Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Don't Forget Those Christmas Seals

AS DECEMBER approaches, we are reminded of the sale of the Tuberculosis Christmas Seals, and the JOURNAL feels it not improper to call the attention of its readers to this humanitarian effort on the part of the National Tuberculosis Association. It may not be amiss to mention that statistics show that one out of every three deaths of men between the ages of fifteen and forty-five is due to tuberculosis. As to the electric railway industry specifically, the association quotes statistics to show that from 1 to 2 per cent of street car conductors, motormen and linemen have tuberculosis in an active stage. Approximately 1 per cent is the figure for office workers and shop men. The economic loss due to decreased efficiency and production of all these men is a direct loss to the railways and the communities served. The National Tuberculosis Association is in the field to help fight this disease. The sale of Tuberculosis Christmas Seals from Dec. 1 to 11 gives to every one an opportunity to support this great national movement.

Can Repair Shop Layout Be Standardized?

THE ideal of the electric railway mechanical department is to keep out on the road every car which is not in the shop for inspection or scheduled overhaul, and the condition of the shop in this respect, barring abnormal conditions such as those of last winter, is an indication of the general efficiency of the management. The degree to which cars can be kept rolling depends in part on the way in which they are routed through the shops. This, in turn, is dependent upon the ideas underlying the shop layout. The writer recently had occasion to visit a large number of shops and was impressed by the wide difference between good shops and poor ones. Some showed that they had been designed really to meet the needs of the maintenance work, others apparently "just grew." The shop where the cars were going through in an orderly manner, where the stock of burned-out armatures was inconspicuous and where neatness stamped the work as having been carefully done was the shop which had been properly planned for its work. The condition of the rolling stock, in general, reflected the condition of the shop.

Now as to this matter of standardization, there are, of course, certain things that must be done to a car to keep it in good running order; while others are desirable they are not absolutely necessary. Each master mechanic has his own ideas as to what he wants to have and do in his shop, but there are certain fundamentals which are the same everywhere. This leads to the question as to the possibility of standardizing upon certain essentials so that the master mechanic and the manager may be sure that they are as nearly up to date in their shop layout as their funds permit.

If anything can be done in the way of standardizing the principles of shop layout, it would be well for the Engineering Association to take the matter under consideration. The work program for 1920-1921, approved at Atlantic City, indicated that a start will be made in this direction. Meanwhile, the management of every property might profitably consider whether improvements could be made locally which would expedite maintenance work. It's a rare shop where some improvement cannot be made. We shall be pleased to receive and print statements regarding economies that have been found practicable even in these strenuous times.

Boston's Problem as Shown by Its Last Quarterly Report

ON ITS face the last Boston quarterly statement, published in this paper last week, is certainly discouraging, showing as it does a deficit over "cost of service" for the quarter of $1,039,147 and for the fifteen months ended Sept. 30, 1920, of $17,080 less or $1,022,067. In addition to this deficit there is $435,348 retroactive back pay, which was paid in October, 1919, but applied to the months of May and June, 1919, and for which no provision has yet been made. All this is regardless of the fact that the company is conservatively capitalized, has had model management over a long period of years and has been providing "service at cost" under public trustees since July 1, 1918, and in spite of successive increases in the fare from 5 cents to 7 cents, then to 8 cents and finally to 10 cents, the 10-cent fare having been established on July 10, 1919.

The official quarterly statement says distinctly that the total receipts per revenue passenger were 10.23 cents, whereas the cost of service per revenue passenger was 11.54 cents, and it points out that the cost of labor alone was 5.71 cents per revenue passenger! The deficit during the last quarter is so large that should the increase in the cost of coal, $239,000 (at $11.50 per ton instead of $5.75), and in maintenance and repairs, $160,000, be eliminated, there would still be a deficit for the quarter of $640,000. Not even the remission of subway and tunnel rental charges paid to city would cancel the deficit, since these totaled $382,555.

Those who have followed the financial fortunes of the Boston Elevated Railway know that beginning October, 1919, or three months after the establishment of a 10-cent fare, receipts began to exceed expenditure and so continued to May, 1920, inclusive except during February. The net result for the year ended June 30 was the surplus of $17,080 previously mentioned. It was then hoped that the succeeding year would enable the company to escape "going on the rates," as the British say of tax-aided municipal systems, even if it could not accumulate the $1,000,000 reserve fund necessary before attempting to lower fares. What is the present opportunity for such an outcome?

A study of the detailed figures of expenses for the

quarter shows that the largest item, wages, amounting to 5.71 cents per revenue passenger, is a slightly larger sum than for the previous twelve months, when the figure was 5.053 cents. Yet, as pointed out in the Nov. 8 issue under "Fares Cannot Recede Yet," a cut in wages would work severe injustice so long as there are no substantial cuts in the cost-of-living items that make up the bulk of the family expenses. Besides, arbitrary reduction is out of the question. Manufacturers can shut down their plants and profit thereby because they have a surplus to work off. Hence, today, they are more likely to welcome than to fight a strike against wage reductions. Electric railways have no surplus to work off. Interruption to service can never be made up by the public taking deferred rides. Arbitration toward permitting a lower wage, based upon proof that the cost of living really has fallen, is practically the only way open, but arbitrations take time while deficits hurry.

But there are other reasons why the results for the quarter and for the year are not more satisfactory, and in this connection it would be better to consider the report for the year ended June 30 as a whole, because in Boston the third quarter is always characterized by light receipts and heavy expenditures in track work so that it is low in net. Among these general conditions are the scarcity and high price of coal, already mentioned, the increase in private automobile travel in good weather and the unusual severity of last winter. The fact must also be borne in mind that the narrow streets in Boston and the large extent of subway construction make the city an expensive one for car operations. Thus, the charges paid last year by the company for the use of subways and tunnels amounted to $1,591,323, which of itself would make a very respectable surplus.

There are, of course, two ways to increase the net in any business enterprise. One is to reduce the expenses and the other is to increase the gross, and some may ask if it is not possible to increase the number of revenue passengers, which for the year ended June 30, 1920, was lower than for any year since 1912 and less by 55,474,000 than in 1917. That is to say, the question naturally arises whether there is any possible way of attracting any considerable number of short-distance riders, presumably the ones lost, who could be carried at a profit at a lower fare if the fare to the long-distance rider would not thereby have to be reduced? To test this possibility the management put in service some time ago several short routes at a 5-cent fare, and of these routes two are still in service. Unfortunately for such a trial the Boston system is not very well adapted for short-route cars, in that its main or arterial lines through the center of the city are underground, where the addition of short-route cars would introduce complications both in fare collection and in making turnbacks. But with cars operating entirely on the surface these obstacles do not exist, and it may be that elsewhere on the system, both in the heart of Boston and in the many self-contained communities in its outskirts, there would be opportunity for such a service.

We trust, however, that the climax has been reached in high costs and low receipts in Boston and that the final quarter of this year will show increased traffic and a satisfactory net for the Elevated. But whether it does or not, the management, in the person of Mr. Dana, has gone on record to the effect that the remedy for decreasing net receipts is not an ever-increasing flat fare. While a property might derive sufficient revenue therefrom out of necessity riding to meet the costs of service, in his opinion it thereby has become diverted from its primary function, which is that of developing community growth and intercourse for the greatest number of the inhabitants in the community, and instead provides a service which can be purchased only by those who can afford it or to whom at any price it is indispensable. We may therefore expect that every effort possible will be exerted in Boston to prevent any further increase in the unit fare.

Fundamentals of Finance and Service

BANKRUPTCY courts and receiverships are not our ideals for utility operation. Such agencies cannot alter facts, and the fundamental fact is that adequate service cannot be rendered at less than cost.

Adequate service is what the public wants irrespective of the financial condition of a utility, but when a receiver is in charge of a property he is wagering his reputation on his ability to improve the financial condition of the utility without primary consideration of service to the public.

Every community can, if it wishes, pay a return to a private utility enterprise which will enable experienced utility operators to render adequate service; every community can drive its utilities into the bankruptcy courts and on into the hands of a receiver, with the result that service is ruined and the going value of the property highly depreciated, or every community can own its utilities and throw the financial burden on the taxpayers and the operating burden on the politicians.

Whatever the procedure, some one must pay the bill. There are no short cuts in utility operation, and the public has the ultimate decision as to the course it takes. But the wisest course is to recognize that poor service in the end is the most expensive to both community and company.

Creepage of Railroad Rails

AT THE meeting of the American Society of Civil Engineers held on Nov. 3 Dr. J. A. L. Waddell, the noted specialist in bridge design and other branches of civil engineering, presented a paper on creepage of railroad rails. This subject is one which may well receive the attention of engineers of way of many electric railways.

The phenomenon of rail creepage is one that has puzzled track engineers ever since railroad tracks were first used. Its causes have long been in doubt, but obviously the primary cause is traffic, since idle tracks show no creepage.

The troubles caused by rail creepage are both numerous and costly, while there is also an element of danger attendant upon its occurrence, which directly affects the lives of the traveling public. Our observation indicates that creepage, though prevalent, is not so serious in electric railway tracks as it is upon steam railroad tracks; nevertheless, it is found in all open tracks electrically operated, whether these be located in subways, on elevated structures, in roadbed or on private right-of-way. That it is not found in tracks in street pavements is due to the retardation or frictional resistance given by the pavements, which resistance also prevents trouble with welded rail joints.

Dr. Waddell, in his A. S. C. E. paper, opens up this

subject for discussion. The editors of this paper desire to be of assistance to him in his study of means for overcoming the trouble and have reprinted in this issue the questions sent out by the doctor in a questionnaire. We should be pleased to print any answers to these questions bearing on electric railway experience which our readers may forward. Dr. Waddell states that he will furnish copies of his paper to interested engineers so long as the supply holds out.

You Can Lead a Mule to Water, but——

MASS transportation is a human as well as an engineering problem, and in the modern city, with its mammoth but vigorous swarm of human bees, the human element is a deciding factor in planning transportation.

Large city transportation systems are chaotic, but the cities are in the same condition—like Topsy, they both just grew. A realization of this condition and of the nuptial relationship of city planning and transportation is now existent and a tendency toward co-ordination is in evidence.

As an engineering project, a competent committee could co-ordinate existing transportation agencies, *i.e.*, the rapid transit electric, the suburban steam, the street railway and the motor bus, in such a manner as to carry the traffic adequately and could allocate to each agency its place in the general scheme. But this co-ordinated transportation plan might fail unless it considered the human elements of the problem.

A primary factor in transportation psychology is speed. Apparently, no agony or discomfort is too great to suffer provided three minutes in time can be saved in going to the office or in returning home. Those who have experienced the rush-hour conditions in subway or other rapid transit agencies can appreciate the absolute speed mania of the metropolitan. The word "express" creates a riot and produces a greater physical and mental stimulus than booze ever did. It enables people to submit to crushed corns with smiling faces and produces a giant's strength in the sharp elbows of diminutive maidens. A luxurious Pullman, if two minutes slower, would not tempt even a crippled strap-hanger in the express.

Another fetish of the rider is the "through train." He does not like to transfer from elevated to subway or from surface car to motor bus; once located in a transportation agency going in his direction he hibernates until he reaches his destination and any change en route arouses his bearish ire. He may even take a local instead of an express if the latter involves a transfer.

Did you ever compare the Sunny Jim smile and hear the sigh of contentment from the man in front of you as he subsides in his seat after readjusting the window to his satisfaction with the apoplectic countenance, impotent wrath and sibilant expletive of the man across the aisle whose window is immovable? Then, again, how some people do like to push the button on the signal system and how they do kick if it doesn't happen to ring the bell.

A more irascible, impatient and unthinking being than the average metropolitan rush-hour rider cannot be found, and in this modern political age he must be humored and petted, not driven.

Get the City Editor's Point of View

WE HAVE been impressed by several recent remarks or statements that the electric railway managements as a rule do not have an adequate conception or appreciation of the psychology of the general public. These statements have come from men whose opinion deserves respect. Among them are public service commissioners who are continually dealing with the public relations of railways and also several public relations representatives or enterprising publicity men of the railways themselves. None from whom such expressions have come has any purpose other than sympathetic constructive criticism. The remedy suggested is to get the "city editor's" viewpoint.

There has been at no time any intimation that railway men are averse to knowing the public, but on the contrary an appreciation that the railway men are eager to have the public understand the problems of railway operation. The question resolves itself into the very practical one of exactly how to do it, a question which has had no end of discussion, but one upon which new suggestions are always welcome. One commissioner, Judge Clyde M. Reed of Kansas, says that we must recognize that the general public as a whole is unreasonable and must be treated as an unreasonable group. Public utility men, he says, appear to treat the public as if it were intelligent and knew or could appreciate almost as much about the nature of the business of furnishing public utility service as do the utility men themselves. This, he says, is false.

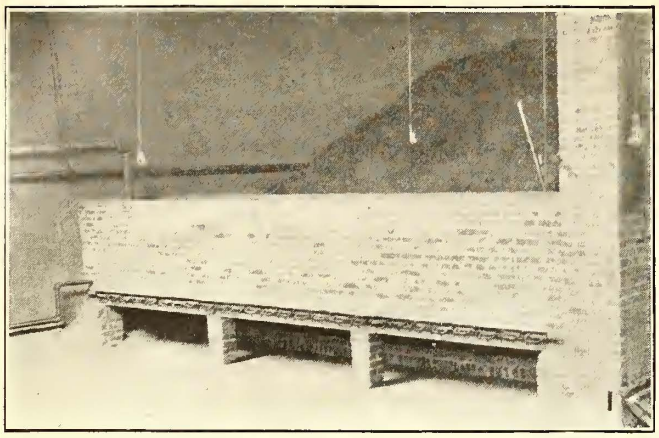
Himself a newspaper man, Judge Reed likens his business to a public utility; at least as a near approach, in that it deals with a larger proportion of the public than any other business. By painful practical experience he has learned that the public's characteristics are as he outlines them. He, and others of experience, urge the railway men to get the city editor's point of view, to study mass psychology, which Commissioner E. I. Lewis of Indiana says is not now included in the curriculum of a public utility employee.

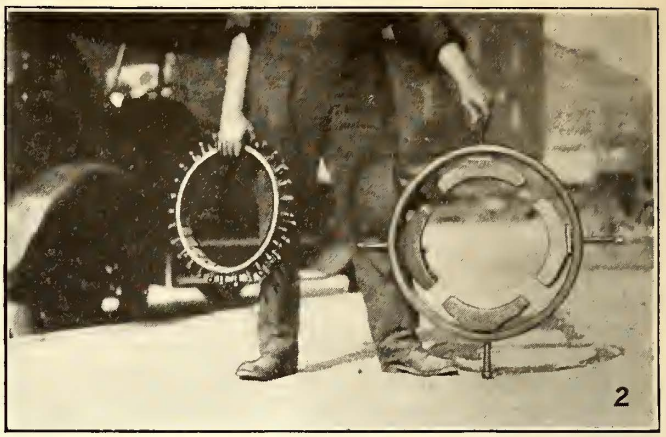
What viewpoint is this which the city editor has and which the electric railway man should acquire if he does not have it? Principally, it seems, the city editor has been talking to the public so long and has felt so directly the reaction to his kind of talk that he has learned the language of the general public. He has learned a good deal about what the public thinks and wants to know. It may not please electric railway men, who have been dealing with the public for years, to be told that they don't know its characteristics.

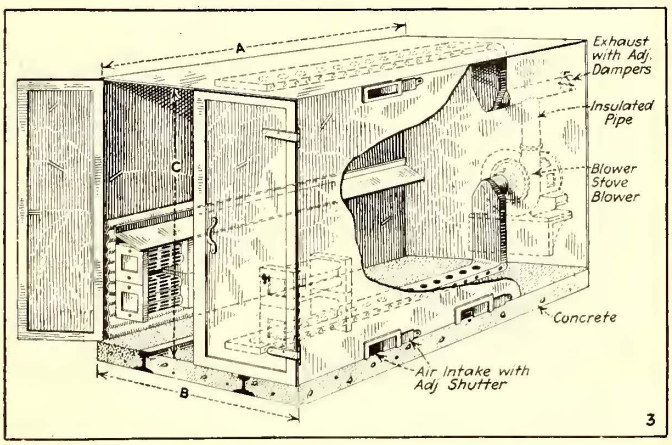
But let it be pointed out that the relation of the electric railway man to the public in the past has been chiefly through the medium of service and fares and in noting the public's reaction to this and the consequent effect on gross and net receipts. Today we all say that there are new elements and methods in the business and these are chiefly concerned with publicity and public relations—principally education of this public in the details of the electric railway business.

