was obtained on through runs with no yard switching service or adverse climatic conditions. It may be concluded therefore that under all conditions of service fully one third the coal burned on our steam engines today is absolutely wasted in standby losses of the general nature indicated above.

Supplementing these tests, a 30-day record was kept of all coal used on the entire Rocky Mountain Division, and the total engine, tender and train movement was reduced to horsepower-hours. The resulting value was

engines to equal the same service now performed by 1 kw.-hr. input at the substations, a figure comparing favorably with the 7.56 lb. arrived at above by an entirely different method.

Making due allowance for the fact that round-up coal is somewhat low in heat units, it is nevertheless within the limits of reasonable accuracy to assume that the steam engines operating over all of our railways are consuming coal at a rate closely approximating 12.75 lb. per kilowatt-hour of useful work done, as measured at the driver rims, or 7 lb. per kilowatt-hour as measured



THE TERMINAL PRESENTED A DIFFERENT APPEARANCE BEFORE ELECTRIFICATION (View from same point as opposite picture)

10.53 lb. of coal consumed per horsepower-hour at the driver rims. Both of the above values were based upon constants of 6 lb. per ton train resistance at all speeds and 0.7 lb. per ton per degree of curvature as determined in part by dynamometer car tests and as representative of general railway operation. Reducing the average coal values of test runs and 30-day record per horsepower-hour to electrical constants we arrive at the values in Table V.

It is this last figure of 7.56 lb. of coal burned on steam engines to get the equivalent tonnage movement of 1 kw.-hr. delivered from an electric power station that is of special interest to this discussion. A comparison of the coal and electrical records on the Butte, Anaconda & Pacific Railway before and after electrification shows a value of 7.17 lb. of coal previously burned on the steam

at a power station and including for convenience of comparison the transmission and conversion losses inherent to electrical operation.

A kilowatt-hour of energy can be produced for so much less coal expenditure than 7 lb. that we are now in position finally to forecast the approximate extent of the coal economy that would result from electrification.

All power values are given at the point of supply from the Montana Power Company at 100,000 volts and include deductions made for the return of power due to regenerative braking of the electric locomotives on down grades and amounting to approximately 14 per cent of the total. Owing to the excessive rise and fall of the profile of the electrified zone of the Chicago, Milwaukee & St. Paul Railway, its operation is materially benefited by regenerative electric braking and the value of 33.2 watt-hours per ton mile for combined freight and passenger movement should possibly be raised to the round figure of 40 to make it apply more nearly to conditions universally obtaining on more regular profiles.

Hence referring again to the ton-mile values of Table I we have the values of Table VIII.

The actual equivalent coal consumed on our steam railways for the year 1918 is given as 176,000,000 tons, closely approximating the figure of 170,000,000 tons estimated above from the operating results obtained on the Chicago, Milwaukee & St. Paul electrified zone.

TABLE VII—RELATION BETWEEN KILOWATT-HOURS AND TON-MILES, CHICAGO, MILWAUKEE & ST. PAUL RAILWAY, AVERY-HARLOWTON, 1918

	Passenger	Freight
Average weight of locomotive-tons	300	284
Locomotive-miles, 1918	651,000	1,431,500
Locomotive, ton-miles	195,000,000	407,000,000
Trailing ton-miles	434,406,000	2,903,099,000
Total ton-miles	629,406,000	3,310,049,000
Kilowatt-hours	24,890,000	105,287,000
Watt-hours per ton-mile	39.6	31.9
Ratio locomotive to total, per cent	31	12.3
Watt-hours per ton-mile, combined movement	33.2	
Ratio locomotive total combined movement, per cent	15.25	

These several values check so closely as to justify the completion of the fuel analysis of the railways as shown in Table IX.

The startling conclusion arrived at is that approximately 122,500,000 tons of coal, or more than two-thirds of the coal now burned on our 63,000 steam engines, would have been saved during the year 1918 had the railways of the United States been completely electrified along lines fully tried out and proved successful today. This vast amount of coal is 50 per cent greater than the pre-war exports of England and twice the total amount consumed in France for all its railways and industries. Moreover, the estimate is probably too conservative, as no allowance has been made for the extensive utilization of water power which can be developed to produce power more cheaply than coal in many favored localities.

**CRITICAL FUEL SHORTAGES IN EUROPE ARE FORCING ELECTRIFICATION**

In striking contrast with the picture of fuel waste on the railways in this country is the situation presented in Europe at this writing. For example, faced with a staggering war debt; with two million of its best men

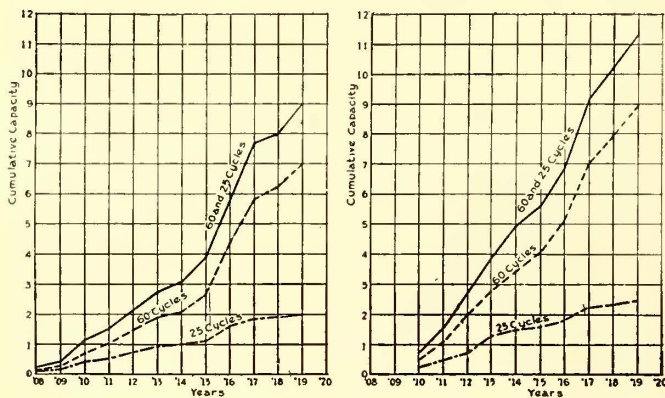


CHART SHOWING THE TENDENCY TOWARD HIGHER FREQUENCY IN POWER GENERATION

gone and an undetermined number incapacitated for hard labor, and with so much reconstruction work to do, France has to contend also with the destruction of half her coal producing capacity. Before the war France imported 23,000,000 tons of the 65,000,000 tons of coal consumed. It is estimated that the full restoration of the coal mines in the Lens region will take ten years to accomplish, which means materially increasing the coal imported into France if pre-war consumption is to be reached, as the relief rendered from the Saar district will not compensate for the loss in productivity of the mines destroyed by the Germans. This situation in part is promptly met by France in the appointment of a commission to study the feasibility of the general electrification of all its railways with special reference to immediate construction in districts adjacent to its three large water power groups, the Alps, the Pyrenees and the Dordoyne or central plateau region.

It is proposed to electrify 5,200 miles of its total of 26,000 miles of railways during a period covering twenty years. If this work is accomplished at a uniform rate of 260 miles a year, it is a modest program if consideration is had of the extreme necessity for the improvement.

In even worse plight is Italy with practically no coal of its own and compelled to import its total supply of 9,000,000 tons. The war has brought home to these countries what it means to be dependent upon imported fuel for their very existence, and both Italy and Switzerland are also going ahead with extensive plans for railway electrification. Contrary to general understanding, the mines of Belgium are not destroyed, but the need of fuel economy is very acute and this country also has broad plans for railway electrification with immediate construction in view.

Recognizing the many advantages of electric operation of its railways, Europe furthermore considers this a most opportune time to start the change, rather than to spend its limited funds in replacing worn out and obsolete steam equipment in kind. Also in marked contrast to the American attitude, is the sympathetic interest and constructive assistance rendered by the governments abroad in regard to the vital matter of rehabilitation of its railway systems. It would not be without precedent if the decade witnessed England and the Continent outstripping this country in the exploitation of another industry which has certainly been more fully developed and perfected in America than elsewhere.

**POWER REQUIREMENTS FOR ELECTRIFICATION ARE NOT FORMIDABLE**

From figures given, the conclusions summarized in Table X are arrived at in the matter of power station capacity required for complete electrification of the railways in the United States.

TABLE X—RAILWAY POWER REQUIRED IN THE UNITED STATES

Kilowatt-hours electric operation, 1918.....	42,776,000,000
Average load, 100 per cent load factor, kilowatts.....	4,875,000
Power station capacity at 50 per cent load factor, kilowatts.....	9,750,000

It appears therefore that approximately 10,000,000 kw. of power station capacity would have been sufficient to operate all of the railroads for 1918, or one half the station capacity which has been constructed during the past thirty years.

TABLE XI—ESTIMATED POWER STATION CAPACITY IN UNITED STATES, 1918

Central stations, kilowatts.....	9,000,000
Electric railways, kilowatts.....	3,000,000
Isolated plants, kilowatts.....	8,000,000
<b>Total, kilowatts.....</b>	<b>20,000,000</b>

In the order of magnitude, therefore, it is not such a formidable problem to consider the matter of power supply for our electrified railways and it becomes evident also that the railway power demand will be secondary to industrial and miscellaneous requirements.

Such being the case, the question of frequency of electric power supply becomes of great importance, if full benefit is to be obtained from extensive interconnected generating and transmission systems, covering the entire country. Indeed with the full development of interconnected power systems supplying both railway and industrial load from the same transmission wires, the above assumption of 50 per cent load factor for the railway load can be materially bettered.

**IMPROVED LOAD FACTOR ON THE ST. PAUL**

In this connection it is interesting to note that a method of limiting the troublesome peak load hitherto considered inherent in railway power supply has been

in successful operation in the Chicago, Milwaukee & St. Paul electrified zone for the past year. With unrestrained peaks, the load factor was approximately 40 per cent, but this low value has been raised to nearly 60 per cent by the installation of the inexpensive and most satisfactory power limiting and indicating apparatus.

TABLE XII—LOAD FACTOR RECORDS, CHICAGO, MILWAUKEE & ST. PAUL RAILWAY, 1919

	Per Cent Duration of Peak	Per Cent Load Factor
April.....	6.4	59.3
May.....	4.6	56.1
June.....	1.6	56.5
July.....	0.7	55.6
August.....	4.1	54.7
September.....	9.5	58.8

The above readings cover the performance on the 220 miles of the Rocky Mountain Division supplied by seven substations controlled as a unit. A load factor of nearly 60 per cent brings the electric railway within the list of desirable customers and makes it possible for power companies to quote attractively low rates for power.

Returning again to the question of power supply, it is instructive to note the general trend toward a higher frequency as evidenced by the turbine and transformer sales of the General Electric Company during the past decade. Sixty cycles is rapidly becoming the standard frequency in America and many instances are of record where it has replaced lower frequencies, principally 25 cycles. This fact in no manner handicaps the future development of electric railways, as entirely satisfactory power can be obtained from 60-cycle transmission lines through either rotary converters or synchronous motor-generator sets, depending upon the direct-current trolley voltage desired.

FREQUENCY IS TENDING TOWARDS STANDARDIZATION

While America apparently has adopted 60 cycles as its standard frequency and can look forward to unlimited interconnection of its large power systems, European practice is evidently crystallizing on 50 cycles. The situation abroad is as yet, however, not clearly defined. In such a small, compact country as Switzerland, for instance, where so much electrical development is taking place, there is much conflict of frequencies. Apparently there is little appreciation of the advantages resulting from interconnected power stations; in fact, the Loetschberg Railway is supplied with power from 15-cycle, water-wheel-driven generators placed in the same power station with 42-cycle units supplying industrial load, while in the same immediate district there is a 50-cycle transmission line and no tie-in frequency-changer sets are as yet installed to interconnect any two frequencies. Power company, power consumer and electrical manufacturer pay heavily for the complication imposed by maintaining three frequencies where only one is needed, and growing appreciation of this fact may lead to the standardization of 50 cycles in

TABLE XIII—POWER SUPPLY FOR LOETSCHBERG RAILWAY, MARCH, 1919

Total for month, kilowatt-hours.....	540,180
Average of six 15-min. peaks, kilowatts.....	3,489
Load factor, 24-hr. basis, per cent.....	20.8

Switzerland and thus swing that country in line with its neighbors and ultimately bring about a more economical ratio of installed generator capacity to average load demand of the country as a whole.

A good example of the necessity for improvement in power distribution conditions in Switzerland is provided in the supply of power to the Loetschberg Railway, as shown in Table XIII.

As the railway was operating for only seventeen hours per day, the load factor during actual operation is somewhat better than 20.8 per cent. On the other hand the actual momentary peak load greatly exceeded 3,489 kw., and this very fluctuating railway load furnishes a good illustration of the need of combining it with other diversified loads, in order to keep down the fixed investment of power station equipment now set aside for this isolated railway load. For example, the 60 per cent load factor of the Chicago, Milwaukee & St. Paul power demand is the ratio of average to momentary peak, while the Loetschberg Railway peak load is determined from six 15-min. peaks with momentary peaks greatly in excess of this figure.

Apparently the adoption of a standard frequency of 50 cycles would meet all general requirements in Switzerland, but would necessitate the installation of frequency-changing substations to meet the demands for 15-cycle single-phase railway power. If the electrified railways are to benefit from the establishment of a common generating and transmission system in Switzerland, the choice of the single-phase railway system might possibly be considered unfortunate viewed in the light of modern development in power economics and the successful adaptation of the less expensive and more flexible direct current motor to high trolley voltages.

From the power-station standpoint, the electrification of our railways admits but one conclusion. We have some 63,000 engines now in operation and their average combined load amounts to approximately 4,000,000 hp. at the driver rims or only an insignificant total of 65 hp. for each engine owned. It is true that owing to shopping and other causes many of these engines are not in active service at all times, still the average 24-hour output of each engine is less than 10 per cent of its rating.

ELECTRIFICATION IMPROVES THE SYSTEM LOAD FACTOR

In the case of the Chicago, Milwaukee & St. Paul electrification, the average load of each individual electric locomotive is only 15 per cent of its continuous rating, but as power is supplied to forty-five electric locomotives from one transmission system, the average combined load factor is raised to nearly 60 per cent, a figure which could even be surpassed on roads of more regular profile. Furthermore, when the railway load is merged with the lighting and industrial power of the district and the whole diversified load is supplied from the same 60-cycle transmission and generating system, it is quite evident that all conditions are favorable for the efficient production of power. In this country such an achievement will probably be governed by the laws of economic return upon the capital required, because our vast natural fuel resources are popularly regarded as inexhaustible, but in European countries there is the compelling spur of stern necessity behind the movement economically to utilize the water powers they possess in place of the coal they cannot get.

While the much discussed subject of power generation and transmission is a very vital part of the railway electrification project, chief interest centers in the electric locomotive itself. Few realize what a truly

wonderful development has taken place in this connection in a comparatively few years and how peculiarly fitted this type of motive power is to meet the requirements of rail transportation. Free from the limitations of the steam boiler and possessing in the electric motor the most efficient and flexible known means of transmitting power to the driving axles, the electric locomotive gives promise of revolutionizing present steam railway practice when its capabilities become fully recognized. The only limits placed upon the speed and hauling capacity of a single locomotive are those imposed by track alignment and standard draft rigging. Only questions of cost and expediency control the size of the locomotive that can be built and operated by one man, as there are no mechanical or electrical limitations that have not been brushed aside by careful development. Just what this means in advancing the art of railroading is not more fully realized than the boldest prophet of twenty years ago could have fully pictured the change that has taken place at the Grand Central Terminal, as the result of replacing steam by electricity.

#### ELECTRIC LOCOMOTIVE HAS UNIQUE OPERATING QUALITIES NOT YET FULLY APPRECIATED

Progress in utilizing the capabilities of the electric locomotive has been slow. It is hard to break away from life-long railway traditions established by costly experience in many cases. In consequence the electric locomotive has thus far simply replaced the steam engine in nearly similar operation. Even under such conditions of only partial fulfillment of its possibilities, the electric locomotive has scored such a signal operating success as to justify giving it the fullest consideration in future railway improvement plans.

On the Chicago, Milwaukee & St. Paul Railway, forty-two locomotives have replaced 112 steam engines and are hauling a greater tonnage with reserve capacity for still more. On this and other roads they have set a new standard for reliability and low cost of operation. In fact, although no official figures have yet been published, it is an open secret that the reductions from previous steam operating expenses on the Chicago, Milwaukee & St. Paul Railway are sufficient to show an attractive return upon the \$12,500,000 expended for the 440 miles of electrification, without deducting the value of the 112 steam engines released for service elsewhere.

Our steam engine construction is unsymmetrical in wheel arrangement and, further handicapped with the addition of a tender to haul its fuel and water supply, must run single-ended. The result has been much congestion at terminals and the necessary roundhouses, always with the inevitable turntable, ashpits and coal and water facilities, have occupied much valuable land. In addition steam operation has greatly depreciated the value of neighboring real estate. The contrast offered by the two large electric terminals in New York City is too apparent to need more than passing comment and similar results may be expected upon the fulfillment of plans for electrifying the Chicago terminals.

While it has been a simple matter to design electric locomotives to run double-ended at the moderate speeds required in freight service, the problem of higher speed attainment, exceeding 60 m.p.h., has presented greater difficulties. The electric motor is, however, so adaptable to the needs of running-gear design that electric

locomotives are now in operation which can meet all the requirements of high speed passenger train running. These results also are obtained with less than 40,000 lb. total weight and 9,500 lb., non-spring-borne or "dead" weight on each driving axle. And finally, but not least, front and rear trucks ride equally well, a success never before achieved in locomotives of such large capacity.

In connection with the riding qualities of electric locomotives, it is of interest to note the following conclusions that a committee of the American Railway Engineering Association, of which Dean F. E. Turneure was chairman, reached in its report of 1917.

From the results of the tests on the electrified section of the Chicago, Milwaukee & St. Paul Railway, the tests made in 1916 on the Norfolk & Western, and the few tests made in 1909 at Schenectady, N. Y., it would appear to be fairly well established that the impact effect from electric locomotives is very much less than from steam locomotives of the usual type. Comparing results obtained in these tests with the results from steam locomotives, it would appear that the impact from electric locomotives on structures exceeding say, 25-ft. span length, is not more than one-third of the impact produced by steam locomotives.

#### ELECTRIC LOCOMOTIVE DESIGN IS FAR FROM STANDARDIZED

There is as yet no general acceptance of a standard design of electric locomotive. Geared side-rod construction for heavy freight service and twin motors geared to a quill for passenger locomotives appear to find favor with the Westinghouse-Baldwin engineers, while the General Electric Company goes in for the simple arrangement of geared axle motors for freight and gearless motors for passenger locomotives. In both Switzerland and Italy the side-rod locomotive enjoys an almost exclusive field. How much of this preference for side-rod construction is due to the restrictions imposed by the use of alternating-current motors is hard to determine, but the facts available indicate the uniformly higher cost of repairs of this more complicated form of mechanical drive both in this country and abroad.

The electric railway situation in Italy is further complicated by the employment of three-phase induction motors, with all the attendant handicaps of double overhead trolleys, low power factor, constant speeds and overheating of motors resulting from operation on ruling gradients with motors in cascade connection. In many respects the non-flexible, three-phase induction motor is poorly adapted to meet the varied requirements of universal electrification, and in consequence Italian engineers are still struggling with the vexing question of system which may, however, be in fair way of settlement through the adoption of a standard of 50 cycles as the frequency of a nation-wide interconnected power supply, thus throwing the preponderance of advantage to high voltage direct current.

The extreme simplicity of the gearless motor locomotive appeals to many, as does its enviable record of low maintenance cost, reliability and high operating efficiency, as exemplified by its unvarying performance in the electrified zone of the New York Central for the past twelve years.

TABLE XIV—MAINTENANCE COSTS—NEW YORK CENTRAL  
ELECTRIC LOCOMOTIVES

	1913	1914	1915	1916	1917	1918
Number of locomotives owned.....	48	62	63	63	73	73
Average weight, tons.....	118	118	118	118	118	118
Cost of repairs per locomotive-mile, cents	4.32	4.03	4.45	3.78	4.01	6.26



The high cost of living did not appear to have reached this favored locomotive until the year 1918.

The records with the Chicago, Milwaukee & St. Paul locomotive are equally remarkable when considered with due regard to their greater weight and the more severe character of the service.

TABLE XV—MAINTENANCE COSTS—CHICAGO, MILWAUKEE & ST. PAUL ELECTRIC LOCOMOTIVES

	1916	1917	1918
Number of locomotives owned.....	20	44	45
Average weight, tons.....	290	290	290
Cost of repairs per locomotive-mile, cents.....	8.21	9.62	10.87

In both of these instances the cost of repairs approaches closely to 3 cents per 100 tons of locomotive weight. Giving due credit to the excellent repair shop service rendered in each case, it is instructive to note that 3 cents per 100 tons maintenance costs of these direct-current locomotives is less than half the figures given for any of the alternating current locomotives operating in the United States or in Europe.

#### THE ELECTRIC LOCOMOTIVE CAN BE DEPENDED UPON

Compared with the cost of repairs of equivalent steam engines, the above figures for electric locomotives are so very favorable as to justify the general statement that electric motive power can be maintained for approximately one-third the cost of steam engines for the same train tonnage handled. As locomotive maintenance is a measure of reliability in service and in a way expresses the number of engine failures, it is quite in keeping with the records available to state also that the electric locomotive has introduced a new standard of reliability that effects material savings in engine and train crew expense as well.

While the first cost of electrification is admittedly high, it may in certain instances be the cheapest way to increase the tonnage-carrying capacity of a single track, especially in mountain districts where construction is most expensive and steam engine operation most severely handicapped. In this connection a comparison of steam and electric operation on the Chicago, Milwaukee & St. Paul may be summarized as follows:

For the same freight tonnage handled over the Rocky Mountain Division, electric operation has effected a reduction of 22½ per cent in the number of trains and 24.5 per cent in the average time per train, and has improved the operating conditions so that nearly 30 per cent more tonnage can be handled by electric operation in about 80 per cent of the time it formerly took to handle the smaller tonnage by steam engines. This means a material increase in capacity of this single-track line, which may be conservatively estimated in the order of at least 50 per cent and probably more. In other words, on this particular road electrification has effected economies which sufficiently justify the capital expenditure incurred and furthermore has postponed for an indefinite period any necessity for constructing a second track through this difficult country.

A careful study of the seriously congested tracks of the Baltimore & Ohio Railroad between Grafton and Cumberland disclosed vitally interesting facts. Company coal movement in coal cars and engine tenders constituted over 11 per cent of the total ton-miles passing over the tracks. In other words, due to the very broken profile of this division, the equivalent of one train in every nine is required to haul the coal burned on the engines. Taking advantage of this fact and the

higher speed and hauling capacity of the electric locomotive and its freedom from delays due to taking on water and fuel, it is estimated that the three tracks now badly congested with present steam-engine tonnage, could carry 80 per cent more freight with electric-locomotive operation. The coal output of the Fairmont District is largely restricted by the congestion of this Division of the Baltimore & Ohio Railroad and it is probable that equal relief with continued steam-engine operation could not be secured without the expenditure of a much larger sum for additional track facilities than would be needed to put electric locomotives upon the present tracks.

Further instances could be cited where the benefits of electrification are badly needed and many of these are coal carrying roads, among which the Virginian Railway stands out conspicuously as a good opportunity to make both a necessary improvement and a sound investment.

Reviewing the progress made in the short period of twenty years, we have seen the steam turbine and electric generator drive the reciprocating engine from the stationary power field. The same replacement is now taking place on our ships, big and small, notwithstanding the fact that the marine reciprocating engine is a very good engine indeed, and operates under the ideal conditions of a steady load and constant speed. And now the steam locomotive must in turn give way to the electric motor for the same good reasons that the reciprocating steam locomotive has become obsolete and fails to respond to our advancing needs. Electrification affords a cheaper and better means of securing increased track capacity and improved service than laying more rails and continuing the operation of still more steam engines in the same old wasteful way.

To conclude the startling picture of our present railway inefficiency, we are today wasting enough fuel on our steam engines to pay interest charges on the cost of completely electrifying all the railways in the United States—fuel that Europe stands in sad need of, and which England and Germany, the pre-war coal exporting countries, cannot now supply. With operating expenses amounting to 82 per cent of revenue, inadequate equipment and congestion of tracks, what we need, in addition to constructive legislation and real co-operation on the part of the government in the matter of rates and the safeguarding of invested capital, is wise direction in the expenditure of the large sums that must speedily be found and used to bring our railways abreast of the times. Accord full honor to the reciprocating steam engine for the great part it has played in the development of our railways and industries, but complete the work by replacing it with the electric motor and enter upon a new era of real railroading, not restricted steam-engine railroading.

During February the Public Service Railway, the headquarters of which are at Newark, N. J., has under way an active safety campaign. By means of dasher signs, safety stickers pasted on the front windows of cars in front of the motorman, the distribution of "Whys and Other Whys on the Trolley Situation," edited with special reference to safety, etc., an aggressive attempt is being made to impress the idea of safety on employees and public. Some details of the campaign and of the results obtained will be given in a later issue of the ELECTRIC RAILWAY JOURNAL.

## Educating Apprentice Track Foremen

The Denver Tramway Has Inaugurated a Course for Training Young Men in the Work of the Way Department

BY W. L. WHITLOCK

Superintendent of Way, the Denver Tramway Company

ONE of the problems of the electric railway way department is the obtaining of capable foremen for track construction and maintenance work to replace the "old-timers" who are constantly dropping out of service due to old age, disability or death. To the uninitiated this may seem to be a matter of small importance, but to the man responsible for this department it is quite often a serious matter. Today the efficient track foreman must be familiar with the many labor-saving devices and special track maintenance equipment found on any modern system. The big cost of labor and its scarcity, together with the reluctance of the workers to exert themselves, make the track foreman's position more responsible than ever before. The day of the "strong arm" boss is gone; its departure followed the exit of the old-time section hand whose buttonhole still held a sprig of shamrock plucked on the "Isle."

To go out into the market and hire a track foreman familiar with your trackage is impossible. The methods of work, the varieties of reports and the thousand and one peculiarities and weak points of any system impose special requirements as to training. With a view to overcoming this condition, and looking toward the future, this company has inaugurated an apprentice track foreman course. Carefully selected young men are employed and systematically trained. The desirable qualifications looked for in such men include good physical condition, an education at least fair and the "sand" to stick. An apprentice track foreman who follows through his program is bound to "make good," first to his own benefit and, second, to that of the organization. In addition he has a vocation that insures his future, and a stepping stone to further advancement. These men must be supplied with sufficient incentive to make the effort worth while. Hence, in addition to the attraction of future possibilities, a scale to start with is made that should hold them to the job.

The system followed in educating the apprentice track foreman is approximately as follows:

*Three months with a general maintenance repair gang.* This work gives experience in ordinary track maintenance in unpaved streets and includes repairing joints, changing minor pieces of special work, repairing broken rails, culverts and spread track, cleaning dead tracks, drainage and similar items.

*Three months with a paving maintenance repair gang.* This work gives experience in all phases of paving in connection with track work and includes stone block and concrete paving, grouting and protection of fresh paving, and the use of concrete mixers and pneumatic tools used in removing various types of paving.

*Three months with an emergency auto truck track repair gang.* This work gives experience in nearly every kind of emergency track repairs that will be encountered on any large system, teaches the value of knowing what to do and how to do it and also furnishes a means of putting "pep" into the work as it emphasizes the value of the time element on certain work.

*Three months or more on construction work.* This work gives experience in practical details of track construction or reconstruction, the proper methods of excavation work, ballasting, distributing material properly, joining, spiking, lining and surfacing track, back-filling and the "short cut" on track removals.

The order of work is varied with the seasons of the year so as to yield best results. At the end of a year's work, the apprentice track foreman is put in charge of a few men on minor repairs and is started on his journey.

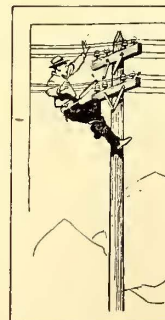
Our experience has shown that three out of five men will not finish more than the first three months, but when the two who do stick it out are graduated, a valuable addition to the organization results.

The apprentice track foreman's education is gained by practical work under experienced men, supplemented by the study of standard books on track construction and maintenance which are available in the company or public library. In addition he is given practical experience and must be proficient in the proper operation of the oxy-acetylene cutting torch, the proper use of all hand tools and the operation of an electric car, an auto-truck, electric concrete mixers, gasoline concrete mixers, gasoline speeders, pneumatic tie tampers and pneumatic concrete cutters. The value of electric welding is taught, as well as methods to be followed in placing and removing temporary crossovers under traffic, and caring for switches and special work. He is also expected to familiarize himself with city ordinances affecting track construction and maintenance, the rules and regulations of water commissioners regarding the use of fire hydrants, methods of making up estimates, reporting quantities and distributing time and materials to proper accounts, and other items.

It is reasonable to expect that an apprentice track foreman will not be 100 per cent efficient at the end of a year's work, but if he has tried at all, he will have a solid groundwork of the items listed above, and time and experience will do the rest.

It costs money to train men as outlined, but experience has convinced me that it is a paying investment notwithstanding the fact that the "quitters" are a total loss not covered by insurance.

### Safety on the Pole Top



Never fasten your Safety Strap to a Cross-arm Brace.

The Pole itself will support you.

The Brace may not.

A HINT WHICH OVERHEAD ENGINEERS MIGHT PASS ON TO THEIR LINEMEN

THE accompanying poster issued by the Ontario Safety League, by courtesy of the Bureau of Safety, tells its own story. A crossarm brace is so strong in itself that a lineman might very easily overlook the fact that the lag screw which holds it to the pole may not be as secure as it appears to be.

# Some Mysterious Car Ailments

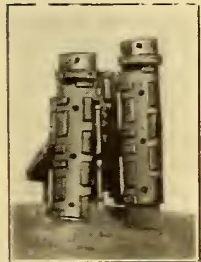
Little but Important Troubles That Tend to  
Keep Equipment Men Interested  
in Their Work



CONTRIBUTIONS ARE INVITED FROM THE FIELD

## Trouble at the End of the Line

**D**URING the years 1913 and 1914 an eastern railway operating General Electric type M multiple-unit control had a series of detentions which all occurred at the end of the line. After changing ends the motormen of these cars frequently found that the cars would not start. An examination of the equipment showed that the reverser fingers had become welded to their contacts so that the reverser could not throw to the opposite direction. As these reports of welded fingers came into the shop it was at first assumed that the tension on the fingers was too light and that poor contact started an arc which resulted in the welding of the fingers to the contact plates. The tension on the fingers was accordingly increased, but the troubles increased instead of diminishing. A man was then sent to the terminal where the trouble was occurring in an endeavor to locate the cause of the welding of the fingers. Investigation showed that when the reverser was thrown from one position to the other the tension of the contact fingers prevented it from throwing entirely to its running position and it would stick with the fingers just at the edge of the contacts. A few fingers only would make proper contact and as soon as power was applied the remaining fingers would fuse to the segments and in some cases cause serious burning of the reverser drum. An attempt was made to use lighter tension on the contact fingers and, while this allowed the reverser to return to its proper position, the light tension was not sufficient to give proper contact so that the fingers continued to fuse to the plates and in some cases the motors flashed over.



FILLING IN BETWEEN REVERSER CONTACTS  
At left, original reverser; at right, reverser as changed.

It was evident that some construction would have to be used which would allow increased tension on the fingers and at the same time do away with the necessity of the fingers lifting to ride up on the contact segments, as it was in this position that the reversers would stick with heavy tension. The accompanying illustration shows the method in which the reversers were changed to overcome the trouble. A piece of fiber was fitted in between the reverser contacts so that it came to the same height as the top of the contacts. The contact segments were  $\frac{3}{8}$  in. high above the segment block, so fiber pieces  $\frac{3}{8}$  in. thick by  $1\frac{1}{2}$  in. wide were fitted into

the space, and drilled with three holes for fastening. Flat head brass screws,  $\frac{3}{16}$  in. by 1 in., were used to fasten the fiber in place. The heads of these screws were sunk into the fiber which was counterbored so that when the screws were in position the space around and over the head could be filled in with sealing wax. The under side of the drum was recessed to receive a nut and washer for fastening. Sealing wax was also filled in over the top of these. By this method of construction the trouble was entirely overcome and it also resulted in a decreased cost of maintenance for the reversers and motors as well.

## Defects of 1,200-Volt Armatures Corrected With Amber Baking Varnish

**A** CERTAIN 1,200-volt interurban road in the East has cars equipped with four Westinghouse 317-A4 motors. These are connected two in series for permanent operation on 1,200 volts and are worked very close to their capacity. The equipments had all run about five years at an average mileage of 60,000 per equipment per year when they began to develop an epidemic of motor flashing.

To one who had only been accustomed to 600-volt operation the solution of the trouble presented some difficulty. The leakage to ground was found to be small, the brushholder tension about right and the brushholders were found to span the proper number of commutator bars. The fields and armatures were given a voltage drop test for shorts or bad connections, but this failed to reveal the trouble. Several of the offending armatures were removed and placed in the lathe to check the trueness of the armature shaft and the commutator. These being found in good shape the commutator slots were carefully cleaned and the commutators given a telephone test for shorts. Again no indication of trouble was found and the armatures were returned to service, this time in motor shells which had given no flashing trouble when used with other armatures. But the offending armatures again flashed over.

It had been noticed that a few of the leads of the armatures had worked loose in the commutator necks and that there had been a small amount of pitting between these leads and their commutator bars, but in view of earlier experience of swedged leads in 600-volt commutators it did not seem probable that these had caused the flashing. But when the armatures continued to give trouble after having been checked and

tested as described in the last paragraph it was decided to resolder the commutator necks of the defective armatures with a high tin solder, and this cured the trouble.