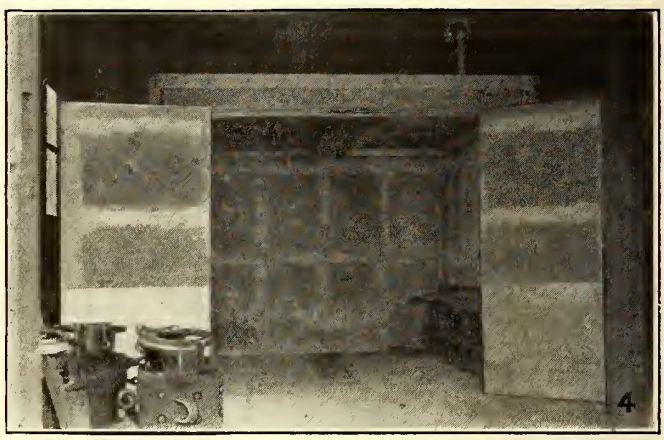
So, say these advisers, get acquainted with the city editor. Learn what he knows about the public and its attitude. At the same time, be sure he becomes fully educated on electric railway problems himself and he will become an agent for the correct portrayal of electric railway matters to the public and also an interpreter to the railway man of the public's attitude.

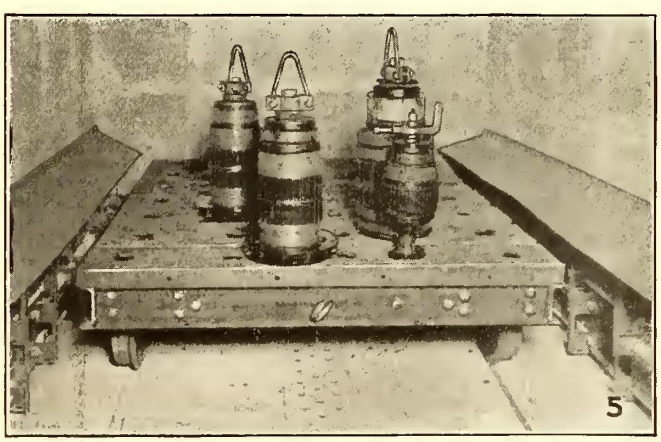
Novel Apparatus and Methods for Maintaining Electric Railway Equipment

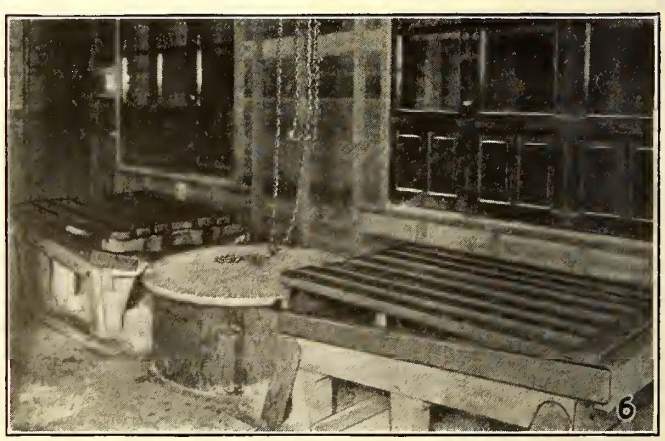


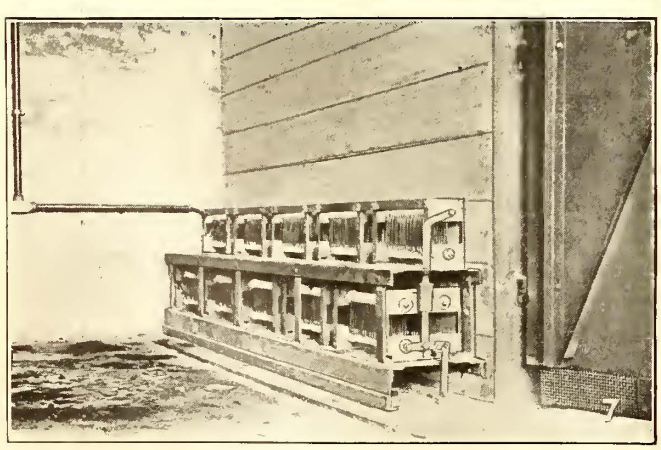












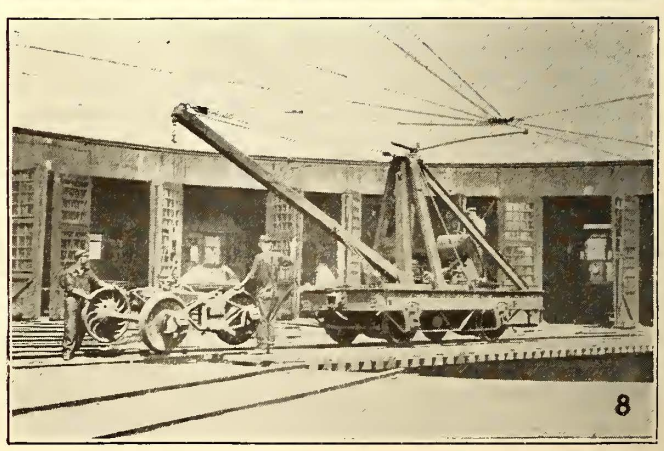


Fig. 1. Steam-heated sand drier installation in the Sioux City, Iowa, shop.

Fig. 2. Two devices rigged up in the Sioux City shop to facilitate the banding of armature coils.

Fig. 3. Isometric drawing of new bakeoven as recently installed in Omaha shops.

Fig. 4. New bakeoven at Omaha, showing ventilating duct in floor and ceiling and recording thermometer suspended from ceiling.

Fig. 5. Interior of Omaha bakeoven, showing car used for moving armatures in and out of the oven and manner of supporting armatures in vertical position.

Fig. 6. Dipping tank in the Omaha shops with drain rack on either side made movable to permit putting cover on tank.

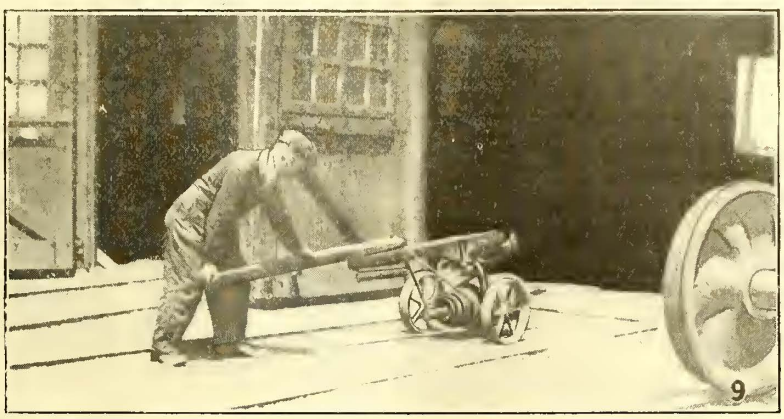
Fig. 7. Interior view of the concrete bakeoven in the Waterloo, Iowa, shops.

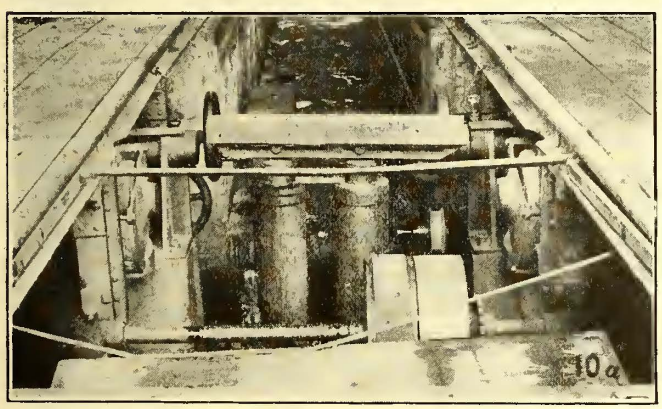
Fig. 8. Handy home-made derrick used for lifting and shifting anything at all about the shops of the Waterloo, Iowa, company

Picturing Iowa Shop Kinks

Various Stereopticon Pictures of Shop Equipment Shown and Discussed at the Recent Omaha Meeting of the Iowa Railway Association

IN ADDITION to the pictures taken to accompany papers presented at the recent Omaha meeting of the Iowa Electric Railway Association, and reproduced with the report of the meeting in the issue of the ELECTRIC RAILWAY JOURNAL for Sept. 25, 1920, a number of other pictures were shown as a means of urging master mechanics to describe interesting kinks in use in their shops. These are presented herewith, together with a brief description. C. M. Feist, master mechanic Sioux City Service Company, explained the accompanying picture of the sand drier, Fig. 1, used at his shop. The wet sand is shoveled into the drier through a window in the wall to the rear. As needed, the sand is moved forward in the drier to the portion of the bin which is heated with steam pipes. To begin with, it required twenty-four hours to dry 7 cu.yd. of sand. Later it was found that by pushing a broomstick down through the wet sand at numerous points the evaporation of the moisture was much more rapid and 7 cu.yd. of sand could be dried in twelve hours. The twenty-four-hour time required before this practice was started seemed to prevail whether the drying was done with the drier open or closed. After the sand in this drier has become thoroughly dried it is removed at the bottom by pulling out the series of iron slides seen along the lower front edge of the furnace, each slide having a loop handle.





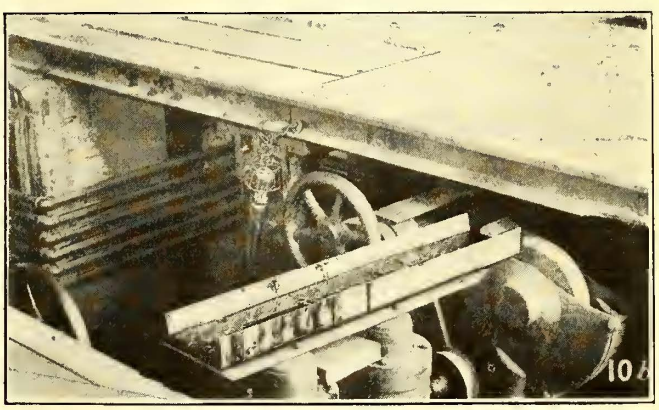
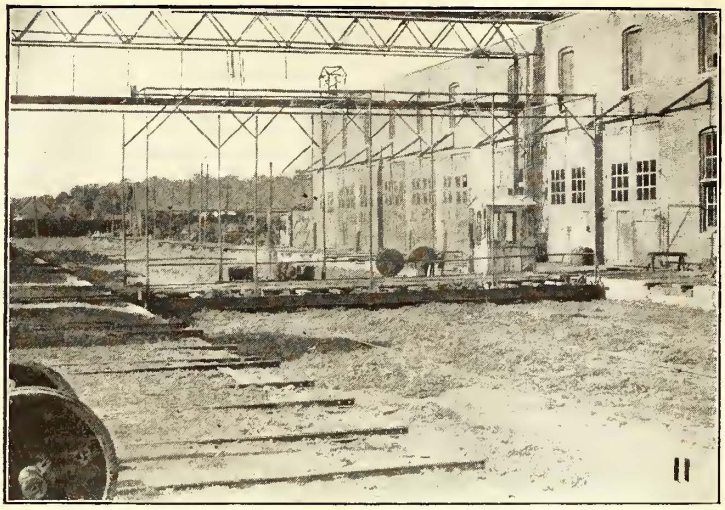
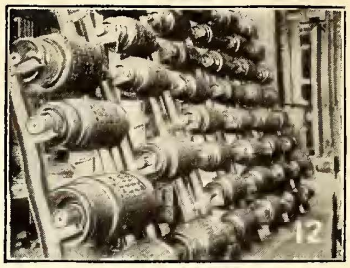
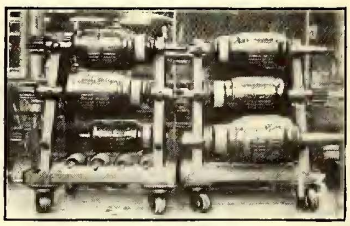


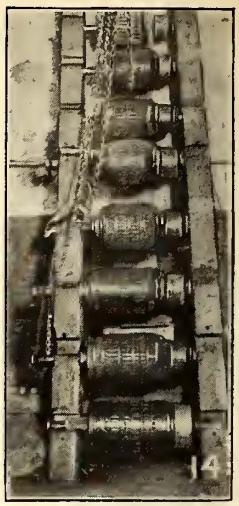
Fig. 9. The Waterloo "mule" found very convenient in transporting armatures. Figs. 10a and 10b. Two views of the hydraulic jack and pit wheel grinder in the Des Moines shops

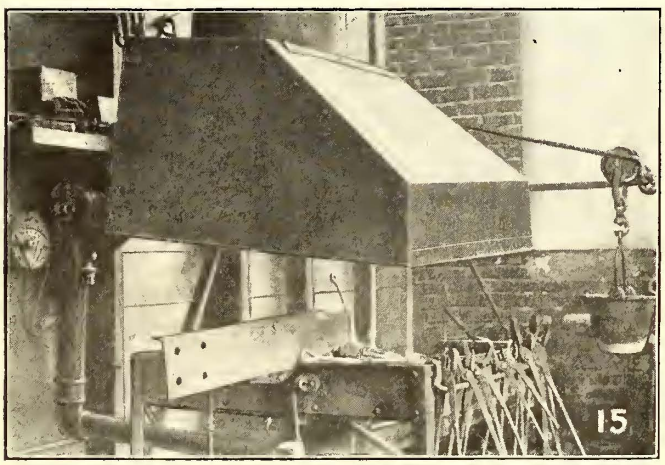
Another piece of equipment from Sioux City that was pictured is used in putting in new armature coils, and another for holding the coils while banding, Fig. 2. The first of these consists of a steel ring ½ in. by 3 in. containing two rows of setscrews laid out to correspond with the slots in the armature. This device is used to force the coils down into the slots solidly and hold them there until they are banded. Caution is taken not to clamp the coils too hard, as this might cause a short circuit, but by forcing them hard against the bottom of the slots all vibration is eliminated. A piece of key stock which fits into the slot is placed between the coil and the setscrew to avoid breaking the insulation as the setscrew is screwed down. The banding of armatures has been done cold up to the present, but it is expected to do it hot in the future. The other device shown in this same picture and having four setscrews and four curved clamps is used to hold the ends of the armature coils while the banding is being done. One of the things which created a great deal of interest both at the Omaha shops on an inspection trip and in the meeting where it was pictured was the new bakeoven recently installed there. An isometric drawing as well as pictures of this oven are shown herewith, Figs. 3, 4 and 5. This oven was laid out according to recommendations made by the Westinghouse Electric & Manufacturing Company. It is built of wood and measures 10 ft. wide by 12 ft. high and 14 ft. long. The walls are made up with 2 x 4-in. vertical members, on the outside of which was placed a layer of 2-in. Johns-Manville thermo fire felt in 24 x 36-in. sheets. On the inside of these two-by-fours were placed two layers of ½-in. Flax-li-mum in 30-in. x 9-ft. sheets, the two layers separated by 1 x 2-in. furring strips placed opposite the 2 x 4-in. studding. This construction left air spaces betwen the two inner linings and the outside lining of the heat insulating material. This same construction was used for the ceiling and for the double doors opening into the end of

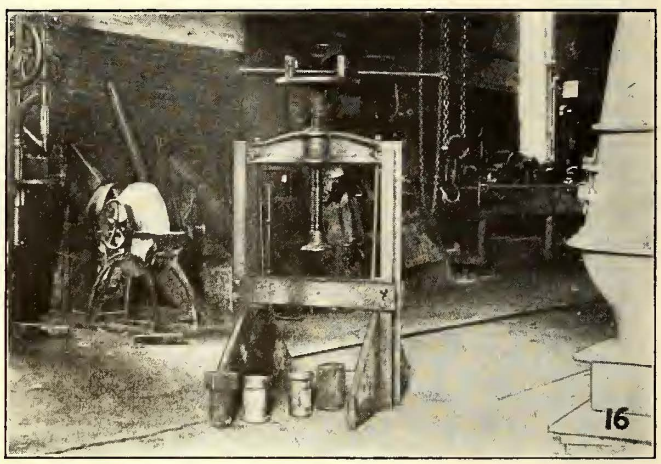


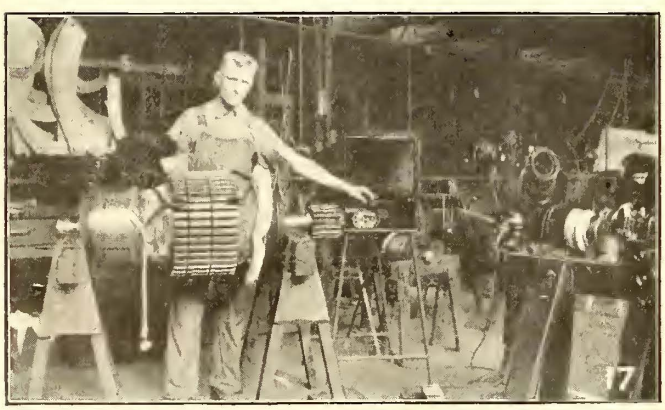


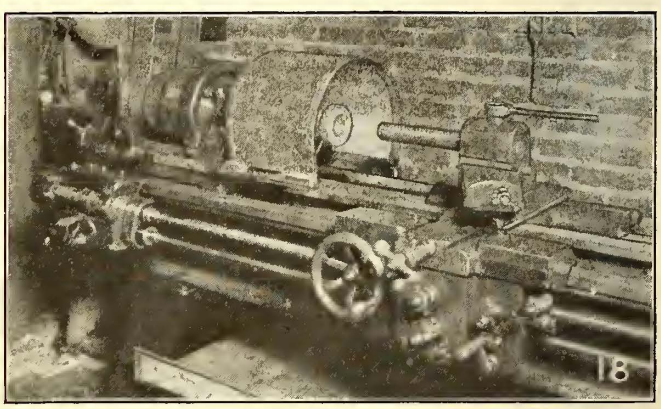


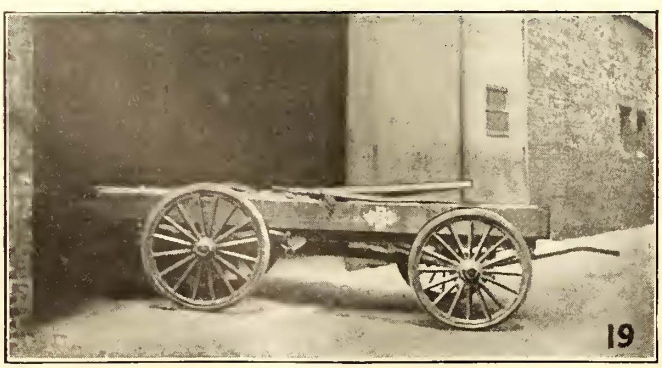












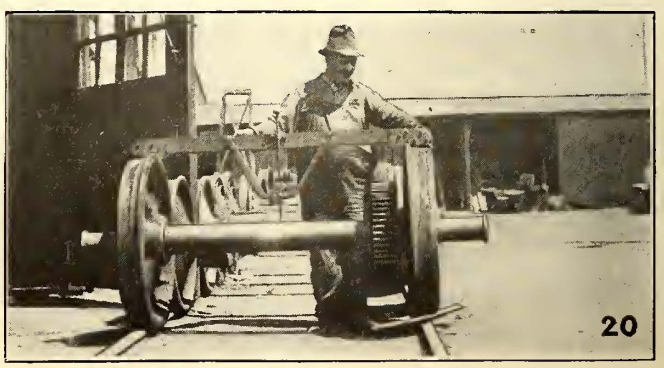


Fig. 11. Transfer table at the Omaha shops equipped with motor-driven "niggerhead" for moving dead cars.
Fig. 12. Method of storing extra armatures at Des Moines.
Fig. 13. Armatures in the Tri-City Railway shops are stored on castor-equipped racks for ready transport from storage to motor assembly room.
Fig. 14. How extra armatures may be neatly stored in the small shop at small expense.
Fig. 15. Counterbalanced hood over blacksmith forge in the Centerville, Iowa, shops.
Fig. 16. Bearing press made out of old cider press in the Centerville, Iowa, shops.
Fig. 17. Small electric oven for warming coils just prior to installation in armatures, Tri-City Railway shops.
Fig. 18. Protection for the eyes of the machinist while boring out brass bearings.
Fig. 19. A handy trailer used in Des Moines for transporting tools and materials.
Fig. 20. Wheel gage used in Waterloo to insure that the wheels shall be pressed on at equal distances from the axle center.

the oven. These doors were faced on the beveled edges with an asbestos rope so that they are as heat proof when closed as the walls.

Blower Keeps Air Circulating

One of the most interesting features of this oven is the ventilating system. This consists of a small blower which is connected with a ventilating duct along the ceiling of the oven and another installed in the floor. This blower can be made simply to keep the air circulating from the blower through the top duct, down through the oven and returning through the bottom duct to the blower, or by simply adjusting a damper in the blower exhaust pipe the air and gases from the oven may be exhausted outside. When the baking of armatures is first begun it is necessary to exhaust the naphtha gases out into the open to avoid the possibility of an explosion, for an accumulation of these gases might be ignited by the red hot elements of the heaters.

The oven is heated by two sets of heaters, one installed on either side of the oven, on the floor, and protected from above by a steel apron. The temperature within the oven is regulated automatically and is recorded by a recording Bristol thermometer. The temperature to be maintained during any heat is adjustable and is usually made 210 deg. F. for small armatures and 260 deg. F. for the large armatures. The thermometer control permits a variation in temperature of 5 deg. either way from the setting. For each heat a new chart is placed on the recording thermometer, on the back of which is entered the serial number of the apparatus placed in the oven for that heat, and the thermometer then records graphically the exact temperature which prevailed during that heat, so that in the case of any armature failure a check may be made to determine that a proper oven treatment was secured. This also forms a check for the men operating the oven that a proper heat is being maintained.

This graphic recording thermometer, the floor switch, the control switch and the main and sectionalizing switches for the two sets of heaters are all mounted on a standard switchboard panel placed at one side of the oven. The Omaha oven had not been in use long enough at the time of the meeting to determine any operating results, except that considerably better service from the armatures thus prepared was indicated. Armatures are heated over night before dipping and then baked from twenty-four to thirty-six hours.

Novel Drain Rack Construction

Another interesting part of the equipment used in conjunction with this Omaha bakeoven is the pair of drain racks and dipping vat installed adjacent to the oven. One of these racks was placed at either side of the vat and arranged so that the drippings from armatures laid on them will drain back into the vat. These racks were built with a toggle joint so that they could be hinged back away from the vat in order to make it possible to put a cover on the vat when not in use and thus prevent the rapid evaporation of the dipping fluid. This arrangement can be readily seen in an accompanying illustration, Fig. 6.

W. G. Lamb, Waterloo, Iowa, spoke briefly of the 50-kw. baking oven used in his shop, Fig. 7, which has 8-in. concrete walls, floor and ceiling and insulated steel doors. It measures 10 x 12 x 14 ft. Only natural ventilation is provided, there being openings in the doors and louvres along the sides at top and bottom. The temperature is thermostatically controlled. This oven has so improved the service given by armatures that one man is now able to do the work which formerly required three armature winders in maintaining the 267 machines in use on that property.

Mr. Lamb also described the small derrick car, Fig. 8, which he has found exceedingly useful about the shop. It was constructed entirely of parts removed from old equipment. The underframe is 20 ft. long, the mast 8 ft. high and the boom 26 ft. long. The car weighs 15 tons and it will pick up and swing a 5-ton load. In fact, it will lift considerably more than its own weight will hold down, and for this reason the back end has been provided with anchors for use when it becomes necessary to lift an unusually heavy load. The weight at the rear end of the car was also made as great as possible by mounting the motor on this axle on the outside, while the motor on the forward axle is mounted on the inside. This small derrick car is also equipped with a third motor which operates the hoist and swings the boom, and it has been found very useful in handling wheels and axles, trucks and for various work about the shop. It has even been used for handling special trackwork on the street in a few cases.

In this same picture, incidentally, is shown the turntable which serves the shops of the Waterloo, Cedar Falls & Northern Railway. To overcome the necessity for calling three or four men out of the shop to move the turntable when it is necessary to change its position Mr. Lamb installed an old 12-A motor on it so that it could be moved by power.

In Fig. 9 is seen the Waterloo "mule," which has been found very convenient for transporting armatures about the shop. Its simple construction is readily seen from the picture without description.

Pit Grinder Saves Time

Fig. 10 shows two views of the pit grinder used in Des Moines for truing up slid flat wheels. The yoke across the top of the two hydraulic lift cylinders fits over the axle bearing housings so that the pair of wheels to be ground can be held in a firm position while they are being revolved by the car motor. As the jack raises the pair of wheels up off the rails the short section of rail on either side is taken out and the emery wheels moved up in contact with the car wheels. The latter are then driven in one direction while the emery wheels are driven in the opposite direction by a separate motor mounted in the pit as shown in the illustration.

The showing of these pictures aroused some discussion, in which it was brought out that the advantage of the pit grinders is that wheels can be ground in about the same time that is required when they are put in a lathe, but the time of taking the pair of wheels out from under the car and replacing them is saved. It was also brought out that screw jacks are used in some shops instead of the hydraulic jacks. When running the car motors during this grinding process, Mr. Feist stated that he makes use of a water rheostat to reduce the voltage from 600 to about 110.

Fig. 11 was taken for the purpose of showing the "niggerhead" installed on the transfer table at the shops of the Omaha company. This is found to be very handy in pulling dead cars on and off the transfer table without the need of getting another motor car to do this shifting.

Figs. 12, 13 and 14 show the methods employed to store armatures in the shops of the companies at Des Moines, Davenport and Centerville, respectively. At Davenport they are supported on a frame mounted on ball-bearing castors, which facilitates their handling. By pushing the frame to the point where a motor is being reassembled only one hoist-handling of the armature is necessary in removing it from its storage position and lowering it into the motor frame. Fig. 14 affords a good illustration of how a small shop can take care of its extra armatures in a neat manner with little expense.

Fig. 15 shows an adjustable hood mounted over the blacksmith's forge in the shop of the Iowa Southern Utilities Company, Centerville, Iowa. In this small shop it is sometimes necessary to heat a very heavy piece in the forge. The consequent necessity to build up a big fire formerly filled the shop with smoke and made working conditions disagreeable. This was overcome by installing this hood, which is let down closely over the fire during a heavy heat and then raised out of the way when the heat is completed. The hood is counterbalanced so that it is easily raised or lowered.

In Fig. 16 is shown what was devised by Charles Wells, master mechanic Iowa Southern Utilities Company, Centerville, as a substitute for a bearing press when money was not available for the purchase of a much-needed tool. He purchased the head and screw of an old cider press from a junk dealer and mounted this between two channel-iron supports and thereby devised the press, which has worked out very satisfactorily for the small amount of this kind of work to be done in this small shop.

Coils Heated to Prevent Cracking

In Fig. 17 is pictured a small electrically heated warming oven which has been found to be of great value in the shops of the Tri-City Railway, Davenport, Iowa. It was found that after armature coils lie in storage for a long period they become rather stiff, so that the fabric is very easily cracked in installing the coils. By putting the coils in this warming oven for ten or fifteen minutes just prior to installation the insulating compound is softened and injuries to the fabric are avoided. The oven is heated by one electric car heater. It is made of sheet steel large enough to hold a bundle of coils and is mounted on legs which bring it up to a convenient height for the armature winder. It is portable, so that it can be moved to any position in the armature room where work is taking place.

The picture of Fig. 18 was taken simply to show the means devised in the Omaha shop to protect workmen from flying chips while boring out brass bearings. This consists of a semicircular steel frame supporting a heavy wire mesh and resting on the lathe bed. By watching his work through the screen, the machinist is fully protected from possible injury to his eyes.

Fig. 19 shows a rubber-tired utility trailer which has been found to be very handy in Des Moines. Tools, materials, etc., can be loaded into it and hauled behind a truck or work car to any particular job, where the trailer can be detached and placed at a convenient point to the work.

Fig. 20 shows the gage used at Waterloo to insure that car wheels shall be pressed on at equal distances from the axle center. The axles are prick-punched at the center and this forms the gage mark to which wheels are subsequently pressed on, making use of the convenient gaging device pictured.

Other pictures shown and discussed at the Iowa convention which have already been published in the ELECTRIC RAILWAY JOURNAL were the following:

Adjuster for installing the springs on gear case covers, page 566, issue of Sept. 20, 1919, as developed at Des Moines.

Reclaiming worn axle bearings in Des Moines, page 565, issue of Sept. 20, 1919.

Shop carriage for fenders, Davenport, page 925, Vol. 54, No. 20, dated Nov. 15, 1919.

Wheel pressing a one-man job in Davenport, page 161, issue of Jan. 17, 1920.

Trolley wheel truing with self-centering chuck, page 374, issue of Aug. 21, 1920.

Unusual Cause for Broken Axle Bearings

AN ELECTRIC railway company with a considerable number of old-type motors on its cars decided to replace these with a modern interpole type. The cars on which this change was made were of a double-truck type and the motors which were used to replace the old type were made by a different manufacturer than were the original motors. Shortly after the re-equipped cars were put in service a considerable amount of trouble developed from worn and broken axle bearings, broken gear cases and broken armature shafts. The railway company's forces were unable to locate the cause of the trouble and so the manufacturer was called upon to determine why the motors would not satisfactorily perform the service. A careful study of the trouble encountered was made and a compilation of results showed that at least 90 per cent of the trouble was with No. 2 motor, while No. 1 motor seemed to give very satisfactory service. Both motors were mounted upon one truck of the car and the other truck was used as a trailer.

One of the cars was given a test run with the trap doors open to permit watching of the operation of the motors. It was found that in notching up the control and while going into transition from series to the parallel position the No. 2 motor gave an unusually severe kick, which apparently subjected the parts of this motor to severe mechanical strains. This condition was checked up by running the car in both directions and while operating the controller from either end of the car. The results were the same in all cases.

With this information at hand the electrical department checked up the current peaks as they occurred on each notch of the control and while changing from the series to the parallel position. It was found that the grid resistors, which were arranged for the old-type motors, required rearrangement in order to give proper stepping with the new equipment. This rearrangement was made and further tests showed that the severe kick had been eliminated. Further service with the equipment changed showed that this had been the cause of the trouble as the repeated breakage of bearings, shafts and gear cases stopped.

An investigation to determine the stresses in steel car wheels, similar to the work recently completed on chilled iron wheels, has recently been undertaken by the Bureau of Standards, Washington, and tests on six of the wheels were completed during October.

Copper, Zinc, Tin and Their Alloys

The General Use of These Metals and Their Alloys by Electric Railways Is Covered, Together with Examples Taken from Various Specifications

BY NORMAN LITCHFIELD

COPPER is, without doubt, the one material which differentiates electric industries from all others. While on the one hand it is the metal which history shows was the first to be used by man, on the other its greatest demand came with the development of the use of electricity. This is because copper holds in a marked degree the combined qualities of low resistance to the passage of an electric current, high ductility, permitting it to be drawn into wire, little or no tendency to corrode by atmospheric action and comparative inexpensiveness.

The steam railway gets along very well with a comparatively small amount of copper, its chief dependence being on iron and steel, but an electric railway without copper is unthinkable.

At the present time copper is divided commercially into two chief grades, *viz.:*

1. Lake copper, which is obtained from the Michigan mines.

2. Electrolytic copper, which is obtained by an electrolytic process from the ores found in the Western states.

A third and lower grade is that known as "Casting Copper," made or recovered largely from brass foundries.

An interesting note on this customary classification is given in the A. S. T. M. specifications for lake copper, reading as follows:

> These specifications have been drawn to cover the peculiar trade situation which has classified the large production of copper from this geographical district as a product in a class by itself. It is realized that a better classification from an academic point of view could be made by method of production or by chemical composition, but the trade does not yet seem ready for such a step.

For electric railways copper (unalloyed) is used most largely in the form of wire, and to a lesser extent as bars and castings.