But with the location of the trouble the road was faced with resoldering some fifty armatures, fully eighty per cent of which had never been rewound. The resoldering necessitated a partial removal of the asbestos hood over the leads on the commutator end, and as these hoods were not in good condition it was decided to replace them with new asbestos hoods. The replacement of these hoods required a rebanding of the armatures where the dried out leads were weakest, and it was feared that the drawing down of the leads by the band wire would destroy some of their insulation and produce a large proportion of grounded armatures. It is interesting to note that this is exactly what happened to several armatures which because of a temporary shortage had to be used without the treatment hereafter described.

On the other hand new coils cost about \$100 per set and were difficult to obtain, as were the services of a sufficient force to carry out the rewinding program which the increasing amount of motor flashing would have demanded had it been decided to rewind all the armatures.

The problem was finally met by softening the dry coils by dipping them hot in amber baking varnish and applying the bands while the coils were still flexible from the dipping and a partial baking. The program was to strip the old bands and heads from the armatures, to blow them out with compressed air, to check and remove all short circuits by a telephone test, to resolder the leads at the commutator necks, to turn and reslot the commutators where necessary, and to hold the new asbestos headers with a temporary tape banding. The armatures were then baked for twenty-four hours in an electrically heated oven maintained at 125 degrees C., following which they were dipped for one hour in Westinghouse amber baking varnish. The armatures were dipped in a vertical position with the commutator ends down, and were immersed below the back end bells.

The armatures were then drained for one hour in a horizontal position and baked for twenty-four hours, when they were removed from the oven and placed hot in the lathe for the final banding. After the banding the armatures were given a second dipping to fill any small crevices which may have been created by a displacement of the coils while banding, and were again drained and returned to the oven, this time for from sixty-four to eighty hours' baking at 125 deg. C. At the conclusion of the baking the armatures were removed while hot and immediately given a 1,200-volt leakage test. It may be noted that the leakage never exceeded 5 volts under the 1,200 volts pressure and that it rarely exceeded 2 volts.

A point worth noting is that during each draining the varnish was removed from the wearing surface of the commutator by cleaning with gasoline, fifteen minutes spent in this manner saving an hour of sandpapering after the armature had been baked. But after the baking it was necessary to saw the baked varnish from the commutator slots with the aid of a piece of hack saw blade.

About ten per cent of the armatures removed from service were so far gone that it was considered advisable to rewind them entirely. On these the preliminary

dipping and baking were omitted. Of about thirty-five armatures which were resoldered, rebanded, double dipped and baked but one came back as grounded, open or shorted during a period of seven months.

Material for the latter armatures aside from the usual banding material were 1½ gal. amber baking varnish per armature at about \$2, 1 gal. gasoline per armature at 25 cents, about 200 kw-hr. of electricity for the baking oven per armature, about 18 hours of the armature winder's time, about 6 hours of the winder's helper's time, and one hour of the machinist's time, or a total of about \$30 per armature, against about \$160 for each armature rewound.

### Testing "Turned the Trick" in This Case

THE blowing of the circuit breaker on a city car equipped with interpole motors was easily traced to a certain motor, but there the trail ended. The motor looked all right and the insulation resistance was high. A new set of main field coils was put in, however, and the motor went into service, but after a week or so of operation complaints began to come in again due to the motor flashing over. The armature was next changed but the result was no better. The carhouse force was then told to change all of the field coils, including interpole fields, which they did with one exception, a coil that they were "dead sure" of. They checked the connections carefully by the tags, but the result was no better.

As there was no field tester at the carhouse the car was finally sent to the repair shop, where careful tests of polarity showed one interpole field, the one that aroused no suspicion, to have had its terminals stamped incorrectly at the factory. This had caused a reversal of polarity in that particular field. The explanation of the ability of the motor to operate at all was that under ordinary load its commutating ability was good even with a commutating pole reversed, but when a very heavy load came on, it flashed over.

Although this is undoubtedly a very unusual incident it is cited here to point the moral: Have and use a tester where a baffling "ailment" has not occurred.

Perhaps a word should be added regarding the proper relation of interpole to main field polarity. To check this in a motor having four main and four interpole fields, connect the positive armature lead to the trolley side of the test, the negative armature lead to the positive main field lead and the negative main field lead to the ground side of the test. If the armature is not in the frame it will be necessary to short-circuit the brush holders. With connections thus made, a rule that can be readily remembered is when standing at the commutator end facing the motor, the polarity of an interpole should be the same as the main pole next adjacent to it in a counter clockwise direction.

Four pole railway motors with but two interpole coils located directly opposite each other have the polarity of both interpoles the same. In motors with three interpole coils, the interpoles diametrically opposite should have the same polarity, while the intervening pole should have opposite polarity.

When desired the interpole coils may be tested separately from the main field coils by making two separate tests. The polarity will be the same as that just described if the positive lead in each case is connected to the trolley side of the test.

# Transformer Action of Tapped Field Railway Motors

Necessary Gaps in Third-Rail Construction Cause an Opening and Closing of the Supply Circuit to Electric Cars With a Resulting Inductive Effect in the Field and Armature Windings of the Motors

By C. W. SQUIER

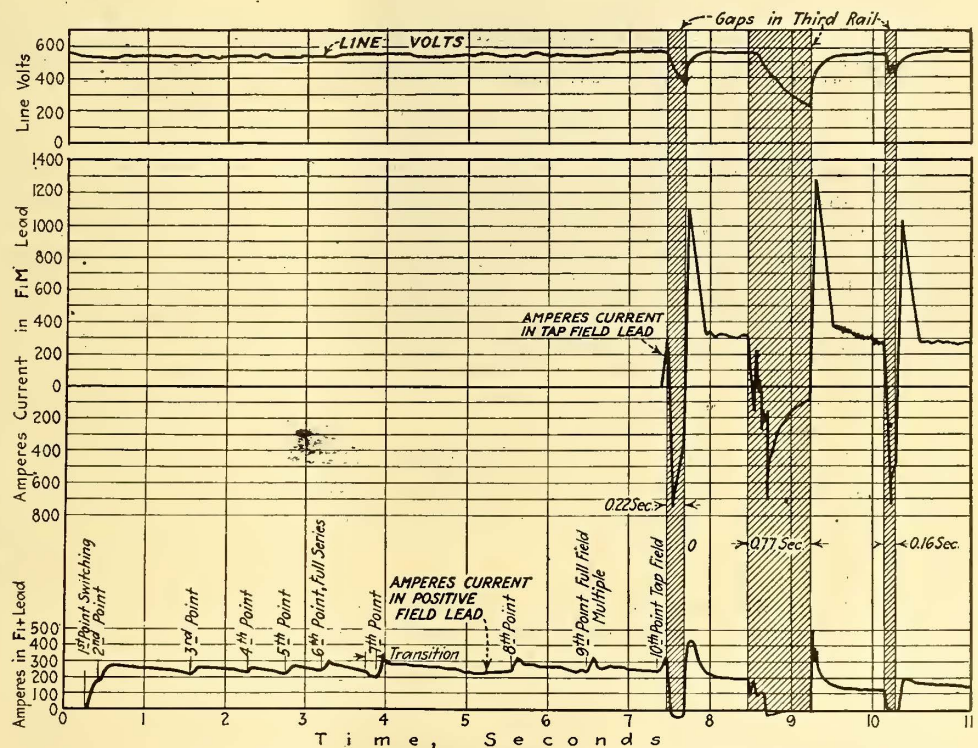
**D**URING the last few years field control for railway motors has been developed and made practical. While the idea of securing additional efficient running speeds by varying the effective field turns is an old one, still on account of commutation difficulties it did not prove successful until the commutating-pole motor was developed. Field-control motors have their main field coils wound in two parts. During the acceleration period with resistance in circuit both sections are connected in series, thus giving a low-speed, high-tractive-effort characteristic to the motor. After the resistance is all cut out and the motors are operating on full voltage, the connections are changed so that only one section of the main field coils remains in circuit. This reduces the field ampere-turns and therefore the magnetic flux and gives the motor entirely different speed characteristics.

The accompanying circuit diagrams show the changes that take place with a two-motor equipment, including Westinghouse type-ABF control, while changing from full field to tapped field. The first diagram shows the motors in full multiple position with full field. The resistance of the full field winding of each motor is 0.06 ohm in the case under consideration. The second diagram shows the first transition that takes place, the short-circuiting of a portion of the field of No. 1 motor having a resistance of 0.025 ohm. In the next transition position the circuit is opened at the ground side of the short-circuited portion of No. 1 field, so that this motor has a field of but 0.035 ohm while No. 2 motor still retains its full field of 0.06 ohm resistance. The next step in the transition is the short-circuiting of a portion of No. 2 field with 0.025 ohm resistance, and in the final or tapped-field position both motors are operating with fields of 0.035 ohm resistance, the remaining portions of the fields being open-circuited.

By following these circuit changes it is seen that approximately 40 per cent of each field is successively first short-circuited and then open-circuited. This of course is necessary, otherwise the main motor circuit

would have to be opened while the transition is taking place.

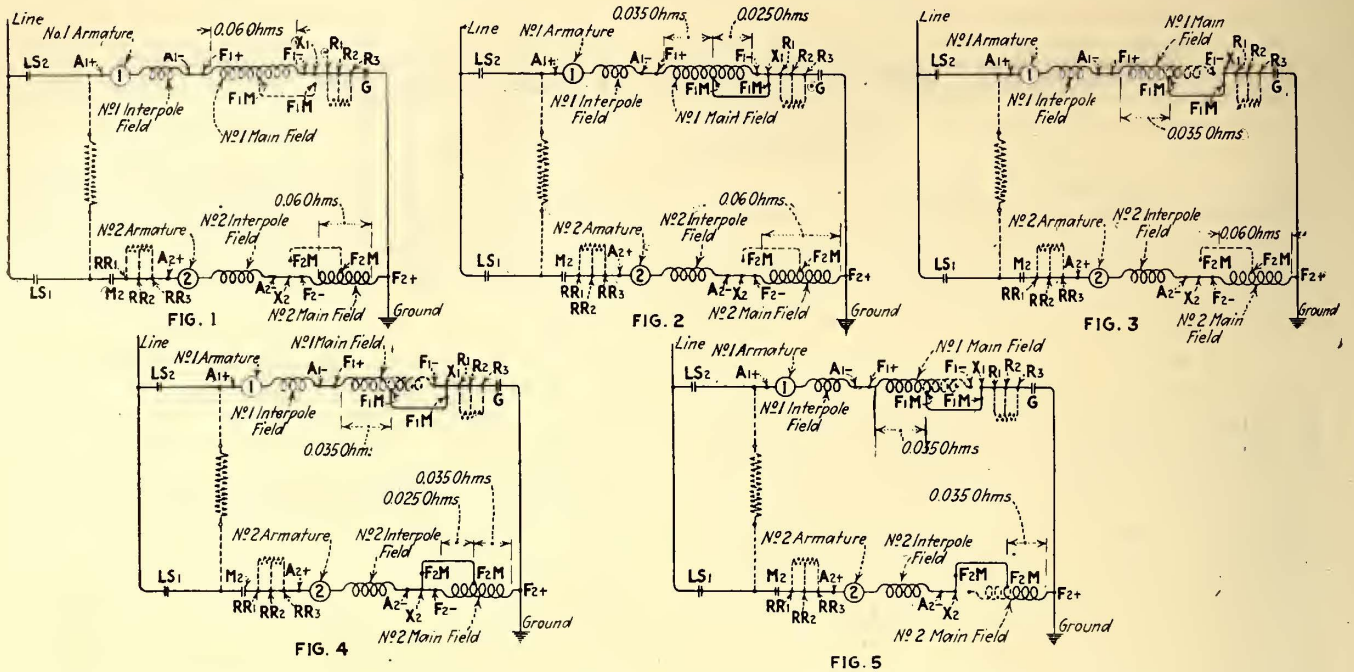
This arrangement of windings and connections produces what is in effect a transformer or induction coil. The two windings on one iron core constitute a pair of mutually inductive circuits with a common magnetic circuit. If then a variation in impressed voltage takes place in one of the windings there will be a corresponding electromotive-force induced in the



GRAPHS OF CURRENT AND VOLTAGE FOR CAR OPERATING THROUGH CROSSOVER

other winding. In regular operation these conditions are fulfilled if the main circuit is broken or made while connections are established as shown in diagrams 2 and 4. If then one of the field windings of a motor is short-circuited while the car passes through a gap in the third-rail, as is necessary at crossovers, the circuit in the other winding is broken and again made. The effect produced under these conditions is the same as that in a transformer with its secondary short-circuited if the primary is opened and closed rapidly.

The graphs of current and voltage shown herewith were taken with an oscillograph on a car while operating through a crossover, with the control operated so as to reproduce the desired conditions. There were three gaps in the third-rail at the crossover where the test was made of approximately 3 ft., 10 ft. and 2 ft



CIRCUIT DIAGRAMS FOR TRANSITION FROM FULL TO TAPPED FIELD POSITIONS

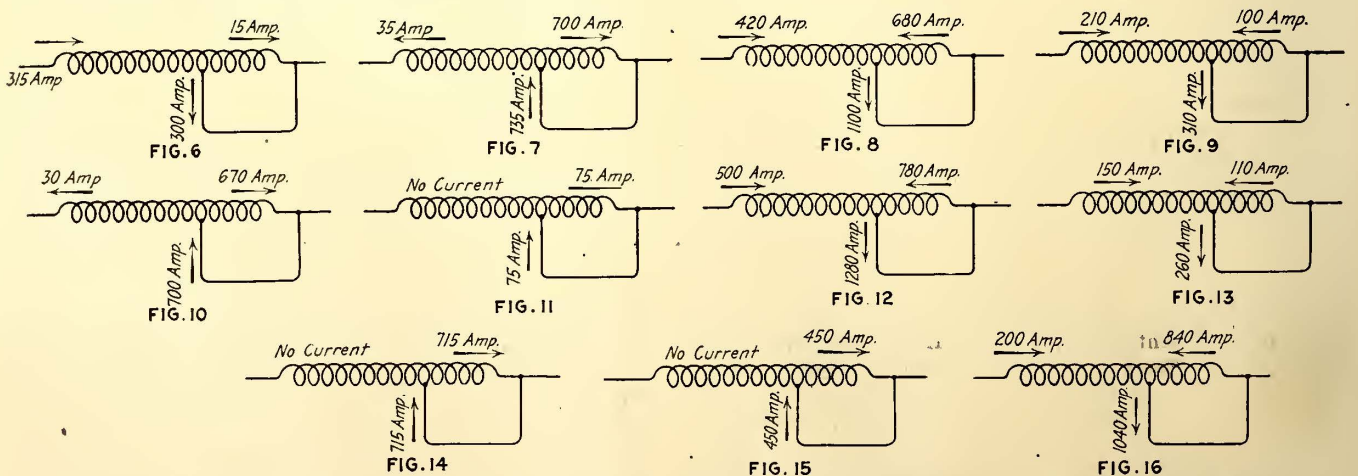
- 1—Motors in multiple with full field.
- 2—A portion of No. 1 field is short-circuited.
- 3—No. 1 motor with short field, No. 2 motor with full field.
- 4—A portion of No. 2 field is short-circuited.
- 5—Both motors with short field.

length measured in the line in which the car traveled. The lengths of time taken to pass through these gaps, measured from the instant that contact with the third-rail was broken at the shoes until it was again re-established, were 0.22 second, 0.77 second and 0.16 second respectively. By referring to the graph for line volts it is seen that in no case did the voltage drop to zero. In passing through the longest gap the circuit must have been completely opened, as the arc from breaking the circuit could not have held on through any such distance as existed. This indicates that there must have been a voltage generated by the car equipment, in the same direction as the impressed voltage. The pressure drop actually obtained in the long gap was from 560 volts to 210 volts.

The other two graphs shown give current values in the F1+ or positive field lead of No. 1 motor and in

the F1M lead, which is the tapped-field lead of No. 1 motor. The graphs show that there was a complete reversal of current in both of these leads. Considering the graphs in conjunction with the diagrams of connections it is evident that from the 6.5-second point to the 7.4 second point of the graphs the connections are as shown in diagram 1. At the 7.4-second point the connections are changed to those shown in diagram 2. This is indicated by a rise in current in the F1M lead. The first gap in the third-rail is reached at the 7.46-second point as is indicated by the drop in voltage shown in the voltage graph.

In order more readily to follow the direction and magnitude of the current changes a series of diagrams is given for the maximum values for each change. The first of these shows the conditions as they existed when the first break in contact between the shoe and the



DIAGRAMS FOR MAXIMUM VALUES OF CURRENT OCCURRING WITH CAR OPERATING THROUGH CROSSOVER

- 6—At first break in contact.
- 7—0.1 second after first break.
- 8—0.05 second after contact is re-established.
- 9—At second break in contact.
- 10—0.24 second after second break.
- 11—At instant of second contact.
- 12—0.06 second after second contact.
- 13—At third break in contact.
- 14—0.1 second after third break.
- 15—At instant of third contact.
- 16—0.08 second after third contact.

third-rail occurred. At this instant 315 amp. was flowing in the positive field lead F1+ and 300 amp. in the tapped-field lead F1M. This indicates that 15 amp. was flowing in a positive direction through the short-circuited portion of the field. The flow of current is considered positive when it is in the normal direction for regular operation.

As soon as the voltage begins to decrease, due to the breaking of contact between the contact shoe and the third-rail, there is a sudden reversal of current. A tenth of a second after contact is broken there is a current of 735 amp. in the reverse direction flowing in the F1M lead, 35 amp. in the reverse direction through the positive field lead F1+ and 700 amp. in a positive direction through the short-circuited portion of the field. After these maximum values are reached the current in the tapped-field lead F1M and the short-circuited portion of the field decreases, while that in the F1+ lead remains nearly constant until contact with the third-rail is again established. A complete reversal of current then takes place again and 0.05 second after contact is re-established, maximum values are reached of 1,100 amp. in a positive direction through the F1M lead, 420 amp. in a positive direction through the F1+ lead and 680 amp. in a reverse direction through the short-circuited portion of the field.

Similar reversals and current values occur at each break and whenever contact is again re-established. The maximum value obtained in this particular test was 1280 amp., which was reached 0.06 second after contact was re-established at the end of the second gap.

The magnitudes of the current values reached under these conditions are quite astonishing when compared with those found in normal operation on a straight track with no gaps in the third-rail. Normally the current peaks range from 280 amp. to 340 amp., and equipment designed for these values will be severely overloaded when currents of the values shown, which are 400 per cent greater than normal are encountered.

The current peaks that occur shortly after contact is re-established with the third-rail are larger than those that occur after the circuit is opened. This is due to the fact that the induced current is in the same direction as the applied current when contact is made, while it is opposed to the applied current when the circuit is opened.

The values for voltage and current shown in the accompanying graphs illustrate what occurred in one particular case. It is evident that these values will change with different conditions. Thus the length of the gap in the third rail and the speed of the car or train as it passes through the gap will have marked effects on the values obtained. Also the design of the motor, the proportion of the field short-circuited to the full field of the motor, the current value at which the transition takes place, the normal operating voltage and the effect that heavy current surges have in varying the voltage, all will cause a variation in the results.

Improvements in control apparatus and in its operation have effectively met the conditions encountered so that under normal operation the equipment is properly protected from dangerous results. The condition, however, exists and a wider knowledge of this together with a discussion of the principals and theory that underlie it will aid in explaining the action and will assist in reducing the troubles of the operating engineer.

## Taking the Track Greaser Off Safety Cars

IT DOES not look good to passengers to see a track greaser in dirty overalls get on a safety car and deposit his pail of grease on the front platform while he stands and talks with the operator until reaching the next curve he is to grease. Not only is the sight offensive, but it presents a real source of complaint, for a woman boarding the car can very easily brush her dress against the pail. For the company that usually means buying a new dress or paying a cleaner's bill. Yet this practice is going on.

F. C. Folsom, roadmaster Tampa (Fla.) Electric Company has solved this problem by providing motorcycle side cars for the track greasers. On the side car is a box in which are carried the pail of grease, a broom and several wrenches and other tools. Two laborers thus equipped now cover the entire system every day, working on a regular schedule. This work formerly required



HOW THE TRACK GREASER HAS BEEN TAKEN OFF THE SAFETY CAR IN TAMPA

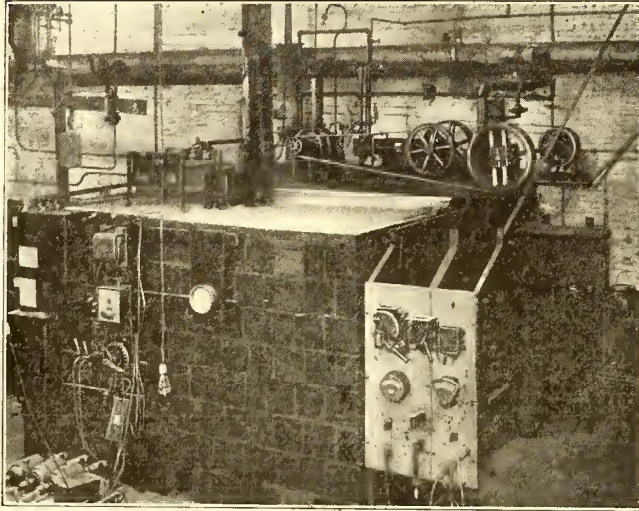
four men. Colored laborers were used for the purpose and when the new plan of using motorcycles was put up to them, three of them did not want to learn to handle the machines. So one old employee and one new one now do the work of the four. Mr. Folsom says that not only is a large amount of time saved, but the work is done better because the greasers are not hurrying the job at any point in order to catch the next car.

The regular schedule over the system every day takes the men as far out of the city as 6 miles on the Sulphur Springs line and 9 miles on the Port Tampa line. On the latter line it takes the street car one and one-half hours to go and come, including a layover of ten minutes at Port Tampa. This gave the track greasers only ten minutes to do the work at this point and catch the same car back. Consequently the job was only half done. Now the round trip is made in one and one-quarter hours on the motorcycle and the man who does the greasing has all the time necessary to do the work thoroughly.

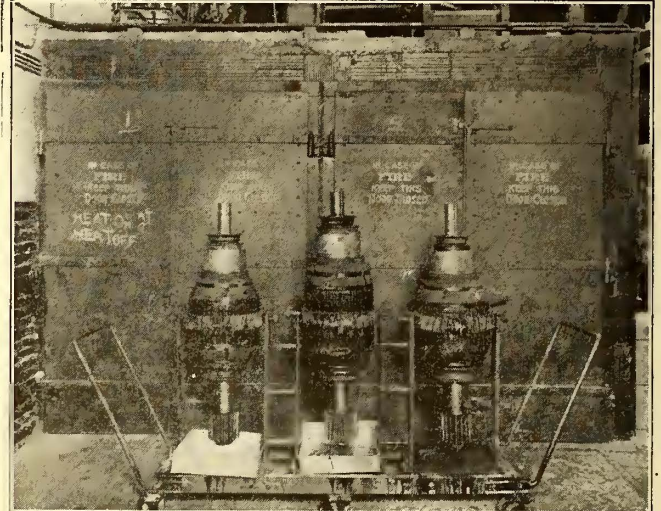
When the plan was worked up to inaugurate the use of the two motorcycles, it was thought that there would result a reduction in the cost of this work. It has been found, however, that the cost of operating and maintaining the two machines has about offset the saving made in labor. However, the company feels that the use of the motorcycles would be justified because of the other advantages, even though their use entailed a greater expense.

# An Almost Laborless Dipping and Baking Plant

In Its Cold Spring Shops, the International Railway Has Installed a Compact Dipping, Impregnating and Baking Equipment Designed with Particular Reference to Economizing Man Power



GENERAL VIEW OF IMPREGNATING AND BAKING PLANT, INTERNATIONAL RAILWAY

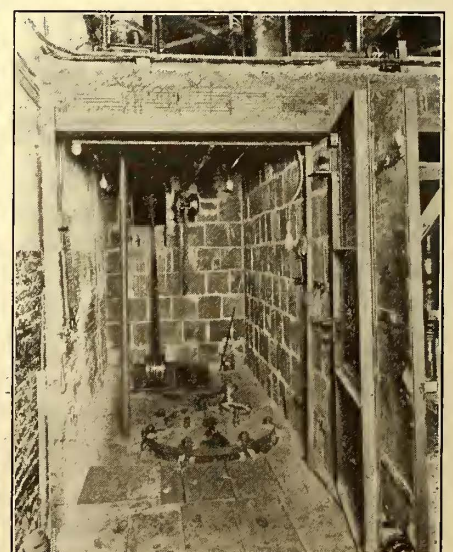
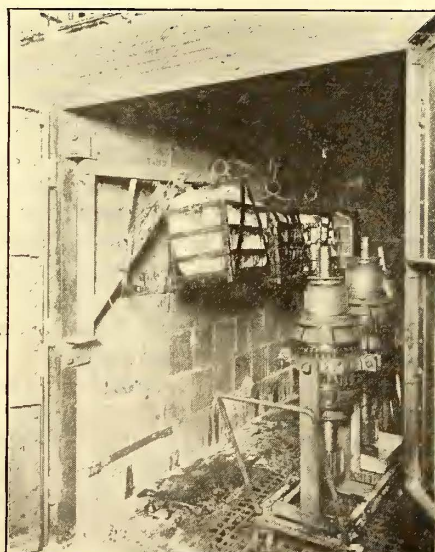
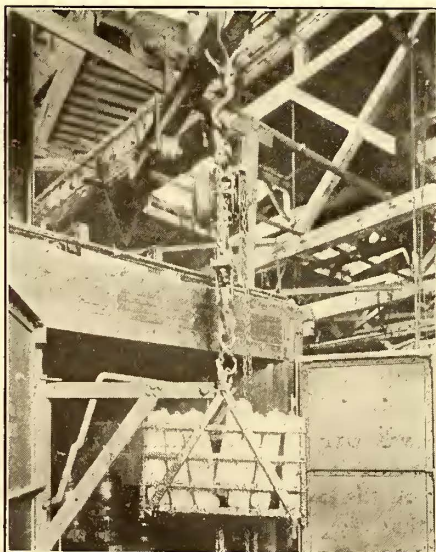


ARMATURE TRUCK WITH ARMATURES IN POSITION FOR BAKING

AS AN ADJUNCT to its armature and field-coil winding room, the equipment department of the International Railway, Buffalo, of which J. W. Hulme is superintendent, has developed a highly successful outfit for dipping, impregnating and baking. Part of this is shown in the accompanying photographs. The practice of this company is to impregnate all new field coils, after which they receive the usual outside wrapping of tape. They are then dipped in varnish and baked. This is done to insure a practically waterproof and oilproof covering. Armatures are not impregnated but practically all of them are dipped and baked for forty-eight hours.

The complete plant consists of a dipping room and a structure built up of hollow tile, with steel door frames and doors, divided into two parts, one for the impregnating plant and the other for the baking oven. The whole is covered with a concrete slab roof.

The dipping room contains two large varnish tanks with tops level with the floor and provision for handling coils and armatures by means of an overhead trolley. Particular attention will be devoted in this article to the impregnating and baking outfit. On the roof of the brick structure is the vacuum pump used for exhausting the air from the impregnating cylinder and a motor which drives the pump and also operates the



AT LEFT—BASKET OF FIELD COILS SUSPENDED FROM TROLLEY CRANE, READY FOR TRANSFERRING TO BAKING OVEN. IN CENTER—BAKING OVEN WITH ARMATURES AND FIELD COILS IN POSITION FOR BAKING. AT RIGHT—INTERIOR OF IMPREGNATING ROOM.



stirrer in the impregnating compound tank below. On the outside wall are the switchboard and transformer used in testing armature insulation and also a pyrometer to indicate the oven temperature. The oven is heated by electric current controlled through the switchboard shown at the right in the general illustration. The impregnating plant was built by the J. P. Devine Co., Buffalo, manufacturer of vacuum drying apparatus. It consists of two tanks which are lined with steam coils for heating the compound. One tank contains the supply of compound which is allowed to run into the second tank after a vacuum has been established. The compound is first heated to 300 deg. F. and is then blended until the proper specific gravity is obtained.

Proper ventilation of the oven is obtained by taking in the cold air from the shop through a duct which has six openings underneath the heater. This arrangement insures an even temperature, as the hot air rises into the oven and is then carried off to the outside atmosphere through a ventilating flue leading from the top of the oven.

#### FACILITATING THE HANDLING OF ARMATURES AND FIELD COILS

The principal feature which Mr. Hulme had in mind in designing this plant was the provision of lifting and conveying devices to permit one man to do all of the work. In the impregnating room is a trolley bar mounted centrally overhead, on which runs a trolley with a differential hoist. By means of the hoist the basket of field coils is lowered into the impregnating cylinder, and on being lifted out is transferred to the outside overhead trolley as the case may be.

The device used for handling the field coil baskets

outside of the impregnating room and the oven deserves special mention. A trolley from which hangs a differential hoist travels on a long I-beam, of which one end is hinged. The free end of the I-beam is supported from a crossbar mounted above the door of the oven and dipping room, by means of a trolley provided below with a roller so that the I-beam can swing freely from side to side.

Inside the oven at one side is an overhead trolley bar with several small trolleys for carrying the baskets of field coils undergoing the baking process. For the purpose of transferring the baskets from the outside hoist to the inside trolley bar a small gib crane, supported from one of the oven door posts, is utilized. On the end of the horizontal member of this little crane is pivoted a lever with one end projecting beyond the end of the crane and having its own end turned up. This lever provides enough vertical movement for the basket to permit it to be hooked onto one of the inside trolleys when the crane is swung inward. The long end of the lever is bent downward so as to permit it to be handled readily, and also to provide stops by means of which the range of action of the lever can be limited. The pictures show the details of construction of this device, as well as its method of operation.

The armatures, after dipping, are carried on a special truck, having a capacity for three of them, the support of the armature being from clamps which span the core at the middle. The clamps are supported in trunnions, simply cap bolts, in such a way that one man can turn an armature with very little effort.

The floor of the oven is made of a grating so that drippings from the armatures and field coils fall into the tank below and are drained away.

## Specifications for Bolts Used in Construction

### Proper Requirements for Physical Properties, Workmanship and Finish Assist in Reducing Number of Loose Bolts

BY HOWARD H. GEORGE

Assistant Engineer Public Service Railway of New Jersey

**I**N A PREVIOUS article I took up the question of the general desirability of purchasing all track materials under definite specifications and covered specifically the matter of track spikes. In this article it is proposed to deal with the subject of track bolts, one which is equally as important as that of spikes. The actual specifications, used on the Public Service Railway and appended, again differ from those usually encountered in that they cover both steel and iron, and for the reasons given in the case of track spikes.

The strength of any mechanical joint depends very largely upon the strength of the bolts. This statement applies with greater force to the case of electric railways with their comparatively light loads, where failures of the joint plates themselves are comparatively rare, and where the trouble experienced is generally due to loosening of bolts from any one of several possible causes. Among the latter may be mentioned failure of nut locks or lock washers, rusting of rail and plates at points of contact, loosening of bolts due to turning of nuts, and

finally the stretching of the bolt itself beyond its elastic limit in tightening of the bolts, either at the time of installation or by track walkers. While other factors may enter into the problem, it is believed that these are the principal ones, and it is felt that the last named is one of the causes of a large percentage of loose bolts. With proper provisions in the specifications, and regulation in the maintenance of way department of the size of track wrenches used, such troubles can be very largely reduced.

The question of when a bolt is tight is entirely a matter of judgment on the part of the trackmen and the latter have often been known to slip a pipe extension on the handle of an ordinary track wrench so as to draw a bolt up tighter, under the mistaken idea that they were doing the proper thing. In this connection, it is interesting to refer to a series of tests made a few years ago by the engineer of maintenance of way of the Baltimore & Ohio Railroad and reported in Vol. 17 of the Proceedings of the American Railway Engineering Asso-

# Steel and Track Bolts

## 1. Material:

If steel, it shall be made by the open hearth or other approved process. If necessary to secure the properties desired, the bolts may be heat treated.

If of iron, the iron shall be double refined, tough and fibrous and uniform in character and quality throughout. It shall be thoroughly welded in rolling and be free from cracks, flaws, blisters and other surface defects. If necessary the bolts may be heat treated to secure the desired physical properties.

## 2. Physical Properties and Tests:

The steel shall conform to the following requirements:

"A" For carbon steel:

- Elastic limit, not less than 35,000 lb. per square inch.
- Elongation, not less than 25 per cent in 2 in.
- Reduction of area, not less than 50 per cent.

"B" For untreated nickel or other alloy steel:

- Elastic limit, not less than 45,000 lb. per square inch.
- Elongation, not less than 20 per cent in 2 in.
- Reduction of area, not less than 40 per cent.

"C" For heat-treated nickel or other alloy steel:

- Elastic limit, not less than 75,000 lb. per square inch.
- Elongation, not less than 15 per cent in 2 in.
- Reduction of area, not less than 40 per cent.

"D" The elastic limit shall in no case be less than 50 per cent of the ultimate strength.

"E" The elastic limit, elongation and reduction of area may be determined on a test piece  $\frac{1}{2}$  in. by 2 in. turned from a finished bolt.

"F" The ductility of the bolts shall be determined by the cold bend test, which requires that the material used in the bolts shall bend cold through 180 deg., and flatten itself without fracture on the outside of the bent portion. This bend may be made on the unthreaded portion of a finished bolt, on a blank bolt, or on a test piece of the same size and same grade of steel. In any case the specimen tested must be subjected to the same treatment as the finished bolt. It is not necessary that the bolt bend double in the threaded portion.