HIGH CONDUCTIVITY IS IMPORTANT

The all important quality for electrical purposes is its ability to carry current, or its conductivity, and as this feature depends upon the purity of the copper, *i.e.*, its freedom from other elements, the grade of the copper is really rated by this quality, although it is customary to allow any percentage of silver, as the latter's qualities of ductility and conductivity are equally as good as those of copper. The simplest way of determining this purity is by measuring the resistivity, and this method has come into general use in recent years, as is fully explained in a note appended to the A. S. T. M. standard specifications for soft copper wire:

> Electric conductivity was formerly expressed as a percentage on the basis of determination made by Matthiessen about 1865 of the electric resistivity of supposedly pure copper. Since that time the methods of refining copper have advanced, so that it is not uncommon to find copper of more than 100 per cent conductivity on the Matthiessen basis. There has until recently not been international agreement on the electric resistivity of copper to be considered the standard for the expression of conductivity. While international agreement upon the value 0.15328 ohm per meter-gram at 20 deg. C. for the resistivity of copper equal to 100 per cent conductivity was reached by the International Electrotechnical Commission in 1913, it has been deemed preferable to express the requirements in standard specifications in the terms of quantities directly measurable, rather than by reference to some quantity whose standard value is the subject of agreement only. The use of the arbitrary term "conductivity" has no more warrant than the employment of arbitrary gage numbers. Therefore in these specifications the requirements are stated as the maximum rejection limits to the resistivity.

Lake copper is again divided into two subgrades: (1) Low Resistance Lake and, (2) High Resistance Lake.

According to the A. S. T. M. standard specifications, Low Resistance Lake wire bars are required to have a resistivity not exceeding 0.15535. Ingots and ingot bars are permitted to have resistivity not exceeding 0.15694. High Resistance Lake has a resistivity greater than 0.15694.

All the above figures are given in international ohms per meter-gram at 20 deg. C. (annealed). The purity of the Low Resistance Lake is required to be at least 99.880 per cent, silver being counted as copper. The High Resistance Lake is required also to have a purity of 99.880 per cent, but in this case silver and arsenic are both counted as copper. In both cases the purity is to be determined by the electrolytic assay. Electrolytic copper is required to have the same qualities of purity and resistivity as the Low Resistance Lake copper.

MECHANICAL PROPERTIES OF COPPER DISCUSSED

Aside from the purely electrical features already discussed, certain mechanical properties are of importance in the successful use of copper in electrical industries. Chief among these are the tensile strength and the ductility.

Copper has a tensile strength running from about 35,000 lb. per square inch in the annealed state up to over 60,000 lb. per square inch in the smaller sizes of hard-drawn copper wire. This quality is largely affected by drawing, the tensile strength running from 49,000 lb. per square inch in a wire of 0.460 in. diameter up to 67,000 lb. per square inch with diameter of 0.040 in. The elongation reduces naturally from 3.75 per cent in the first case to 0.85 per cent in the other.

The necessary selection must be made of the proper physical qualities for the particular purpose in hand. Thus ordinary insulated wire and cable must be flexible and hence require copper having a tensile strength running from 36,000 to 40,000 lb. per square inch, with an elongation in 10 in. of from 30 to 10 per cent. Other properties of this grade of wire are given in the A. S. T. M. tentative specification for tinned soft or annealed copper wire for rubber insulation, Serial No. B 33-19 T. The resistivity reduced to pounds per mile ohm at 20 deg. C. runs from 938.20 in the smaller sizes (0.003 to 0.011 in. diameter) to 896.15 in the larger sizes (0.460 to 0.290 in. diameter).

On the other hand, trolley wire necessarily demands the use of copper of considerably greater strength.

Thus, in the A. E. R. E. A. standard specification for round and grooved high conductivity trolley wire physical properties are required as follows:

Area, Circ.mil	Tensile Strength, Lb. per Sq.In. Min.	Max.	Elongation in 10 In., per Cent
211,600	49,000	53,000	3.75
168,100	50,000	54,000	3.25
133,200	51,600	56,000	2.80

The specification further requires a twisting test, "for the purpose of determining defects which may be prejudicial to the life of trolley wire, owing to its peculiar service, as compared to that of copper wire for other purposes," as follows:

Area, Circ.mil	Twists in 10 In.
211,600	8
168,100	9
133,200	10

The wire is required to be "twisted to destruction and not to reveal any seams, pits, slivers or surface imperfection not consistent with the best commercial practice."

The effect of tinning copper wire is given in the A. S. T. M. specifications: "The coating of tin on copper wire is for the purpose of protecting the copper against the action of the rubber insulation. It is therefore necessary that the coating be continuous. The test in a sodium-polysulphide solution is therefore prescribed for the purpose of determining whether or not the wire carries a continuous envelope of pure tin. Under the same conditions of tinning the coating on all sizes of wire, excepting on fine wire, is approximately the same. The coating on fine wire is generally relatively heavier than that on coarse wire.

"It has been found that the tin coating on copper wire consists of two parts, an envelope of pure tin on the outside, with an intermediate layer of copper-tin alloy. This tin alloy, as well as the amount of tin present, has an effect on the resistivity of the wire. Since the relative amount of tin coating and alloy is greater on the small wire than it is on the coarser wire, the resistivity of the wire increases as the size decreases. This also accounts for the decrease in elongation due to tinning soft wire."

The foregoing covers in a general way some of the chief uses of pure copper in the railway field. The next consideration is the use of copper in some of its alloys.

Composition of Brass and Bronze

Brass consists of copper and zinc and is probably the most widely used alloy of copper. The composition should always be borne clearly in mind in order that brass be not confounded with the other important material, bronze, which is an alloy of copper and tin. The terms are quite generally mixed up in common use, a notable instance being the use of the term "journal brass," the metal of which in reality is an alloy of copper, lead and tin. A great variety of brasses are made having varying proportions of copper and zinc, the ordinary alloys running from a minimum of about 55 per cent copper up to nearly 100 per cent.

The color of the resulting alloy varies with the amount of copper contained therein, and hence it has always been more or less customary to differentiate the variation of some sort of color nomenclature. This is more or less of an indefinite matter, but this year one of the committees of the A. S. T. M. has attempted to define a series of limits of composition for the various color designations, as follows:

Yellow brass, containing from 63 to 80 per cent copper and having a yellow or brass color. Typical composition zinc 30 per cent, copper 70 per cent.

Red brass, containing more than 80 per cent copper, the color varying from a golden to a copper red. Typical composition zinc 15 per cent, copper 85 per cent.

Yellow red brass, containing from 55 to 63 per cent copper and having a yellowish red color.

In addition to the straight brasses, which as before pointed out are alloys of copper and zinc alone, there are many varieties of special brasses in which a small amount of some other metal or metals is added in order to impart certain special qualities. These have been known by various names, such as manganese bronze, Tobin bronze, leaded brass, etc.

In the term "manganese bronze" we have another misnomer, inasmuch as it is in reality a brass, and furthermore in the finished product there is practically no manganese, a small amount of the latter only having been used as a deoxidizer and disappearing in the process of manufacture. Its composition as given in the A. S. T. M. specification is: Copper, 53 to 62 per cent; zinc, 36 to 54 per cent; aluminum, 0.05 to 0.5 per cent; lead, not over 0.15 per cent.

Its physical properties are considerably above those of ordinary brasses—tensile strength, 70,000 lb. per square inch; elongation in 2 in., 20 per cent.

Likewise "Tobin bronze" is a trade name for a brass which is said to contain about 58 per cent copper, 40 per cent zinc and the balance tin, iron and lead. "Free cutting" brass contains about 3 per cent lead, which is added to improve the machining qualities, particularly for threading. For these and other special alloys the A. S. T. M. committee has recommended: "In cases where other metals are added to the brass in small amounts these brasses be designated by the use of the proper prefix or prefixes, thus:

Lead Brass, such as lead, 1 per cent; zinc, 33 per cent; copper, 66 per cent.

Tin Brass, such as tin, 0.5 per cent; zinc, 39.5 per cent; copper, 60 per cent.

Manganese-tin-brass, such as manganese, 0.50 per cent; tin, 1 per cent; zinc, 38.50 per cent; copper, 60 per cent.

Composition of Forging Brass

To obtain a brass which can be forged and easily machined, the copper content is kept down around 60 per cent and small amounts of iron and lead are added, the A. S. T. M. specification being: Copper, 58.5 to 61.5 per cent; lead, 1.5 to 2.5 per cent; iron, not over 0.15 per cent; materials other than copper, lead and zinc, not over 0.35 per cent; zinc, remainder.

This material will stand flattening while hot, until reduced to 20 per cent of the original length, without cracking. With regard to this material an explanatory note is added: "The material exhibits a very considerable variation in properties with slight changes in composition. Its strength, stiffness and ability to stand forging operations are in inverse proportion to the copper content; so also is the amount of lead which the alloy can contain without producing hot shortness. Toughness, on the other hand, is directly proportional to the copper content."

As before stated, bronze is an alloy of copper and tin, containing more than 50 per cent of copper. The tin content runs from about 4 per cent to 25 per cent.

In this class are a great variety of alloys, a characteristic one used industrially being "gunmetal," whose composition is: Copper, 86 to 89 per cent; tin, 8 to 11 per cent; zinc, 1 to 3 per cent. Its physical properties are: Tensile strength, 30,000 lb. per square inch; elongation in 2 in., 14 per cent.

A variety largely in use for car hardware is that known as "statuary" bronze, which contains a small amount of lead and on exposure to the air takes an "oxidized" finish.

Bronze is used to a considerable extent for trolley wire chiefly on account of its resistance to wear. Standard specifications do not call for a given chemical composition, but simply require that the bronze shall be of "such nature and composition as to secure, by proper treatment, the qualities desired." Two grades are covered by the specification, one to have a conductivity of 40 per cent and the other 65 per cent, figured according to the International Annealed Copper Standard, which is 0.15328 ohm per meter-gram at 20 deg. C.

The 40 per cent conductivity wire is required to have a tensile strength of about 70,000 lb. per square inch, and the 65 per cent about 60,000 lb. per square inch. This is as compared to the plain copper trolley wire having a tensile strength of about 50,000 to 55,000 lb. per square inch.

Kinds of Bearing Metals Used

The alloys commonly used for bearings are of four kinds: Copper base with more than 50 per cent copper; tin base with more than 50 per cent tin; lead base with more than 50 per cent lead, and zinc base with more than 50 per cent zinc.

The bearings in general use for car truck journals and motors consist of a so-called "phosphor" bronze lined with "babbitt." The term "phosphor" bronze really does not describe the metal, as only a very small amount of phosphorus is added to the metal, and the purpose of it is simply to act as a cleanser during the process of manufacture, there being practically none left in the alloy when completed.

The American Railroad Association (M. C. B.) has a standard specification for bronze for journal bearings, which permits two alternative compositions, as follows:

	A per Cent	B per Cent
Lead	24.0 to 30.0	8.0 to 16.0
Tin, not less than	4.0	7.0
Copper, not less than	65.0	Not over 82.0
Zinc and other impurities, not more than	3.0	3.0

The A. S. T. M. has prepared a tentative specification for car bearings, serial No. B 17 - 18 T, which provides as follows: Lead, 17.0 to 22.0 per cent; tin, 4.0 to 6.0 per cent; zinc, maximum 2.5 per cent; iron, maximum 0.40 per cent; antimony, 0.50 per cent; copper, remainder. Total impurities, including zinc, maximum 3.0 per cent.

The A. R. A. (M. C. B.) committee on specifications and tests for materials presented at the convention in June of this year a report calling for a revision of the standard A. R. A. (M. C. B.) specification, so that it will be as follows:

	A per Cent	B per Cent
Lead	16 to 24	24 to 30
Tin	5 to 7	4 (minimum)
Total of other impurities, maximum	4	3
Copper	67 to 77	63 to 72

"The owner of the equipment on which the bearings are to be used shall specify which class of metal is desired. If he does not do so, metal of Class A shall be furnished."

It is to be understood that the foregoing is not yet a standard of the A. R. A., but is simply the recommendation of the committee. It is possible also that some action may be taken to bring the specifications of the A. R. A. and the A. S. T. M. into agreement.

The present A. R. A. (M. C. B.) standard specification for lining metal is as follows:

	Up to ½ In. Thick	½ In. Thick and Over
Lead	94.0 to 96.0 per cent	Not over 88.0 per cent
Antimony and tin	3.0 to 5.0 per cent	Not over 17.0 per cent
Tin	0.50 to 1.5 per cent	.....
Other impurities, not over	0.5 per cent	0.75 per cent

The A. S. T. M. tentative specification for lining metal, Serial No. B 17 - 18 T, calls for copper, 0.50 per cent maximum; tin, 4.5 to 5.5 per cent; zinc, none; antimony, 9.25 to 10.75 per cent; arsenic, 0.20 per cent maximum; lead, remainder. Total impurities, maximum 0.75 per cent.

The A. R. A. committee report this year recommends the following for lining metal:

	C per Cent	D per Cent
Tin	3 to 5	0.5 to 1.5
Antimony	8 to 10	.....
Antimony plus tin	12 to 14	3 to 5
Arsenic, maximum	0.2	.....
Total of other impurities, maximum	0.5	0.5
Lead	85 to 88	94 to 96

"Metal of Class C is for linings of a nominal thickness over ⅛ in., metal of Class D is for linings of ⅛ in. or less in nominal thickness. Either composition of the back may be used with the composition of lining metal specified for the thickness of lining which is ordered."

A. E. R. A. Has No Standard Specifications

In passing it may be noted that the American Electric Railway Association has never adopted any standard specification for either bronze or lining, although A. R. A. specifications are used by many of the electric railways for journal bearings. Another generally used specification for journal bearings is the following:

Bronze.—Copper, 77 per cent; lead, 15 per cent; tin, 8 per cent; phosphorus, 0.2 per cent.

Lining.—Lead, 85 per cent; antimony, 10 per cent; tin, 5 per cent.

For armature and motor bearings a high class "phosphor" bronze is quite generally used by electric railway companies in this country having the following composition:

Copper, 84.00 per cent; lead, 0.50 per cent; tin, 12.00 per cent; zinc, 3.50 per cent.

Lining metal.—Tin, 83⅓ per cent; antimony 8⅓ per cent; copper, 8⅓ per cent.

Attention is called to the fact that the lining material above quoted has a tin base, which makes it expensive, but this composition is particularly desirable for armature bearings on account of the high speed of the shaft and difficulties of lubrication. This is a true "babbitt" metal, the term applying strictly only to tin base bearing metals having over 50 per cent tin in their composition. The journal linings are therefore not strictly "babbitt," but should rather be termed "lead lining metal."

To sum up, we may make use of the following tabular form for the alloys in common use:

1. *Pure Copper:*
   - Lake
     - Low resistance
     - High resistance
   - Electrolytic
   - Casting
   - (a) Wire:
     - Cable (annealed).
     - Trolley wire (hard drawn).
   - (b) Bars for buses, etc.
   - (c) Castings for terminals, controller fingers, etc.
2. *Brass.*—Compound of copper and zinc (over 50 per cent copper):
   - (a) Yellow brass, typical composition, copper 70 per cent, zinc 30 per cent.
   - (b) Red brass, typical composition, copper 85 per cent, zinc 15 per cent.
   - (c) Yellow red brass, typical composition, copper 60 per cent, zinc 40 per cent.
   - (d) Special brasses, such as "Manganese Bronze," "Tobin Bronze," "Leaded Brass," "Forging Brass," etc.
3. *Bronze.*—Composed of copper and tin (over 50 per cent copper). Typical composition, copper, 90 per cent; tin, 10 per cent.
4. *Bearing Metals:*
   - (a) Copper base (over 50 per cent copper, such as journal brasses), copper, 65 per cent; lead, 30 per cent; tin, 5 per cent.
   - (b) Tin base (over 50 per cent tin, such as lining for armature brasses), tin, 83⅓ per cent; antimony, 8⅓ per cent; copper, 8⅓ per cent.
   - (c) Lead base (over 50 per cent lead, such as lining for journal bearings), lead, 85 per cent; antimony, 10.4 per cent; tin, 5 per cent.
   - (d) Zinc base (over 50 per cent zinc). Not in general use.

It has been impossible in the limits of an article such as this to give other than an outline indicating the general nature and use of these metals and their alloys. And it must be remembered that any specification does no more than the recipe book of the housewife, providing simply the basis on which a good cook can produce a good loaf of bread. And so in the handling of these copper alloys a great degree of experience is necessary in their manufacture, as it has long been recognized that brass founding is one of the most difficult of arts. The figures given herein are therefore merely illustrative and are used simply to give a slight indication of the nature and the use of these materials on electric railways.

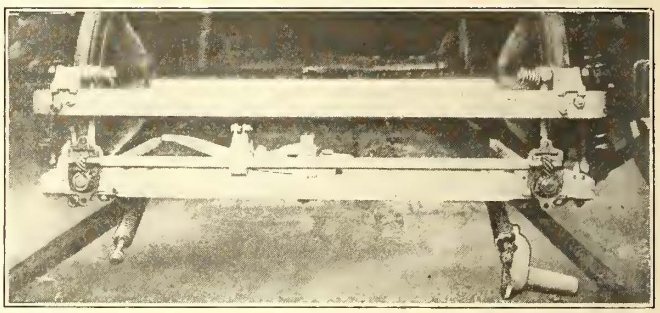
Fire and accident hazard have been almost wholly eliminated by the use of gas for removing and setting locomotive tires in the shops of the Colorado & Southern Railroad. Also less space, time and fuel are required by the use of gas burners which fit around the circumference of the tire, which is chained into position and all ready to be set when the expansion is sufficient. Formerly it was necessary to heat the tires over wood or forge fires and then handle them while hot. Later, liquid fuel burners were devised to heat the tires while in place, but the heat control was difficult, and the danger of fire and accident was very serious.

New Type Brake Adjuster

A DEVICE for the convenient adjustment of the brakes on surface cars has been designed by S. Thomas, engineer of the Peckham Truck & Engineering Company of London. It consists of a geared arrangement which can be fitted to any type of truck, and the adjustment of the brake rigging is accomplished by turning a ratchet pawl.

The advantages claimed for this device are:

That it adjusts all brake shoes evenly and simultaneously, so that all the brake shoes have proper



HAND ADJUSTER FOR BRAKE RIGGING

clearance from the wheels, thereby insuring perfect braking of the car.

That it is so constructed that it is impossible to adjust one pair of brake shoes without adjusting others.

That it is impossible to adjust the brakes so that the shoes will be too tight against the wheels.

That the adjusting mechanism is entirely encased in a dust tight grease box and is always free from dirt.

That once adjusted it is not necessary to readjust the brake rigging every time that old brake shoes are replaced with new ones, as the nuts on the brake rods are slackened off evenly.

To renew worn out brake shoes, the pawl of the ratchet lever on the adjuster shaft is released and the adjuster shaft is then turned with a spanner wrench. This will slacken the brake shoes from the wheels evenly and the old shoes can then be replaced with new ones. The ratchet pawl can then be allowed to fall into position again.

Charring Does Not Preserve Wood

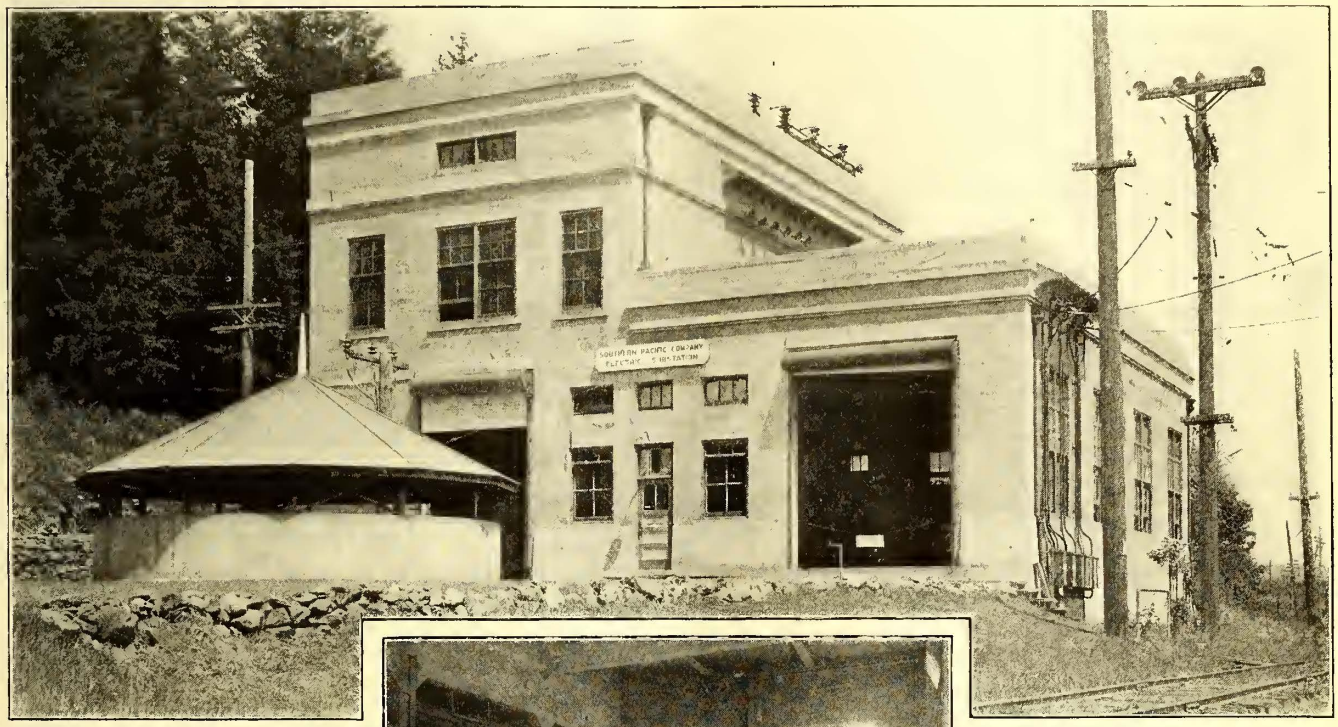
CHARRING is of little value in protecting the butts of fence posts and telephone poles from decay. This is shown by service tests made by the United States Forest Products Laboratory on fences of charred and untreated posts of various species. The charred posts proved in these tests to be even less durable than the untreated ones.

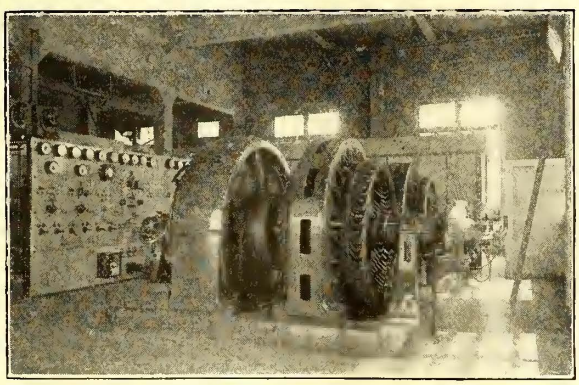
Theoretically, an area of charred wood around a post should prevent decay, because charcoal does not decay or encourage the growth of fungi. But the charred area around a post is not usually a solid covering. It is checked through in many places. If posts are seasoned before they are charred the charring does not reach to the bottom of the season checks which are always present. If green unchecked posts are charred checks will open through the charred part as the wood seasons. In either case the uncharred center of the post is exposed to fungus infection and will decay as rapidly as any untreated wood. Charring deep enough to resist decay would undoubtedly weaken a post of ordinary size.

Substation Layout of Southern Pacific Company in Oregon

Power for 1917 Extension of Interurban Lines Furnished from Substation with Outdoor High-Tension Construction—Two-Unit Rotary Converter Sets Installed

BY PAUL LEBENBAUM
Electrical Engineer Portland Division Southern Pacific Company





EXTERIOR AND INTERIOR VIEWS OF OSWEGO SUBSTATION

The upper view shows the 1,000-kw. substation at Oswego, with indoor switching equipment. The lower view shows the 500-kw. synchronous motor-generator sets in this substation.

THE Southern Pacific Company is now operating approximately 146 miles of 1,600-volt electric interurban lines in the territory adjacent to Portland, Ore., the exact location of which is shown in the accompanying map. That portion of the lines between Portland and Whiteson, a total of 103 miles, was placed in operation in January, 1914. Articles descriptive of this appeared in the issues of the ELECTRIC RAILWAY JOURNAL for Feb. 14, 1914, page 359; July 10, 1915, page 57, and Sept. 10, 1915, page 562.

In June, 1917, an extension to the foregoing electrification was placed in service, comprising 43 route-miles of track between Whiteson and Corvallis. A brief résumé of the main features of the earlier construction may not be out of place at this time. The contact system and, of course, the rolling-stock are common to both sections. The differences, appearing principally in the substations, are illustrative of the advance in the art of designing railway conversion apparatus during the time intervening between the purchase of the first sets in 1911 and the newer sets in 1916.

The contact system is of the standard catenary suspension type, with a No. 0000 grooved copper trolley wire supported every 15 ft. from a $\frac{7}{16}$-in. galvanized steel strand messenger cable of 15,000 lb. breaking strength. The standard span is 150 ft., and cedar poles, brush-treated with carbolineum, were used. As a result of favorable experience with the preservative treatment it was decided to give all poles used in the extension from Whiteson to Corvallis an open-tank treatment with creosote. Steam, obtained from an existing boiler plant, was fed through coils laid on the bottom of the treating tanks. The poles were set in the cold oil and the temperature was raised until it registered between 215 deg. and 220 deg. F. The length of time at which the oil was maintained at this temperature varied from fifteen minutes for a run of well-seasoned poles to two hours or more for the greener poles. A satisfactory penetration was obtained, ranging from $\frac{1}{2}$ in. to 1 in.

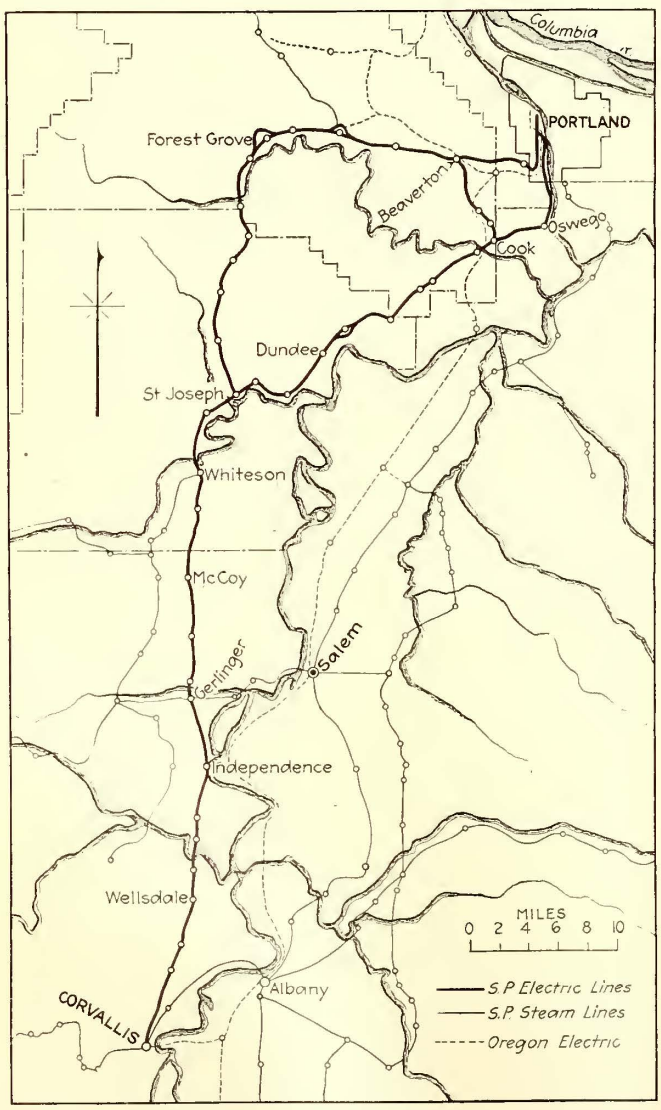
In the operation of the road, trains are made up with from two to six cars, both motors and trailers, in the ratio of one trailer to every two motor cars. All cars are steel, the motors weighing 51 tons and

the trailers 35. The motor equipment consists of four GE-205B 110-hp. motors, with Sprague-General Electric type M multiple-unit control. There are in use thirty-eight motor cars and eleven trail cars, and there have been ordered for delivery in 1921 six additional motor cars and six trail cars. This will bring the total number of cars, including eight cars for mail, baggage and express, up to sixty-one. All freight trains are operated by steam locomotives.

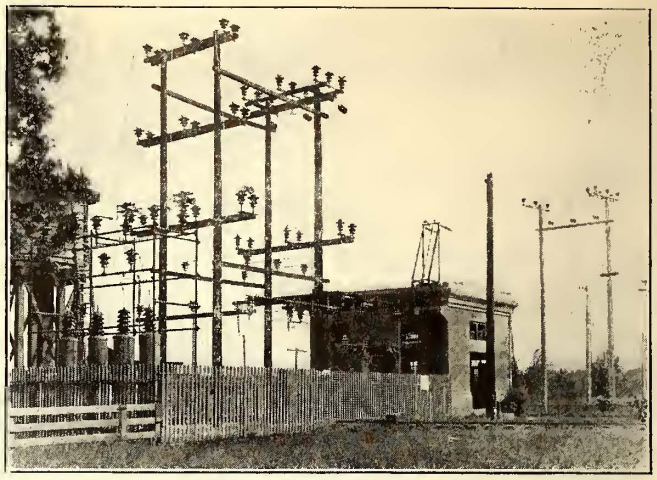
EARLY 1,600-VOLT GENERATORS SUCCESSFUL

For the lines between Portland and Whiteson direct current at 1,600 volts is supplied to the contact system through substations at Oswego, Forest Grove and Dundee. Each of these substations contains two 500-kw. motor-generator sets, each consisting of a 560-kw., 13,000-volt, 60-cycle, three-phase, 720-r.p.m. synchronous motor direct-connected to a 1,600-volt generator. Energy for these substations is taken from the lines of the Portland Railway, Light & Power Company at 55,000 volts. At Oswego this is stepped down to 13,200 volts through two 1,000-kw., three-phase transformers for transmission to Forest Grove and Dundee.

The direct-current generators, ordered in 1911, were about the first machines to be built with 1,600 volts on one commutator. They are equipped with commutating poles, but have no compensating pole-face windings or flash-barriers. Everything considered, they are operating in a satisfactory manner; flashovers occur occasionally, but they are seldom of a serious nature. During the winter, when the heating load is added to the regular traction load, the two sets at Oswego often carry a maximum half-hour average load of 1,200 to 1,400 kw.



MAP OF SOUTHERN PACIFIC COMPANY'S ELECTRIFIED LINES IN OREGON



WELLSDALE STATION, SHOWING OUTDOOR HIGH-TENSION APPARATUS

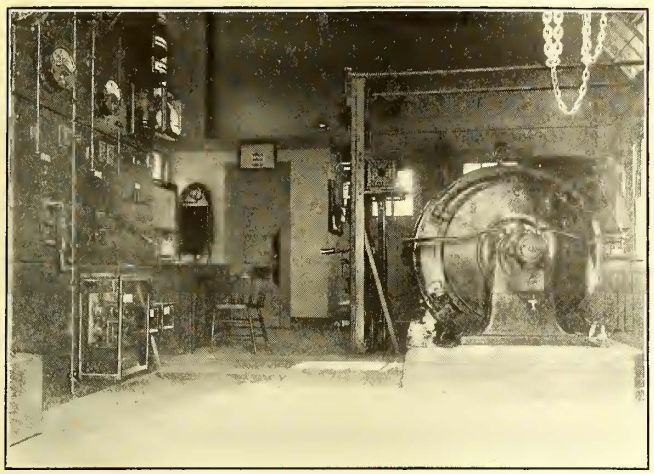
NEW SUBSTATIONS ARE OF ROTARY CONVERTER TYPE

The substations on the extension between Whiteson and Corvallis are located at McCoy and Wellsdale. They are supplied with energy at 55,000 volts, delivered at Salem by the Portland Railway, Light & Power Company to the transmission line of the railroad. From Salem to Gerlinger this line is on the company's right-of-way; at Gerlinger it branches north to McCoy and south to Wellsdale. Open-air, pole-top sectionalizing switches are located in each branch at Gerlinger.

Sixty-cycle rotary converters are used to deliver current to the contact system. Each station contains a 1,000-kw. set, consisting of two 500-kw. units mounted on a common base with three bearings. The alternating-current ends of these units operate in parallel from the doubly-wound secondaries of the three-phase step-down transformer. The direct-current ends are connected in series to give 1,600 volts. The rotaries run at a speed of 1,200 r.p.m. The over-all dimensions are 4 ft. 5½ in. x 5 ft. 7¾ in., with a height of 4 ft. 10¼ in. The total weight of the set is 22,250 lb.