The iron shall conform to the following requirements:

"AA" Ultimate strength, not less than 50,000 lb. per square inch.

"BB" Elastic limit, not less than 50 per cent of the ultimate strength.

"CC" Elongation, not less than 18 per cent in 2 in., with the fracture wholly fibrous.

"DD" Reduction of area, not less than 25 per cent.

"EE" The elastic limit, elongation and reduction of area may be determined on a test piece  $\frac{1}{2}$  in. by 2 in. turned from a finished bolt.

"FF" The ductility of the bolts shall be determined by the cold bend test, which requires that the material used in the bolts shall bend cold through 180 deg. with a radius of not more than  $\frac{1}{2}$  in. without fracture on the outside of the bent portion. When nicked specimens are bent cold the

vary more than  $\frac{1}{16}$  in. from the dimensions shown.

(d) The outside dimensions of the nut shall not vary more than  $\frac{3}{32}$  in. from the dimensions shown.

(e) The shoulder of the bolt shall not vary more than  $\frac{1}{16}$  in. from the dimensions shown.

The heads and nuts shall be free from checks or burrs of any kind. They shall have the United States standard upset thread unless otherwise specified. The threads may be either cut or rolled and shall be full and clean with not less than two, nor more than five, finger threads.

## 4. Inspection:

When required, the manufacturer shall furnish samples of bolts from a preliminary rolling before proceeding with the filling of the order and shall give sufficient notice in advance of the date when they will be ready for inspection.

The railway company's inspector shall have a free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

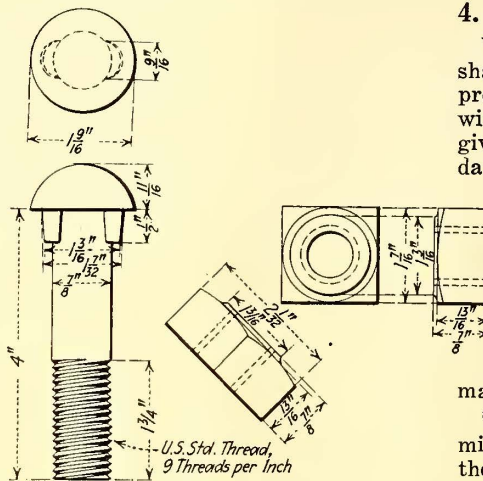
The inspection shall be made at the mill and the manufacturer shall afford the railway company's inspector, free of cost, all reasonable facilities to satisfy himself that the bolts are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Tests shall be made of samples of the finished product selected by the railway company's inspector from each lot of 100 kegs. Two pieces shall be selected for each test and if both meet the requirements of the specifications the lot will be accepted, but if both fail the lot will be rejected. If one of the test pieces fail a third piece shall be selected and tested; if it meets the requirements of the specifications the lot will be accepted, but if it fail the lot will be rejected.

If, after shipment, any bolts are found to be defective, due to material or manufacture, they may be rejected.

## 5. Marking and Shipping:

When the bolts are shipped they shall have the nuts applied for at least two threads, and shall be properly oiled to prevent rusting. They shall be packed in good serviceable kegs of 200 lb. each. All kegs must be plainly marked as to material, size of bolts, and name of manufacturer. Each keg shall also bear the name and shipping address of the consignee.



STANDARD TRACK BOLT

fracture must be wholly fibrous. The bends may be made on the unthreaded portion of a finished bolt, on a blank bolt, or on a test piece of the same grade of iron. In any case the specimen tested must be subjected to the same treatment as the finished bolt. It is not necessary that the bolt bend double in the threaded portion.

In either case, a sufficient number of tests shall be made to satisfy the railway company's inspector that the material meets the specifications in every respect, and he shall have the privilege of selecting the specimens to be tested.

## 3. Workmanship and Finish:

The form and dimensions of both the steel and iron bolts shall conform to the drawings submitted by the railway company and forming a part of these specifications, subject to the following permissible variations:

- The length shall not be more than  $\frac{1}{16}$  in. less nor more than  $\frac{1}{8}$  in. greater than that shown on the drawing.
- The diameter of the bolt shall not vary more than  $\frac{1}{16}$  in. from the dimensions shown.
- The size of the head shall not

ciation. The facts contained in this report emphasize the importance of insuring a certain minimum in the ultimate strength and elastic limit of the materials entering into the manufacture of the bolts, and these factors are largely controlled by other elements in the specifications.

The tests referred to were made on what are commercially known as 1-in. x 4 $\frac{1}{4}$ -in. bolts with eight threads per inch, and hexagonal nuts. The bolts were tested in a Riehle testing machine, the initial load being applied by a trackman with a wrench under conditions which approximated very closely those met with in the track. No attempt was made to obtain uniformity of load with the same length of wrench, the trackman using his own judgment in determining when the nuts were tight. Six bolts were tightened with each size wrench. The results follow:

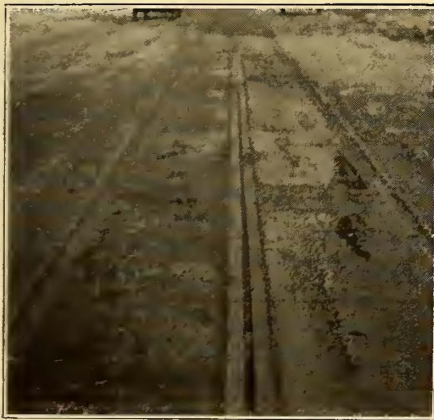
Length of Wrench	Load Registered
30 in. ....	23,600 lb. to 31,200 lb.
36 in. ....	23,500 lb. to 34,360 lb.
42 in. ....	33,000 lb. to 42,600 lb.
48 in. ....	43,600 lb. to 46,350 lb.

A 1-in. diameter bolt has an area of 0.7854 sq. in. and with an elastic limit of 35,000 lb. per square inch for carbon steel, the elastic limit or strength of the bolt is only 27,489 lb. From this it is evident that it is not a difficult matter permanently to stretch a bolt with even

more than 10 cents per keg of 200 lb. The cost of track bolts is at the present time approximately \$5 per 100 lb., and the inspection therefore adds only 1 per cent to the purchase price. The satisfaction obtained from the knowledge that specifications are being lived up to more than compensates for the small additional cost of the bolts.

## New York Lines Fight Snow and Ice Details of the Recent Storm and Methods Employed to Clear the Underground Conduits in Manhattan Borough

THE latest snowstorm of Feb. 4, 5 and 6, appears now upon analysis to be the heaviest snow ever recorded in New York. The storm of 1888 has been cited as the equivalent, at least, but in 1888, while the snowfall measured 20 in. as against 17 in. this year, the water equivalent was only slightly over 2 in. as against 4 $\frac{1}{2}$  in. this year. In other words, the snowfall this year weighed almost 24 lb. per cu. ft. Moreover, much of the precipitation was in the form of a sort of hail in grains about the size of bird seed or large sized sand; it didn't pack but shifted like sand in the heavy wind, and blew down into the slotted conduit which it filled as sand would fill such a duct. Subsequent rain and slight thaws followed by freezing made the conduit



SNOW-FILLED CONDUIT, REMOVING ICE FROM TRACK AND STALLED CARS, NEW YORK RAILWAYS

a 30-in. wrench, which is the length ordinarily used on electric railways. It also strongly indicates what may be expected where material is substituted whose elastic limit falls below the above figure. In this connection, it might be well to call attention to the fact that these loadings were obtained on a 1-in. bolt, whereas the usual diameters in use on most electric railways are  $\frac{3}{4}$ -in. and  $\frac{7}{8}$ -in., so that with the 30-in. wrench such bolts can readily be stretched beyond the elastic limit of the material.

Considering next the question of workmanship and finish, imperfections in the material will affect the strength, and threads which are too tight will add to the difficulty of removing nuts from the bolts when they are to be used. It is also necessary to limit the variation from given dimensions for several reasons, one of the principal ones being that if this is not done there would be a tendency for manufacturer to use his dies after they had worn beyond a reasonable amount, and the result would be to produce oversized or otherwise unacceptable bolts.

As to the cost of inspection to insure compliance with the terms of the specifications, this cost for bolts is not

filling more like ice, particularly in the slot. Similar ice, from 4 to 12 in. thick, covered the tracks and pavements.

Two general methods have been employed to clear this ice—one, the manual, the other, electrical and manual. For the first, practically the entire force of trainmen and shopmen were mobilized and put to work with hand tools. Picks had to be used to reach the street surface, and then more muscle was necessary to open the slots with sharp pointed tools. Poking and scraping with long tools and with hoes inserted through the slot, gradually loosened the snow in the conduit so that it could be shoved by hand tools or by heavy power tools to manholes and then removed. In this way on the New York Railways lines, progress was made at the rate of about 4 $\frac{1}{2}$  mi. per day. The New York & Harlem Railroad (Fourth and Madison Ave. lines) used streams of water to loosen the snow and make it easier to push along to the manholes. This could be done only on warm days, however.

The second method tried was suggested by R. B. W. Peck, cable engineer of motive power department of the New York Railways. This consisted of sending a

current of 1,000 amperes through the channel rails. The four channels on about 2,500 feet of track were connected by jumpers to form a big M and the 10,000 feet thus placed in series across 585 volts gave 1,000 amperes. This melted a cylindrically shaped hole in the snow around the channel as a core and later the remaining snow was pushed manually or by a power pusher to the manholes. The temperature of the channel rails by this method was kept at about 104 deg. F. and no insulation failures occurred.

The New York Railways Co. has kept close account of the results of the various methods for future use in case a similar emergency arises. While these figures are perhaps not conclusive, indications are that while in actual cost per mile the electrical method is cheaper, it is slower, and, counting lost revenues due to the longer time in resuming service, is more expensive after all. The major part of the work, including the more important lines, were cleaned manually.

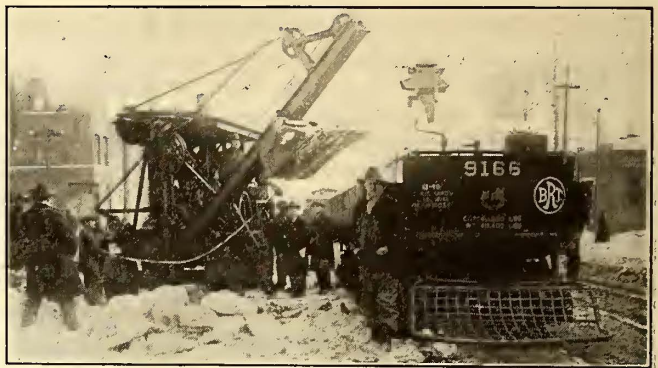
## B. R. T. Digs Out With a Steam Shovel

Recent Severe Storm Brings Out Novel Means of Getting Rid of Vast Accumulations of Snow and Ice

THE use of steam and electric shovels for loading snow has increased this winter. An accompanying illustration shows a Keystone loader loading snow into a flat car on one of the principal lines of the B. R. T. system in Brooklyn, N. Y. Similarly, in Boston, after the recent storm, a large Brownhoist equipped for snow loading by means of a grab bucket was used with good results. The first instance of which this paper has record of the use of steam shovels for snow-removal work was that reported from Milwaukee last winter, when a Thew shovel was used.

In Boston automatic dump cars are used in connection with the snow work. In Brooklyn special snow-dump tracks are installed at wharves along the East River and a special "pusher" device pushes the snow overboard from the regular flat cars.

A number of properties have taken advantage of available sewers and use the sewer manholes as a convenient disposal point, the snow being pushed to the manholes and also carried to them in concrete carts

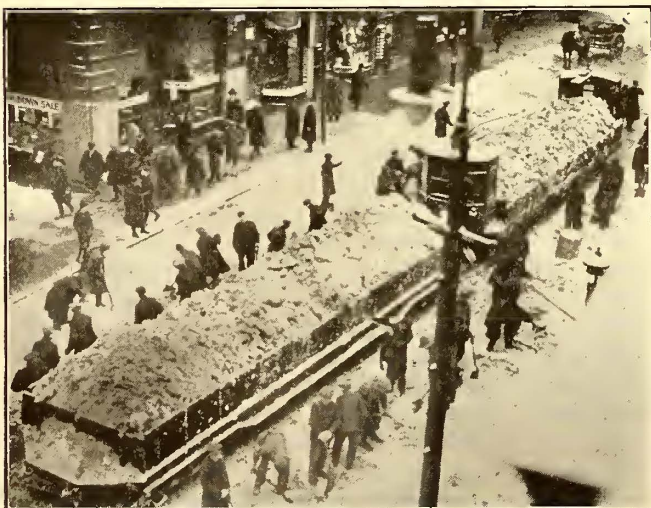


GRADER WITH  $\frac{3}{4}$  CU.YD. BUCKET LOADING SNOW ON ST. JOHNS PLACE, BROOKLYN

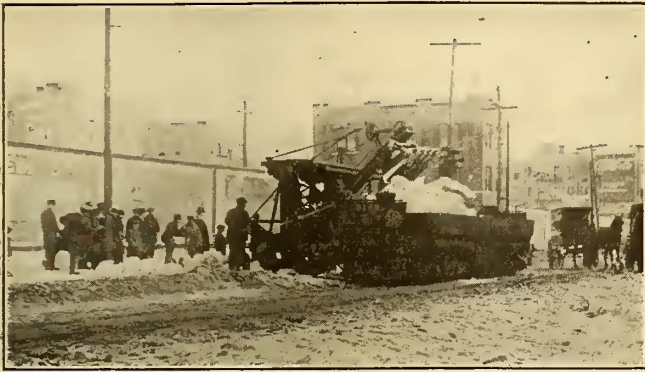
and dump wagons of various kinds. It has been found in Brooklyn that an 18-in. sewer, when aided by water from fire hose attached to near-by hydrants, will permit the disposal of as much snow at each manhole as six men can shovel into it, working continuously. In order to prevent clogging, very large lumps and cakes of ice are not allowed to reach the manholes except in cases where the sewer is 36 in. in diameter or larger, and carrying a very heavy flow of sewage.

In Brooklyn it is estimated that a snow gang of from fifteen to twenty men can handle as much snow through the manholes, even allowing for the comparatively long distances between manholes, as they can load upon flat cars during a day's work. Part of this result is due to the fact that snow cars must not stand long enough to delay regular car traffic, which requires constant shifting and some idle time for the loading gang. This is the first season in which the railroad company has been permitted by the city authorities to use sewers for snow disposal.

The scheme of placing portable crossovers and loading the snow cars upon a "dead" track is not practicable, as there is too much congestion of team and car traffic, particularly because both kinds of traffic would have to try to move over the single-track space, directly upon the single-track area, which alone is available when the snow is piled high in both roadways. It is reported from Brooklyn that the cost for manhole disposal is about 35 cents per cubic yard, while car disposal costs from 65 to 85 cents per cubic yard, depending upon length of haul to dump. The steam-



REMOVING SNOW ON FEDERAL ST., BOSTON, AFTER THE RECENT SEVERE STORM. PHOTOGRAPHS THROUGH COURTESY OF THE BOSTON POST



LOADING SNOW WITH  $\frac{3}{4}$  CU.YD. BUCKET GRADER IN BROOKLYN

shovel loading method costs about 70 cents per cubic yard with the same average haul to dump. The latter cost is higher than it would be if the shovel were owned instead of rented, the rental alone amounting to about \$35 per 8-hr. day. All of the foregoing costs are based upon loading labor at 50 cents per hour and a 9-hr. day, with no allowances for supervision, time-keeping or other forms of "overhead" charges. The work-car charges in Brooklyn are based upon regular freight tariff tonnage rates and the cost for freight haulage or car service, which includes car, crew and power as well as wear and tear on equipment, will average \$12 per load of approximately 30 cu.yd. or 40 cents per cubic yard. The records in Brooklyn also indicate that snow removal is now costing about three times what it cost, on a cubic-yard basis, in 1917.

## Use of Pneumatic Tools in Track Construction

**Tamper Has Many Uses—Author Gives Practical Suggestions as to Auxiliary Tools and Shows Importance of Using Best Tool Steel**

BY THOS. W. BULPIN

Executive Engineer Los Angeles (Cal.) Railway

IN THE early part of 1919 the Los Angeles Railway Corporation purchased a pneumatic tie tamper in order to minimize the use of high priced and inefficient labor. The results so far have been very satisfactory. We find that with the use of this machine we have been able to construct a much better track than heretofore, and at a very considerable saving.

The machine, when delivered at our yard, was mounted, as customary, on the ordinary flanged-wheel truck. As this mounting required the use of tracks upon which to operate, the truck was removed and the machine was set on a four-wheeled trailer, making it possible to transport it to and from the work by an ordinary auto car, and to station it alongside the track where it would not interfere with the operation of service cars.

Some slight improvement has been made in the trolley pole, also, making it possible for cars to operate through or under the point of contact without necessitating stoppage of the machine or attention from the operator. This trolley pole, or "stinger," as some people call it, consists of an upright pole which can be fastened to the machine, hinged at about the height of the trolley so as to permit the wire which connects with the motor to make contact with the top of the trolley wire. No difficulty has been experienced with this pole, and

it saves not only the services of one man, but does away with the stopping and starting of the machine and the consequent loss of time.

While no accurate estimates have been made of the efficiency of this machine, nor of the actual saving of money it effects per track-foot, we do know that with this equipment and about six men it is possible to do the work of probably from twenty to twenty-four men. This is quite a saving, especially when one considers the inefficiency of the average laborer now available for this kind of work. However, the saving in money is not the principal element of efficiency. The fact that it is possible to construct track which is thoroughly and scientifically tamped—thus minimizing the chance of poor work being done by individual workers—is in itself worth many times the cost of the equipment.

While we appreciate the usefulness of this machine as a tie tamper, we believe that its greatest value is as an excavator of concrete paving. To adapt it for this purpose, a set of C.C.25 drift-bolt drivers are used. These tools are fitted to ordinary steel gads, which are driven through the concrete base of the pavement, breaking it into pieces sufficiently small for removal by hand. Our experience with this class of work has been most trying, and we have found that under ordinary conditions it is best to remove the asphalt wearing surface by the usual methods, reserving the drift-bolt drivers for the concrete. We have used this machine for excavating, breaking concrete and tamping in and around special work in busy street intersections, where speed is usually of the first importance, and instead of being obliged to marshal all the forces of the department, we find that we are able, with ordinary sized gangs, to be ready in the morning when the first car goes over the line.

As to the cost of excavating concrete pavement, we had occasion to construct a piece of double track in a street already paved, the pavement consisting of a 6-in. concrete slab, with a concrete wearing surface which was not of the ordinary contract variety, but a job constructed by the municipality; and if I am any judge it was "some concrete." Seven-foot trenches were required for our ties. We found that the most economical method was to cut a trench not over 12 in. wide along one side of the 7-ft. strip, then with bars and hammers to break out the balance of the work. The cost of this work was about two cents per square foot.

### HOME TOOLS NOT SATISFACTORY

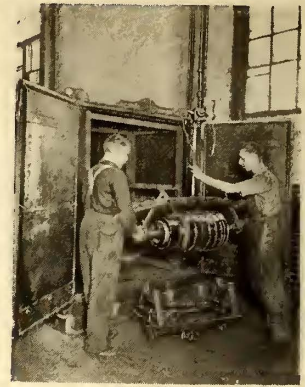
I wish to add a word regarding the tamping bars and steels necessary for gads. It is not advisable to attempt too much saving in the selection of steel for these tools, as ordinary steel will not stand the strain to which the tools are subjected. Our experience has shown that the better policy is to have the compressor company furnish the tools, or at least the steel, as delays are costly. While we have broken a great many home-made tampers, the original set which came with the equipment is still in use and has not been broken in service.

We have also purchased grinders, drills, and other useful tools which can be operated with the same equipment, making it possible to meet any ordinary requirement connected with track work; and as we have another of these machines on the way, it is needless to say that we believe in them, and are more than satisfied with the results we get from them.



# Shop, Track, Power and Line

These Articles and Ideas Are From Men on the Job Who Find Special Applications and New Methods an Incentive for Greater Effort — If You Have Something Good Pass It Along



## Keeping Down the High Cost of Work

By Use of Labor-Saving Devices for Track Maintenance the Cleveland Railway Has Kept Cost Down in Spite of Wage Increases

BY CHARLES H. CLARK

Engineer Maintenance of Way, Cleveland (Ohio) Railway

WITH the large increase in the wages paid for labor the problem of keeping down the cost of renewing tracks and pavements has developed into a question of machinery vs. brawn.

On Jan. 1, 1914, was paying a base rate of 19 cents per hour for labor. About one-sixth of the men received 20 cents, and a few as high as 30 cents. We also had about five men who received 40 cents. These wages prevailed during the year 1914. Jan. 1, 1915, we increased the base rate to 20 cents and 21 cents. In April, 1915, we increased to 22½ cents, and 23½ cents. This rate was carried along until February, 1916, when we again advanced the rate to 25 cents, and again in April, to 27½ cents. The next raise occurred in April, 1917, when we paid 30 cents, and June 1 saw another increase to 32½ cents, followed in August, 1917, to 35 cents. This was the base rate until July 1, 1919, when the men were all given an approximate advance of 20 per cent, which gave them 42½ cents an hour as a base rate, and all others were raised proportionately.

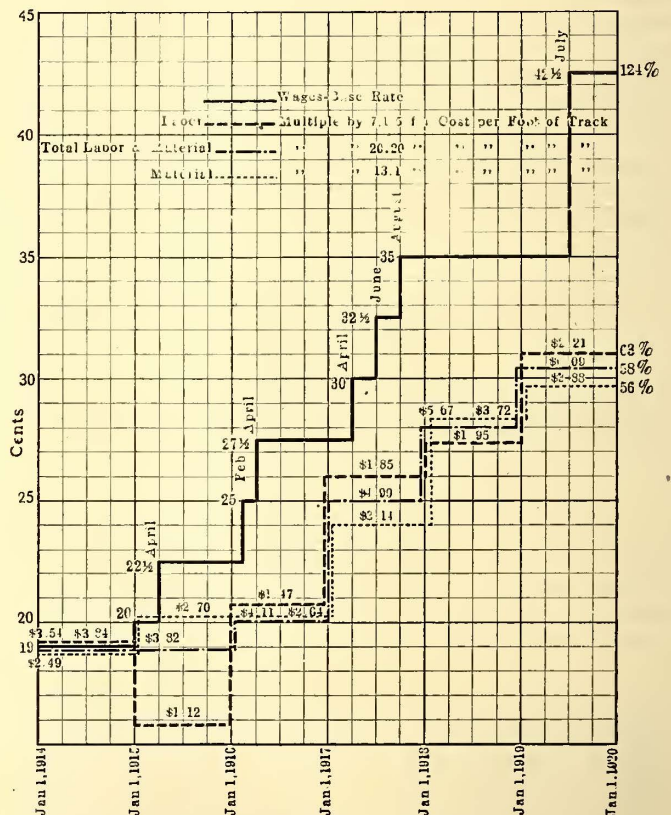
Now let us note the effect of this advance and the causes for the increases and decreases in the labor cost per foot of track:

In 1914, labor per foot of track averaged.....	\$1.354
In 1915, labor per foot of track averaged.....	1.12
In 1914, material per foot of track averaged.....	3.84
In 1915, material per foot of track averaged.....	3.82

This shows that material had not been affected, as we had ordered enough ahead to cover any advance for a year. The cost of labor per foot of track decreased 23 cents. During the year we designed and constructed a pavement plow, purchased a Brown Hoisting 5-ton derrick car, two Universal dump car trains of three cars each, and also installed a machine for cleaning concrete bags.

In 1915, labor had advanced 45 per cent over 1914, and the cost per foot of track had increased about 9 per cent. During this year we added a Differential dump car train of three cars, and improved the pavement plow. We also installed a 60-ft. hammer-head full swinging gantry crane in the yard, which travels along a special track about 800 ft. with a storage space on either side, 50 ft. in width.

In 1917, wages had advanced about 84 per cent, but the track work per foot of track had advanced only 37 per cent, which was a natural increase. We, however, purchased a 15-ton, 50-ft. boom, locomotive derrick, and one pavement grouting machine. We also used a Thew shovel rearranged for breaking concrete.



GRAPHS SHOWING COSTS FOR APPLIED LABOR

In 1918, the increase in wages remained the same but the cost of track work advanced 5 per cent over the previous year, and 44 per cent more than the year 1914. Our only alibi for this was the scarcity and quality of labor we had to contend with during this period of the late war. We purchased three more grouting machines, but these were used on pavement and so did not affect the cost of track work.

In 1919, wages had advanced to 124 per cent over 1914, and track work advanced to 63 per cent more than the same year. We added to our equipment, two concrete conveyors for feeding the mixers.

One must not forget that, in the last two years, the laborer has been rather independent and certainly has

not produced in proportion to former years. Thus the diagnosis shows that, although wages were increased far beyond the most extreme vision of 1914, we have been able to keep the cost of labor applied down very materially by the use of labor-saving devices. In other words, we have studied the situations diligently, and our efforts to combat the H. C. L., or would you say the H. C. W. (high cost of work)? have not been in vain.

## Butt-Welded Joints Installed on the Lines of the Pittsburgh Railways

### Molds Placed Around the Rail Joints Hold the Heated Flux While Clamps Force the Rail Ends Together

**D**URING December, 1919, the Lorain Steel Company installed twenty-six electric butt-welded joints, Jacobs patent, on the 134-lb. trilby rail of the Franks-town Ave. line in Pittsburgh. The equipment used and the method of making the weld are shown in the accompanying illustrations.

A motor-generator set was used for supplying the welding current. This consisted of a 30-kw. alternating-current generator direct connected to a direct-current motor of 65 hp. This motor was essentially an inverted variable-speed motor operated at constant speed on voltages varying from 350 to 650. The welding current averaged about 1,500 amp. at 30 volts.

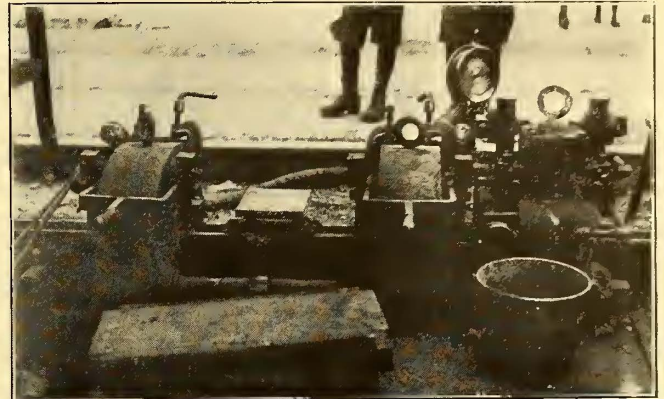
For heating the flux used in the welding, an oil-burning furnace lined with fire brick was used. A motor-driven air compressor supplied air at about 50 lb. pressure for operating this burner.

The molds used for making the joints were of baked fire clay, such as are used with thermit welding, except that they were baked before use and not baked around the joint with a preheater as is customary with the thermit weld. A clamp was used for holding the molds around the rail joints, and for drawing the rails together. This supplied the necessary pressure for making the welds.

The clamp consisted of two crossheads, into which the rails were clamped by means of wedges, and a hydraulic pump capable of supplying a pressure of 5,000 lb. per sq.in. was rigidly connected with one of the crossheads by means of two side rods. The other crosshead slid on the side rods, and the two rams of the hydraulic jacks acted against this crosshead so that

when pressure was applied to the rams the crossheads were forced toward each other, carrying the rails with them. This equipment was mounted on a car equipped with the ordinary street railway motor and control apparatus.

After the molds had been secured around the joint with a clamp, the flux previously heated was poured into the mold and the welding current was turned on. When the temperature in the mold, as determined by pyrometer tests, indicated between 2,400 and 2,500 deg. the rails were drawn together by means of the hydraulic jack. A pressure of about 3,000 lb. per square inch was used. It required about twenty minutes to complete the weld after the heated flux had been poured into the mold and the current turned on.

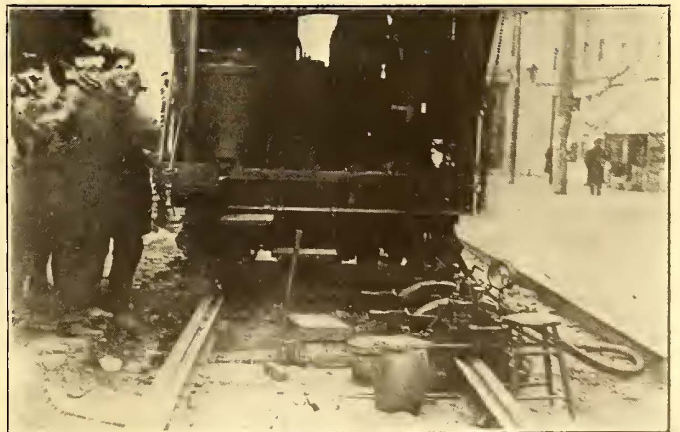


RAILS AS PREPARED FOR WELDING BY THE BUTT-WELDING METHOD

In carrying out this operation it is necessary that the first two rails welded be laid loose with their ends  $\frac{1}{2}$  in. apart. The drawing together of the rails when the welding point has been reached provides space for the succeeding joints, so that all the rails are laid tight after the first two. The fact that the rails must be pulled together to make the weld, makes this type of joint unsuitable for use in repair work.

After the weld is made the joint has to be ground both on the head and gage side of the rail. On this particular work the grinding was done with the same grinder that is used for grinding thermit welds.

Present results indicate that this type of joint is most satisfactory and should it prove as good as it looks under heavy traffic it will be an excellent joint for new construction.



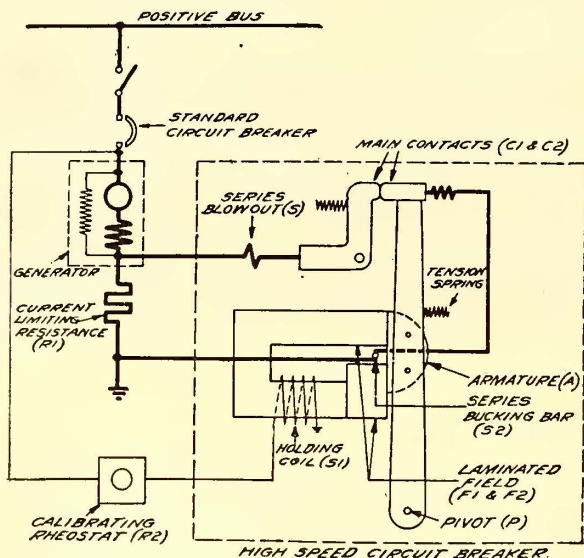
AT LEFT, WELDING CAR IN PLACE READY FOR OPERATION. AT RIGHT, CONNECTION FROM THE WELDING CAR TO THE TRACK EQUIPMENT

## Some Technical Electrical Developments of the Past Year

### A Partial Summary of the Progress Made by One of the Large Manufacturing Companies in Electrical and Steam Machinery

EACH year John Liston, of the General Electric Company, prepares for the *General Electric Review* a comprehensive summary of the developments in the electrical industry during the preceding year. This is frankly confined to the work of the General Electric Company, but it is valuable for general reference and comparison. The following notes are based on the latest summary just issued.

In the field of steam turbines the greatest progress noted was in ship propulsion. However, the record of



SIMPLIFIED DIAGRAM OF HIGH-SPEED CIRCUIT BREAKER

$F_1$  and  $F_2$  represent a laminated field structure something like that of an ordinary alternating current magnet. The poles of  $F_1$  and  $F_2$  are bridged by a very light armature  $A$  pivoted at  $P$ , which is held in contact with the field by a shunt coil  $S_1$  energized from any convenient constant voltage source, such as the exciter circuit or the main bus.

The series bucking bar  $S_2$ , which electromagnetically trips the breaker, is located between the poles of the field magnet in a plane perpendicular to the plane of the laminations and in very close proximity to the armature, so that a given current flowing in it produces a maximum change in the armature flux with a minimum change in the flux interlinking the shunt winding  $S_1$ .

The tension spring attached to the armature provides a means of adjusting the breaker and also gives the high speed opening of the contacts. The main contact tips  $C_1$  and  $C_2$  are of the solid copper type used so successfully on railway contactors. The blow-out coil  $S$  is of the series type and designed to give a very intense magnetic field at the contacts.

a 6,000-kw. turbine in the plant of the Arizona Power Company merits attention. With cool water in the condenser this machine produced a kilowatt-hour from 18,628 B.t.u., or at a thermal efficiency of 18.3 per cent.

Among the latest features considered in the development of turbine-driven alternators is that of a closed system of ventilation, which is desirable under some conditions. With this arrangement it is necessary to remove the heat of the generator losses from the cooling air, which is used over and over again. Generally an air washer may be utilized for this purpose, but sometimes it has proved desirable to utilize a water-cooled radiator of the fin-and-tube type, the function of which is the reverse of that of an automobile radiator. A radiator having a core of 100 cu.ft. would have a good margin in capacity for cooling the air from a 25,000-kva. alternator.