All high-voltage alternating-current apparatus is situated outside the building. This permits a very compact arrangement of the apparatus inside of the building, with the result that the inside dimensions of the building are only 19 ft. x 22 ft. The transmission line ends at a pole-top, fused switch, operated by a lever from inside the station. Choke coils and a four-tank electrolytic arrester afford protection against lightning and other line disturbances. The step-down transformer is star-connected on the primary side with a doubly-wound secondary of 480 volts. Each secondary winding is tapped at the center to obtain starting voltage for the converters. This makes a total of eighteen secondary leads.

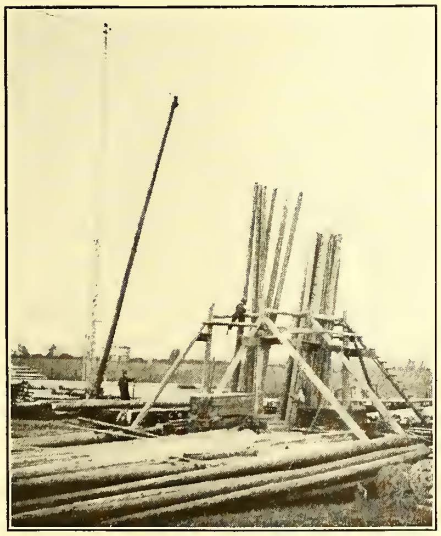
The rotaries are six-phase, diametrically connected through suitably interlocked starting and running oil



INTERIOR OF WELLSDALE SUBSTATION, CONTAINING ONE 1,000-KW. TWO-UNIT ROTARY-CONVERTER SET

switches to the secondary leads. The oil circuit breakers are manually operated and provided with low-voltage release coils. In starting, the "low" machine is first put on the line at starting voltage, direct-current polarity is fixed in the usual manner, and then the machine is thrown on full voltage. The same operations are performed in starting the "high" machine. The negative circuit breaker and switch are closed, then the positive breaker, and finally the closing of the positive switch, which is interlocked with the breaker, places the machine on the line.

The set is guaranteed to carry 300 per cent load momentarily. On a test load of 2,500 kw. the direct-current breakers were opened without any sign of sparking at the commutators. The only protection against flashing is the feeder resistance of 0.12 ohm between the machine and the first tap to the contact wire. Flashing occurs at infrequent intervals and is caused mainly by line or equipment trouble. The machines were originally equipped with soft graphite brushes, which threw a great deal of dust around the station when the commutators flashed over. More recently a harder type of carbon brush was substituted. It gives apparently the same highly polished commutating surface as the graphite brush, but has the advantage of not disintegrating on flashover to the same extent as the other brush. There have been no flashovers between collector rings.



POLE-TREATING PLANT, ST. JOSEPH, ORE.

The transformers are water-cooled. Water is supplied from a well at each station and raised to the water tank by means of a motor-driven triplex pump. From the tank the water flows by gravity through the transformers back to the well.

A motor-driven air-compressor is provided for blowing out the machines.

On the switchboard, besides the usual ammeters and voltmeters, there is a graphic recording wattmeter, measuring the incoming power, and a wattmeter indicating the wattless component of the incoming energy.

The substations, completely equipped and ready for operation, cost approximately $25 per kilowatt.

Creeping of Rails

Dr. J. A. L. Waddell Inaugurates Investigation by Means of Questionnaire — Subject Should Receive Attention of Engineers of Way

IN A PAPER presented before the American Society of Civil Engineers in New York City on Nov. 3, 1920, Dr. J. A. L. Waddell gave the results of a canvass which he had made, on behalf of a client, to determine the facts regarding rail creepage. He used the following questions in his investigation, and they are reprinted here for the convenience of way engineers of electric railways who may desire to contribute the results of their experience.

1. What troubles, in your experience, are engendered by the creeping of rails?
2. Is rail creeping proportional to the amount of traffic passing over a track?
3. With the traffic in one direction only, is the creeping greater on down grade or up grade, and to what extent?
4. On a single-track line, is the creeping greater in the direction of the heavy traffic, and, if so, to what extent?
5. On what portions of your line do you find the greatest creeping of rails—on tangents or on curves?
6. Does the degree of curvature affect the amount of creeping?
7. Does one rail in a track ever creep more than the other? Under what conditions?
8. For the same train loads, is the creeping greater on light rails or on heavy ones, and, if so, to what extent?
9. Does the amount of creeping vary with the nature of the roadbed, and with the kind and depth of the ballast, and, if so, to what extent?
10. Does the amount of creeping vary with the temperature and weather conditions?
11. Does the amount of creeping vary with the character and efficiency of the rail splicing, and, if so, to what extent?
12. Does the amount of creeping depend on the use or the non-use of rail-chairs or of tie-plates, and, if so, to what extent?
13. Have you found any satisfactory method of checking or of lessening creeping, and, if so, what is it?
14. Have you evolved any theory as to the causes of rail creeping, and, if so, what is it?
15. Have you had any computations made as to the resultant force causing creeping under specific conditions?
16. Is there any information on the subject that you can furnish, not covered by the preceding questions, and, if so, what?

The National Research Council has established a Research Information Service as a general clearing house and information bureau for scientific and industrial research. This "Service" on request supplies information concerning research problems, progress, laboratories, equipment, methods, publications, personnel, funds, etc. Ordinarily inquiries are answered without charge. When this is impossible because of unusual difficulty in securing information the inquirer is notified and supplied with an estimate of cost. Requests for information should be addressed, Research Information Service, National Research Council, 1701 Massachusetts Avenue, Washington, D. C.

Lubrication of Electric Railway Equipment

Facts and Figures to Demonstrate the Relation of Correct Lubrication to the Problem of Keeping Operating Expense Down to a Minimum

THE September issue of *Lubrication* contains an article on the relation of lubrication to operating expense. Some parts of this are given in the following paragraphs:

Two very important factors of operating expense are affected by lubrication, the initial cost of lubricants and the cost of car maintenance. The relation of these two factors to the total operating expense is shown by the consolidated figures of five typical electric railways operating in one of the Eastern states. The following figures were taken from their annual reports for 1918 to the State Public Utilities Commissioners:

	Total	Per 1,000 Car-Miles	Per Cent of Total
Total operating expense	$12,659,000	$237.40	.....
Maintenance of equipment	1,357,000	25.71	10.82
(a) Cars	599,000	11.28	4.72
(b) Electrical	419,000	7.89	3.31
Cost of lubricants	13,296	.25	.10
Total car-miles	53,184,000	.....	.....

From these figures it is very clear that the actual cost of lubricants is the insignificant amount of one-tenth of 1 per cent of the total operating cost and only 2.21 per cent of the cost of maintaining the cars. These costs prevailed in 1918, and although the cost for 1920 will be much higher the ratio between the various items will not be far different.

An essential requirement in reducing maintenance cost as affected by lubrication is the regular inspection of cars. The inspection periods will vary with different properties operating under different conditions and with varied equipment and should be worked out in accordance with conditions. These inspections are usually divided into three classes, daily, light and heavy.

The daily inspections cover all the safety devices and the repair of broken parts reported by the crew. In addition, some types of motors require daily oiling and in some instances other parts of the equipment as well. Such daily oiling periods should be eliminated whenever possible through co-operation with equipment manufacturers in the way of design in which efficient lubrication should be given proper consideration.

The light inspections, at intervals of eight to ten days, include a thorough inspection of all mechanical and electrical equipment that may become worn or damaged under normal operating conditions. Modern types of motors having oil and waste lubrication are oiled at this time and the amount applied should be given careful consideration, as the excessive application of oils does not improve lubrication and can have but one effect, which is absolute waste.

The heavy inspections covering complete overhaulings are determined by the normal life of the equipment and must be regulated in accordance with the various elements surrounding the particular operation, the mileage made by the equipment and many other factors which demand close attention and good judgment by those responsible for the general upkeep of the equipment.

At the time of any of these inspections if it is shown that any of the bearings are worn beyond the safe limit allowed they should be removed promptly, as many damaged armatures have been caused by careless inspections and the attempted use of bearings which should have been removed. The best of lubricants and the most efficient method of applying them will not lubricate a bearing that has become worn to a point where it is no longer in proper alignment. In the replacement of bearings care should be exercised to see that the new bearings have been properly babbitted, finished and lined up.

The efficiency of lubrication depends to a considerable degree upon the suitability of the bearing metal used in connection with the work imposed upon both the bearing and the lubricant. Certain kinds of babbitt may give excellent results under a given set of operating conditions, while under other conditions they may be wholly unsatisfactory. As he is not in the bearing-metal business, it does not behoove the oil man to attempt to say what kind of metal should be used, although the lubricating engineer should make a study of and be qualified to advise with master mechanics as to the proper metal, the method of heating and pouring babbitt, the heating of bearing shells and all other details connected with this important factor. After suitable bearings have been provided care should be given to the correct method of cutting oil grooves, as well as to see that all bearings are properly lined up.

Some Essentials in Packing of Boxes

Journal boxes should be carefully cleaned of all old waste and other foreign matter before packing with clean waste. The method of packing depends a great deal upon the design of the waste cellar and the position in which the waste must rest against the journal. Journal boxes should be packed by placing a roll of saturated waste in the mouth of the box and then shoving it evenly under the journal to the extreme back of the box. This first roll should be packed in very tightly against the sand collar to assist in keeping out sand and other foreign matter. Other rolls are packed in similarly until the box is full to the end of the shaft. The waste should not extend in front of the journal nor above the center line of the journal on each side.

In the packing of armature and axle boxes where waste rests on top of the shaft the waste around the sides of the box should be packed down very tightly to hold the waste in the box securely for the purpose of keeping the oil from flowing down the sides of the box when added to the waste, and all loose ends of the waste should be gathered up and packed in tightly to prevent any leaking of the oil from the box.

Axle and armature bearings of the side window type should be packed in such a way that the waste keeps its position against the shaft, to permit of the capillary action of the oil. On certain types of such bearings it is necessary to use a wedge to hold the waste in place.

The waste used in packing all bearings should be of a high-grade quality and resilient, so that it will not pack down in a soggy mass at the bottom of the box when

oil is added. It too often occurs that the initial price of the waste is the first consideration without any thought being given to its life, the frequency of renewal and the ability of the waste to carry the oil to the bearings in the proper quantity.

Saturation of Waste Important

The initial saturation of waste should be given careful consideration and can be best accomplished in a tank containing a sufficient amount of oil completely to submerge the waste which has been thoroughly pulled apart. The oil should be kept at a temperature of not less than 70 deg. F. and the waste allowed to stand for forty-eight hours, after which it should be placed upon a coarse-mesh screen and allowed to drain for twenty-four hours before being put in use.

In addition to efficient waste saturating tanks the well-equipped oil house should have steel tanks with measuring devices for holding car oils, compressor oil and signal oil, as well as a waste-washing machine. While it may seem expensive to install this equipment it pays for itself in a short time through the improved condition of lubrication, the elimination of foreign matter in the waste as applied to the bearings and the elimination of considerable waste of oils, the latter occurring to a large degree through leaky barrels and the accessibility to the supply by those who are not interested in economies. When wood barrels are emptied into steel containers they can be returned promptly to the oil seller, who will pay the market price for them, thus offering another opportunity to make a saving in the initial cost of lubricants.

Human Element Should Be Considered

After officials of street railway companies have done all that can be accomplished in the way of providing suitable equipment and methods for handling lubricants there is still the human element to be considered, viz., the type of man who actually handles the lubricants and applies them to the equipment. In power houses considerable money is spent in providing automatic lubricating devices and elaborate means are furnished to insure efficient lubrication. Conditions in power houses are not nearly so severe as those imposed upon rolling stock, and the latter naturally requires closer attention to bring about the desired results, consequently it is not economical to use the cheapest possible men for this work, as so much depends upon the thoroughness with which the work is carried out. To so great an extent can car maintenance cost be reduced by proper attention to lubrication that intelligent, trained men should always be employed for this work. Trained men are necessary to care for the mechanical equipment and to keep it in good condition. Why should not the man who is responsible for the application of the lubricants, the principal factor affecting the condition of the equipment, be as thoroughly trained in his part of the work?

With the equipment in good condition and with trained men to apply the lubricants we must now decide what lubricants should be used. The rolling stock of all electric railways is subjected to very severe service, entailed by rough tracks, dusty and sandy roadbeds, mud and water, snow and ice. The vibration of the car and the other elements mentioned all tend to make efficient lubrication somewhat difficult. The varying conditions of operation and equipment require different kinds of lubricants, but in every instance the higher quality lubricants will last longest and give the most efficient results.

Too little attention has been given to the reclamation of oils. All oils retain their lubricating value until they have decomposed, and as the decomposition of straight mineral oils, which can be and should be used quite exclusively for electric railway lubrication, is of such an indeterminable period proper filtering facilities should be installed for the purpose of reclaiming oils from discarded waste, from compressors and all other places where it is possible to gather dirty oil, which, at the present time, is quite generally thrown away. This oil, if properly filtered, will afford just as efficient lubrication as it did in its initial state. Users of mechanism in all other classes of business are giving close attention to the reclamation of dirty oils, by which enormous savings are shown. This factor should be given the careful attention it deserves by electric railway companies.

Gear and Pinion Lubrication

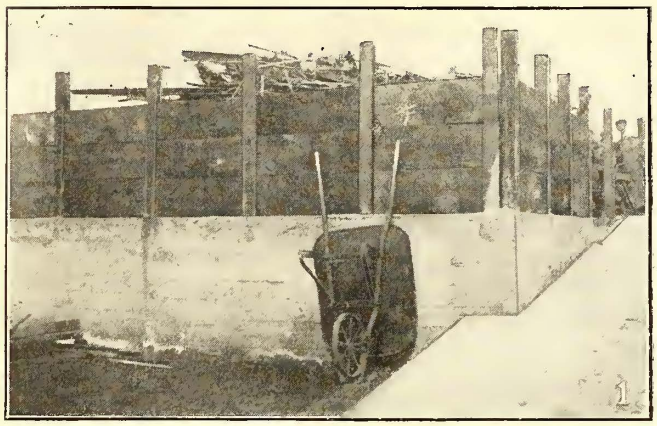
One of the most important problems and one which has received the least actual practical consideration in the way of developing a suitable lubricant is that of the gear and pinion lubrication. Gears and pinions when properly installed should be provided with an oil-tight gear case which will provide means for the bath system of lubrication, if so desired, as well as preventing grit, dirt, water and other foreign matter from coming in contact with the gear and pinion teeth. A suitable lubricant should be semi-fluid, heavy enough in body to reduce wear to a minimum, sufficiently adhesive to be carried up to the gear teeth by the pinion and to remain on the teeth at the highest speed of operation. It should not be so thin in hot weather that it will leak out of any possible crevices in the gear case onto the streets, nor so heavy in low temperature that it consumes an excessive amount of power. To meet these extremes of temperature summer and winter grades are necessary.

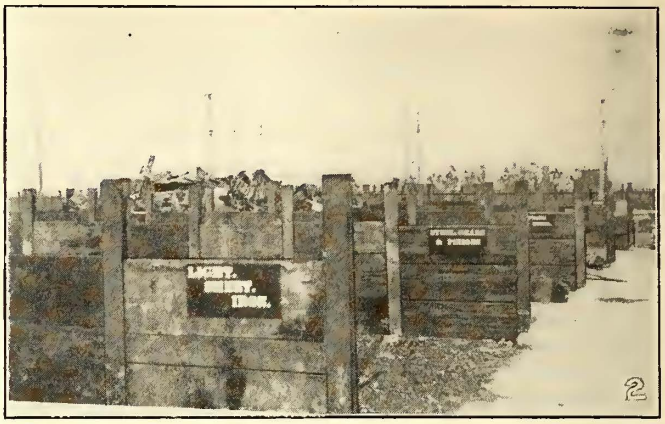
When gear cases are properly installed enough gear lubricant should be placed in the gear case to cover the lowest teeth on the pinion and any larger quantity is unnecessary. When gear cases are worn or loose fitting the lubricant must be heavier and no bath carried. The lubricant should be applied to the teeth direct at the point of mesh between pinion and gear, and by moving the car a short distance the lubricant will be spread over all the teeth uniformly. If it has the necessary adhesive qualities it will lubricate for a long time. The difficulty of securing gear cases that will stay tight is a serious one and the manufacturers of such equipment have a great field for investigation and improvement.

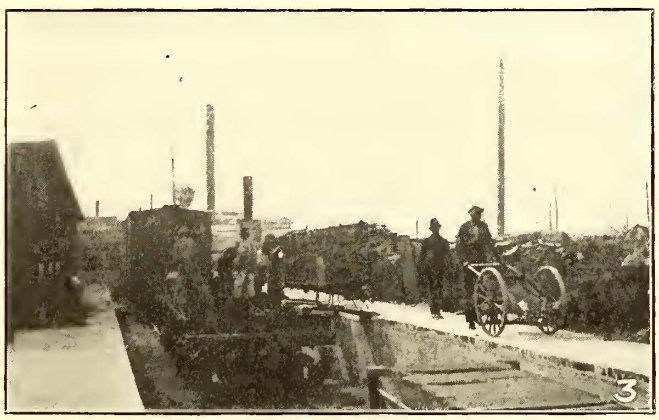
Air Compressor Lubrication

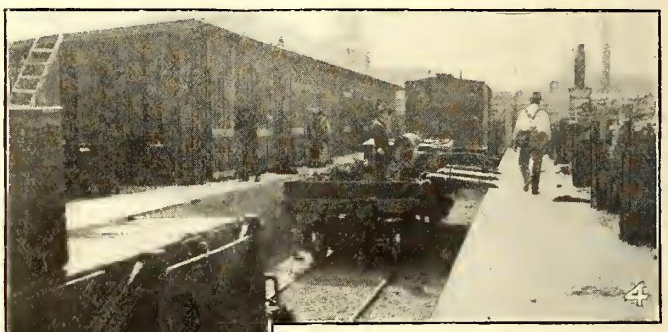
The air compressors should be lubricated with an oil of proper viscosity to maintain a film on all the bearing and cylinder surfaces and to assist the piston rings in forming a seal to prevent the leakage of air. Compressors lubricated by the splash feed system run in a bath of oil, so that any excessive oil getting past the piston rings should vaporize quickly and be carried out of the cylinder with the air. If it remains in the cylinder too long the heat will carbonize it and the valves will clog. This excess oil vapor is carried into the main reservoir, where it condenses and may be drained out with the water.

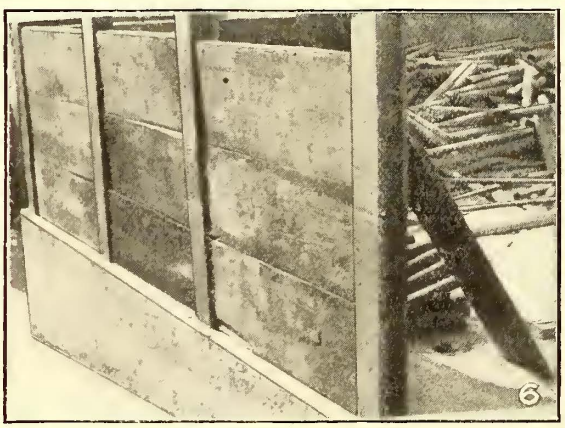
Scrap Material Is Salvaged and Efficiently Handled by Means of These Bins by the Pacific Electric Railway

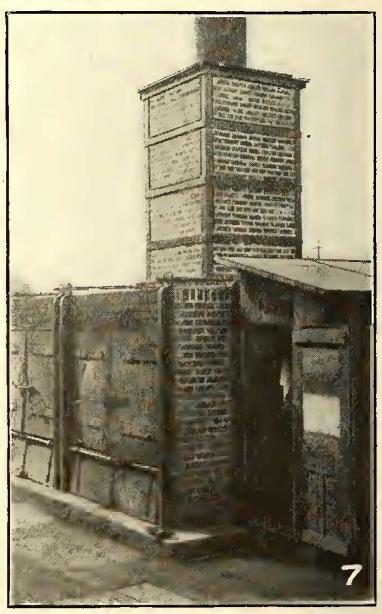


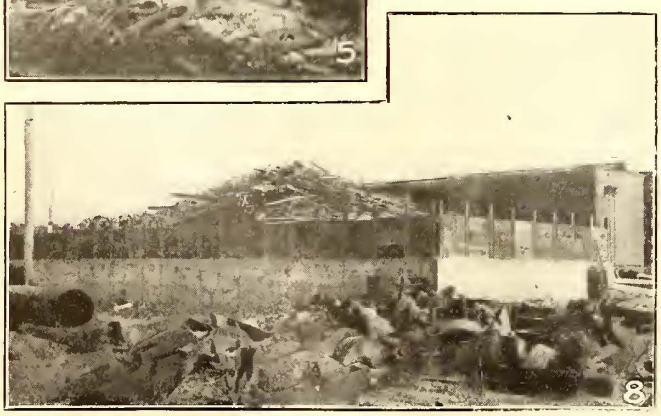


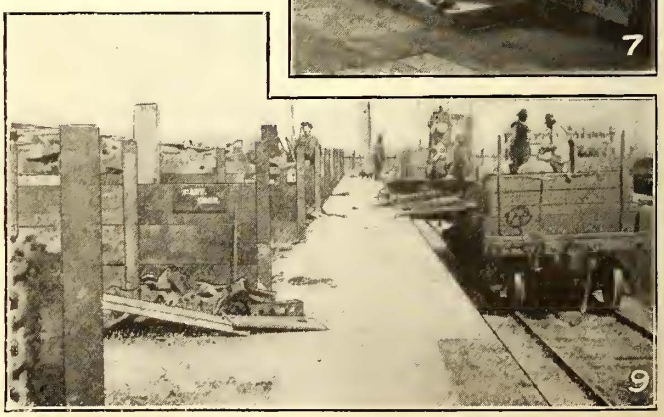












1. End view of scrap docks and ramp approach to dock platform.
2. Bin arrangement and signs designating class of scrap stored.
3. Switching track between platforms with shop forces handling scrap from cars to bins.
4. Runway in front of bins.
5. Scrap bin for brakeshoes.
6. Scrap bins for iron pipe.
7. Incinerator for burning rubbish and insulation from wire and cable.
8. Rear of scrap docks.
9. Arrangement of scrap bins and runway for handling material.

Salvaging Scrap Material

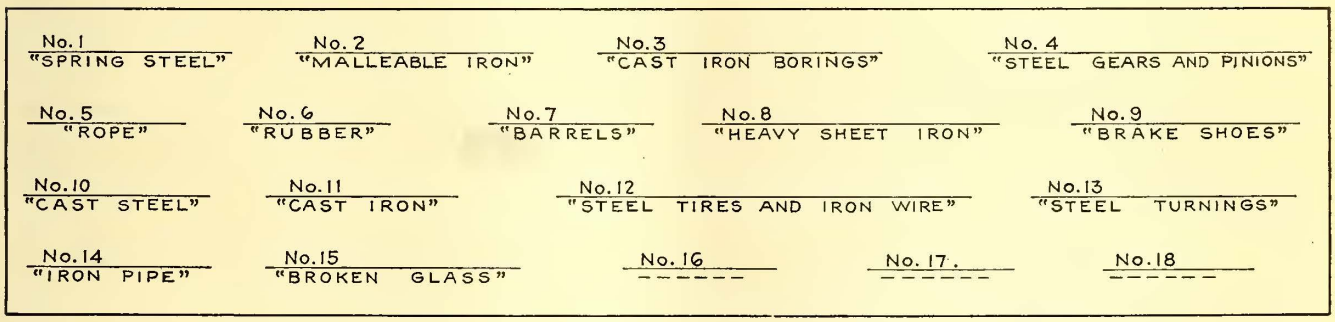
Scrap Docks and Storage Bins Constructed by Pacific Electric Railway for Efficient Handling and Salvaging of Scrap Material

BY CLIFFORD A. ELLIOTT
Cost Engineer Pacific Electric Railway, Los Angeles, Cal.

THE Pacific Electric Railway has constructed at its new Torrence Shops two docking platforms with eighteen scrap bins to facilitate the handling of salvagable material. Each docking platform is 165 ft. long and 30 ft. wide and has a height from the top of the rail to the platform level of 4 ft. There is a switching track between the two docks so that cars can be loaded and unloaded as desired.

The platforms are of solid concrete construction and have concrete ramps at the ends for handling scrap material to and from the docks with trucks or wheelbarrows.

A somewhat novel method was followed in constructing the several scrap bins on the two platforms, 60 lb. scrap T-rail being utilized. This was placed vertically in the concrete for a depth of 3 ft. and extended 4 ft. above the surface of the platform. The use of this T-rail provided a convenient arrangement for holding the wooden planking that serves as the sides of the bins and for the various partitions. Three-inch planks, each 3 ft. in length by 1 ft. in width, were inserted between the ball and base of the rail. The height of the rails above the platform permits the inserting of four planks, but at present only three are used. This arrangement permits increasing the storage space in any bin by removing sections as desired and also provides an easy method of access to the bins. The bins are of nearly uniform size, approximately 25 ft. in depth. Six of them are 10 ft. wide, three 11 ft. wide, one 12 ft. wide and eight 15 ft. wide. There is a 5-ft. runway in front of the bins for the full length of both platforms.



ARRANGEMENT, NUMBERING AND CLASSIFICATION OF MATERIAL STORED IN BINS

EACH CLASS OF SCRAP CONFINED TO A PARTICULAR BIN

The outside scrap bins are so arranged as to confine each class of scrap to its particular bin. Each bin is numbered and the class and description of the scrap to be stored are designated on a wooden sign with black background and prominent white letters. This sign is displayed at the bin entrance. An accompanying diagram shows the numbering of the various bins and the material that is stored.

By the location of the docking platforms on a level with the car floors and by use of the concrete runways the sorting of various materials is easily taken care of. All scrap from outside points is transported directly from the carhouse or shop to the scrap docks on cars. These are brought in often enough to keep all outside points well cleaned. The sorting of the various materials is done after arrival at the scrap dock. All heavy scrap material is sorted at the outside bin and is then distributed to other bins. The sorting of finer metals and wire which requires additional work in salvaging is confined to an inside salvage warehouse or workshop. This latter class of salvage work requires more skill and attention.

The unloading of heavy scrap is handled by the store department's electrically operated crane, which is mounted on a flat car. This crane is now being equipped with magnets to simplify and reduce the cost of handling cumbersome and extra heavy classes of scrap.

A frame structure 105 ft. long by 25 ft. wide, located at the end of one of the platforms, is utilized as a workshop for the salvage or reclamation foreman and his assistants. There is a separate room in this building for the storage of scrap copper and other valuable metals. At the rear end of the scrap shop an incinerator has been built. This serves for burning rubbish and for removing the insulation from scrap wire and cable. The reclaiming of solder from wire joints, etc., has saved in one month nearly 750 lb. of this material.

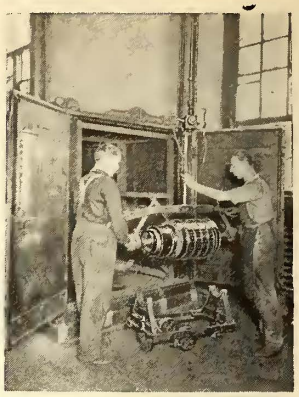
The scrap docks as now operated handle from 80 to 100 tons of scrap each month and during some months as high as 300 tons of material has been salvaged. This scrap comes from all sources, such as division carhouses, way and structures and line departments, and the several maintenance shops of the system.

A carload of shop rubbish is handled daily, which consists of sweepings and clean-ups from around the shop buildings. This rubbish is put through the incinerator and finally, if there are any metal parts to be reclaimed, these are handled by the salvaging department. The scrap docks are under the jurisdiction of the general storekeeper at the new Torrance Shops, who has the full co-operation of the shop forces in carrying on the work.

Under test conditions unusual performance was obtained from an installation of 665-hp. B. & W. boilers converted to oil burners by the Savannah Electric Company. Efficiencies ranged from about 82.5 per cent at 100 per cent rating to about 80 per cent at 300 per cent rating. A rather unusual circumstance discovered was that the superheat obtained was only half that obtained when the boilers were coal fired, due no doubt to the more complete burning of the oil in the combustion space, giving higher initial temperatures with better heat transmission in the first pass.

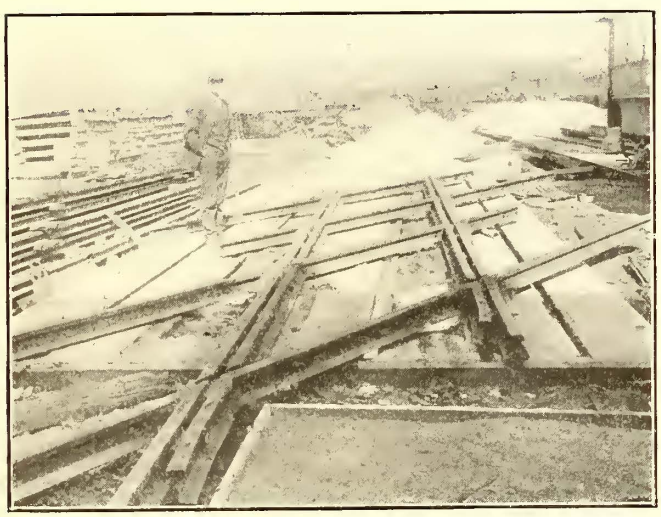
Shop, Track, Power and Line

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



Welded Crossings for Steam and Electric Intersections

IN ADDITION to the thermit shop-welded frogs and crossings installed in the paved streets of St. Joseph, Mo., described in the ELECTRIC RAILWAY JOURNAL for June 5, 1920, page 1135, the St. Joseph Railway, Light, Heat & Power Company has recently placed in service some of these welded crossings at certain intersections of the electric railway tracks with steam railroad lines.



ACUTE ANGLE CROSSING FOR DOUBLE-TRACK ELECTRIC RAILWAY AND SINGLE-TRACK STEAM RAILROAD INTERSECTION

An accompanying illustration shows an acute angle thermit-welded crossing for double-track electric railway and single-track steam railroad intersection. This crossing was built up in the shops of the electric railway company and installed as a complete section.

Carbon Dioxide and Monoxide in Flue Gas

CHIMNEY losses are indicated by three factors, the percentages of CO_2 and CO and the temperature of the flue gas. F. F. Uehling, in his paper read before the fuel section of the Sixth National Exposition of Chemical Industries, points out that the CO_2 determination is by far the most important as the CO_2 can easily be regulated by the fireman. Given a tight boiler setting, the operator can, by regulating the amount of air admitted and the thickness of the fuel bed, reduce the amount of excess air to about 50 per cent while striving for a maximum CO_2 indication. The determination of the percentage of CO, while necessary where there is suspicion of incomplete combustion, is not essential when CO_2 recorders are in use, Mr. Uehling said, since extraordinarily good economy results from their installation alone.

As an example of the result obtainable with recorders an instance is cited of the placing of a CO_2 recorder in a small New England plant in the engineer's office. None was installed in the boiler room. The firemen were advised to exert every effort to keep up steam with the least coal possible and a twenty-four-hour evaporation test was conducted. This showed a low percentage of CO_2. An additional recorder was then placed in view of the firemen, who were instructed to keep the steam at the customary pressure and to make the CO_2 reading as high as possible. On a second run, made under those conditions, the chart showed a consistently high average of CO_2 and under actual test the fuel saving was 9.9 per cent.

Side Window Curtains for Safety Cars

The Considerations that Led to the Use of Curtains in Cars Are Enumerated and Their Advantages Discussed

IN AN article in the ELECTRIC RAILWAY JOURNAL for May 15, 1920, page 984, one safety car manufacturer advocated the construction of safety cars without side window curtains. A representative of a curtain manufacturer presents the following in favor of the continued use of curtains:

Most passengers of traction cars consider side window curtains in the light of a necessity and also a convenience. The advocates of "curtainless" cars are, we believe, jeopardizing rather than promoting the interests of the traction companies. Their contention, which is based upon the viewpoint of economy of construction and maintenance, is, it would seem, the result of first thought and not a development of serious consideration.

In order properly to cover the subject let us consider the functions of side window curtains for safety cars from the viewpoint of the passenger, as well as from the viewpoint of the operator of the electrical equipment. The primary objects of side window curtains are as follows: (1) To afford shade to passengers. (2) To protect passengers from summer storms. (3) To furnish and trim the car. (4) To protect and preserve the interior of the car.