In heavy electric traction, attention is naturally focused on the section of the St. Paul electrification between Othello and Seattle and Tacoma, on which two freight locomotives were placed in operation in October, 1919. These released for other service five steam engines ordinarily used as "pushers" on this grade. The electrification of the government-owned steam suburban lines radiating from the City of Melbourne, Australia, also progressed materially during the year. About 200 miles of line are now operating electrically. The Salt Lake, Garfield & Western Railway completed its change-over to electric operation during the past summer, and is now operating about 21 miles of lines with multiple-unit equipment and automatic substations. Another electrification which will begin operation during the present year is the Hershey Cuban Railway, which will operate a line about 60 miles long between Havana and Matanzas, Cuba. About one-half of this road is now operating with steam engines and the remainder will be new construction.

In the field of automatic substations, the largest unit so far constructed is a 2,000-kw. synchronous motor-generator set, now being installed for supplementing the power supply to the Michigan Central Railroad operating electric locomotives through the Detroit River tunnel. At the end of 1919 there were approximately fifty G. E. automatic-substation equipments in operation and about twenty more were under construction or being installed. In the line of safety cars, approximately 1,400 of the two types of motors made by the company for this service were sold during the year. These two types differ mainly in the style of bearings used.

Among miscellaneous features of equipment, the power-limiting and indicating system installed along the lines of the Chicago, Milwaukee & St. Paul electrification has shown interesting possibilities. By the use of this scheme a high load factor has been maintained.

The intensive study of methods to protect direct-current machines, particularly the 60-cycle, 600-volt synchronous converter, from flashing was continued during 1919 with important results, and there were developed three graduated forms of protection which will now give immunity under all operating conditions. These are as follows: (1) Commutating poles of a high-reluctance type, with much stronger field windings than those previously used were designed, tested in service and adopted as standard. This insures ample protection where operating conditions are favorable. (2) Where greater protection is required, the machines can be provided with a type of flash barrier, which has now fully demonstrated its value in railway service on lines where severe short-circuits are of frequent occurrence. (3) The highest degree of protection includes the use, with the foregoing, of a high-speed circuit breaker, which has fully demonstrated its value under tests of much greater severity than those imposed by the most unfavorable conditions encountered in actual service. The accompanying diagram illustrates the principal features of this breaker. At the Atlantic City Convention of the American Association a 300-kw. 600-volt, 60-cycle synchronous converter protected by a high-speed circuit breaker was subjected to short-circuits from two to three times per hour throughout the five days of the convention.

The success of the automatic generating station at Cedar Rapids, Iowa, and the many railway automatic substations in service have encouraged the development



of other generating and substations along automatic lines. For example, such a station at Ontario, Cal., consists of a 500-kva. 60-cycle generator, direct connected to a Pelton water wheel. Instead of being entirely automatic, this station is controlled by pilot wires from a manually operated station a few miles below on the same stream. When the operator desires to start the remote-control plant, he closes the control circuit which opens the nozzle to the Pelton wheel. When the machine is up to speed, he synchronizes it, and then increases the load to any desired amount by a further opening of the nozzle. The machine can be shut down at the will of the operator by closing a second control circuit, but in case of necessity, due to overload or hot bearings, this generator will shut down automatically.

In alternating-current machinery, the maximum unit capacity for synchronous condensers will soon be doubled as compared with existing units by the installation of a 30,000-kva., 600 r.p.m., 6,600-volt, three-phase, 60-cycle condenser at Los Angeles, Cal. Here in combination with two 15,000-kva. condensers already installed it will be utilized to maintain constant voltage on a 150,000-volt transmission line about 240 miles long. Another record-breaker is the 32,500-kva. 12,000-volt water-wheel-driven generator now being installed by the Niagara Power Company, which represents the maximum capacity for machines of this class.

The use of alternating current for arc welding has led to the development of a special transformer for supplying this current. Alternating current arc welding requires an operating potential of from 25 to 30 volts across the arc; while to strike the arc and hold it with the ordinary bare metallic electrode, an open-circuit potential of about 100 volts is required. Varying operating conditions also require that the welding current be adjustable through a considerable range, generally from 100 to 200 amp. The transformer designed for this special service consists of primary and secondary coils assembled on the center leg of a five-legged core. The secondary coil is generally placed at the bottom of the core and firmly secured. The primary coil is placed above the secondary and attached to a suitable mechanism by which it can be raised or lowered, varying the distance between the primary and secondary coils, thus giving a means of adjusting the welding current. The transformer is inclosed by a metal screen and is mounted on casters, so that it may be readily moved from place to place.

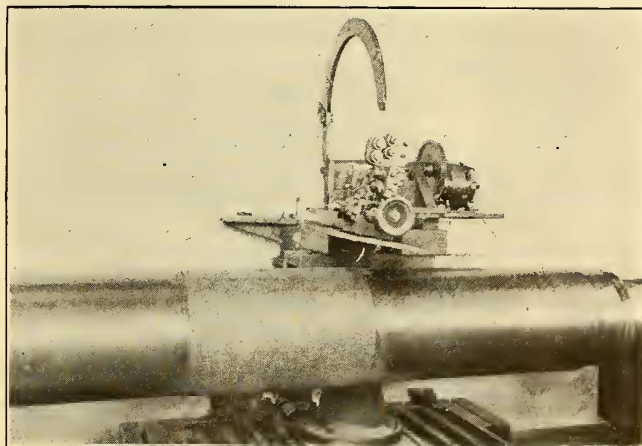
In switching apparatus progress was continued during 1919 in the development of safety inclosed equipment of this type; and the line of truck-type safety panels which previously covered feeder circuit control only was extended to include generator, synchronous motor, and lightning arrester panels. In addition to their essential safety features these panels are very convenient for installation and repair.

In an endeavor to reduce the noise of its electric cars, the Seattle Municipal Street Railway, Seattle, Wash., has recently equipped the motors of one of its cars with helical gearing. Experiments are also being made by fitting felt and canvas under the floor of the car and suspending canvas from the lower edge of the sides of the car so as to reach nearly to the pavement. The theory is that this will absorb the sound waves and thus reduce the noise.

## Automatic Welding Developed

**A**UTOMATIC arc welding is now accomplished by a new device perfected by the General Electric Company, and soon to be put on the market, which is known as the automatic arc welder. This welder, for use with the regular welding set, is designed to take the place of the hand controlled electrode. It consists of a pair of rollers, called feed rolls, driven by a small steady supply of wire. The whole is controlled from a small panel which automatically maintains the best working distance.

The welding head is held by a suitable support with a certain amount of hand regulated adjustment, and consists of a steel body carrying feed rolls and straightening rolls which are made adjustable for various sizes of wire. The arm is supported on a gear box, together with the motor. This box contains gears which give



DIAMETER OF SHAFT FIT INCREASED  $\frac{3}{8}$  IN. BY AUTOMATIC WELDING

three gear ratios, thus extending the range of the device while allowing the motor to operate at its most favorable speed.

The control panel carries an ammeter and voltmeter for the welding circuit, as well as rheostats, a control relay, and the contactors and switches for the feed motor. It is possible to start and stop the equipment from the work by a pendant push button, but adjustment of the feed must be made from the panel.

The adjustment for arc conditions by regulation of the speed of the feed motor, as the arc voltage varies, is taken care of by the panel equipment. The result is a practically steady arc, which is greatly superior in smoothness of operation to any hand controlled arc, consequently increasing the speed of the welding.

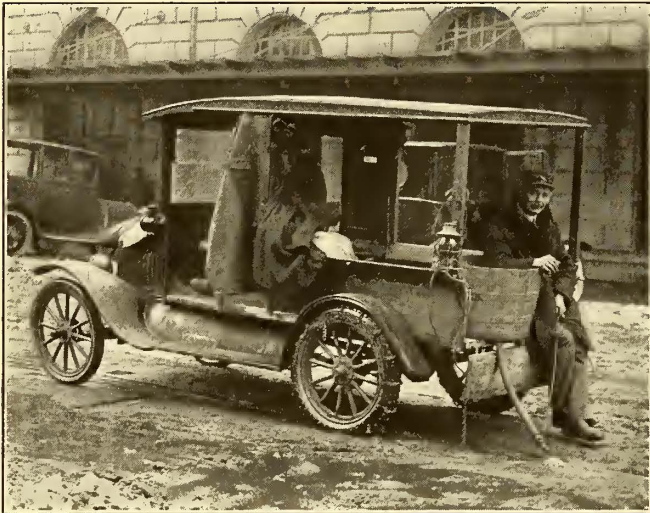
The whole apparatus is mounted on a base which can be bolted to any form of support. Thus a great variety of working conditions can be met, but provision must be made for carrying the arc at uniform speed along the weld. For instance, for straight seams, a lathe or planer bed may be used, and for circular ones, a lathe or boring mill. However, the local conditions will dictate the method to be followed.

The device is especially valuable where a large amount of routine welding is to be done, since it is capable of from two to six times the speed possible to skilled operators and gives uniform weld of improved quality. It is adaptable to welding seams of tanks and plates, rebuilding worn or inaccurately turned shafts (as shown in the illustration), rebuilding worn treads and flanges of wheels, and many other kinds of work.

## A Sanding Car Which Is a Great Time and Labor Saver

THE New York State Railways, Utica lines, has found the sanding outfit shown in the accompanying illustration to be a very useful device in sanding slippery rail and salting switches. It consists of a 1-ton Ford truck, carrying a sand tub and several extra bags of sand or salt. A 1-in. flexible hose 3 ft. or so in length leads from the bottom of the tub, and a  $\frac{1}{2}$ -in. iron rod about 4 ft. long is attached at the lower end of the hose, to serve as a handle, so that the operator sitting on the floor of the truck can guide the stream of sand or salt.

This sanding truck normally is held at one of the car-houses subject to the orders of the dispatcher. It is



A USEFUL SANDING AND SALTING TRUCK

especially useful in September and October when the leaves are falling, and is superior to a sand car running on the track in that it can take short cuts to a point where it is needed in a hurry.

In salting switches the truck replaces ten men who would otherwise be required to patrol the track by sections to insure proper working of the switches. The truck darts from switch to switch, keeping them in good condition without difficulty.

The above facts and the illustration were supplied by E. P. Roundey, engineer of way and structures of the Utica lines.

## Armature Dipping Tank With Air Pressure and Air Control

THE United Railroads of San Francisco for over a year have been dipping armatures in baking varnish as they go through the shops for repairs, with the result that there has been 40 per cent less trouble with grounded armatures when equipment is so treated. An arrangement for applying the compound has been worked out which requires a minimum of time and affords a convenient means of very accurately controlling the level of the compound in the dipping tank.

This consists of a tin-lined wooden tank supported at convenient height by a substantial timber framework. The bottom slopes to the center, from which a 1-in. pipe connects with the reservoir holding the compound. The reservoir consists of old car air reservoir tanks, as these were the most convenient form of container avail-

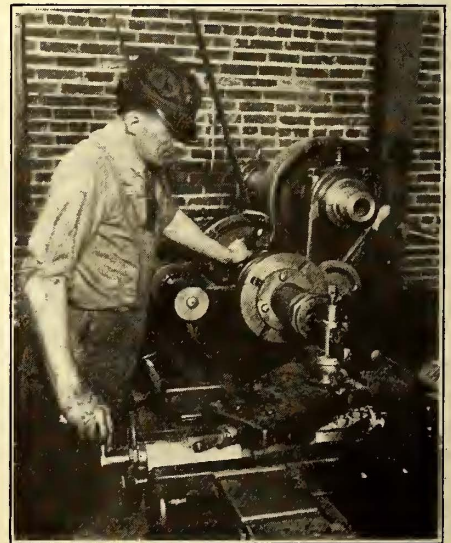
able. Four were used to get the desired capacity. The tanks are connected in parallel and by means of a motor-man's valve, air at 40 lb. pressure can be admitted at the top. This forces the compound up into the dipping tank. When the dipping process is finished the compound is removed from the dipping tank into the reservoir by applying a vacuum in the top of the reservoir tanks. This is obtained by connecting a pipe line to the intake of a car air compressor. Through this system it is easy to bring the height of the compound to any mark required in the dipping tank.

The tank is rectangular in plan so that long armatures can be rested upon it with the shaft lying lengthwise, while short armatures are placed crosswise. A sheet-metal cover is used to keep dirt out of the tank, when it is not in use, and also as a safety measure to be used in case the compound catches fire. The armatures are placed on and removed from the tank by means of an air hoist suspended above it. The methods of dipping, pre-heating and baking are those used in standard practice.

When new armatures are taken from the baking oven, two strap iron clamps are put on, one around the end of the coils at each end of the armature, and the clamps are drawn up tight by means of bolts. This keeps the coils in place while the armature is cooling, and eliminates the necessity for banding while it is hot.

## Handy Chuck for Boring Armature Bearings

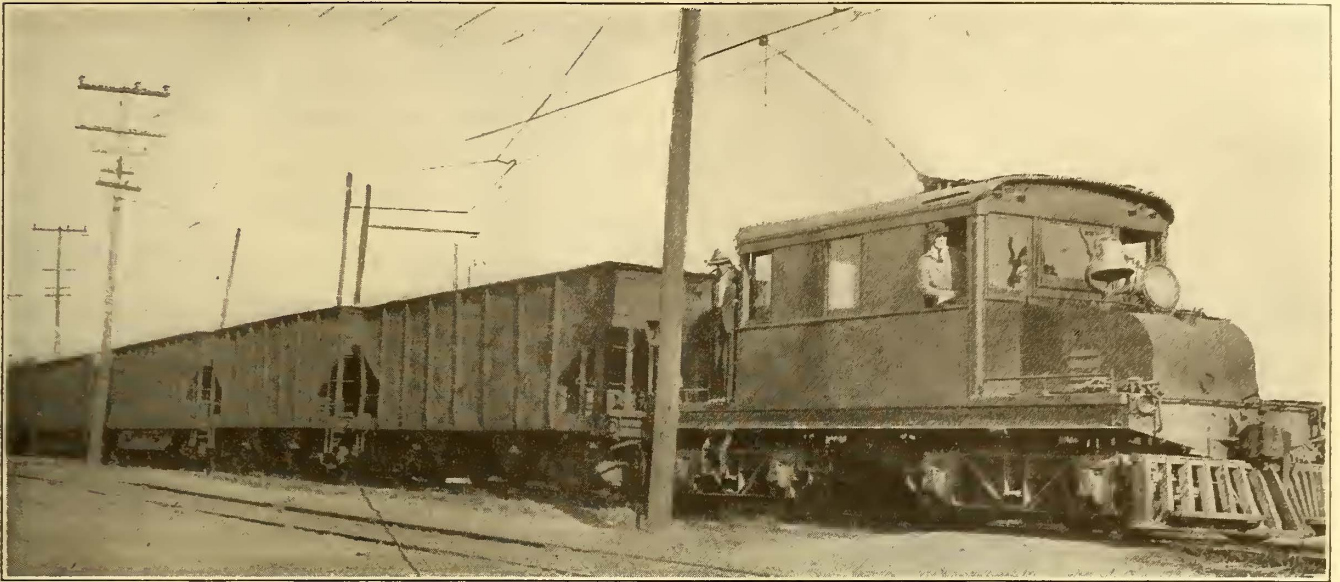
THE setting up of an armature bearing for boring in the ordinary lathe consumes considerable time, and most shops have adopted some special means or use a special chuck for facilitating this work. The accompanying illustration shows a self-centering chuck devised by William Mohr, master mechanic, Pennsylvania-New Jersey Railway. It consists of a cylinder with a flange at one end for fastening to the lathe headstock. The inside diameter of the cylinder is made 0.01 in. larger than the diameter of a standard bearing, and the end is tapered and threaded on the outside for a distance of  $2\frac{1}{2}$  in. This threaded



BORING AN ARMATURE BEARING HELD IN A SELF-CENTERING CHUCK

portion of the cylinder is slotted, so that by running up a tapered nut on the tapered thread, the chuck will clamp the bearing firmly.

In addition to its use as a chuck for facilitating the boring of the bearings, it also serves as a gage for detecting excessive wear of bearings, as any bearing which cannot be clamped securely with this chuck will be found to have been worn so that it is unfit for further use.



NEW LOCOMOTIVE HAULING EIGHT CARS OF CRUSHED STONE

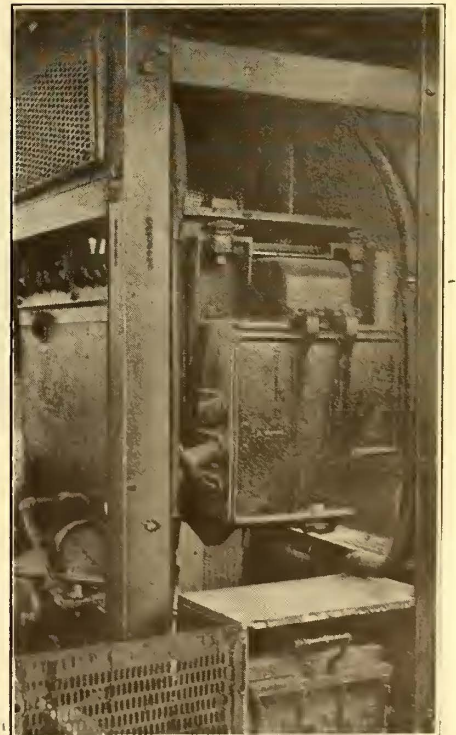
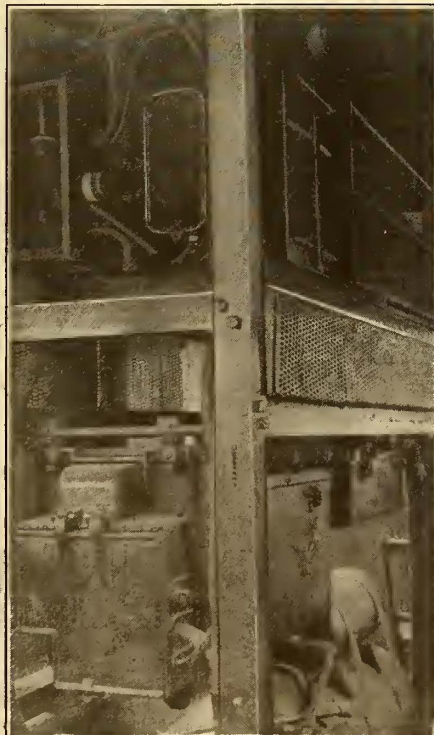
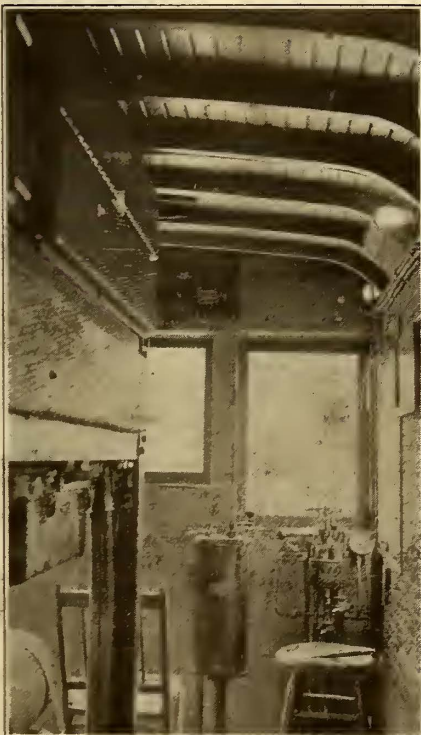
## 45-Ton Freight Locomotive Built in Indiana Shop

Indiana Railways & Light Company Builds Up-To-Date Locomotive for Handling Products of Stone Quarry and Other Freight

A 45-TON electric locomotive designed for use in handling freight trains between Marion and Frankfort, Ind., a distance of 53 miles, has recently been built in the Kokomo shops of the Indiana Railways & Light Company. The Kokomo Stone Company has a large quarry adjacent to the right of way of the railway, and the locomotive is used to move the product of this quarry to various points along the line and onto foreign lines for use as road-building material.

The underframe of the locomotive consists of 6-in. 25-lb. steel I-beam longitudinal and intermediate sills and 6 in. 18 lb. channel cross-sills. All corners are reinforced with 12-in. x 12-in. x  $\frac{1}{2}$ -in. gusset plates and 6-in. x 12-in. x  $\frac{1}{4}$ -in. angles. All work is hot riveted with  $\frac{3}{4}$ -in. rivets. Corrugated iron sheets are supported on the lower flanges of the I-beam and channel sills and concrete with reinforcing rods and wire mesh is filled in to the top of the sills. The flooring is  $1\frac{3}{4}$ -in. plank. The end sills are 6-in. channels with the web space filled in with 2-in. oak and the whole covered with a 1-in. plate as shown in the illustrations. The over-all length is 26 ft. and the over-all width 8 ft.

The cab is 14 ft. x 8 ft., built with 5-in. x 5-in. yellow pine corner posts and 3-in. x 3-in. intermediate posts



AT LEFT, INTERIOR OF CAB SHOWING OPERATING EQUIPMENT. IN THE CENTER AND AT RIGHT, TWO INTERIOR VIEWS OF CAB SHOWING LOCATION OF CONTROL, RESISTORS, FEED AND CHECK VALVES, ETC.

cross-braced with 3-in. x 3-in. lumber. There are three windows in each side and two in each end, the four corner side windows being of the drop-sash type. A door in each end of the cab opens inward. The cab is covered with No. 14-gage sheet iron and the arch roof is  $\frac{7}{8}$ -in. beaded ceiling with oak carlines reinforced with  $\frac{1}{2}$ -in. x 2-in. iron carlines covered with  $\frac{3}{4}$ -in. poplar and 14-oz. duck. The over-all height is 12 ft. 3 in. All the control, resistors, lightning arresters, and feed and check valves are mounted on a frame in the center of the cab built of 3-in. x 3-in. x  $\frac{3}{4}$ -in. angle iron. The sloping hoods at either end of the cab are built from No. 14-gage sheet iron supported on 1-in. x 1-in. x  $\frac{1}{4}$ -in. angles and are 5 ft. long. The air compressor



45-TON LOCOMOTIVE DESIGNED AND BUILT IN INDIANA RAILWAYS SHOP

is located under one hood and a tool box under the other. A sand box is also built in the end of each hood, thus giving a straight drop from the trap to the rail.

The trucks are Peckham interurban with bolsters spaced 16 ft. centers and a 6-ft. 10-in. wheelbase. Axles are 5 in. in diameter with 34-in. steel-tired wheels. Four Westinghouse 93-A motors are used with a gear ratio of 16 to 71 and a free running speed of 35 m.p.h. For very slow running, or in case of trouble with any motor, all motors can be operated in series. The control is Westinghouse HL double end with Westinghouse double-end A.M.M. air brakes and Westinghouse D-3 E.C. compressor. Other equipment includes Gould No. 1080 couplers, Ohio Brass Company sanders, General Electric headlights, Baldwin Locomotive Company bell, Electric Service Supply Company gongs, Nuttall No. 13 trolley base, Dayton drop-handle hand brake and Hartman center bearings.

This locomotive was designed by and built under the direction of M. S. Ferguson, master mechanic. Its use for snow plow operation was described in last week's issue of the *ELECTRIC RAILWAY JOURNAL*.

### Paint Substituted for String Band Reduces Grounded Commutator Trouble

**I**N THE SHOPS of the United Railroads of San Francisco string bands are no longer used on the commutator mica rings of armatures which have been rewound or repaired in the shop. It has been found that a much better method is to apply a special paint compound which incidentally can be put on more quickly and more cheaply than the ordinary string band.

After the armatures come from the baking oven the ends of the commutators are given three coats of paint while the armature is still hot. The paint is made up

of oxide of iron mixed with any good grade of shellac. This has been found to harden with a smooth glazed surface so hard that even a sand blast does not remove it.

The high resisting qualities of this compound are such that grease and dirt which accumulate here and tend to form a short circuit across the commutator insulation to ground are rendered harmless. Wiping the grease off the ordinary string band invariably leaves a certain amount of it "rubbed in," but when the compound is used, wiping removes all traces of grease and dirt.

This compound forms an insulating cement of such good adhesive qualities that it has been used in repairing the insulation between commutator bars. It is applied for that purpose in the same way as any cement would be applied, using the mica as a filler. When the desired surface has been built up the surplus is ground off in smoothing up the commutator. Since this compound has been used in this way the trouble with grounded commutators has been reduced by 80 per cent.

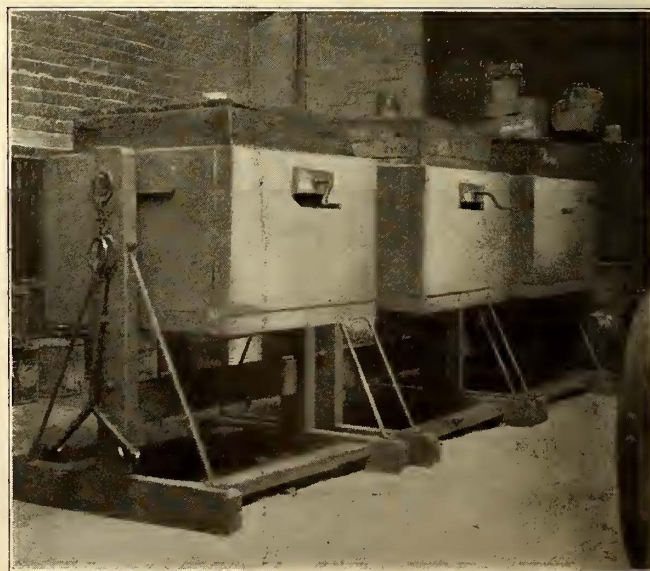
### Getting Liquid Out of the Carboy

**T**HE Cleveland (Ohio) Railway uses in its paint house, which forms one of a group of buildings comprising the Harvard Avenue shops, a carboy holder of the type shown in the accompanying illustration. This device facilitates the handling of chemicals which are received in glass carboys. It was made in the local shop and consists of a box mounted in trunnions on a substantial, well-braced wood frame. The carboy case is clamped in the box by means of a clamp screw which terminates in a crank at its outer end.

The illustrations show also, hanging on the side of the frame, a pair of hook-irons, which fit over the carboys and form an attachment for the hook of the small crane which is used to lift the carboys into boxes.



CLOSE-UP VIEW OF IRONS



ROW OF CARBOY CARRIERS IN CLEVELAND RAILWAY PAINT HOUSE

## Armature and Field Coil Bake Oven

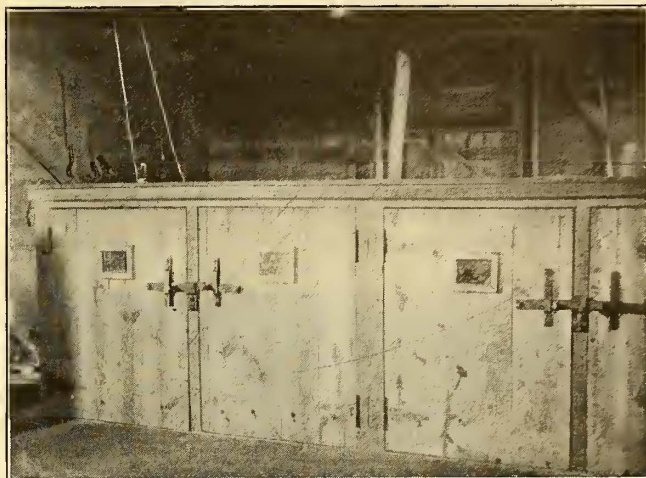
Special Dipping Tank Placed Beside the Oven Also Aids in Securing Best Insulation—Transveyor Handy for Moving Armatures About Shop

A NEW bake oven for armatures and field coils has recently been built in the shops of the Newport News & Hampton Railway, Gas & Electric Company at Hampton, Va., and this, together with a new dipping tank and the practice followed in heating and dipping armatures and coils, has resulted in a notable improvement in the insulating qualities of the motors. The oven measures 12 ft. x 7 ft. on the outside, and is constructed with double walls, with the space between filled with sawdust. This insulating material was used in lieu of mineral wool which could not be secured at the time the oven was built. The oven is lined inside with a  $\frac{1}{2}$ -in. layer of asbestos. It is equipped with four double-wall doors, each of which has an inspection window, as seen in an accompanying photograph. Ventilation holes were provided at the bottom and top of the oven by boring  $\frac{1}{2}$ -in. holes through the walls and ceiling, so that there would be no chance of gas collecting and exploding. One complete four-motor equipment can be overhauled and taken care of in the oven at one time. This is more capacity than is usually required, but it was the basis on which the oven was planned. The oven is heated by two circuits of five panel type heater coils each, supplied with energy from the 600-volt trolley supply.

### DIPPING TANK MADE AT SMALL COST

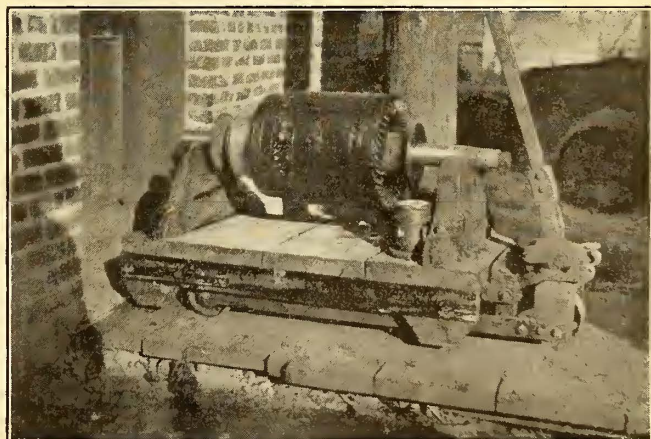
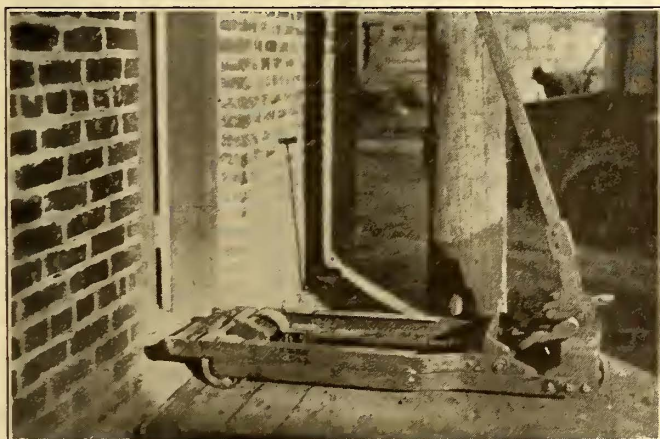
A steel dipping tank for armatures and coils forms another important auxiliary equipment used in the maintenance of motors in the Hampton shops. This is located adjacent to the baking oven so that armatures may be readily taken from the oven, dipped in the varnish, and returned to the oven according to the practice outlined

bake oven, and in fact for the movement of almost any heavy equipment about the shops, the Hampton company has found the Cowan transveyor to be exceedingly helpful. This is a small three-wheeled device having a sur-table which is elevated about 3 in. by means of the handle used to draw the transveyor. A number of platforms have been built upon which motor armatures or other heavy equipment can be placed, the transveyor



PARTIAL FRONT VIEW OF ELECTRIC BAKE OVEN AT HAMPTON

backed underneath the platforms, the sur-table elevated, and the equipment easily hauled to the point in the shop at which it is desired. Hauling the transveyor is made easy by its ball bearings. The platform is lowered to the floor by tripping a foot lever, and an oil cylinder and plunger prevent the load from dropping suddenly. One of these transveyors was purchased in June, 1918, at a cost of \$80 and has been used eighteen months at



AT LEFT, THE TRANSVEYOR USED TO MOVE ARMATURES AND OTHER HEAVY EQUIPMENT ABOUT THE SHOP. AT RIGHT, ONE OF THE SPECIAL ARMATURE PLATFORMS WHICH HAS BEEN PICKED UP BY THE TRANSVEYOR

below. A triplex chain block is so located in front of the oven that it serves for use in this dipping process.

The dipping tank was made in the company's shop from a sheet of No. 10 steel, bent around into a cylinder and the joints welded and riveted. A steel bottom was electrically welded to the cylinder. The tank was set in the ground about a foot to stabilize it. It measures 24 in. in diameter x 4 ft. 6 in. in height.

For conveying the armatures and field coils from the truck repair shop to armature room and thence to the

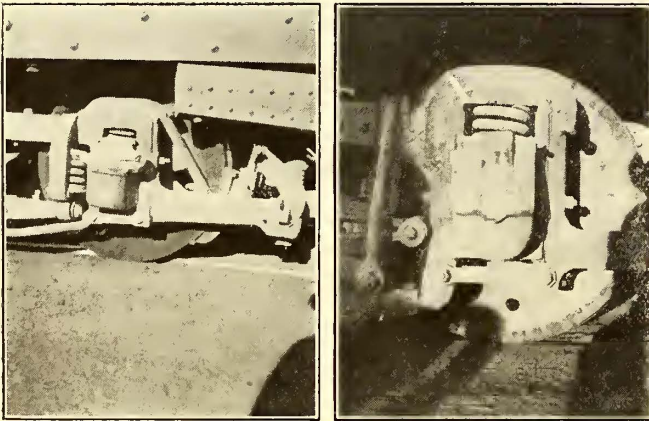
time of this writing without any expenditures for maintenance. This transveyor is shown in an accompanying illustration.

After an armature or field coil has been repaired in the armature room, it is placed on one of the transveyor platforms and hauled to the bake oven. The transveyor with its load is then pushed back into the oven, the sur-table lowered and the transveyor released for other use, leaving the armature in the oven for heating. The armature or field coils are allowed to remain in the oven

for 10 or 12 hours, usually over night, before dipping, in order that they will be thoroughly hot at the time they are subjected to the varnish treatment. It is considered very important to dip the armatures and coils while hot, in order to expel all moisture. The heat thins the varnish so that it penetrates the small crevices to better advantage. The immersion in the varnish is continued until all bubbling stops, and then the armature or coils are placed back in the oven and baked for 48 hours at a temperature of approximately 110 deg. C.

### Welding Broken Pedestals Without Removing the Truck

THE welding of broken truck pedestals has been worked out by R. J. Morrison, Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., with satisfactory results not only as to mechanical strength, but also



AT LEFT, REINFORCING WELDED TRUCK FRAME WHERE BREAK OCCURRED ON SIDE OF PEDESTAL. AT RIGHT, REINFORCING BROKEN AND WELDED PEDESTAL WHERE BREAK OCCURRED AT TOP

as to method. The accompanying illustrations show two kinds of breaks in Brill 27-F truck pedestals and the scheme of repairing.

In the first case the pedestal broke where the journal box hinge wing, in the picture, casts a shadow. The first step in making the repair was to remove the side frame of the truck so that it could be placed in any position for working with the Indianapolis electric welder without removing the truck from the car. This was done by removing the four bolts holding the side frame to the end frame, the four bolts holding the transoms, and the two bolts holding the spring plank, the latter being blocked up. The side frame of the truck was then placed on a power saw and a section was saved out of each piece of the pedestal at the break to make a wide-open "V." The two pieces were then blocked in the proper relative position and the "V" was filled with metal, using a hard steel electrode for the purpose.

A 1-in. x 3-in. piece of iron bar was then forked at one end to fit over the end piece of the frame which supports the transom, and bent to fit over the top of the pedestal, as seen in the picture. This bar was then electrically welded along both edges to the top of the pedestal, and at the forked end, thus providing a substantial reinforcement or brace for the broken side of the pedestal.

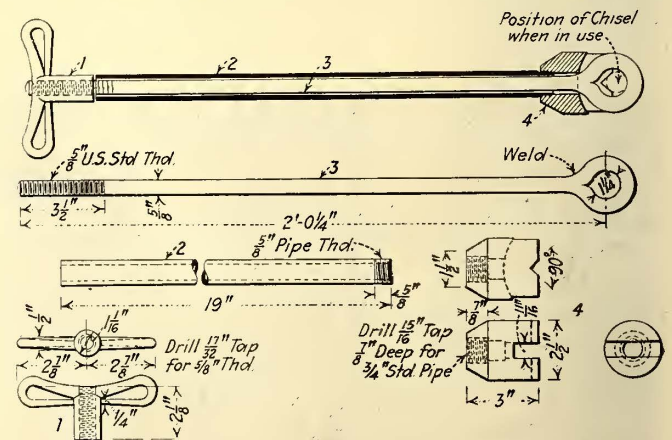
The truck frame was then slid back into place on the truck and bolted up and the car was ready for service.

The entire job was completed in seven hours, of which four hours were required to do the actual welding. A similar break has been repaired in the same manner on three cars with complete success.

In the second case illustrated the break of the pedestal was at the upper left-hand corner, as indicated by the white chalk mark. In this case the side frame of the truck was removed as described above, and a power saw was used to cut a wide "V" in the pedestal at the point of the break. The straps across the bottom of the pedestal were then put in place to help in holding the two pieces of the pedestal in proper relative position and the "V" was filled with metal. To reinforce this break, a strap of 1-in. x 3-in. iron bar was bent completely over the top of the pedestal and forked at the left-hand end to straddle the side frame. All edges of this bar were then thoroughly welded to the pedestal, forming a very substantial reinforcement.

### Good Type of Chisel-Bar Holder

THE accompanying illustration shows details of a very convenient type of chisel-bar holder which, due to the adjustments provided, can be used to fit on a chisel of almost any diameter or length. It consists essentially of four parts: a long rod  $\frac{5}{8}$  in. in diameter with an eye at one end and threaded at the other; a socket made of machine steel, case-hardened, which fits over the rod and provides a clamp for the chisel; a piece of  $\frac{3}{8}$ -in. pipe which serves as a sleeve and to which the socket is screwed, and a hand nut which is screwed on the threaded portion of the steel rod or stem. By tightening the nut the pipe sleeve, together with the socket, is forced against the chisel, so as to clamp it in position. By the use of a rubber or leather bushing in the socket, the jar and vibration occasioned by strik-



DETAILS OF CHISEL-BAR HOLDER

ing the chisel can be absorbed, so that very little of it will be felt by the man holding the bar. The information regarding this holder was secured from the Rochester Railway and Light Company.

The above note is based on a poster forming a part of a recent issue of the National Safety Council weekly news-letter.

P. H. Hooper, water works superintendent, Winnipeg, Man., has been instructed to report upon the cost of examining 25 miles of Winnipeg water mains, which are alleged to have been injured by stray currents from the return circuits of the Winnipeg Electric Railway. The city is now suing the company for \$18,000 damages said to be due to this cause.

## A. I. E. E. Holds Eighth Midwinter Convention

From the Electric Railway Standpoint the Most Important Session Was That Devoted to the "Super Power System" Advocated by W. S. Murray

THE American Institute of Electrical Engineers held its eighth midwinter convention on Wednesday, Thursday and Friday of this week at the Engineering Societies Building in New York City. A registration of about five hundred indicates the continued success of these conventions and the interest in the subjects under discussion.

Registration opened Wednesday, but, aside from inspection trips and attendance at a session of the American Institute of Mining and Metallurgical Engineers, there was no convention schedule until the evening meeting. At this meeting President Calvert Townley delivered an impressive address. He re-outlined and explained the recommendations of the joint conference committee of the four national societies with reference to the type of organization engineers should effect to express most efficiently the sentiment of engineers at large on national questions and to formulate policies which concern all engineers as differentiated from individual groups. Three papers were presented; on "Daylight Saving," by P. S. Millar; on "Essential Statistics for the General Comparison of Steam Power Plant Performance," by W. S. Gorsuch of the Interborough Rapid Transit Company; and on "Standard Graphic Symbols," by E. J. Cheney, engineering staff Public Service Commission of New York. Mr. Millar gave an impartial analysis of the effects of daylight saving, discussing coal saving, the habits of the people and many other points. Mr. Gorsuch made a plea for a system of reports of steam power plants which would allow general comparison, the chief argument being for a uniform system of questionnaires from governmental authority. Mr. Cheney showed the wide variation in graphic symbols used in electrical drafting and made suggestions looking toward standardization of at least some items.

The session Thursday morning was devoted entirely to a symposium on an "Economical Supply of Electric Power for the Industries and the Railroads of the Northeast Atlantic Seaboard." This was the result of the efforts of W. S. Murray, chairman of the traction and transportation committee of the Institute, who requested some nine others to make contributions on particular parts of the general subject such as generators, turbines, railroad electrification, coal saving, transmission problems and insulation. Mr. Murray presented the whole symposium in a covering paper. The subsequent discussion emphasized many of the more important aspects of the proposed plan. The plan has been outlined in the technical and public press. It is, specifically, a tying together of the northeastern Atlantic seaboard district into one electrical network, the more economical production and utilization of power and the electrification of the railways in the entire zone. Mr. Storer, Westinghouse Electric & Manufacturing Company, made the point that the railways must take a leaf from the housewife's notebook and say "Do It Electrically," not only as to motive power but also as to all other places along the line where electricity might be applied to save labor. The sentiment of the meeting seemed to

be that some answer would have to be found and that an impartial committee should be formed to investigate and formulate methods of attack.

On Thursday afternoon, parallel sessions were held. At one, devoted to communication, there were papers on "Printing Telegraph Systems," by J. H. Bell of the Western Electric Company, and on "Maximum Output Networks for Telephone Substation and Repeater Circuits," by G. A. Campbell and R. M. Foster, of the American Telephone & Telegraph Company. At the other session there were papers on "A Method of Separating No-Load Losses in Electrical Machinery," by C. J. Fechheimer of the Westinghouse Electric & Manufacturing Company, on "Inherent Regulation of d. c. Circuits," by A. L. Ellis and B. W. St. Clair of the General Electric Company, and on "Measurement of Projectile Velocities," by P. E. Klopsteg of Leeds & Northrup Company and A. L. Loomis, formerly major, Ordnance Corps, U. S. A.

On Thursday evening, the convention dinner dance was held at the Hotel Astor.

Friday's morning session was devoted to detailed apparatus such as "A New Form of Vibration Galvanometer," by P. G. Agnew of the Bureau of Standards; "Precision Galvanometer for Measuring Therm. E.M.F.'s," by T. R. Harrison and P. D. Foote of the Bureau of Standards; and "Notes on Synchronous Commutators," by Prof. J. B. Whitehead of Johns Hopkins University. In the afternoon the following papers were on the program, on "Oscillographs and Their Tests," by Prof. A. E. Kennelly of Harvard University, R. N. Hunter of the American Telephone & Telegraph Company and A. A. Prior of the Case School of Applied Science; and on "The Accuracy of Commercial Measurements," by H. B. Brooks of the Bureau of Standards.

A more complete abstract of some of the papers presented and the discussions following will be given in a later issue of this paper.

## February Meeting of the New England Street Railway Club

THE February meeting of the New England Street Railway club was held at the American House, Boston, on Feb. 5, 1920. Owing to the severity of the snow storm, a small attendance resulted. The papers prepared by Mr. Bennett and Mr. Lindall were postponed until the April meeting of the club. The afternoon session was adjourned.

At the dinner Mr. Atwill, chairman of the Commission on Public Utilities of the State of Massachusetts, gave a short address on 100 per cent Americanism. Announcement of the annual dinner to be held March 25, 1920, at the Copley-Plaza, Boston, was made. The speakers for this banquet will be Matthew Brush, Governor Sproul of Pennsylvania, Governor Coolidge of Massachusetts, and Mayor Peters of Boston.

A note in a recent issue of *London Engineering* states that the work on Simplon Tunnel No. 2 had to be suspended in July, 1918, owing to the dearth of labor and materials. The operations were resumed at the beginning of November, 1919. By the end of 1919 more than 87 per cent of the tunnel had been completed. The tunnel will be nearly 11½ miles long.

## Association News

### Association at Coal Hearing

#### Representatives Make Protest at Washington on Increased Prices for Fuel

PROTESTS against the passing on by the operators of the 14 per cent wage increase allowed coal miners by Dr. Garfield were registered before the President's coal commission, Feb. 17, by representatives of several of the public utility associations. Confiscation and diversion of public utility coal by the Railroad Administration also came in for severe condemnation. Several of the public utility witnesses advised the Commission that they regarded as essential to continue in force the Government restrictions on coal until normal conditions have been restored. It was stated, however, that the distribution of fuel should be placed with an agency other than the Railroad Administration. A seasonal rate on the railroads for coal and operators' discount were recommended to assist in the effort the utilities associations are making to induce their members to buy more coal during the spring and summer.

George W. Elliott, of the National Committee on Gas and Electric Service, was the first witness. He called attention to the fact that public utilities use 50,000,000 tons of coal annually. With 98 per cent of this coal bought on contracts the public utilities have been hard hit by the action of the coal operators in passing on the 14 per cent increase to them. He, as well as practically all the other witnesses, asked that the public utilities be relieved of that increase in their price. Mr. Elliott also dwelt at length on the difficult situation which had been brought about by their failure to receive coal after it had been ordered.

Chairman Robinson asked Mr. Elliott to furnish a statement showing the quantity of coal consumed in normal times by the public utility companies of the country. He also asked that a tabulation be made to show a record of the deliveries of coal by months during 1919. A third request was for an estimate as to the storage capacity which is available at public utility plants.

Mr. Robinson also asked if it is the policy of public utility companies to take advantage of the fact that they are second only to railroads in the matter of priority of fuel supply and delay purchases of coal when there is a prospect of making a better bargain at a later time. Mr. Elliott replied to the effect that if such a practice were indulged in the cases were insignificant in number.

A. W. Brady, president Union Traction Company of Indiana, said that the point had been reached where traction lines cannot recoup their revenues by increasing fares. Any further increases, he said, would result in decreased receipts, and as a consequence traction companies must curtail their service if they are to absorb the 14 per cent increase in coal price or any further increases which might be made in the cost of coal.

Charles Edgar of Boston, representing the National

Electric Light Association, told how the Boston Edison Company has a storage capacity for 100,000 tons of coal but is unable to utilize its entire storage capacity due to the fact that deliveries of coal cannot be secured in summer months. It has been the practice with the company to store three months' supply of coal during the summer, he testified, while the practice of the New York Edison Company is to enter the winter with a two months' supply. Inability to get coal last summer found the New York Edison Company at Christmas time with a margin of only 20,000 tons of coal. He declared that public utilities companies generally are in entire sympathy with the storage plan. He also told of the many difficulties which the Railroad Administration's distribution program had brought to large consumers of coal.

Paul Thompson, of Philadelphia, representing the United Gas industries, brought out the need for prohibiting the confiscation of gas coal for steam purposes. He said that the railroads had confiscated and burned in their boilers large quantities of this special coal which was so needed by the manufacturers of artificial gas.

M. H. Aylesworth, general manager of the National Electric Light Association, among other things urged that steps be taken to make it profitable for public utilities companies to buy coal at summer prices for storage. He told of the additional expense occasioned by the rehandling made necessary by the storage of coal. At this point in his testimony, Chairman Robinson asked whether in view of the general public's dependence on public utilities and because many thousands of mine owners are seriously affected by the seasonal character of the purchases of coal, it is not the duty of public utilities companies to store coal even if the cost to them should be greater. Mr. Aylesworth replied that it is his personal conviction that it is their duty.

Oscar H. Fogg, secretary of the American Gas Association, testified that it was the usual practice for manufacturers of artificial gas to store a three or four months' supply of coal during the summer.

With the completion of the testimony of the representatives of the utilities associations, Ralph Crews, representing the coal operators of the central competitive field, asked permission to make a statement regarding the passing on of the 14 per cent advance. He explained that price control had been lifted by the fuel administration, and for eight months contracts had been entered into in good faith without any provision for a reinstating of the price control. For that reason the fuel administration had ruled that where contracts provided that price agreed upon is to be augmented by any wage increase, it is only fair and business-like that the contract shall be strictly lived up to.

The same points were made before the Frelinghuysen sub-committee which is investigating coal for the Senate.

### Instructions to Committees

SECRETARY BURRITT has sent to officers and committee members of the Engineering Association, copies of a pamphlet containing a code of instructions and regulations governing the style of specifications. This is in form for insertion in the covers of the Engineering Manual.



# News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION  
PERSONAL MENTION

## Ottawa for City Ownership

City Officials Take This Stand, but Company Conducts Campaign for Service-at-Cost

On Jan. 19 the Ottawa (Ont.) Electric Railway sent a letter to the Board of Control of the city suggesting that they investigate the service-at-cost plan of operation for the railway in Ottawa. The company did not do this with the intention of opposing municipal ownership at the expiration of its franchise in 1923, but because the adoption of this plan would enable it to continue to provide adequate service during the declining years of the franchise.

### RAILWAY TAKES FIRM STAND

The company hoped that the city authorities would inquire carefully into the proposal. The city clerk has written that the City Council "is not prepared to enter into any service-at-cost scheme such as suggested, and therefore considers it unnecessary to discuss the general principles of this method of operating."

The railway is so firmly convinced that service-at-cost is the best plan that could possibly be devised for the operation of public utilities that it proposes to continue to discuss with its patrons through the *O. E. R. News* the theory of the plan, and its practical application to the local situation.

Supplementing in a way the statement of the general rejection of the company's proposal by the city, Mayor Fisher subsequently addressed well attended meetings of the Board of Trade on the matter. At one of these meetings the Mayor said the proposition of the company that it should be guaranteed 6 per cent not on the money it had put into the business but on the capitalized value of the system now, was not a fair proposition. He said:

If the company does not recede from its position, there can be only one conclusion, that it is a hold up, a deliberate attempt to take money from the people that they are not obligated to pay. If the company wants to deal honestly and fairly with the city, it should be prepared to carry out its contract in a decent and honorable way.

### MAYOR WILLING TO HELP

The Mayor was emphatically in favor of municipal ownership and against the service-at-cost proposition. He was willing to consider the city assisting in financing the purchase of necessary equipment to put the service in proper shape, to have the city agree to take over new equipment at present prices, less depreciation, or the city might buy the equipment and rent to the company at a sum sufficient to cover the interest on investment and depreciation until the end of the franchise.

That the proposal of the company was misinterpreted in some of its phases by the city appears quite plain, for as the company pointed out after the talks by the Mayor, the company's capitalization has no bearing upon the settlement question.

In a statement addressed to the public the management of the company has explained that when the city decides to take over the property it will not be interested in the capitalization, but will ask a board of arbitration to decide what the property is worth in dollars and cents. The proposal of the company is that after the worth of the property has been ascertained by some one competent to judge, the company carry on the business with the understanding that the fares received from passengers be sufficient to pay the usual cost of operation and 6 per cent on the valuation to the owners of the property. Any revenue remaining at the end of the year, over and above the cost of operation, would belong to the city.

As stated previously the Mayor favors municipal ownership. The company feels that service-at-cost affords the best solution. It is, however, open to suggestion. This is indicated by its stand as follows:

When the counter proposal of the Board of Control is received by the company, it will be given most careful attention, but we do not want the people of Ottawa to have a wrong conception of service-at-cost because we, as life-long students of this business, consider it the most equitable plan of street railway operation that can possibly be devised.

## Reorganized Company Plans Improvements

Several hundred thousand dollars are to be spent by the San Francisco-Sacramento Railway, the successor under reorganization to the Oakland, Antioch & Eastern Railway, for improvements during the coming year, according to the expenditure budget just adopted. The work contemplated includes the construction of a branch line between Clyde and the plant of the Pacific Coast Shipbuilding Company, the purchase of additional motor equipment and rolling stock and extensive improvements on roadbed, maintenance and general equipment.

In addition to six new passenger coaches to handle intercity traffic, new transforming substations will be installed, catenary construction employed between Saranap Junction and Bay Point; the tunnel between Shepherd and Redwood Canyons constructed at a cost of \$150,000, and the entire roadbed reballasted.

Work has already started on the Clyde extension.

## Loop Subways in Chicago

Their Cost to Be Estimated—\$90,000 Spent in Fight Against Increased Fares

At its meeting on Feb. 6 Mayor Thompson's traction commission designated George W. Jackson, engineer, to prepare an estimate of cost of building subways in Chicago's loop district under Lake, Randolph, Washington, Madison, Monroe, Adams, Van Buren and Harrison Streets, from Halstead Street to Grant Park, and under Wells, La Salle, Clark, Dearborn and State Streets, and Wabash Avenue from Twelfth Street to Erie Street.

### MORE MONORAIL TALK

Chairman Samuel A. Ettelson explained that the commission was not committed to the subway, or any other plan as yet, but wanted to have at hand the data for subways under those streets. Mr. Jackson is the engineer who built the freight subways under Chicago operated by the Illinois Tunnel Company.

The monorail proposition, referred to previously in this paper had another inning before the commission at this meeting, and a special representative of the Mayor tried to incite the commission to immediate action in building a 5-mile experimental installation of the system. F. D. Flint, promotor for the monorail, took occasion to correct the figure which had been given in the newspapers as the estimated cost of building and equipping a monorail system. He stated that a double-track line could be built and completely equipped for \$200,000 a mile. This figure provides for a structure weighing less than 400 lb. per lineal foot and gives a clearance below the bottom of the cars of 15 ft. The proposed cars will weigh only 12 tons.

The principal reasons for the traction commission taking so great an interest in the monorail system are its low cost and the fact that it is claimed that a 5-mile structure could be installed by the middle of next summer. This is compared in the minds of the commissioners with enormous cost and twelve years' time required to build a subway system.

### \$90,000 SPENT FIGHTING FARES

It was learned on Feb. 5 that \$90,000 of the \$105,000 appropriated for the city's fight against the increased railway fares has already been spent. Eleven \$60-a-day engineers and fifty-one \$30-a-day appraisers had been on the pay roll in this fight, according to the report made to the finance committee of the Council.

## Service-at-Cost Terms

### New Toledo Proposal Is for Twenty-five Year Franchise With Six-Cent Initial Fare

The proposed service-at-cost franchise for the settlement of the railway problem at Toledo, Ohio, drafted by a commission of business men appointed by Federal Judge John M. Killits, has been submitted to Henry L. Doherty, operating head of the Toledo Railways & Light Company, and a committee of ten prominent Toledo lawyers. All objections will be made in writing. The measure will then be submitted to Council for passage, after which it will have to be ratified by a vote of the people.

#### INTERURBAN PROVISIONS CHANGED

The most important change made during the past week was in the section affecting interurbans. Rather than be required to turn over all fares collected in the city, they will be allowed to contract with the local company and in case of dispute will refer all matters to arbitration for settlement. Council will have to approve all contracts.

The following is a summary of the most important provisions in the new service-at-cost measure:

Franchise is for twenty-five years.

A new company, to be known as The Toledo Street Railway, is to be organized to take over the railway system, except the power houses, and operate it independently of the lighting and power business of the Toledo Railways & Light Company.

Provision made for sliding scale of fares, with initial rate of 6 cents with 1 cent for transfer. Possible maximum fare, 7 cents, with 1 cent transfer; possible minimum fare, 3 cents.

The company is to place \$400,000 in a stabilizing fund. All receipts of company above expenses are to be placed in this fund. When the fund reaches \$500,000, fares are to be decreased automatically. If a deficit is shown and the fund is reduced to \$300,000, fares are to be increased.

Provision is made for creation of maintenance, depreciation and sinking funds. The sinking fund is to be invested in bonds of the company, which are to become the property of the city, but stamped as junior securities.

In event of purchase of the property by the city, the price is to be reduced by the amount of the sinking fund.

City reserves right to lease or purchase railway at any time.

Mayor may investigate affairs of company, board of control or traction commissioner at any time.

After franchise has been in effect ten years it may be renewed or the city may begin process of gradual purchase by creation of an amortization fund, by adding a small amount to the rate of fare—enough to pay one-fifteenth of the value the first year of amortization period, one-fourteenth the next year, and so on down until the entire amount is paid and the car lines become municipally owned.

Interurban cars can be operated on city tracks by contract between interurban and local companies, but subject to regulation of Council.

Contract for electrical power shall be between the Toledo Street Railway and the Toledo Railways & Light Company, but subject to approval of the city commissioner. In case of disagreement as to rate, State Public Utilities Commission or board of arbitration may make adjustment.

If freight cars are operated, it shall be under regulation of Council.

Capital value of company, based upon appraisement of its physical property, is yet to be determined. City's appraisement is \$7,111,000; while Henry L. Doherty's maximum is \$17,000,000.

Company's bonds bear 6 per cent interest and have a call premium of 4 per cent. Stock dividend shall be 7 per cent and there shall be a call premium on stock of 8 per cent.

Stock issues must not exceed 40 per cent of capital value, the remainder to be represented by bonds.

Toledo Street Railway must provide \$1,000,000 cash, for which stock will be sold. This will be used for betterments and extensions, including cross-town line and rerouting. Also \$500,000 must be provided for repair and rehabilitation of the property, to put it in good operating condition generally.

Mayor is to appoint a board of railway control, consisting of three members, who are to serve without compensation and act in a general advisory capacity to Council and the city transportation commissioner.

Transportation commissioner to be appointed by the Mayor, upon recommendation of the board of control, his salary to be fixed by the board subject to approval of the Mayor. Commissioner is to employ necessary assistants, engineers and clerks to aid in supervision of operating of the lines and checking receipts and expenditures of the company, having access to the books of the company at all times.

Board of control is to employ expert engineers to plan rerouting and rearrangement of car lines at a cost of \$10,000 or more if necessary, subject to approval of Council.

Company is required to pay for new street pavement between car tracks and one foot on each side, but is not required to pay for repaving.

Company is required to operate modern, comfortable cars.

Schedules are to be fixed by City Commissioner and Council has authority to order improved service on any line, at its discretion.

The hope for a municipal ownership measure to submit to the people of Toledo at the same time their cost-of-service franchise is up for ratification now lies in a favorable decision from the Supreme Court of Ohio on the test case brought by the city to determine whether or not a municipality can issue general credit bonds to purchase a transportation system. Decision was expected either Feb. 17 or 24.

## New York Mayors State Their Plans

William P. Capes, Albany, N. Y., secretary of the State Conference of Mayors of New York, has made public the program of legislation of the Mayors and other public officials. Many sweeping changes are suggested, among them home rule for the cities, reforms affecting the Public Service Commission law and a plan advocating hydro-electric utilities.

The members of the conference believe that the public utility bill presented at the last session of the Legislature is "the most practical and the safest plan yet proposed." They say:

It is not a municipal ownership bill—it does not even express a preference for that solution of the problem. It is simply a utility measure by means of which a city and its public service corporations may cure utility ills in any way that will be equitable to the corporation and give adequate service at as economical a cost as possible. At the present time the cities have no power to do this. All that the cities seek is this authority so that they may exercise it when needed. The cities are opposed to any legislation which will confer upon the Public Service Commission power to regulate rates, irrespective of franchise restrictions. They also are opposed to any legislation which will permit a utility to unload on a municipality.

The conference also has something to say about the matter of valuations. On this point it says:

The cities believe that the Legislature at its 1920 session should grant to the Public Service Commission, Second District, sufficient funds whereby the commission can make an independent appraisal of the properties of the telephone companies in this State for the purpose of determining equitable service rates.

## "The Street Cars Must Go"

Publicity copy which appeared under the above caption is being distributed by a motor truck manufacturer. It is apparently intended to be a broadside aimed at the electric railway industry to retire the railway by condemnation and substitute the motor bus by acclamation. There is a good laugh in it for anyone who knows anything about the transportation business. At the same time a lesson may be drawn. The statement follows:

It becomes daily more apparent that the motor truck has sounded the death knell of the street car. Traffic congestion in large cities make the street car just as awkward and unnecessary as its predecessors the horse car and the stage coach. The day of the surface car has gone forever, and it will not be long before the large cities are trackless and free from the unsightly and abominable overhead wires with their appurtenances.

A single street car out of order can hold up traffic for hours. When a motor bus is out of order, the passengers are simply transferred to another bus, and the derelict is repaired at their leisure by a wrecking crew or hauled to the garage. There is no break in the service, the strength of which lies in its constancy. A fire can hold up an entire street car system, but motor buses are not subject to the limitation of tracks, and they can readily change their route to another street when one is closed to them.

Motor buses mean faster service. While one bus is taking on passengers at a corner, the bus following can keep on going and pick up the passengers at the next corner. There is no waiting for one car to complete its loading and discharging of passengers before those behind can go ahead. In this way every motor bus bears its full share of the day's work, and the spectacle isn't seen of some crowded to the roof, while others go by empty.

The motor bus is the poor man's limousine. It gives him all the comforts and delights of closed-car motoring with none of the expense. It is swift, sure, silent, comfortable, and even luxurious.

What astonishes street car companies unable even to meet their dividend requirements is the appalling cheapness of motor bus transportation. Statistics procured by the Commissioner of Plant and Structure in New York showed that 100 buses operating on a 5-cent fare basis would pay a profit of \$376.80, after allowing for every expense, including 30 per cent for depreciation.

The Fifth Avenue line of buses in New York charge a 10-cent fare. This company has been highly successful from its beginning. Subjected to the fierce competition of three different four-track subway lines, and a number of elevated and surface routes, it not only survives but continues to roll up dividends year after year. People prefer it to street cars and are glad to pay the higher fare.

City transportation of the future will consist of subways, working in conjunction with motor buses. As for the street car, it is now in its decadence and must give way to the modern motor truck, easy to operate, efficient in all kinds of weather, economical, and, most important, standing high in the graces of the riding public.

## Emergency Aid for Employees

President Alexander has announced that an official of the Monongahela Valley Traction Company, Fairmont, W. Va., has been designated to look after the employees of the company who are on the sick list. Many of the employees have been losing time because of influenza. It is the duty of the agent to visit all the men who are incapacitated, to see if any service can be rendered them by the company, ascertain if a nurse is needed, and if so, to attempt to secure one, and to look after other needs that might arise when a man is suddenly stricken.

## Construction Program Announced for Minneapolis

The Minneapolis (Minn.) Street Railway in the spring will begin construction of a new loop in the downtown district and two through lines, one across the new Third Avenue bridge to the East Side, and one across the Seventh Street N. bridge, thus making a new outlet to the North Side now reached only by one avenue for all lines, or by company motorbuses. This work, with the construction of front exits for 300 cars, will cost \$1,000,000. The order issued by the Council on Feb. 13 has been accepted by the company.

Operation of two-car trains, which have been tried out for a long period, will be impossible, the company reports, while the reconstruction of the 300 cars is in progress. In St. Paul 225 are to be equipped for front exit. Although John A. Beeler's recent suggestion that the need in Minneapolis is relief from loop congestion, the proposed plan to bring him into consultation has been given up by the City Council.

The directors of the company at the recent meeting in New York had authorized the construction of the proposed North Seventh Street line. This additional construction will also be begun. Horace Lowry, president of the company, said the directors have voted to use every available fund for making the extensions and improving the service.

Seven Socialist Aldermen tried for two hours in the Council meeting to block the improvements, as they had done in the committee meetings, on the ground the company might make more money if the orders were carried out and that the public had not received an opportunity to express an opinion.

Application for a writ of mandamus was granted on Jan. 18 in the District Court to compel the Minneapolis Street Railway to build the Seventh Street line as ordered by the Council on April 27, 1917. This order had not been pressed pending a vote on the proposed new service-at-cost franchise by the people. After defeat of the franchise the Aldermen renewed the request for the railway extensions.

## Atlanta Wage Negotiations Progressing

A strike of the union carmen in the employ of the Georgia Railway & Power Company, Atlanta, Ga., is more or less of a remote probability. H. O. Teat, business agent for the union, declares that no strike vote had been taken and that the men are negotiating with the company for an amicable settlement of the difficulty. The demands of the men have not been announced, but it is understood from good authority that they want an increase from 40 cents an hour, which is provided by the 1919 contract, to from 58 to 60 cents an hour; time and one-half for overtime, Sundays and

holidays; and an annual vacation of two weeks with pay.

It was previously stated that the men demanded also a closed shop, but it is now understood this point has virtually been abandoned, making an amicable settlement still more probable.

H. M. Atkinson, chairman of the board of directors of the company, stated that no crisis is at hand and that he believes the matter will be settled shortly to the satisfaction of both sides.

By some sources it is denied that the men have asked for a two weeks' vacation annually, and time and one-half for overtime, Sundays and holidays. Definite information is not obtainable as neither side will divulge the exact demands. It is probable, however, that these demands were contained in the first contract presented, and that they have since been withdrawn, the only demands in the 1920 contract being increased pay to 58 and 60 cents an hour.

## Economist Analyzes New York Situation

David Friday, of the Department of Economics of the University of Michigan, who was an expert economist and statistician in Government bureaus during the war, has issued a booklet dealing with the New York traction companies in particular. The booklet was published and is being distributed by the firm of Thompson & Black, legal and financial accountants and engineers, New York City. It is the first of a series which that firm will publish dealing with general financial problems as they affect the public.

Mr. Friday shows that while the New York traction companies have been held to their 1913 rates, the net earnings in 1919 were but 61.8 per cent of what they were in 1913. In 1913 all of those companies earned about \$39,000,000, but by 1919 this had dropped to slightly more than \$24,000,000. The companies must pay for what they buy in terms of a price level more than twice as high as it was in 1913, while they must sell what they have to sell on the basis of the 1913 level.

Mr. Friday holds that public utilities, especially the New York traction companies, will be utterly unable to compete in the market for new capital. This may postpone perhaps indefinitely the time when the additional traction facilities which the city needs will be provided. Mr. Friday says that new capital will not be attracted to the traction companies unless it can earn at least 8 per cent, but that would be impossible unless the companies are permitted to increase their fares.

Mr. Friday has discussed the New York traction situation from the standpoint of fairness to the companies and to the public interest. In its essence, he says, the problem is entirely one of adjusting the price of transportation on the general level of prices prevailing at the present time.

## Commissioner Nixon for Square Deal

Anent the talk of legislation on a service-at-cost proposal at the present session of the New York body at Albany, Lewis Nixon, Public Service Commissioner for the First District, does not believe permissive legislation is necessary. He sees nothing to prevent the adoption of a flexible fare as matters stand at present. His statement reviewing the workings of such an arrangement is largely of interest to the general public not acquainted with methods of procedure under service-at-cost. Mr. Nixon did, however, include in a recent statement this interesting summary of his attitude:

Every fact drawn out at the investigation, now slowly dragging along, but emphasizes the city's duty. Why is the matter not being so handled that at least an attempt should be made to end the present deplorable condition of the traction situation?

Does the city fear that it may be worsted in a battle of wits? The entire people are keenly alive to the situation and every step will be carefully watched and in the end no solution not satisfactory need be concluded.

Is it considered bad politics to recognize property rights in any degree? Every citizen is jealous of the city's credit and just recognition of honest investment honestly applied will be applauded. This city must from time to time borrow money and must not even by implication be accused of desire to repudiate just obligations.

My desire is not to raise fares for a few months to put the systems back on their feet, but to reduce fares for many years. A self-respecting people such as ours will not commend forcing even a corporation to supply its product at less than cost unless it is the expressed policy of the people that city transportation shall be free and paid for out of the tax levy. We must not forget, though, that the city is already taxing our people millions a year to provide transportation on the subways, and this in addition to the fares they pay.

The longer a meeting of the issue involved is avoided the greater will the bill become against the people to pay for neglect.

Blind ignoring of existing facts and fundamental economic laws only increases the peril of forcing essential factors of transportation to fall into the hands of certain underlying bondholders. This might be most advantageous to the bondholders, but the responsibility of those who wilfully cause such result must be faced from every standpoint of criticism.

This commission has no power to escape its responsibility. It must insist upon service and maintenance requiring great expenditures, even if it means bankruptcy to the companies furnishing such service.

But such bankruptcy can be avoided if the problems involved are met with a sincere desire to preserve the integrity of our transportation systems in the direct interest of the public welfare.

The city government has full power in the matter and this carries with it full responsibility.

The people will soon begin to ask in a mighty voice why is responsibility avoided and duty neglected.

This cannot be answered by saying someone made too much money in the past when inaction will result in such profits being repeated in the future.

## Trainmen at Toledo Want More

High prices for uniforms, caps and shoes will be cited by trainmen of the Toledo Railways & Light Company, Toledo, Ohio, in asking for a 12 per cent increase in wages this spring. The wages asked by motormen will range from 45 cents to 55 cents an hour with a possibility of a demand for a 50-cent minimum for experienced men. The present contracts expire on April 1. Business Agent Harry Power of the Carmen's union declared that the men would be forced into other lines of business if not granted more wages.

## Court Makes Railway Sprinkle Streets

The electric railway system of Sacramento, Cal., is operated by the Pacific Gas & Electric Company under a franchise granted many years ago by the city and in which there is no provision requiring the company to do any street sprinkling. In 1913 the city passed an ordinance requiring any railway operating within the city limits to sprinkle "between the rails and tracks and for a sufficient distance beyond the outermost rails thereof so as to lay the dust effectually and prevent the same from arising when cars are in operation." A violation of the ordinance was declared to be a misdemeanor.

The Pacific Gas & Electric Company, operating the railway, believed the ordinance was unconstitutional and for that reason refused to comply. The company was tried in the Police Court of the city, found guilty of the misdemeanor and fined the sum of \$400. Later the District Court of Appeal sustained the validity of this judgment. The company then took the case to the Supreme Court of the United States. Here it sought to obtain a reversal of the judgment on the ground that the natural and necessary effect of the enforcement of the ordinance would be to shift from the taxpayers of the city to the company the public burden of sprinkling 24 miles of the streets at an expenditure of not less than \$2,200 annually for the benefit of the public without any compensation. It also contended that the company would thereby be deprived of its property without just compensation or due process of law.

The United States Supreme Court, however, affirmed the decision of the District Court of Appeals on the ground that the adoption of the ordinance was not an unreasonable exercise of the police power of the city of Sacramento and consequently the exercise of such power was not controlled by the due process clause of the Fourteenth Amendment of the Constitution of the United States and that such ordinance did not deny to said company the equal protection of the laws.

## Arbitrators Decide Interurban Wages

The unanimous finding of the board of conciliation which investigated the dispute between the Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont., and its employees, members of the Amalgamated, has been filed with the Minister of Labor. It recommends a nine-hour day for all passenger trainmen to be completed within eleven hours and a wage scale ranging from 36 cents an hour for the first six months to 45 cents an hour for employees with three years' service. All overtime to be paid for at the increased rate of 15 cents an hour over the scale suggested for the first hour or fraction thereof over nine hours,

and at the rate of time and a half for all time served over ten hours.

The hours of freight trainmen are fixed at ten hours, six days a week, to be completed in the least number of hours possible. The board recommends that the wages of freight conductors during the first, second and third years of their service shall be 47 cents an hour and after the third year 48 cents an hour and after ten years a bonus of 2 cents an hour shall be allowed.

The wages recommended for brakemen and polemen are 41 cents an hour for the first six months and 43 cents an hour after the first year. All freight trainmen, according to the report, should receive extra pay at the rate of 15 cents an hour for the first hour or fraction thereof after ten hours and time and a half after eleven hours' service.

The Minister of Labor will hand down a decision based upon the report of the board.

## Approach the Problem With an Open Mind

Conditions of electric railway operation which made municipal charges just at one time have so entirely changed that there is no longer any justification for such charges, A. W. Thompson, president of the Philadelphia Company, Pittsburgh, Pa., controlling the Pittsburgh Railways, made plain in an address before the Pittsburgh Economic Club on Feb. 4. He said:

Lasting improvements in traction affairs call for all parties to approach the problem with open minds, and with a determination to be fair, with an appreciation both of what the communities have done for the railways and what the railways have done for the communities, the absolute necessity of each for the other, and their positive interdependence. This aspect was early recognized by local legislative bodies in their franchise enactments and in their imposition of certain obligations on the railways, such as street paving requirements, street cleaning assessments, park taxes, etc. The public, through its duly-authorized representatives, bestowed on the traction companies more or less circumscribed monopolies, and it was deemed proper to secure something in return for the franchise.

In the days of horse cars, the animals wore ruts in the pavings and littered the streets, so that paving and street cleaning assessments, if properly imposed, could not be considered unreasonable. Then, too, it was supposed, with the convenient transit for those days, that people would flock to the public parks, and that the railways should bear a part of their upkeep; hence the park tax.

With the development of the electric car from the horse stage and laterly the development of the automobile, conditions have changed. The electric car neither wears ruts in the pavements nor litters the streets. The advent of the automobile has considerably increased the expense of maintaining the parks. Yet the car rider still has to pay for these things when the modern service provided for him has no relation to them whatever.

## Small Municipal Line Doing Well

The earnings from the operation of the Pekin (Ill.) Municipal Railway are now in excess of \$100 a day. The traffic has become so heavy that the city has purchased three new cars. The road in Pekin is being operated on a 5-cent fare with six tickets for a quarter.

## Kaw River Power Plant Closed

The Kaw River power plant which was built by the old Metropolitan Street Railway, Kansas City, Mo., and placed in operation on May 26, 1897, has been closed and the machinery will be placed on the market for sale. This marks the passing of another power plant which was considered a special engineering feat and an exceedingly large plant at the time of its construction.

The Kaw River plant was equipped with six 250-hp. Babcock & Wilcox boilers and six Aultman & Taylor 500-hp. boilers which operated under a steam pressure of 180 lb. The engine room contained four Corliss engines direct-connected to generators. The largest of these engines had a cylinder measurement of 36 in. x 72 in. and it was considered about the largest engine imaginable in the power generation field of that day. In fact it was large enough to pull the entire electric railway load at that time. There was one 1,320-kw. direct current 550-volt Walker generator direct connected to an E. P. Allis Company tandem compound engine; and a similar unit of 1210-kw. capacity. The largest unit was a 1,550-kw. direct current General Electric Company generator.

It required a crew of thirty men, exclusive of three men who handled the unloading of coal on a piece-work basis, to operate the plant which consumed daily 150 tons of coal. This personnel was distributed as follows: Two engineers, eight firemen, six oilers, two boiler washers, two repairmen, four ash and coal men, one wiper and two general hands.

## Recent Bills at Albany

Bills introduced at Albany recently affecting electrical interests follow:

Senate Intro. No. 269, Print No. 273, Introduced Feb. 2 by Mr. Dodge. Adding new section 453-a code of civil procedure, providing that in an action wherein the validity of a rate or charge made by a public service corporation is involved the municipality granting the franchise shall be a necessary party to the action.

Assembly Intro. No. 434, Print No. 458, Introduced Feb. 4 by Mr. Donohue. Inserting new subdivision 27, section 29, General City Law authorizing cities to acquire by purchase or condemnation and to own, lease, construct maintain or operate or contract for operating of gas or electric light, heat or power, telephone or railway works or systems or any other public utility, the local authorities to determine the necessity or expediency of such acquisition, etc., in the city of New York the local authorities shall be the board of estimate.

Assembly Intro. No. 443, Print No. 470, Introduced Feb. 5 by Mr. Bourke, Incorporating the Motor Corps of America to render without charge vehicular transportation and personal service to the government, state and municipalities of the United States in any emergency and to generally render patriotic and civil service.

Senate Intro. No. 380, Print No. 392, Introduced Feb. 10 by Mr. McGarry. Providing that all street cars in the cities of Greater New York and Buffalo shall be manned by a crew consisting of at least two persons.

Senate Intro. No. 408, Print No. 434, Introduced Feb. 11 by Mr. Walker. Adding new article 12 to General City Law, authorizing cities to acquire by condemnation or purchase and to own, lease, construct and operate or contract for operation gas or electric light, heat or power telephone or railway works or systems or any other public utility, the local authorities to determine the necessity or expediency of such acquisition. In the city of New York the local authority shall be the board of estimate and apportionment.

## Oil Burning in Stand-by Station to Make Big Saving

The Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., has a 2,700-kw. steam stand-by station which is used only four or five weeks during a year. For this very limited use, it is very expensive to keep an organization together to operate the plant, or very difficult to get a satisfactory one together in an emergency if it is not maintained regularly. The company is now putting in oil burners and will henceforth burn oil instead of coal because of the great advantages which are possible under the particular conditions prevailing at this plant. By using the oil, a very small organization will be needed, so that it can be maintained permanently. The boilers can be readily forced to carry 200 to 250 per cent overload with the oil whereas practically no forcing could be secured under hand-fired coal operation. It is expected that the burning of oil will save the company \$15,000 a year.

## News Notes

**Mayor Starts Cincinnati Subway.**—Mayor Galvin of Cincinnati, Ohio, on Jan. 28 operated the steam shovel which dug the first scoopful of earth in the actual work of constructing Cincinnati's rapid transit subway.

**Carhouse Burned.**—Thirty-three cars of the Saginaw-Bay City Railway Saginaw, Mich., were destroyed when the carhouse just outside of the city was burned. The loss is estimated at \$175,000, all of which is covered by insurance.

**Object to One-Man Cars.**—The trainmen employed by the Trenton & Mercer County Traction Corporation and the New Jersey & Pennsylvania Traction Company, Trenton, N. J., are complaining against operation of one-man cars. Committees from both railway unions as well as a committee of various labor unions of Trenton have been appointed to act on the matter.

**How the Dollar Shrinks.**—The rapidity with which the dollar dwindles was described recently before the Illinois Public Utilities Commission by a witness in the Chicago Elevated Railways case. He asserted that as compared with 1915 the value of the dollar had dwindled in purchasing power to 93 cents in 1916, to 82 cents in 1917, 69 cents in 1918, 54 cents in 1919, and 47.74 cents thus far in 1920.

**Wants City to Take Over Line.**—Thomas W. Slick, city attorney of South Bend, Ind., has been instructed to proceed immediately with an action which would give the municipality power to take over and operate the

cars of the Chicago, South Bend & Northern Indiana Railway in South Bend. Councilman Charles B. Beyers said that the company had failed to live up to its obligations. It is believed, however, that the matter was brought to a head by the failure of the company to operate cars at all times this winter on city lines on account of deep snows.

**Third Arbitrator Chosen.**—Hugh Ogden of the firm of Whipple, Sears & Ogden, has been named as third arbitrator on the board of arbitration to decide the compensation for men who will operate the one-man cars which the public trustees of the Eastern Massachusetts Street Railway, Boston, Mass., will soon place in operation throughout the system. The other two arbitrators are James H. Vahey, counsel for the union, and Philip G. Carleton, counsel for the railway. The union has agreed to the operation of the one-man cars pending the outcome of the arbitration proceedings. The wages decided upon by the arbitration board will be retroactive to the date when the cars are placed in operation.

**Service-at-Cost Suggested for Syracuse.**—An attempt to secure an investigation of the railway service in Syracuse, N. Y., has been defeated by the Common Council. Mayor Harry H. Farmer proposed a commission of representative citizens to investigate the situation, but the Common Council declared the project impracticable as the committee would have no official power to act and could offer no relief. The Council made an attempt to start its own investigation, but left the question unsettled. The problem is being agitated, and Senator J. Henry Walters, Syracuse, who is majority leader of the State Senate, promises to introduce a measure to empower the city to adopt the service-at-cost plan.

**Brooklyn Men Accept Delay.**—The offer of the Brooklyn (N. Y.) Rapid Transit Company to put into effect 70 per cent of its proposed new working schedule on Feb. 24, and the remaining 30 per cent on March 6, has been accepted by the members of the Amalgamated Association representing the surface, elevated, shop and maintenance departments. Some of the employees were apparently inclined to favor a strike unless the company met their demands on Feb. 24, but later assumed a more conciliatory attitude when the company officials assured the men of their good faith in the matter. The sensational stories that followed of an impending strike were denied by union leaders, who explained that violent differences of opinion were not unusual, particularly when so many men were involved.

**Toledo Men Want More.**—Trainmen and electrical workers employed by the Toledo Railway & Light Company, Toledo, Ohio, have put in demands for increased wages to go into effect when their contract expires on April 1. The trainmen, it is said, are asking 72, 76 and 80 cents for work for which they are now being paid 42, 44 and 46 cents.

Linemen are rated as high as \$1 an hour and other electrical workers accordingly. In some cases the increases amount to 50 per cent. Frank R. Coates, president of the company, will confer with Henry L. Doherty before replying to demands which have been submitted to him. If fares have to be increased it may be necessary to take the matter to the federal court.

**One-Man Car Explained to City Representatives.**—Walter Jackson has contributed to *The American City* for February an illustrated article "Modern Car Service at Moderate Fares," in which he tells for the benefit of officials connected with city administration how the light weight automatic or safety car operated by one man is solving for many cities the problem of modernized service at little or no increase in fare. In conclusion Mr. Jackson says that the millennium of unlimited rides, unlimited service and unlimited courtesy at zero fares or less is not going to come through mass production of car miles with the automatic tool known as the safety car, but that the safety car is at least one thing that can prove of equal benefit to both the community and the electric railway that serves it. He made a plea to let 1920 apparatus and 1920 service go hand in hand.

## Programs of Meetings

### Illinois Electric Railway Association

Owing to the coal situation in December it was thought best to postpone the annual convention of the Illinois Electric Railway Association, which under the by-laws is held in January, until some future date. It is the intention now to hold this the latter part of March or the first of April. This will be settled definitely, within a few days.

### Southwestern Electrical & Gas Association

The sixteenth annual convention of the Southwestern Electrical & Gas Association will be held at Galveston, Tex., on May 13, 14 and 15. The Hotel Galvez will be the convention headquarters.

From reports and engagements made by members, the attendance promises to be a record one, and from the programs of papers, addresses and discussions outlined by the various chairmen of the different sections of the association, the proceedings of this coming convention will surpass all previous ones in interest and value.

Many of the delegates from the East and South to the convention of the National Electric Light Association, which will be held in Pasadena, Cal., the week following the convention of the Southwestern Association, will go there by way of the Southern Pacific Railway and invitations to all such will be issued to arrange to make a "stop-off" at Galveston and attend the convention there as guests of the Southwestern Association.

# Financial and Corporate

## Local Financing Planned

Springfield Sees Advantages of Subscribing \$300,000 of Bonds to Help Its Railway

According to a plan of rehabilitating the Springfield (Mass.) Street Railway, outlined on Feb. 12 by Clark V. Wood, president of the company, at a conference of business men called by the jitney committee of the City Council, residents of that city may be called upon to subscribe about \$300,000 for bonds of the company. This is a part of a \$5,000,000 bond issue which Mr. Wood anticipates will eventually discharge present indebtedness and furnish the new money that will be needed to assure Springfield the transportation facilities that will be necessary to meet and encourage the city's industrial development.

### IMPROVEMENTS NECESSARY

Mr. Wood said that if the company did not secure the money needed to expand its facilities, it would struggle along as best it could, but without promise of aiding in the growth of the city. He said:

The ultimate result does not worry me. Either this or some other City Council will see the right and wrong of it. The street railway is bound to grow. It is to stay here and the public will make use of it. I don't want any donations, but I do want support and all who buy bonds will do so with the knowledge that there is good security behind them and that they will receive a fair interest.

Mr. Wood justified his plan to sell bonds locally by contending that it is a local proposition and should be financed by those who derive the benefit. The bonds should be purchased, not to make a lot of money, but because good security is offered and to help the company to give that service which the city needs to prosper and grow. He did not believe the company could expect outsiders to go in on any such basis.

### TRAFFIC SURVEY PLANNED

On Feb. 13 there was a conference on the subject between President John J. Lester of the Board of Aldermen and Clifton D. Jackson, secretary of the Chamber of Commerce. In a statement issued after the conference, Messrs. Lester and Jackson said that an agreement had been reached, subject to approval by the executive committee of the Chamber of Commerce, whereby the chamber will co-operate through a special committee of merchants, manufacturers and employees, with the City Council jitney committee to accomplish two things: First, to make a definite and practical traffic survey to assist the street railway officials in working out a practical revision of downtown routing in order to relieve congestion, and possibly suggest new routes and exten-

sions; second, to work out the details of disposing by popular subscription of the \$300,000 bond issue proposed as an immediate necessity by Mr. Wood.

Mr. Jackson said further:

If the local railway is our road, as President Wood said it was, it means that we will make it our business to take an active part in investigating ways and means of rerouting in the business section to eliminate the serious congestion which now exists, and to see that the promised extensions are carried through. We will take an active interest in the affairs of the company, not as a closed corporation, but as a representative body with the interests of Springfield at large given first consideration.

The plans for floating the bond issue will probably be arranged so as to dispose of most of the issue to individuals. On this point Mr. Lester said:

We believe that these bonds should be taken by hundreds of people in Springfield first as a safe investment and second as the people's share in solving the problems that mean so much to them. We intend to see that the railway company goes through with its program, and if it does, and if the company is able to do what it claims can be accomplished by these extensions, it will mean a great deal for the future of Springfield.

Mr. Lester said that it must be clearly understood that present interest was only in the proposed \$300,000 for immediate extensions.

It is possible, according to Secretary Jackson, that an organized movement will be started to sell the street railway bonds at popular subscription in the same manner and with a similar organization as during the Liberty bond drives. The business people of the city will be asked to help, and the people as a whole will be given the opportunity in this way to help the city.

## Mr. Ham Asks a Square Deal

William S. Ham, president of the Washington Railway & Electric Company, Washington, D. C., testifying on Feb. 11 on the railway merger bill before the House district committee, expressed the belief that the Public Utilities Commission has been influenced in its treatment of public utilities in the District by the opinion entertained by its members regarding the advantages of public ownership of utilities.

He emphasized that for a year and a half the Washington Railway & Electric Company has been pounding at the doors of the Public Utilities Commission for relief; has proved the justice of it; the commission admits the need for relief, "but is not giving it to us. We must have this relief or we must discontinue to serve the public."

He said further:

I do not think the Washington Railway & Electric Company will go into the hands of a receiver, and one of the means to prevent the parent company from going on the rocks will be to allow the unprofitable lines running into the suburban territory to appeal for their rights in the courts.

## B. R. T. Doing Better

Company Kept in Bankruptcy Largely by Increase in Wages to Employees

A statement of Carl M. Owen, counsel to Lindley M. Garrison, receiver of the Brooklyn (N. Y.) Rapid Transit Company, shows a progressive advance in the earning power of the corporation. The gross earnings of the rapid transit and surface lines, as made public, were \$3,000,000 in excess of operating expenses from March, 1919, to December, 1919. The advance in wages prevented the company from emerging from receivership.

The figures show a gain for every month on the subway and elevated lines except in August, when the strike took place, and in September, and October.

From February to December inclusive, the total revenue was \$14,814,987, and the total operating expenses were \$11,914,268. Income deductions amount to \$155,000 a month, including interest on receiver's certificates and on 4 and 5 per cent bonds.

Mr. Owen continued:

The operating revenue of the six months ending Dec. 31 last amounts to \$9,057,492 and the operating expenses were \$7,375,169, which left an excess of earnings over expenses of \$1,682,322. It is the interest on the \$60,000,000 of 5 per cent bonds which were issued for the building of the subways which the company defaulted on and which threw the company into bankruptcy. This interest, plus the increased wage scale, are the two charges which are keeping the company in bankruptcy.

This table shows the difference between the gross earnings and the operating expenses:

### RAPID TRANSIT LINES

1919	Gross Income	Operating Expenses
February .....	\$1,150,893	\$789,323
March .....	1,324,839	891,322
April .....	1,364,757	881,609
May .....	1,451,442	842,958
June .....	1,465,625	933,893
July .....	1,522,779	1,312,104
August .....	1,347,095	1,199,176
September .....	1,452,557	1,136,414
October .....	1,522,289	1,743,916
November .....	1,548,411	1,168,475
December .....	1,664,300	1,415,083

Total .....\$14,814,987 \$11,914,268

Gross income and expenses of the Nassau Electric Railroad, the most important surface line in control of the B. R. T., follow:

### SURFACE LINES

1919	Gross Income	Operating Expenses
March .....	\$433,424	\$383,240
April .....	452,196	368,334
May .....	495,249	389,897
June .....	505,128	403,334
July .....	505,599	379,037
August .....	457,910	488,775
September .....	432,013	499,782
October .....	539,179	501,165
November .....	513,089	472,501
December .....	537,289	467,721

Total ..... \$4,971,076 \$4,353,780

The net corporate income of the company per month was: December, \$44,569; November, \$15,897; October, \$13,105; September, \$12,573; July, \$24,641; June, \$27,155; May, \$30,346. In August, during the strike, there was a deficit of \$36,348, in April \$12,270, and March \$49,207. This left a total net profit for the ten months of a little more than \$50,000.

### Deficit of \$1,033,379

#### Report Just Made Public Covers Practically First Year of Rhode Island Receivership

The Rhode Island Company, Providence, R. I., operated its lines at a loss of \$1,033,379 during 1919, according to the financial statement filed on Feb. 11 with the Public Utilities Commission. This report covers practically the first year of receivership which began in January, 1919.

1918. The receipts per car-mile for the month were 54.75 cents, an increase of 9.39 cents, and the receipts per car per day were \$87.07, an increase of \$14.81.

The report shows that the receivers continue to reduce the car-miles operated, the total for December of 1,190,606 being 4,058 less than the same month a year ago.

The total operating revenue for December was \$687,807, an increase of \$110,584. The total operating ex-

### Pottsville Outlook Better

#### Prospects Improve for Railway and Light System Operating From Pottsville as Center

The J. G. White Management Corporation, the operating managers of the Eastern Pennsylvania Railways, Pottsville, Pa., have made an exhaustive study of the probable sale of power and the needs of the company to take care of the business. Moreover, the protective committee representing the bondholders retained the services of A. Merritt Taylor, Philadelphia, Pa., who engaged Ford, Bacon & Davis to make a study of the power demands of the territory and the needs of the company in order properly to serve the territory with power. It is expected that from these two studies a plan will be formulated for the reorganization of the financial structure of the company which will provide for the company's immediate and future capital requirements.

#### THINGS IN COMPANY'S FAVOR

Hopes are expressed for the future of the company. Many increases have been obtained in light and power rates and in the railroad tariffs to meet the several demands of the company's employees and to offset other increasing expenses.

On most sections of the company's railway fares have been increased by successive stages from 5 cents to 10 cents per section. These increases have been obtained without undue friction or expense for hearings before the Public Service Commission of Pennsylvania. The relations of the company with the public, with the miner's union so active in the Pottsville territory and with its own employees are very friendly. The company has not yet, however, reached the point where it earns a fair return on a fair valuation. That it is doing better is attested by the accompanying statement of earnings for the year ended Dec. 31:

INCOME ACCOUNT OF RHODE ISLAND COMPANY FOR DECEMBER, 1919, AND FOR TWELVE MONTHS ENDED DEC. 31, 1919, COMPARED WITH 1918

	December, 1919	Per Cent	12 Months to Dec. 31, 1919	Per Cent
Total operating revenue.....	\$687,807	+19.16	\$6,970,675	+10.45
Total operating expenses.....	730,301	+54.96	5,928,262	+15.89
Net operating revenue.....	\$42,494	-140.12	\$1,042,412	-12.82
Non-operating income.....	2,076	+212.45	37,852	-66.00
Total net income.....	\$40,418	-137.92	\$1,080,265	-17.35
Deductions from income:				
Taxes.....	\$49,280	-20.20	\$621,885	+2.92
Rentals.....	97,116	+0.34	1,161,874	+0.03
Interest and discount.....	26,523		328,254	+3.71
Miscellaneous.....	5.4	-68.25	1,630	-30.49
Total deductions.....	\$172,926	-6.57	\$2,113,644	+1.39
Deficit.....	\$213,344	+171.79	\$1,033,379	+32.91

OPERATING STATISTICS OF RHODE ISLAND COMPANY

December	1918	1919	Per Cent
Passenger earnings.....	\$541,857.52	\$651,799.42	+20.29
Car miles run.....	1,194,663.18	1,190,605.66	-0.34
No. 18-hour cars.....	7,499.11	7,486.34	-0.17
Average No. 18-hour cars run per day.....	241.91	241.49	-0.17
Receipts per car mile (cents).....	45.36	54.75	+20.70
Receipts per car per day.....	\$72.26	\$87.07	+20.50

The total operating revenue for that period was \$6,970,675, an increase of \$659,390 over the previous year. At the same time the total operating expense was \$5,928,262, an increase of \$812,711. These figures show a net operating revenue of \$1,042,412, which was \$153,321 less than for the previous year. Added to this sum was non-operating revenue of \$37,852, making the total net income for the year \$1,080,265.

Expenditures to be deducted from this amount, including taxes, rentals and miscellaneous expenses, totaled \$2,113,644, leaving a deficit for the year of \$1,033,379.

The total operating revenue increased during the year \$659,390, but at the same time the operating expense jumped to \$812,711, showing a loss of \$153,321. The non-operating income for the year dropped \$73,481, and the total net income for the year shows a loss of \$226,802.

The rentals for the year alone, charged off against the net income, were \$1,161,874, or \$80,000 more than the entire balance of the net operating income. Taxes for the year were \$621,885, an increase of \$17,635 over 1918. The increase in the rentals was only \$380. Interest and discount expenditures for the year of \$328,254.78, increased \$11,752. The miscellaneous expenditures were \$1,630, a decrease of \$715.18.

The passenger earnings for December last, included in the report, shows the revenue to be \$651,799. This is an increase of \$109,941 over December,

pense for the same month was \$730,301, an increase of \$259,000. This makes a decrease of \$42,494 in the net operating revenue for the month, and a decrease of \$148,422 in the operating revenue when compared with December, 1918.

After deducting the fixed charges for the month, amounting to \$172,926, added to the loss in operating revenue, leaves the company with a deficit of \$213,344 for December.

The financial returns of the company are shown in the accompanying tables.

### Dallas Has Good Month

The Dallas (Tex.) Railway transported during January more than 5,000,000 passengers. During the month cars handled approximately 161,500 passengers daily. Of the total number of passengers transported in January 13.31 per cent were transfer passengers.

The Oak Cliff-Second Avenue car line topped the list with the greatest number of passengers handled for the month, carrying 1,089,418. The Bryan-Ervay Street line came second with slightly more than 1,000,000 passengers transported.

The cars of the Dallas Railway traveled 618,159 car-miles during January, averaging about eight passengers per car-mile. Trainmen in the employ of the company were in service during the month 67,435 car-hours, and the average speed of the cars was slightly more than 9 m.p.h.

Year	1919	1918	Per Cent Increase
Gross revenue.....	\$1,632,911	\$1,192,994	36.87
Operating expenses.....	1,157,072	892,251	29.68
Operating income.....	\$ 475,839	\$ 300,743	58.22
Taxes.....	26,466	22,409	18.10
Gross income.....	\$ 449,372	278,333	61.45
Total deductions.....	297,094	276,305	7.52
Balance.....	\$ 152,278	\$ 2,028	

In August, 1919, a bondholders' protective committee was formed by certain bankers to whom it appeared the company might not be able to meet its bond interest due on Jan. 1, 1920, and for the further reason that the company is in need of additional power generating plant capacity and has no funds which can be used for that purpose and no means through which such funds can be obtained. It is explained that since the bondholders' committee was formed the company has made a contract for its immediate needs for power with the Metropolitan Edison Company, Reading, Pa. The connecting

transmission line is now in process of erection. This power contract places the company in a position to take ample time to formulate a comprehensive plan for providing itself with ample power, either through the erection of a power plant or the purchase of all its needs from one or another of the power generating companies serving contiguous territory.

The annual meeting of the company will be held on March 10.

## \$11,846,034 Memphis Value

**Tennessee Commission Fixes Value for Determination of Proper Return and Adequate Fare**

The State Public Utilities Commission of Tennessee has fixed the valuation of the Memphis Street Railway at \$11,846,034. This sum will be the basis for the determination of a proper return and a fare necessary to provide such return on the investment.

### VALUATION REVIEWED PREVIOUSLY

The valuation was referred to at length in the *ELECTRIC RAILWAY JOURNAL* of Jan. 10. Referring to the table shown on page 7 of the report of Albert S. Richey and reproduced in part in this paper, Chairman Enloe and Commissioner Hannah adopted the figures of Professor Richey except that they substituted \$1,752,413 for superseded property. As noted on page 24 of Professor Richey's report, this figure represents the cost of property superseded since 1905 and amounts to a reduction of about 10 per cent in the professor's allowance for superseded property.

Commissioner Welch voted for a valuation of \$11,000,829, made up by the use of Professor Richey's figures for all except development cost and superseded property. The total of the professor's figures, with these two exceptions, is \$9,306,042, including physical property, working capital, cost of financing, and all other overhead except development cost. Commissioner Welch arbitrarily allowed 10 per cent of the previous figure (\$930,604) for development cost in place of the professor's figure of \$787,579. He thus allowed superseded property to the amount of \$764,183. This was the figure shown by Professor Richey in his detailed report as that supersession due to causes originating with the public.

### FARE MATTER IN ABEYANCE

A further hearing was set for Feb. 10 on the matter of fares, including the rate of return to be allowed on the above rate base and the proper allowance for renewals and replacement reserve. Professor Richey testified before the commission on the subject of rate of return on Jan. 16. Later he sent to the commission a statement of his views on the proper amount of renewals and replacement reserve.

## Financial News Notes

**Pennsylvania Line Sold.**—The Bloomsburg, Millville & Northern Railroad, Bloomsburg, Pa., has sold all of its personal property and expects to sell its real estate soon.

**Dismantlement Proposed.**—The Shore Line Electric Railway proposes shortly to set about removing the rails and the other equipment of the line from Atlantic Beach at New London, Conn. to Weekapaug.

**Foreclosure Sale on March 15.**—March 15 has been set as the date for the sale under foreclosure of the holdings of the West Virginia Traction & Electric Company, Wheeling, W. Va., the decree of sale of which was referred to in the *ELECTRIC RAILWAY JOURNAL* for Feb. 7, page 307.

**Kansas City Western Railway Sold.**—The Kansas City Western Railway was sold under foreclosure at Kansas City, Mo., on Feb. 18 for \$250,000 to Walton H. Holmes, representing a committee of the bondholders. Suit to foreclose was brought by the Guaranty Trust Company, New York.

**Permission Granted to Foreclose.**—Permission has been granted by Federal Judge Mayer to the Bankers Trust Company, New York, N. Y., to bring a foreclosure suit against the Coney Island & Brooklyn Railroad in default of \$44,600 interest due July 1, 1919, on \$2,232,000 in bonds. The company is a Brooklyn Rapid Transit subsidiary.

**Receivership Hearing Postponed.**—The hearing on the position of C. H. Walsh for the appointment of a receiver for the Rock Island (Ill.) Southern Railway set for Feb. 9 before United States Judge Louis Fitzhenry has been postponed indefinitely. The case will doubtless be called before Judge Fitzhenry in Springfield at the spring term.

**Sarnia Appraisal Completed.**—The Hydro-Electric Commission experts, who have been conducting an appraisal of the property of the Sarnia (Ont.) Railway under the direction of Alexander McDougal, have completed their work. It is reported that the municipality will open negotiations soon for the purchase of the system and its operation and extension as a public utility.

**May Scrap Interurban.**—George Whysall, president and manager of the Columbus, Marion & Bucyrus Railway, says that the stockholders have become so discouraged over the prospects of its operation they have authorized him to dispose of the line or junk it if necessary. He says that the 18 miles of rails are worth much more now than they were when the line was laid down in 1908.

**Would Abrogate Lease.**—Cancellation of the 999-year lease on the Narragansett Pier Railroad, and the reversion of the properties of that corporation, valued at approximately \$500,000, has been asked of the Superior Court by the receivers of the Rhode Island Company, Providence, R. I. Filing of two suits, aggregating more than \$100,000, against the Rhode Island Company by the Pier corporation for non-payment of rentals, depreciation of the property and other specifications is the cause of the action toward cancellation of the lease.

**Appraisal to Start.**—Appraisal of the lines and properties of the Seattle & Rainer Valley Railway, Seattle, Wash., will be started at once by Councilman William Hickman Moore, to determine what price the city would be willing to pay, to add the only private-owned railway remaining in the city limits to the municipal railway system. The property has been offered to the city for \$1,656,000 by M. E. Sampsell, president, who has also submitted an itemized estimate of the value of the line. This estimate will form the basis for Mr. Moore's investigations.

**Successor Company Elects.**—Directors of the Erie County Traction Company elected at the organization meeting include Robert B. Austin, Jamaica; John L. Cummings, New York; Edward L. Frost, Brooklyn; William M. Griffith, Jamaica; Edward B. Parsons, David N. Rumsey, East Aurora; William G. Taylor, Reading, Pa., and William B. Wheeler, Brooklyn. The Erie County Traction Company has an agreement with the International Railway, Buffalo, N. Y., for the operation of interurban cars into Buffalo over the International tracks. The company is the successor to the Buffalo Southern Railway.

**City Wants New Receiver.**—The city of New York through Assistant Corporation Counsel Edgar J. Kohler, asked Justice Callaghan, in the Supreme Court in Brooklyn on Feb. 10 to appoint a receiver for the Staten Island Midland Railway in order that operation of the company's lines may be resumed and to supplant Jacob Brenner, who was appointed receiver by Federal Judge Chatfield, to wind up the company's affairs. This action followed an effort by the city several days ago to have the officials of the company punished for contempt for failing to obey an injunction issued by Justice Faber directing the company not to cease operation of the lines. Justice Cropsey decided that the order was not served on the proper persons and dismissed the matter so far as the contempt was concerned. During the proceedings on Feb. 10 it came out that the city had obtained from Justice Faber a continuation of his order. Bertram G. Eadie, counsel for the company, contended that Justice Cropsey had closed the matter when he decided the injunction order issued by Justice Faber had not been properly served. Counsel were directed to submit briefs.



# Traffic and Transportation

## Seeks Traffic Solution

**Indianapolis Board of Works to Appoint Expert to Co-operate With Company**

The Board of Public Works of the city of Indianapolis, Ind., suggested to the Indianapolis Street Railway on Feb. 13 that a traffic expert be employed by the Board of Works at the expense of the company to work out a solution of traffic problems in the city of Indianapolis.

### COMPANY'S AID SOUGHT

Numerous suggestions have been made as to the operation of trailers, rerouting car lines, establishment of cross-town shuttle car lines, diverting cars to certain lines during peak hours, and endeavoring to work out with manufacturing establishments a system of having their employees go to work and quit in shifts, so as to relieve congestion.

The board stated that all these matters must be considered in relation to the practical operation of the railway system, and that a man who has had experience in dealing with such problems would be able to assist the board in handling the problem intelligently.

Company officials advised the board that on account of the influenza more than 200 of the company's men were on the sick list. This curtailed service. The company has also been handicapped by delay in receiving the thirty-five cars now being built. It was estimated that between twenty-five and fifty new cars in addition to those now ordered would give the company sufficient equipment to handle traffic. The attention of the board was called to the fact that it would be necessary for the city officials and the public to co-operate with the company, so that it would be able to finance its additional requirements.

The letter of the board follows in part:

The board of works insist on your company giving better service than you are now giving. We are tired of promises and we must, from now on, insist on immediate action. We firmly believe that you have capable officers who are able to work out some kind of a system whereby more cars in the early morning service can be run to these industrial plants from the downtown junction points so as to enable these laboring men to get to work. Are you willing to agree to pay the expenses of an expert whom we will employ to make a survey of the condition of the street car situation of our city? Please advise us as promptly as possible what you are going to do in the matter.

### DEPRECATES CITY'S POLICY

In an editorial in its issue of Feb. 14, headed "Street Cars by Magic" the Indianapolis *Star* takes exception to the letter of the Board of Works in asserting that the railway must immedi-

ately provide improvements in large numbers, and that the city authorities are not interested in the company's financial difficulties. The editorial follows in part:

A more or less justifiable resentment over sharp practices in former conduct of the car company has about spent its force in this community, owing to the change in the company's attitude and especially to the enormous costs of operation, from which no business whatever has been free. The company's credit is practically nil, because of its inability to promise returns on investments with any assurance of those promises being redeemed. The only method the city authorities seem able to suggest in the way of rehabilitating the company's credit, is to demand the impossible in harsh tones. It takes money to buy street cars and time in which to procure them.

If it is determined to make the company go along at 5-cent fare, then the city authorities, in co-operation with the Public Service Commission, should try to think up some way of assisting the company to strengthen its credit, rather than continue the old and discredited method of demanding the impossible. This petulant and unjust ragging of the company will never build a street car or enable the company to borrow a dollar, and nobody can possibly know the fact better than these municipal statesmen, who might just as well strike at Aladdin's lamp and command a hundred cars to spring into being.

## Detroit Earned 40.76 Cents Per Car-Mile

Owing perhaps to the city's enormous growth in population, the total number of passengers carried by the Detroit (Mich.) United Railway in the year ended Dec. 31, 1919, was 525,410,880 or an increase of 94,542,610 over the previous year. The passenger statistics follow:

	1919	1918
Revenue passengers .....	394,374,451	319,843,176
Transfer passengers .....	122,422,145	103,608,353
Employee passengers .....	8,614,284	7,416,741
<b>Total .....</b>	<b>525,410,880</b>	<b>430,868,270</b>
Receipts per revenue passenger...	0.0585	0.0553
Receipts per passenger .....	0.0440	0.0410

Car mileage traveled during 1919 was 60,550,950, compared with 53,931,394 in 1918. Earnings per car mile were 40.76 cents in 1919 compared with 35.26 cents in 1918, and expenses per car mile were 32.68 cents compared with 27.36 cents, leaving net earnings per car mile in 1919 8.08 cents compared with 7.90 cents in 1918. These figures supplement the statement of earnings of the company which were published in the issue of the *ELECTRIC RAILWAY JOURNAL* for Feb. 14.

During the year the track mileage of the company increased from 915.46 miles to 923.39 miles. Additions to the properties reached the sum of \$1,799,301.76.

The companies' rolling stock comprises 1,895 passenger cars, 284 freight and construction cars, 38 line cars, 104 express cars, 21 miscellaneous cars, 4 locomotives, 4,880 motors and 3,806 trucks.

## Would Retain Lines

**Interborough President, Testifying at New York Hearing, Declares Against Public Ownership of Road**

The inquiry into the need of the Interborough Rapid Transit Company, New York, N. Y., for more revenue was resumed on Feb. 18 for a day. It will be continued on Feb. 25.

There was considerable talk back and forth about the poor widows and orphans, Irish dividends and the state of individual prosperity of the present directors of the company. The Mayor wanted to know why the company hung on so desperately to a losing venture.

Mr. Hedley explained that he did not think the road a losing venture in the long run, but that for the time being the company had to have more money. Asked if he were willing to turn the subways back to the people and let the city run them, Mr. Hedley said he didn't want to see the people imposed upon.

### SUBWAY'S GOOD SHOWING

A report prepared by A. F. Weber, chief statistician of the Public Service Commission, detailing the results of his investigation into the company's financial affairs, was read into the record. Mr. Weber, who was also a witness, declared in the paper that the most striking thing to him was the relatively good showing of the subway division of the company and the poor showing of the elevated. The report said in part:

The financial statement submitted by the Interborough Rapid Transit Company indicated that the necessary cash disbursements made, or expected to be made, in the months of July, August and September would exhaust its cash resources, despite the fact that in its published reports the company set out a corporate surplus in excess of \$19,000,000. If such surplus is not now represented by cash or other liquid assets, it must have been expended in the acquisition of fixed assets or securities of other companies, for which the Interborough Company would be entitled to issue its own securities. If the acquisition of such assets was made out of the surplus earnings, why might not the company now sell its own securities and thus secure the reimbursement of its treasury for the expenditure of surplus earnings?

A corroborative report was offered in evidence by Fred W. Linders, chief accountant of the Rapid Transit Construction Commission. Mr. Linders wrote that in face of the fact that the net income for the fiscal year 1918 of \$4,600,000 approximately amounted to only 50 per cent of the net income of the previous year, nevertheless dividends were declared aggregating \$6,125,000, or approximately \$1,500,000 more than was earned. Likewise, during the fiscal year 1919, dividends were declared despite the fact that the operations resulted in an actual loss of \$3,810,000, Mr. Linders reported.

Dr. John Bauer, transit expert of the Corporation Counsel's office, was among the witnesses. Dr. Bauer continued along the lines of his testimony at the hearing on Feb. 11 and went into detail as to the value of the company's outstanding capital stock. He declared that its assets were much inflated.

## Changes at Louisville

### President Minary and Four Directors Resign at Mayor's Demand— Higher Fare Request Refused

The Louisville (Ky.) Railway has followed a plan proposed by Mayor George W. Smith, who handed the company an ultimatum calling for the reorganization of the company before he would consider an increase in fares over the franchise agreement.

At a meeting of stockholders on Feb. 18, T. J. Minary, Oscar Fenley, W. S. Speed, John W. Barr, Jr., J. D. Stewart and John Stites were re-elected directors and seven new directors were named, all of whom are prominent bankers, manufacturers and business men. Four old directors retired, these being F. S. Wicks, Syracuse, N. Y.; Hardin H. Littell, Buffalo, N. Y.; Judge Alex. P. Humphrey, former vice-president and general counsel of the railway, and Samuel G. Boyle.

At a meeting of the directors on Jan. 20, T. J. Minary resigned the presidency after forty-seven years' active service with the company, and accepted the position of chairman of the board of directors. Samuel G. Boyle, who resigned as director, was re-elected secretary-treasurer.

#### WILL CHOOSE NEW PRESIDENT

The directors just elected have not decided who will be elected president, but it is planned to retain the best operating talent the financial condition of the company will permit. Samuel Riddle, general superintendent, and James B. Wilson, of the Louisville Water Company, are two men whose names have been mentioned, but it is reported in Louisville that a manager from out of town will probably be secured. For the present the active management will be under a board composed of W. S. Speed, John W. Barr, Jr., and W. H. Kaye.

The report of Mr. Minary showed that the 1919 income was \$458,938 less than in 1916 and expenses \$1,232,859 greater. No dividends were paid. The income from city lines from Jan. 1, 1920, to Feb. 16 showed a loss of \$3,667 as compared with the corresponding period of last year. He stated that to take care of deferred maintenance and pay dividends of 5 per cent on the common stock and 6 per cent on the preferred stock, an increase of 20 per cent in gross earnings would be necessary.

The strike last summer cost the company \$327,000 net. Wages paid to the employees have increased 97½ per cent and taxes 16⅔ per cent since 1916.

In spite of the large attendance of stockholders at the meeting on Feb. 18, control of the company remained as before and plans for the reorganization were adopted by a single ballot cast by Secretary Boyle, representing the investors.

Announcement has been made that meetings will be held every other day by the directors to shape up the new program and to arrange for an ex-

perienced executive to take charge as president.

A policy of retrenchment will be put into effect during a four months' trial period, it being planned to cut off a number of parallel lines, save the more profitable ones, or at least decide during that period which lines should go.

#### MAYOR SMITH'S STATEMENT

The Mayor on Feb. 19 in referring to the reorganization said:

The Louisville Railway must convince the Louisville public that it has been reorganized to furnish better service. I'm convinced that the new management will strive to show that it is going to do its best, but it must give the public service before the stockholders are considered. The company must not forget that its duty does not lie wholly with persons who have money invested in it. It must show more efficiency than it has in the past, regardless of the incentive for getting increased fares.

These changes in the company's personnel came as the result of an ultimatum from Mayor Smith issued on Feb. 9, in which the Mayor refused point-blank to consider the company's request for an increase in fare. The Mayor in his statement declared that the solution of the company's difficulties did not lie in an increase in fare. He branded the management as inefficient, and asserted that "the public had lost confidence in the ability of some of the officers, directors and managers of the company to operate the railway economically and efficiently."

The Mayor's statement was addressed to John W. Barr and Oscar Fenley, directors, who had represented the company in its demand for an increase in revenue. It called for a change in administration of the company's affairs, and suggested the election of a new directorate and new officers. Such action on the part of the stockholders was essential, the Mayor asserted, if the company hoped to receive any consideration at the hands of the city administration.

Although refusing to consider the request for higher fares under existing conditions, Mayor Smith made a counter-proposal for the eventual relief of the company. He announced that, if a new set of officers were chosen, and if, after four months of operation under the new management the company were still in need of an additional source of revenue, he would recommend to the General Council that relief be given through increased fares.

#### MAY GRANT RELIEF LATER

He stated his willingness to allow the present 5-cent fare provision of the company's franchise to be waived if this plan were followed. He declared, however, that the new management must clearly demonstrate the need for more revenue before it could hope for relief. After outlining his proposition he said:

I conclude by reminding you and every one of your stockholders that you are bound by contracts of many years' standing to operate under a 5-cent fare, but as we are going through a period of time that no man could foretell, it is possible that temporary relief should be granted to you. At this time I am not willing to recommend relief except along the lines indicated above. The matter rests with you.

## City Sees Need

### Investigation by Portland, Ore., Officials Confirms Plea of Company for Relief

The hearing is under way before the Oregon Public Service Commission in Portland of the case of the Portland Railway, Light & Power Company, in regard to the railway system. After the most painstaking investigation on the part of city officials, through J. P. Newell, consulting engineer, and Alexander Young, expert accountant, the city has frankly admitted that its findings practically coincide with the statements laid before the commission by Franklin T. Griffiths, president of the company. The opinion is expressed that relief must be found for the company either in a flat increase in fares, or a zone system of charges. Suggestions for relief include an 8-cent fare, with books purchasable at a reduction of 1 cent on each fare, school tickets to remain the same.

Suggestions offered by Mr. Newell for relief to the company are: establishment of central zone for free transfers, with charge for all traffic originating outside of it; authorization of such fares on lines built to develop land values and thinly settled districts as will pay the cost of such operation, or failing that, their abandonment, establishment of one-way traffic, rearrangement of loops in center of city to avoid unnecessary crossings, and adoption of traffic regulations which will facilitate the movement of cars without undue increase of maximum speed.

#### DANGER OF DISINTEGRATION

Relative to the gravity of the railway company's financial situation, Mr. Newell pointed out that the situation cannot be fully comprehended without consideration of the possible results of bankruptcy of the company. If a movement for separate receivers for the constituent companies should succeed, each system would be operated independently and there would be no exchange of transfers.

Mr. Newell points out that to effect any satisfactory arrangement, "the approval and co-operation of the representatives of the city must be first secured, and it must be made clear to the public that any changes proposed are to be made, not for the profit of the company, but for the benefit of the patrons."

The case of the Portland Railway, Light & Power Company was originally brought before the Public Service Commission in September. At the time the company contended that on account of the increased cost of materials and the advance in wages, an increase in fares was necessary to allow the company to pay expenses and obtain a fair interest return on its investment. After hearings, the case was postponed to allow engineers for the city and officials of the company an opportunity to examine the evidence submitted and to investigate the company's books.

## Courtesy Campaign

### Kansas City Railways Calls on Employees to Help Company By Considerate Treatment of Riders

"The public be pleased." This is the motto which the transportation department of the Kansas City (Mo.) Railways has adopted in an effort to secure closer co-operation between its employees and its patrons. The transportation department of the company is conducting a campaign with the object of encouraging trainmen to show every courtesy toward car riders. It is believed that this policy will react favorably on the company by improving its relations with the public.

The company is using its official organ, the *Railwayman*, to bring home to its men the principles of courteous service. The *Railwayman* said in a recent issue:

The old saying, "A man is judged by the company he keeps," has been changed to "A company is judged by the men it keeps." Exercise care, patience, forbearance and self-control. Take pride in keeping your temper. Smile in the face of everything. This is difficult, of course, otherwise there would be no effort to do it. Rules are made for you in a book which has been given you, but rules cannot be made to cover every situation.

You must use common sense. Never quarrel with a passenger over a fare. If too much fare is dropped into the box, do not refuse to adjust the matter in a civil manner. See that the passenger leaves the car satisfied. Make change upon request in an agreeable manner. Remember you are selling the ride.

A good rule to avoid controversy is to call the amount of the bill given you and ask the patron to "please drop the fare in the box" as the change is given. Conductor should not "load up" passengers with small change unless it is absolutely necessary. In that event kindly say, "I am sorry, but this is the best I can do." If a passenger gets on your car by mistake let him off at the next block. Do not insist on collecting fare and issuing transfer unless you are sure the transfer will be taken on the car he wants. No good can result from telling him to "keep his eyes open next time." We all make mistakes.

Trouble is bound to occur on cars at times. In cases of this kind common sense plays an important part. Never lose your self-control under such circumstances. Do not talk back to passengers who contend you did not call the street. It takes two to start an argument. Be sure you are right, then be firm in your position—but do not argue. Watch for passengers closely. You do not want to be "passed up." Every time you pass up a passenger you make an enemy for the company and for yourself if the passenger knows you. The company is judged by what you do. Never forget that if you are in the wrong, you cannot afford to get mad; if you are right there is no need of it. The angry man cannot think clearly. Give "the soft answer that turneth away wrath" at all times.

There is no place where the golden rule of life can be so effectually employed as in the street railway business. Treat every passenger exactly as you would like to be treated if you were a passenger. Every victory over discourtesy makes you a better citizen—a more efficient employee for any concern. Be pleasant—and smile.

### Milwaukee Interurban Order Suspended

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., will continue to run its interurban cars over its city tracks in Milwaukee for ninety days despite the injunction issued by Circuit Judge Fairchild restraining the company from carrying on its interurban service into the city after midnight on Feb. 5. An agreement between the court, City Attorney

Clifton Williams and attorneys for the railway resulted in a stay of execution of the court order.

City Attorney Williams won his fight for the writ on the ground that the company has no franchise for the operation of interurban cars inside the city limits.

After S. B. Way, general manager of the traction company, had announced that all passengers would have to alight at the city limits and walk across an imaginary line which forms the city boundaries, the stay was decided upon pending an investigation of the situation to be made by a committee composed of city officials and business men. Nine interurban lines were hit by the order.

City Attorney Williams seeks to unscramble the interurban system from the city lines, to force the company to return to a 5-cent fare and to contribute to the upkeep of city streets and bridges.

### Electric Railway Held Blameless

Responsibility for the accident which took place at Parmaco, a small station between Parkersburg and Marietta, on Aug. 14, 1919, when a car of the Monongahela Valley Traction Company, loaded with excursionists, crashed into a Baltimore & Ohio switching engine, has been fixed upon the Baltimore & Ohio Company, by Ex-President William H. Taft, who inquired into the matter. Eighteen persons, mostly little children, met death in the accident.

An investigation into the accident and its cause was made by a coroner's jury. The Public Service Commission of West Virginia then inquired into the disaster through its engineer. Finally the Interstate Commerce Commission went into the matter through representatives of the Bureau of Safety.

Subsequently, by agreement, the United States Railroad Administration, as the operator of the Baltimore & Ohio Railroad, and the Monongahela Valley Traction Company, combined and made settlement with all persons injured in the accident and with the dependents and representatives of the persons who died as a result of injuries received in the accident. The two parties then agreed to submit to arbitration the question as to which company was responsible for the accident and as to what portion of the amount paid out in making settlement for the persons injured or killed should be paid by each company. Ex-President Taft was agreed upon to decide the question of responsibility for the accident and the amount of damages each should pay. In his finding Mr. Taft said:

There are fewer difficulties in this case than in most cases involving judgment of speed, time and distance. To me the case is very clear. The award is that the Railroad Administration operating the Baltimore & Ohio Railroad shall pay the entire cost of settlements of all claims, suits, court costs and other expenses growing out of this collision, including the injury to traction car 625 and its equipment, and thus save the Traction Company harmless therefrom in accord with the terms of the contract of Aug. 1, 1910.

## Tacoma Hearings Start

### Railway Manager Promises to Furnish Valuation Figure Regarded by Company as Its Minimum

The first hearing before the City Council of Tacoma, Wash., began on Jan. 27 in the controversy between the city and Tacoma Railway & Power Company over the 10-cent fare that the company is asking. The company is now operating under a 7-cent fare. Little progress was made at the hearing, the discussion being chiefly on the question of valuation of the company's properties.

R. T. Sullivan, manager of the railway, agreed to furnish the City Council a valuation upon the properties of the Tacoma Railway & Power Company and the Pacific Traction Company, based on what the companies feel must be taken as a minimum in any plan to guarantee a reasonable return, and establish a service-at-cost plan of operation of the Tacoma railways similar to that in effect in Cleveland. He promised also to submit a statement of the earnings and cost of operation of the companies for 1919.

The valuation to be submitted is to be understood as one given for no other purpose than that of determining a minimum return on the investment, the idea of sale and purchase or other purpose being excluded from consideration it was agreed.

The Council made it clear that it would expect a valuation based on what the properties are worth as a business concern, rather than on what the properties have cost. The Councilmen apparently have in mind a generous scaling down from the \$7,000,000 valuation established by the State Public Service Commission.

M. M. O'Shaughnessy, city engineer of San Francisco, Cal., who recently investigated the railway situation in Tacoma, expressed the opinion that a 10-cent fare was not the solution of the railway problem. He states it was his belief that a 10-cent fare would produce less revenue than the present one.

### Chicago Commission Order Upheld

The Chicago (Ill.) Surface Lines and the Illinois Public Utilities Commission won another victory in the State Supreme Court on Feb. 18 when the court upheld the original 7-cent fare order of the commission as applied to the surface lines of Chicago. This case was the outgrowth of an appeal from the decision of the Circuit Court of Sangamon County. The city brought action in this court against the original order of the commission on the ground that it had not had an opportunity for a full hearing. The circuit court sustained the city's contention, and the case was then taken direct to the Supreme Court. The fare order in the meantime continued in force.

The original order of the commission was made as an emergency ruling

coupled closely with the strike of trainmen in Chicago. The present decision of the Supreme Court would, therefore, indicate that the commission is clothed with full authority to issue an order determining the rate of fare in an emergency case as well as in a regular case where all parties are given full opportunity for presenting evidence. Since the temporary order made in August establishing the 7-cent fare the commission has issued a new temporary order reducing the fare to 6 cents.

### Wants Temporary Transfer Charge in Buffalo

Retention of the 5-cent fare with a charge of 3 cents for transfers is asked by the International Railway, Buffalo, N. Y., in a communication to the City Council. Herbert G. Tulley, acting president, requests that the municipal authorities join with the company in seeking to have the Public Service Commission amend its 7-cent fare order so as to provide for a 5-cent fare with a 3-cent charge for transfers.

The city is inclined to favor the company's suggestion. The 5-cent fare is still in effect, Thomas E. Mitten, president of the Philadelphia (Pa.) Rapid Transit Company, and a factor in the operation of the International system on behalf of the bondholders' committee, being opposed to a 7-cent fare.

In his communication to the City Council, Acting President Tulley says that a transfer investigation made by Philadelphia experts revealed that only 40 per cent of the passengers carried over the lines in Buffalo used transfers. He said it would not be fair to charge 7 cents for all passengers when a 3-cent additional charge for 40 per cent of the passengers would, in all probability be sufficient to place the company once more on a sound financial basis.

Mr. Tulley says that the suggestion of the company is merely as a temporary step to relieve the present situation whereby the company is operating at a loss. It is proposed that the city and company enter into negotiations for a service-at-cost plan similar to the proposal made some time ago by Mayor Buck and approved by members of the City Council.

Enactment by the City Council of a resolution joining with the International Railway in a request to the Public Service Commission to make a charge for transfers would be subject to a referendum by the voters if petitions were circulated. It is generally believed that the voters would overwhelmingly reject such a proposition the same as they did the higher fare proposition on two previous occasions. If the plan is rejected, the company will have the right automatically to charge a 7-cent fare as authorized by the commission unless an injunction is obtained pending the determination of the case in the higher courts of the state to which it has been appealed by the city.

### Court Stays Collection of Second Fare

Justice Greenbaum, in the Supreme Court in Manhattan on Feb. 14 declined to grant permission to the Brooklyn City Railroad, recently separated from the Brooklyn Rapid Transit System, to charge an extra fare of 5 cents, under the zone system, on its Flatbush Avenue line. At the same time Justice Cropsey granted a temporary stay in a motion brought by the city to strike from the calendar a suit brought by the railroad to show cause why the city should not be restrained from using buses in competition with the cars of the company.

In its application to Justice Greenbaum the railway offered to issue a refund ticket with each second fare received on the Flatbush Avenue line, pending the outcome of proceedings to review an order of the Public Service Commission forbidding the collection of more than 5 cents for a fare.

Colonel William N. Dykman, counsel for the company, issued the following statement:

I have hurriedly read Justice Greenbaum's opinion. He does not touch upon the merits of the claim of the Brooklyn City Railroad that it may charge a second fare on Flatbush Avenue. He apparently denies the power of the court to issue a stay or an injunction in the proceedings by certiorari to review the action of the Public Service Commission. The merits of the controversy will be submitted to the Appellate Division of the Supreme Court in March.

The proceeding before Justice Cropsey followed the introduction by the city of an amended answer to the complaint in the company's suit to stop the use of buses. Jackson Dykman counsel for the company, declared that the amended answer was filed for the purpose of delay. Justice Cropsey said:

If the amended pleadings were served for the purpose of delay—and there are indications that such was the purpose—they may be stricken out. But that can be done only on motion. The case will be set over until the 16th to permit the making of such motion if it is desired to do so.

### Jitneys Become Menace in Storm

The police court at Hartford, Conn., through Judge Alexander W. Creedon, has taken the position that when a railway clears its tracks of snow it has the right to those tracks to such an extent that when an automobile is warned by a motorman's gong that the right of way is desired, the auto must give way. Two jitney bus drivers have been fined \$5 each in the police court within the last ten days and they have taken appeals to the Superior Court. Their attorney, who represents a jitney bus association, says he will go to the Supreme Court if necessary.

Meantime public spirit has reached such a pass that the people are demanding that the jitneys obey the laws which require that they stop their overcrowding and keep lights inside during night use. This sentiment is reflected in the action by Alderman Ithamar B. Davis, warning Milton Bacharach, counsel for the jitney men, that if the overcrowding is not stopped,

he will introduce a city ordinance that will "put the jitneys out of business."

The police board's meeting brought a protest from Commissioner John A. Pilgard that the jitneys ought to carry lights inside at night. The chief of police was instructed to enforce the law in this respect. The jitneys will also be watched to prevent overcrowding.

Three jitney drivers who were "frozen out" in eastern Massachusetts have applied for the right to drive their buses in Hartford. Under the Connecticut law the driver of a public service car must get from the chief of police in the town which he wants to serve, a clean bill of health. The three applicants, one from Brockton and two from Salem, come recommended by the chiefs of police of their respective towns, but as yet no action has been taken. The number of jitneys operating in Hartford is very small. Plans of a jitney company operating on all lines served by trolleys in Hartford are in abeyance.

### Won't Order More Service for Rochester

Public Service Commissioner John A. Barhite, after hearing the defense of the New York State Railways, Rochester Lines, in the complaint of the municipal authorities against alleged inadequate service in Rochester, said the commission would never order the company to provide a service which the revenues would not pay for and also provide a reasonable return on investment. At the hearing it developed that the company is in need of funds to rebuild many lines in Rochester and provide additional equipment to handle increased travel. The company is restricted to a 5-cent fare.

James F. Hamilton, president of the New York State Railways, testified it would cost \$2,000,000 and an annual maintenance fund of \$500,000 to put the tracks in Rochester in proper operating condition. It would also cost \$370,000 to bring car equipment into first-class condition, including the renewal of fifty cars with modern trucks at a cost of \$5,000 each and inside remodeling of thirty cars at an estimated cost of \$4,000 each. In the past two years practically no renewals have been made.

It developed at the hearing that 28 per cent more service would meet the requirements of travel in non-rush hour periods. A greater increase, perhaps 35 per cent, it was said, would be required in the rush hours. There has been an increase in travel of about 30 per cent in the last few months.

The Bankers' Trust Company, New York, N. Y., and the Lincoln Trust Company, Rochester, are among the banks which have recently called notes of the company. Mr. Hamilton says that if the Public Service Commission orders the company to give additional service, the railway will face receivership proceedings.

## Transportation News Notes

**Wants More in Jacksonville.**—The Jacksonville Railway & Light Company, Jacksonville, Ill., has applied to the State Public Utilities Commission for permission to increase its fare from 6 cents to 7 cents and to sell four tickets for 25 cents.

**Postpone Fifth Avenue One-Way Trial.**—Owing to the condition of the New York City streets resulting from the recent blizzard, the thirty-day trial of one-way operation of vehicular traffic on Fifth Avenue has been postponed. The one-way rules were to have gone into effect on Feb. 16.

**Seven Cents in Gary.**—The Gary & Southern Traction Company and the Gary & Hobart Traction Company, Gary, Ind., have received permission from the State Public Service Commission to charge 7-cent fares on their lines in Gary. The companies have been charging 6-cent fares.

**Wants Seven Cents in Ottawa.**—The Northern Illinois Light & Traction Company, Ottawa, Ill., has filed with the State Public Utilities Commission a petition for an increase in the fare within the Ottawa city limits from 6 cents to 7 cents. The company is part of the Illinois Traction System.

**Buses Running in St. Louis.**—Nine motor buses began operating in St. Louis, Mo., on Feb. 10. The vehicles are of the double-deck type, each seating sixty-one persons. They are owned and operated by the Missouri Motor Bus Company. The fare is 10 cents. More buses will be placed in service in the near future.

**Announces Seven-Cent Fare in Phillipsburg.**—The Phillipsburg (N. J.) Transit Company has announced its intention of increasing its fare on March 1 from 5 cents to 7 cents, with the consent of the Interstate Commerce Commission. The company operates in Phillipsburg and neighboring towns in Pennsylvania.

**No More Jitney Licenses.**—The City Council of Springfield, Mass., has passed an amendment to the municipal jitney ordinance temporarily suspending the clause giving the Police Commissioner authority to issue jitney licenses. A committee of the Council is investigating the jitney situation in Springfield to determine the city's future policy toward the vehicles.

**Seven Cents Asked in Easton.**—The Easton (Pa.) Transit Company has notified the State Public Service Commission of its intention to raise its fare from 6 cents to 7 cents. This company and the Lehigh Valley Transit Company have also filed notice of

increases in joint rates between Allentown and Easton and other points in Lehigh and Northampton Counties.

**Ten Per Cent Increase in Traffic.**—The number of passengers carried by the Georgia Railway & Power Company, Atlanta, Ga., was nearly 10 per cent greater for 1919 than for 1918. The increase in fares amounted to more than 8,000,000, or 9.49 per cent. The number of pay passengers increased 8.83 per cent, the number of those riding on transfers, 12.63 per cent.

**Six-Cent Fare Upheld.**—The Public Service Commission of Pennsylvania has dismissed a complaint against the 6-cent fare now in effect on the lines of the Harrisburg Railway. The commission in its report endorsed the proposed short-line between Harrisburg and Steelton and approved the quality of service furnished by the company. The 6-cent fare became effective on Dec. 1, 1918.

**Survey of Scranton Lines.**—Engineers of the Pennsylvania Public Service Commission are conducting a survey of the property of the Scranton Railway to obtain a basis for the fixing of a permanent rate. The present fare of 7 cents with four tickets for 25 cents, was allowed last year by the commission with the understanding that a report of the earnings for the period covered by the increased fare be made to the commission, also that a survey of the property be made so that later a permanent rate might be fixed.

**Long Beach Buses Prosper.**—Motor buses during 1919 carried nearly 2,700,000 passengers in Long Beach, Cal., a city of 25,000 persons. The Long Beach Transportation Company, which operates twenty-six buses over four routes, carried 2,670,000 persons during the year ended Dec. 14, 1919. The company charges a 5-cent fare and gives free transfers. Its gross receipts during the period amounted to \$136,473. The company pays an annual franchise tax of \$4,094. The bus drivers receive \$4 a day, the total labor cost for the year amounting to \$50,000.

**Interurbans Want Part of Six-Cent Fare.**—Attorneys for six interurban lines entering Toledo, Ohio, have notified the commissioners who are writing a cost-of-service franchise for the Toledo Railways & Light Company that a provision by which the company would collect the entire 6-cent city fare would necessitate the raising of intercity fares on all interurban lines entering the city. They declared that their six lines brought 3,241,495 persons into the city in 1919. These lines paid the local company 3 cents for each passenger carried. This yielded a profit to the company of more than \$50,000, the attorneys told the commissioners.

**Fare Reduced by Georgia Road.**—The Albany (Ga.) Transit Company on Feb. 2, voluntarily reduced fares from 10 cents to 7 cents. The reduction was accompanied by an appeal for increased patronage as the only means of preventing the ultimate dissolution of the system. Heavy losses have been suf-

fered by the company in the past few years because of the increased use of automobiles. The Railroad Commission early last year permitted the company to increase rates from 5 cents to 10 cents. The company has notified the City Council that if it is required to pave its right-of-way in the sixteen blocks the city plans to lay this year, it will be forced into bankruptcy.

**Sixteen Rides for a Dollar.**—At a meeting of the home rule committee of the city of Quincy, Mass., on Feb. 10, it was announced that the new rate of fares on the Eastern Massachusetts Street Railway within the city limits would be sixteen rides for \$1 with no transfers issued. Furthermore a new rate is ordered for the following lines: 6½ cents to Houghs Neck, Neponset Bridge, Fore River Bridge, Fore River Loop, Newcomb Square, Braintree Line and East Milton, all from the Quincy Square starting point. Under the new plan of operation whereby co-operation on the part of the citizens is given through the home rule committee, the books of the railway will be open to inspection by the public on application to the committee.

**Jurisdiction Lacking, Says Florida Commission.**—The Railroad Commission of Florida has petitioned the State Supreme Court to quash an alternative writ of mandamus issued by the court on Jan. 20 requiring the commission to take jurisdiction of the application of the Jacksonville Traction Company for an increase in fare. The commission contends that it has no power to act on the company's request for a higher rate. The company was placed in the hands of a receiver last October following the rejection by the voters of Jacksonville of an ordinance providing for a 7-cent fare. After an attempt to have the commission pass on the petition for an increased fare, the receiver applied to the court for a writ of mandamus to bring the matter before the former body.

**Storm Ravages in New York City.**—All told, including rapid transit and surface railway systems, there are in greater New York more than 1,500 miles of track. In the boroughs of Manhattan and the Bronx there are more than 300 miles of underground conduit system. All conduit lines were put completely out of operation by the recent storm and the great bulk of it remained out of operation for more than a day. On Feb. 16 it was reported by the Public Service Commission that service had been restored on practically all of the underground conduit lines, except the Thirty-Fourth Street cross-town, the Ninth Avenue and a few other lines of lesser importance, in Manhattan. The trolley lines in Queens are operated entirely on the overhead system, and they were practically all out of service for a time. In Brooklyn the overhead trolley is used by all the surface lines. The system there was kept in operation continuously except for a few of the shuttle lines and roads in the outlying districts.

## Personal Mention

### Mr. Cooke Out of E. F. C.

Charles B. Cooke, Jr., has resigned as assistant manager of the passenger transportation and housing division of the Emergency Fleet Corporation. Mr. Cooke is a member of the firm of Kelly, Cooke & Company, consulting engineers, Philadelphia, specialists in financial operating and economic problems of public utilities. He was called into Government service early in 1918 as chief engineer of passenger transportation and was later made assistant manager of the transportation and housing division in charge of all railway operations of the United States Shipping Board.

Mr. Cooke's work included the investigation of transportation conditions at all shipyards throughout the country and the determination of steps necessary to provide adequate facilities for transporting shipyard workers. He personally directed in the field the investigation in the important Delaware River district where owing to the sudden concentration of enormous war industries the problem of local transportation of workers rapidly became so acute as to retard and threaten the shipbuilding program. Mr. Cooke also developed comprehensive plans for systematic study of transportation deficiencies which were successfully applied to situations throughout the country where conditions were reported as affecting ship production. Over \$12,000,000 was expended by the government under his supervision for the construction and operation of facilities which it is estimated, provided transportation for 125,000 shipyard workers daily.

Mr. Cooke has also written extensively on financial engineering subjects concerning the construction and operation of public utilities. Last fall he contributed to the *ELECTRIC RAILWAY JOURNAL* articles on the simplification of corporate structures and on the valuation of public utility properties.

J. H. Moir, superintendent of the Edmonton (Alta.) Municipal Railway, has resigned.

William H. Newell has assumed the duties of vice-president and counsel of the Androscoggin & Kennebec Railway, Lewiston, Me.

Miss G. E. Fitz has been elected treasurer of the Androscoggin & Kennebec Railway, Lewiston, Me., the successor to the Lewiston, Augusta & Waterville Street Railway.

E. E. Nicholson, superintendent of the eastern division of the Chicago, South Bend & Northern Indiana Traction Company, South Bend, Ind., has resigned because of poor health.

Robert H. House, superintendent of the electrical department of the Knox County Electric Company, which operates trolley lines in Rockland, Me., and neighboring towns, has resigned.

Robert W. Hewins, formerly superintendent of the Norton, Taunton & Attleboro Street Railway, Norton, Mass., has been appointed treasurer and general manager of the company.

A. S. Kidd has been appointed superintendent of the eastern division of the Chicago, South Bend & Northern Indiana Traction Company, South Bend, Ind. Mr. Kidd succeeds E. E. Nicholson, resigned.

William Porter, assistant engineer of motive power of the Interborough Rapid Transit Company, New York, N. Y., has resigned to join the sales department of the Electric Service Supplies Company.

W. O. Cline, assistant general passenger agent of the Twin City Rapid Transit Company, Minneapolis, Minn., has been promoted to general passenger agent of the company. Mr. Cline succeeds A. W. Warnock, resigned.

William B. Skelton of Lewiston, has been elected president of the Androscoggin & Kennebec Railway, Lewiston, Me., the successor to the Lewiston, Augusta & Waterville Street Railway. Mr. Skelton is a prominent member of the Maine bar.

Lloyd Benner has been appointed superintendent of the electrical department of the Knox County Electric Company, Rockland, Me., to succeed Robert H. House, resigned. The company operates trolley lines in Rockland and nearby towns.

Donald Goodrich, superintendent of the Minneapolis division of the Twin City Rapid Transit Company, Minneapolis, Minn., has been appointed general superintendent of the company. Mr. Goodrich has been in charge of the Minneapolis city lines since 1915.

Alston Green, second vice-president and assistant general manager of the Alabama City, Gadsden & Attalla Railway, Gadsden, Ala., has resigned. Mr. Green has been connected with the company for several years. He was formerly in the clothing business in Gadsden.

W. R. Robertson, superintendent of the Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont., has resigned to accept a position with the Ontario Hydro-Electric Power Commission. Mr. Robertson is on the staff of the commission's railway department and has been placed in charge of operations.

F. J. Bjorck has been appointed acting superintendent of the Minneapolis

city lines of the Twin City Rapid Transit Company, Minneapolis, Minn., Mr. Bjorck succeeds Donald Goodrich, the latter having assumed the duties of general superintendent of the company. He occupied the position of supervisor previous to his new appointment.

N. S. Cumming has been appointed superintendent of the Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont. Mr. Cumming succeeds W. R. Robertson, who has resigned to accept a position with the Ontario Hydro-Electric Power Commission. Until his new appointment he was chief clerk of the railway department of the Dominion Power & Transmission Company, Hamilton, Ont., which operates 107 miles of track.

C. B. Goodsell, formerly superintendent of the Minneapolis division of the Twin City Rapid Transit Company, Minneapolis, Minn., has been placed in charge of the company's St. Paul lines. Mr. Goodsell has been connected with the company since 1907, when he was appointed secretary to the general manager. In 1913 he was made assistant to the general superintendent. He was subsequently appointed superintendent of the Minneapolis lines, serving in the latter capacity until his transfer to St. Paul.

Frederick J. Frey has assumed the duties of superintendent of the Fresh Pond division of the Brooklyn (N. Y.) Rapid Transit Company. Mr. Frey has been acting superintendent of the division since June, 1919. He joined the company as a motorman in 1895. Three years later he was promoted to inspector, and in 1905 he was made chief inspector of the Lower Fulton Street district. He was subsequently appointed general inspector, holding this position until his appointment as acting superintendent of Fresh Pond division, the largest of the company's surface transportation divisions. In his present capacity he has charge of more than 800 men.

A. Merritt Taylor, formerly director of the Department of City Transit of Philadelphia, Pa., and recently head of the housing and transportation division of the Emergency Fleet Corporation, is the author of an article in *The Manufacturers' Record* for Feb. 12 on the effect of the present system of taxation upon building construction and all other business. Mr. Taylor takes the position that the present excess profits tax paid by corporations and excessive surcharges to individuals are an important factor in maintaining high prices and diverting capital from railroads, public utilities, and other business enterprises. He gives examples to show the effect of these taxes on building construction and says that owing to this factor the building of homes has been brought practically to a standstill. He urges all manufacturers and merchants to appeal to Congress for prompt elimination of these taxes, as otherwise there will be a period of business depression, unemployment and untold suffering of the American people.

## Brooklyn Surface Operation Unified

H. Hobart Porter and C. E. Morgan Placed in Charge by Receiver Garrison—Lines' Status Unchanged

Unified management and operation of all the Brooklyn (N. Y.) surface lines have been secured through the appointment of H. Hobart Porter, vice-president and general manager of the Brooklyn City Railroad, to direct the surface lines of the Brooklyn Rapid Transit Company. The appointment was made by Lindley M. Garrison, receiver for the Brooklyn Rapid Transit System, to take effect on Feb. 16. The operation of the surface lines will be in direct charge of Clinton E. Morgan, assistant general manager of the Brooklyn City Railroad.

### NEW ARRANGEMENT EXPLAINED

The new arrangement re-establishes, so far as operating conditions are concerned, the unity of control which ex-



C. E. MORGAN

isted prior to Oct. 19, 1919, when the lines of the Brooklyn City Railroad, until that date operated as a part of the Brooklyn Rapid Transit System, were returned to their owners because of the inability of the latter company to meet rental payments. These lines, which comprise approximately one-half of the Brooklyn surface line mileage, have since been operated as an independent system under the direction of Mr. Porter, assisted by Mr. Morgan. The remaining B. R. T. lines continued to be operated by the Brooklyn Rapid Transit Company.

### MR. PORTER IN CHARGE

The present arrangement is for the purpose of affording a unified and harmonious service by the various lines. The new plan brings under the leadership of Mr. Porter, under the receiver, the lines of the Nassau Electric Railroad, the Brooklyn, Queens County & Suburban Railroad and the Coney Island & Brooklyn Railroad. While these lines will be operated in unison with those of the Brooklyn City Railroad, the two systems remain distinct as to ownership and control.

Mr. Porter has been general manager of the Brooklyn City lines since their separation from the Brooklyn Rapid Transit System. He is a member of the engineering firm of Sanderson & Porter and is also president of the American Waterworks & Electric Company, Inc., which owns and operates a number of waterworks and electric properties in various parts of the country. A biography and a portrait of Mr. Porter were published in the *ELECTRIC RAILWAY JOURNAL* for Oct. 18, 1919.

Mr. Morgan, who assumes direct charge of all the Brooklyn surface lines, has achieved marked success in the operation of the Brooklyn City Railroad, of which he has been in charge under Mr. Porter since last October. In announcing the new arrangement, Receiver Garrison stated that Mr. Morgan's efficient handling of difficult problems during the past five months gave assurance to the public that the system as a whole would be managed "efficiently and in the best interest of the community."

Mr. Morgan was formerly general superintendent of the Michigan Railway, Jackson, Mich. He began his railroading experience as a clerk in the office of a steam road. For the next five years he acted as assistant to the president and other officers of the Indianapolis & Greenfield Electric Railway. In 1905 he had charge of the work of rebuilding and operating the Indianapolis line, and was also superintendent of the Danville line of the Terre Haute, Indianapolis & Eastern Traction Company. Four years later he accepted the position of general manager of the Indianapolis, Crawfordville & Western Traction Company. He resigned in 1912 to become connected with the Michigan Railway.

Alfred Sweeney, formerly general manager of the Lewiston, Augusta & Waterville Street Railway, has been elected general manager and clerk of the Androscoggin & Kennebec Railway, Lewiston, Me., the successor to the former company. Mr. Sweeney is also assistant general manager of the Cumberland County Power & Light Company, Portland, Me. A biography and a portrait of Mr. Sweeney were published in the *ELECTRIC RAILWAY JOURNAL* for Nov. 3, 1917.

C. Nesbitt Duffy, formerly vice-president of the Manila Electric Railroad & Light Company, Manila, P. I., has joined the staff of the Philadelphia (Pa.) Rapid Transit Company as assistant to the vice-president in charge of accounting and finance. Before going to Manila Mr. Duffy was connected with the Milwaukee Electric Railway & Light Company. The work that he has done in the industry and in the interest of the industry through the

American Electric Railway Association is so well known throughout the industry that little need exists to reiterate it at this time.

### J. A. Munroe at Omaha

John A. Munroe, vice-president of the Union Pacific System, will retire from steam railroad service on March 1 to assume the duties of first vice-president of the Omaha & Council Bluffs Street Railway, Omaha, Neb. Mr. Munroe, who was elected to the vice-presidency of the Omaha company at a recent meeting of the board of directors, will succeed W. A. Smith, formerly vice-president and general manager, who was recently elected president of the company to succeed the late Frank T. Hamilton.

The selection of Mr. Munroe to be vice-president will give the Omaha & Council Bluffs Street Railway the benefit of his experience, extending over a period of forty years, as a railroad



J. A. MUNROE

operator. In addition to his duties as vice-president of the Union Pacific, he has for some time acted as traffic manager of that road, and also as traffic manager of the Oregon Short Line Railroad, the Los Angeles & Salt Lake Railroad, and the St. Joseph & Grand Island Railroad, controlled by the Union Pacific. He has been a director of the Omaha & Council Bluffs Street Railway since 1913.

Mr. Munroe was born in Bradford, Mass., in 1853. Soon after his graduation from Dartmouth College in 1873 he went West and became a clerk in the employ of Green Bay & Minneapolis Railroad. In 1881 he was appointed general agent of the Chicago, St. Paul, Minneapolis & Omaha Railway at Omaha. A year later he was promoted to assistant traffic manager of the same road, with headquarters at Minneapolis. Joining the Union Pacific in the same year, he was made assistant general freight agent of the company, continuing in that capacity until 1901, when he was advanced to freight traffic manager in charge of traffic. In 1911 he became vice-president of the company.

# Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

## Cotton Yarn Advance Forces Up Tapes and Webbing

Varnished-Cambric Tapes and Flexible Non-Metallic Conduit Marked Up 10 Per Cent

Cotton materials have again advanced in price. Flexible non-metallic conduit prices are about 10 per cent higher than they were a week ago. Price at time of shipment is rather generally ruling. Prices on tapes and webbings, which had been withdrawn, were greatly increased in varying amounts last week. Varnished-cambric tapes and cloth advanced about 10 per cent. Friction tape has been advancing more or less sporadically, with the common grades of splicing tape quoted around 45 and 50 cents a pound.

The spot-cotton market slumped early in February, but started to recover at the end of last week and at this writing is at 38.45 cents. The yarn and fabric market has been rising for several months. Inability to secure sufficient labor in the process work of making the semi-finished products in the face of the heavy demand is given as the cause for the continued increases in price of these materials.

Loom manufacturers are booked up for many months ahead, and their policy of price at time of shipment shows the uncertainty of the cotton-yarn market for the coming months. Orders for varnished cotton insulating tapes and cloths are extremely heavy, but they are for rather short delivery. The buying seems to be much of the hand-to-mouth variety rather than for long shipments, showing an expectation on the part of the users of a drop in the market.

## Painting Materials Advance

White Lead, Turpentine and Brushes Marked Up—Heavy Demands to Be Met for Spring Work

Increased activity is noted in the paint, varnish and enamel market. Recent large car orders which have been placed, have broken up the usual lull which follows after the first of the year. The volume of business has been improving in the railway field since late in the fall and with the present heavy buying of equipment sales no doubt will continue to increase.

White lead has advanced from  $\frac{1}{2}$  to 1 cent per lb., according to the quantity ordered. The latest quotation for white lead, 100 lb. keg, is 15c., with quotations ranging from 15c. to 15 $\frac{1}{2}$ c. for smaller quantities.

Turpentine during the past two weeks advanced to \$2.04 per gallon,

the highest price recorded in the history of the industry. It has now fallen and the Feb. 16 quotation is \$1.98 per gallon. There has been little buying at the advanced figures, and wherever possible paint and varnish manufacturers are waiting for the new turpentine crop on which prices are now quoted at \$1.25 to \$1.30 per gallon for second quarter.

Linseed oil is holding firm. Present prices are \$1.80 per gallon for raw linseed oil in 5-bbl. lots and \$1.82 for the same amount boiled. Prices for second and third quarter deliveries recently have declined gradually to \$1.55 per gallon on carload lots. Future prices, however, will depend somewhat on the amount of flaxseed shipped in from Argentina and India.

Paint brushes have been advanced 15 to 25 per cent by a number of important manufacturers. Material for brushes is scarce and expensive.

## Safety Car Equipment Prices Increased

Motors, Control Equipment and Air-brakes Increased in Price This Week—Options Closed Feb. 16

An increase, which has been long expected, was made recently by manufacturers of safety car equipment, on motors, control equipment and on air-brakes. According to reports, Feb. 16 was the last day on which safety car orders could be contracted for at the old price. The increase, according to reports, amounts to \$50 on equipment formerly quoted at about \$1,650.

Many railway companies are known to have obtained options at the former price, and accordingly safety car orders for the next few months are expected to be exceedingly heavy, owing to the placing of orders by the different companies which now hold options.

## Heavy Buying of Rolling Stock Continues

Orders Placed for 334 Cars During Week, Which Amounts to 14 Per Cent of Entire Number Purchased During 1919—Inquiries Out for Additional 350 Cars

The heavy buying movement of all kinds of equipment by electric railways, noted in the February 7 issue of the *ELECTRIC RAILWAY JOURNAL* in which orders for more than 200 cars were announced, has continued steadily with the result that during the past week, orders have been placed for 339 cars of which 239 are safety cars and 100 cars double-truck trailers. In addition, there are inquiries out for 350 cars, a considerable number of which will no doubt be placed during the month.

United Railways & Electric Company, Baltimore, Md., is the heaviest purchaser this week, having just placed an order with the J. G. Brill Company, Philadelphia, Pa., for thirty-three safety cars and for 100 double-truck trailers. The safety cars are for single-end operation and will seat twenty-eight persons. The trailers are of the center-entrance type and designed to seat sixty-two passengers.

Stone & Webster, Boston, Mass., on Feb. 14, ordered eighty-three Birney safety cars to be distributed among its properties as follows: Northern Texas Traction Company, Fort Worth, Tex., twenty-five; Baton Rouge (La.) Electric Company, eight; Tampa (Fla.) Electric Company, eight; Galveston (Tex.) Electric Company, fifteen; El Paso (Tex.) Electric Company, ten; Columbus (Ga.) Railroad, nine; Tacoma Railway & Power Company, Tacoma, Wash., six; and the Everett Railway,

Light & Water Company, Everett, Wash., two cars.

Another large holding company has placed an order for 118 safety cars for its different properties. Announcement as to the properties on which the cars are to be used and the number of cars for each property will appear shortly in the *ELECTRIC RAILWAY JOURNAL*.

Among the inquiries, is one just issued by the Brooklyn Rapid Transit Company, which is for 200 subway cars. According to reports the company desires to purchase 100 cars immediately and to leave 100 cars on option for a short period. Other large orders pending are those of the Hudson & Manhattan Railroad, twenty-six cars for the Hudson tubes; and the Connecticut Company, which is expected to buy a fairly large number of safety cars. Many small orders ranging from two to ten cars, also, are pending.

Among the small orders placed recently but not included in the 334 cars, are the following, Chambersburg & Shippensburg Railway, Chambersburg, Pa., two safety cars; Pekin (Ill.) Municipal Railway, three safety cars, with National Safety Car & Equipment Company, Benton Harbor-St. Joe Railway & Light Company, Benton Harbor, Mich., two safety cars with the National Safety Car & Equipment Company, and the Danbury & Bethel Street Railway, Danbury, Conn., four safety cars.



## Brill Profits for 1919 Show Slight Decrease

Sales During 1918, Which Included Much War Work, Were Double Those of 1917

The sales value of the combined output of four plants operated by the J. G. Brill Company, Philadelphia, Pa., for the past year amounted to \$14,201,622, as compared with \$16,761,154 for 1918 and \$7,706,099 for 1917. Although sales dropped off slightly over two million dollars or approximately 17 per cent, largely because of completion or cancellation of war contracts, the profits for the year after deducting \$833,292 for depreciation, maintenance and repairs, amounted to \$916,869. From this amount, Federal taxes, estimated at \$85,000, must be deducted leaving a net profit of \$831,869, or approximately 9 per cent less than for the year 1918. This amount was sufficient to pay to the preferred stock holders all the accumulated dividends and the full dividend of 7 per cent on the preferred stock for the year. On Jan. 14, 1920, a full quarterly dividend of 1½ per cent was declared on the preferred stock for the quarter ending Feb. 1, 1920, which was paid on Feb. 2, 1920.

As the Wason Manufacturing Company was manufacturing aeroplanes for the Springfield Aircraft Corporation during 1918, this plant was greatly handicapped for the first few months of 1919 on account of putting its plant back into condition to manufacture cars. Final settlement with the Government of the Springfield Aircrafts Corporation's contracts has not been made fully, but when completed it is very likely that additional profits will accrue to the Wason Manufacturing Company.

Total orders on hand as of Feb. 1, 1920, amounted to a total of \$6,904,792 as against orders on hand as of Feb. 1, 1919, for \$8,204,448. Prospects for a considerable amount of work is encouraging, especially as the plants begin the year with a large amount of work on hand.

## Westinghouse Additions at Lester to Cost \$5,000,000

New buildings and equipment to cost \$5,000,000 will be put up at Lester, Pa., near Philadelphia, by the Westinghouse Electric & Manufacturing Company. Contracts for the construction have been let to Westinghouse, Church, Kerr & Company, who will start the work at once.

An erecting shop, 130 ft. x 300 ft. with balcony; a machine shop for large work, 130 ft. x 750 ft. with balcony; a three-story warehouse, 40 ft. x 600 ft. and a one-story machine shop, 130 ft. x 500 ft., make up the buildings. It is believed the buildings will be ready for occupancy by July 15, 1920. When completed the entire plant will provide work for from 4,000 to 5,000 men, the number employed at the present time being approximately 3,000.

## Rolling Stock

Brooklyn Rapid Transit Company, Brooklyn, N. Y., has sent out inquiries for 200 subway cars.

Cumberland Railway & Power Company, Fayetteville, N. C. are in the market for a number of new cars.

Chambersburg & Shippensburg Railway, Chambersburg, Pa., has placed an order for two safety cars.

Knox County Electric Company, Rockland, Maine, is in the market for one safety car and one semi-convertible double-truck car.

Beach Grove Traction Company, Indianapolis, Ind., expect during the coming week to place an order for three Birney safety cars.

Danbury and Bethel Street Railway, Danbury, Conn., through its receiver J. Moss Ives, has placed an order for four safety cars.

Pekin (Ill.) Municipal Railway, reported as being in the market for three cars, has placed this order with the National Safety Car & Equipment Company.

Toronto Civic Railway, Toronto, Ont., Canada, through its commissioner of works, R. C. Harris, is reported to be in the market for cars to the value of \$200,000.

Benton Harbor-St. Joe Railway & Light Company, Benton Harbor, Mich., has placed an order with the National Safety Car & Equipment Company for two safety cars.

United Railway & Electric Company, Baltimore, Md., has placed an order with the J. G. Brill Company for thirty-three safety cars and for 100 center-entrance trailers.

Saginaw-Bay City Railway, Saginaw, Mich., recently lost thirty-three cars in a fire. The equipment destroyed included old open summer cars, two interurban cars, several snow plows and sweepers and work cars.

Sandwich, Windsor and Amherstburg Railway, Windsor, Ont., Canada, will be taken over by the Hydro-Electric Power Commission of Ontario. The commission will purchase new cars and additional equipment. T. U. Fairlie, Toronto, Canada, is engineer in charge.

Los Angeles (Cal.) Railway has placed an order with the St. Louis Car Company for twenty-two safety cars and with the American Car Company for twenty-three instead of forty-five safety cars as was incorrectly stated in the Feb. 7 issue of the ELECTRIC RAILWAY JOURNAL.

## Recent Incorporations

St. Malo, Que.—An electric line from St. Malo to Limoilu, Que., is being promoted by John T. Ross and J. G. Scott. The cost of construction will amount to approximately \$500,000.

Wilmington, Cal.—Wilmington citizens are working out plans for building

a municipally owned electric railway in Wilmington. Engineers estimate the cost of the entire project at \$247,000. It is proposed to vote bonds to cover this amount. H. E. Carter is working out plans for holding a bond election.

## Franchises

Boothbay Harbor, Me.—Luther Madocks of Boothbay Harbor has secured a charter for an electric line ten miles long connecting that town and South Newcastle. At South Newcastle the road would connect with the Maine Central Railroad. The cost of construction and equipment is estimated at \$200,000. Work will be started this spring.

## Track and Roadway

Calgary (Alta.) Municipal Railway.—The City Council of Calgary has endorsed plans for improvements to the lines of the Calgary Municipal Railway to cost \$14,000.

British Columbia Electric Railway, Vancouver, B. C.—The British Columbia Electric Railway will extend its tracks on Granville Street and remove the tracks on Wilson Road, east of Granville Street, Point Grey, B. C.

Miami Beach Electric Company, Miami, Fla.—The Miami Beach Electric Company is completing its line between Miami and Miami Beach, and plans to have it in operation before the end of the winter.

Baton Rouge (La.) Electric Company.—The Baton Rouge Electric Company will build four additional passing tracks on its three belt lines.

Androscoggin & Kennebec Railway, Lewiston, Me.—This company, the successor to the Lewiston, Augusta & Waterville Street Railway, plans to expend more than \$800,000 on permanent improvements. The company will spend \$500,000 on improvements to its roadbed and transmission lines.

Granite City Railway, St. Cloud, Minn.—The Granite City Railway will relay one mile of track with 60-lb. rail.

Erie County Traction Company, Buffalo, N. Y.—The Erie County Traction Company, which recently acquired the property of the Buffalo Southern Railway, plans to extend its line from Ebenezer to East Aurora, a distance of ten miles.

Cumberland Railway & Power Company, Fayetteville, N. C.—This company is building about eighteen miles of track. The company is completing a concrete bridge.

Trenton, Ont.—The Bloomfield City Council has passed a resolution requesting the Hydro-Electric Power Commission of Ontario to complete estimates for a hydro-radial line from Picton to Trenton. The Hallwell Council has passed a similar resolution.

Quebec Railway, Light, Heat & Power Company, Quebec, Que.—The Quebec

Railway, Light, Heat & Power Company has received permission to construct a line from Quebec to Loretteville, Que. Work will start in April.

**Nashville Railway & Light Company, Nashville, Tenn.**—The City Commission of Nashville, Tenn., has passed an ordinance granting a franchise to the Nashville Railway & Light Company to lay tracks in Deaderick Street, Sixth Avenue, Fifth Avenue, and Commerce Street. The company has filed amendments to its charter embodying these changes.

### Power Houses, Shops and Buildings

**Glendale & Montrose Railway, Glendale, Cal.**—This company has completed a new carhouse at Glendale.

**Aurora, Elgin & Chicago Railroad, Aurora, Ill.**—The Aurora, Elgin & Chicago Railroad plans to build an addition to its repair shop at Wheaton, Ill.

**Fort Dodge, Des Moines & Southern Railroad, Boone, Iowa.**—This company has installed a new 600-hp. boiler and underfeed stoker.

**Escanaba (Mich.) Traction Company.**—The Escanaba Traction Company will build a new carhouse, shop and office during the present year.

**Cumberland Railway & Power Company, Fayetteville, N. C.**—This company is building a power house. It will install a new steam plant in the near future.

**City Electric Company, Albuquerque, N. M.**—This company has under construction a repair shop at Albuquerque.

**Hamilton, Grimsby & Beamsville Railway, Hamilton, Ont.**—The carhouse and three of the cars of this company were recently destroyed by fire. The loss is estimated at \$40,000.

**Chambersburg, Greencastle & Waynesboro Street Railway, Waynesboro, Pa.**—This company has ordered 14,000 pounds of overhead trolley wire for replacements.

### Trade Notes

**Western Electric Company, New York, N. Y.**, announces that W. F. Abely, sales manager at Boston since June 1908, has been made assistant manager of the Boston branch.

**H. R. Worthington Company, Harrison, N. J.**, manufacturer of pumps, is rushing work on the construction of its three new additions. The structures will be each two-story, 50 ft. x 137 ft., steel and reinforced concrete, and will cost about \$100,000.

**Waclark Wire Company, New York, N. Y.**, has sold its plant in Elizabeth, N. J., to the American Copper Products Company, a Delaware company capitalized at \$14,000,000. Besides manufacturing various wire products the Waclark company operates a brass mill.

**Maher Engineering Company, 30 North Michigan Avenue, Chicago, Ill.**

has opened a branch office at 708 Schofield Building, Cleveland, Ohio, for handling the distribution of Erie engines, Dayton-Dowd centrifugal pumps and Galland-Henning hydraulic presses.

**National Association of Purchasing Agents, New York, N. Y.**, has adopted as a national standard the catalog size, 7½ in. x 10½ in., with its half size, 5½ in. x 7½ in., when saddle stitched so that it may be opened up flat for filing. This size was arrived at by the standardization committee after a very thorough research.

**J. E. Moody, chief engineer of the Massey Concrete Products Corporation, Chicago,** will take charge of the concrete pipe division of the American Concrete Pipe Association at its convention which will be held at the Great Northern Hotel and the rooms of the Western Society of Engineers on February 20 and 21.

**New York Switch & Crossing Company, of Hoboken, N. J.**, manufacturer of railway track special work, announces that Chester F. Gailor has been appointed sales agent of the company. During the war, Major Gailor rendered efficient service in the U. S. Army, and will again continue to devote his activities to the electric railway industry.

**Locke Insulator Company, Victor, N. Y.**, will commence immediately the construction of a 24-kiln factory in South Baltimore, Md., for the manufacture of fine porcelain for insulators. The plant will occupy about 15 acres, and according to reported estimates will cost from \$1,000,000 to \$1,500,000 and will employ from 7,000 to 10,000 persons.

**Lewis E. Ashbaugh, hydraulic engineer with the J. G. White Companies and clients for the past twelve years,** has become connected with John R. Proctor, Inc., of Bayonne and New York. Mr. Ashbaugh is to be the sales-engineer at the New York office, in charge of installations of fuel-oil apparatus and other electrical equipment for power and lighting purposes.

**American Coin Registering Company, Emeryville, Cal.**, manufacturer of Voglesong fare boxes, announces that James Lynch, for many years Pacific Coast manager of the Herring-Hall-Marvin Safe Company, has been made vice-president and sales director. This company recently received an order to equip with its fare boxes a large number of safety cars for the Brooklyn Rapid Transit Company.

**Railway Audit & Inspection Company, Philadelphia, Pa.**, at the annual meeting of the board of directors, January 23, accepted the resignation of E. C. Hathaway as president. He was subsequently elected chairman of the board. H. N. Brown was elected president; T. C. Cary, 1st vice-president and general manager; C. E. Horney, 2nd vice-president and treasurer, W. W. Groves, 3rd vice-president and sales manager and Walter H. Taylor, secretary.

**Blaw-Knox Company, Pittsburgh, Pa.**

has purchased the C. D. Pruden Company of Baltimore, Md., manufacturer of standardized steel buildings. J. Grier Campbell, purchasing agent of the Blaw-Knox Company, has resigned to become assistant treasurer of the C. D. Pruden Company. William S. Boyd, formerly assistant purchasing agent of the Crucible Steel Company, and purchasing agent of the Page Steel and Wire Company, has been appointed purchasing agent of the Blaw-Knox Company.

### New Advertising Literature

**Trump Manufacturing Company, Springfield, Ohio:** Booklet "B" on its hydraulic turbines.

**Barnes Drill Company, Rockford, Ill.:** A circular on its self-oiling all geared 24-in. drill and tapper.

**De Laval Separator Company, New York, N. Y.:** Bulletins No. 101 and 102 on its method of reclaiming oils.

**Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.:** Bulletin No. 9 on its line of safety switches.

**Thompson Electric Company, Cleveland, Ohio:** A bulletin "Do Your Reflectors Reflect" describing its safety disconnecting hangers.

**Milliken Bros. Manufacturing Company, New York, N. Y.:** Catalog No. 10 on transmission towers, radio towers, poles and steel buildings.

**Walter A. Zelnicker Company, St. Louis, Mo.:** A pamphlet listing products such as rails, cars, locomotives, machinery and equipment.

**Belden Manufacturing Company, Chicago, Ill.:** Bulletin 1208 on Beldenmold molded pieces made from "Condensite," "Bakelite" and "Redmanol."

**Allis-Chalmers Manufacturing Co., Milwaukee, Wis.:** Bulletin 1537 giving details of its oil engine, diesel type, for ordering repairs and spare parts.

**Industrial Products Company, 1001 Chestnut Street, Philadelphia, Pa.:** Illustrated booklet on new electrical lineman's belt and collapsible canvas tool-bag for linemen.

**Midwest Engine Company, Indianapolis, Ind.:** Copies of a Diesel engine paper delivered at the company sales convention by N. McCarthy are being distributed by the company.

**Ohio Brass Company, Mansfield, Ohio:** A pamphlet illustrating a number of safety cars fitted with one or more O. B. specialties. O. B. trolley bases and catchers, sand traps, and types Z. P. and W. D. F. imperial headlights, also are shown.

**Metal & Thermit Corporation, New York, N. Y.**, has issued and will distribute on request a large 1920 map calendar showing railroad time zones in the United States and Canada, also showing illustrations of interesting Thermit welding jobs as applied to sternframes of ships, rail special work and locomotive frame repairs.