1. It is very seldom that the tracks of an electric railway on any route continue in the same direction. This necessitates the car's continually changing direc-

tion, thereby altering the angles at which the rays of the sun enter the car. The majority of electric railway passengers are carried in the earlier hours of the morning and in the late afternoon when the rays of the sun are at an acute angle. Without curtains, therefore, there is no means of preventing these rays from entering the car and affecting the comfort of the passengers.

2. When electric cars were originally built, they were divided into two classes—namely, closed cars for winter and open bench cars for summer use. This practice has gradually been discarded and the modern practice of electric railways is to build a car which will be suitable for all seasons. Especially in the summer months, therefore, when sudden storms occur at reasonably frequent intervals, we believe there can be no means provided to protect the passengers and at the same time afford adequate ventilation without the use of side window curtains. As a matter of fact, it is interesting to note that in the case of the open bench car, which has now been virtually discarded, it was found necessary to equip all such cars with curtains capable of being extended to the floor of the car, this being done simply for the purpose of protecting passengers from storms.

3. A very important purpose of the car window curtain is found in the completion of the car trimming. Any one would deem it illogical to consider a dwelling or other structure complete without the addition of such window hangings as would be comparable with the type of construction, and this is likewise true of any type of conveyance, not excepting the safety car.

4. Much harm can be done by the elements to car interiors through lack of curtains, particularly during the summer season. As a matter of fact, without curtains, under such conditions, the entire interior of the car is exposed to the elements and the natural consequences of same.

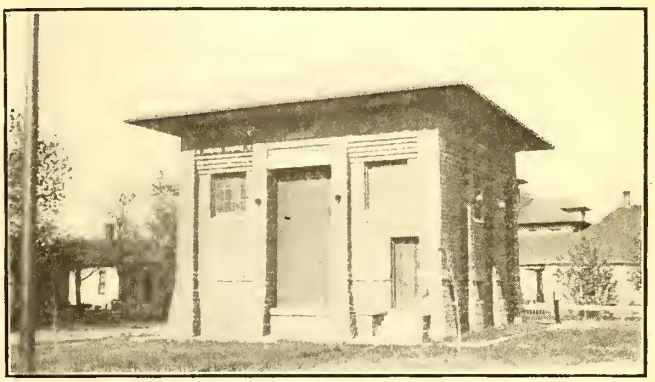
It is rather interesting at the present time to consider the expense that is actually necessary in order properly to equip the average safety car with side window curtains. It can be conservatively said that the cost of this equipment would not exceed $90 per car. The elimination of an item of $90 would hardly seem worth consideration from any viewpoint of additional saving in the car construction. Moreover, we believe it is a fact that the purchase, on the part of railway companies, of curtain material, fixtures and parts for the maintenance of such equipment is one of the lowest items on the books of these companies. From the standpoint of a manufacturer of side window curtains the evidences on our books would indicate this contention as absolutely correct.

In conclusion, it would seem as though a very substantial question which must of necessity be brought up is: "Do the owners of safety cars intend to place their equipment and their capabilities upon a par with the ordinary jitney or automobile bus, or do they intend to provide the public with a commensurate return for the increased fares over the jitneys that they advertise as being necessary?"

If the first is the case, safety cars should not be built with curtains, but, on the other hand, if electric car riders are to be provided with the best possible service and safest mode of transportation, the only way to back up the advertising of such service is to furnish most modern and attractively equipped cars.

Automatic Substation Building Constructed of Old Paving Blocks

THE accompanying picture is of particular interest because it portrays with what pleasing results old granite paving blocks may be used in building construction. The building here shown is a new automatic substation built by the Omaha & Council Bluffs Street Railway, in Council Bluffs, Iowa, last spring. It is located in a residential section and conspicuously situated on a triangular corner lot. It is distinctly a beautifying addition to the surroundings. It is built from ground line to roof entirely from worn-out granite paving blocks, so that the material involved in the construction of the new substation may be said to have cost the company only the reclamation expense.

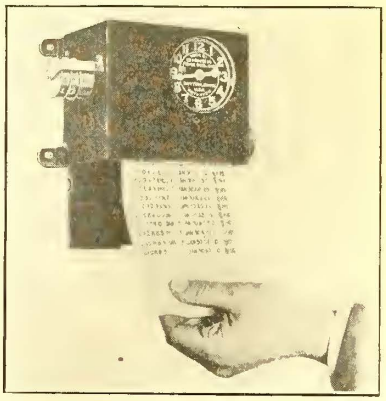


AUTOMATIC SUBSTATION IN COUNCIL BLUFFS, IOWA, BUILT OF OLD GRANITE PAVING BLOCKS

The station is equipped with one rotary converter and the automatic equipment for its control. The machine entrance to the building is closed with a rolling steel door, which may be seen in the picture. Ventilation for the machine is secured through three openings at the floor level on either side wall and a single opening on each of the four walls at the roof line.

Instrument to Check Truck Drivers

THE Ohmer Fare Register Company has recently perfected a device for truck owners in the form of the Ohmer Truck Auditor. This instrument produces printed reports of the day's work and acts as a mechanical cost accountant, recording the expenditures for truck operation in the terms of material, time and distance traveled. This device weighs 7 lb., is placed on the dash of the truck and provides a complete printed report of the day's work. The report gives such information as the machine number, driver's number, date and exact time, mileage and miscellaneous data about loading, changing of tires, taking gasoline and oil, etc.



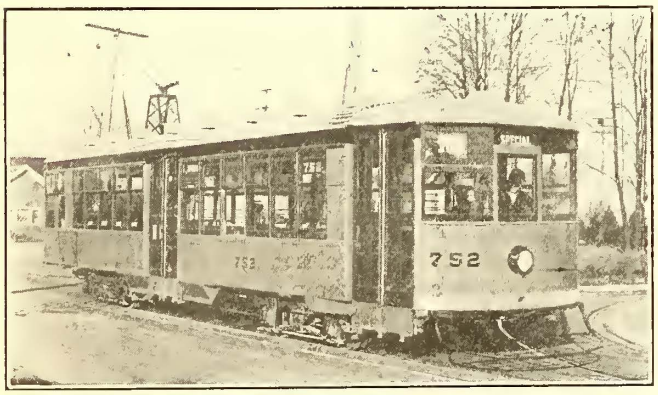
TRUCK AUDITOR SHOWING RECORD

Each driver is provided with an identification key

bearing his number. This key must be inserted in the truck auditor before it is possible for him to take his opening statement or to start the engine. He then turns the knurled knob at the right, which prints the opening statement, locks the key in the machine and allows the motor to be started. If the driver wishes to remove the key a closing statement must be printed, and a comparison of the two statements reveals the time and reason for leaving the truck. When the truck is stopped for any reason and the fact recorded, automatically the engine is cut off and another print must be taken to start it. The record thus made shows the time that the truck was stopped and the automatic stopping of the engine effects a great saving.

New Type Car Tried at Seattle

THE Seattle Municipal Street Railway, Seattle, Wash., has recently placed in service a car remodeled under the direction of A. Flanigan, assistant superintendent of equipment, which combines several features of modern cars. This car can be used for either one or two-man operation as it has entrances at both front and side. It is the intention to use two men during peak hours and one when the loads are comparatively light. Both entrances are constructed with double

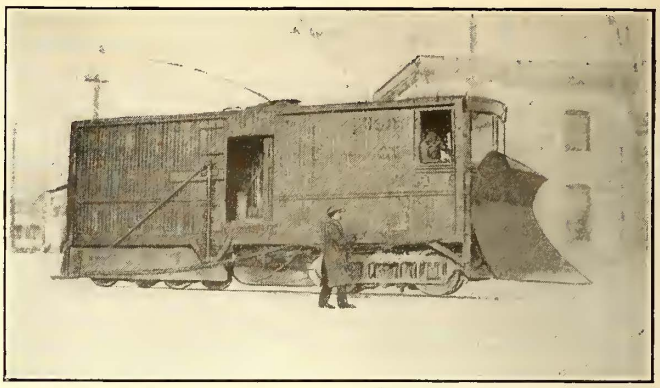


SEATTLE'S ONE-MAN-TWO-MAN CAR

doors to facilitate quick loading and unloading. The car is approximately 50 ft. in length and has seats for fifty-nine passengers, with additional standing room for sixty passengers. Hand straps are not provided, but instead hand rails have been installed. The general design of the car, as well as the step construction, is shown in an accompanying illustration. The car is equipped with the latest safety devices and also is provided with multiple-unit control, which will enable this type of car to be used in train operation if it is found desirable.

Permanent Home for National Research Council

A NEW building in Washington, D. C., will soon house the National Research Council and the National Academy of Sciences. It is to be erected on a block bounded by B and C Streets and Twenty-first and Twenty-second Streets, N. W., facing the Lincoln Memorial in Potomac Park. The site cost about $200,000, which sum was contributed by a number of friends of science, including such men as Charles F. Brush and Ambrose Swasey of Cleveland, Henry Ford, P. S. du Pont and George Eastman. Funds for the erection of the building have been provided by the Carnegie Corporation of New York.



SNOW PLOW OF MONTREAL & SOUTHERN COUNTIES RAILWAY

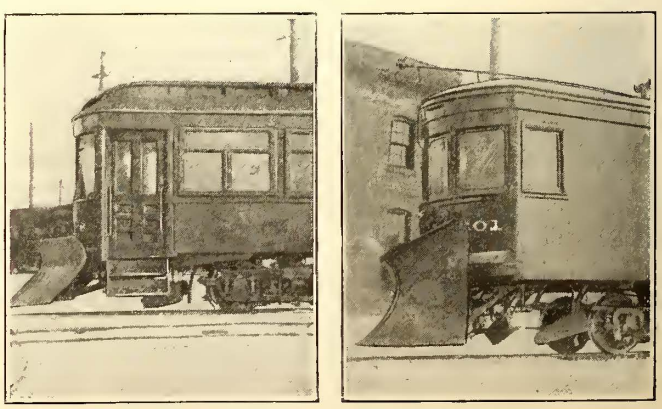
Snow Fighting on an Interurban

How the Montreal & Southern Counties Railway Equips Cars with Plows and Keeps Traffic Going All Winter

WHEN snowfalls are heavy and continuous each year, so that they form a part of the regular program of winter operation, there is no real difficulty in keeping the track clear. This, at least, is the experience of the Montreal & Southern Counties Railway, an interurban line supplying transportation between a group of prosperous communities southeast of Montreal and the city itself.

The line, which has about 66½ miles of track, all electrically equipped, is a part of the Grand Trunk System and crosses the St. Lawrence River on special electric tracks over the Grand Trunk Railway Bridge. Both single cars and trains are run, and for a considerable part of the system a 20-minute service each way is given during the greater part of the day. There has been a continuous increase in traffic since the electrical equipment was installed, and the increase this year is expected to be about 15 per cent.

The principal dependence for snow fighting is a form of steel nose plow, of which illustrations are shown. This plow is built in three sizes. The largest, of which there is one, is used on a 30-ton locomotive, employed as a snowplow in winter and as a locomotive in summer. The plow is somewhat shorter than would otherwise be used because of several sharp curves on the line. As shown, this largest plow is capable of being raised with compressed air, so that when the locomotive enters the paved streets of Montreal it can be lifted. This plow is also equipped with flanges for clearing the right of way.

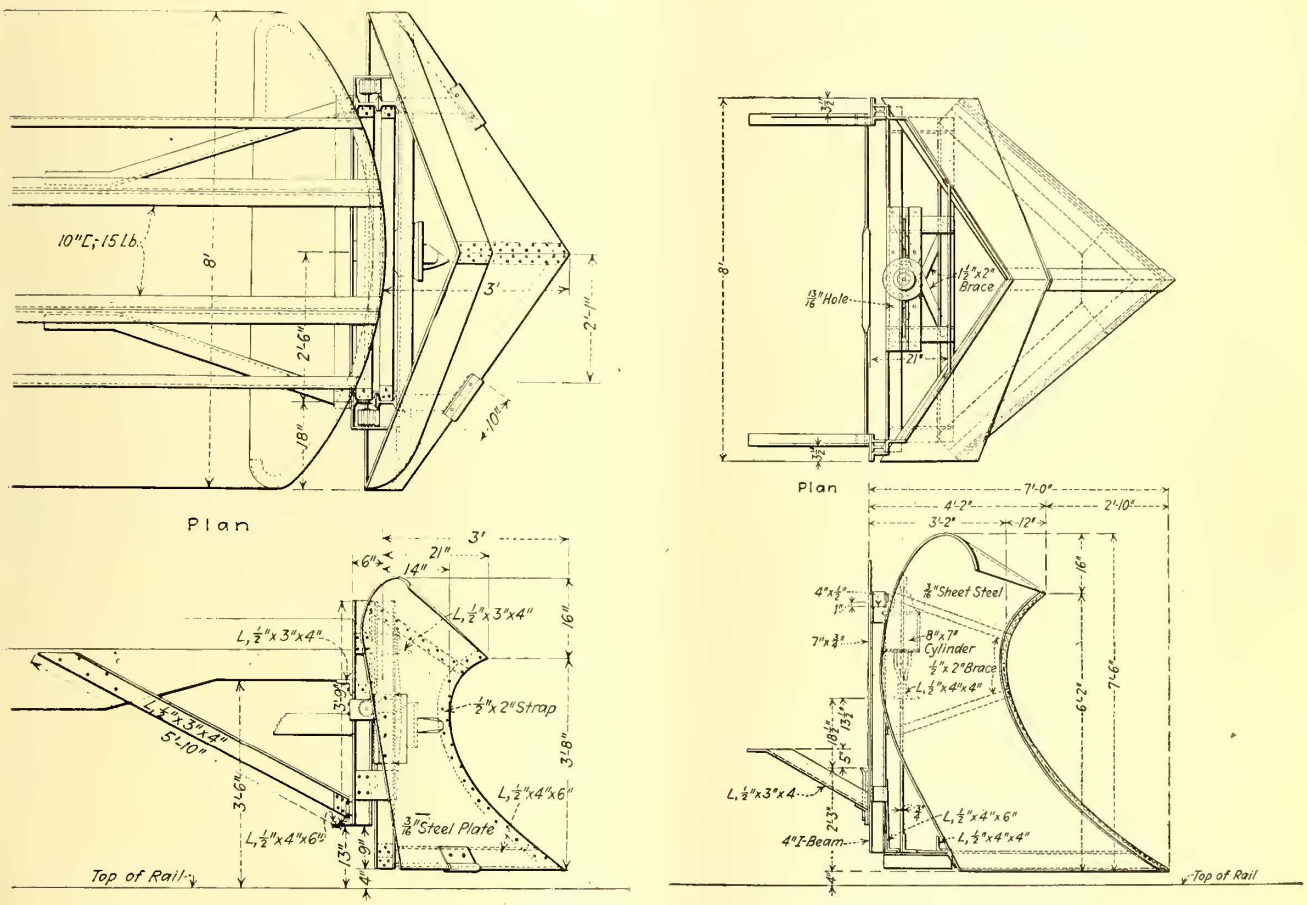


TYPES OF SNOW PLOWS USED ON CARS

The second or medium size plow is also illustrated. It is similar in general construction to that used on the locomotive, but smaller and lighter, weighing only about 1,000 lb., and being raised and lowered by hand. This plow is used on interurban cars. A smaller plow, weighing about 600 lb., is used on local cars. Both interurban and local cars are also fitted with scrapers.

It has been found that if about 40 per cent of the cars are equipped with these plows practical immunity from snow trouble is secured. The plows are installed on the cars about November and carried until the end of March.

In addition to the use of these plows the company has two sweepers and a large nose snow plow fitted with flangers. Originally a rotary was used, but the present equipment has been found more efficient and the rotary has been dismantled.



PLANS AND ELEVATIONS OF LARGER PLOWS

Blasting Pole Holes in Frozen Ground

DURING the past five or six years a good deal of dynamite has been used for blasting post and pole holes in frozen ground. Many contractors, construction foremen and others who have tried it condemn the practice because, they say, it makes too large a hole; that is, too wide at the top, and that there is a tendency to loosen the soil too much around the sides of the hole. E. I. du Pont de Nemours & Company, Inc., state that to blast a relatively straight up and down, narrow hole and avoid widespread loosening of the sides the charges should not be tamped in the bore holes.

Importance of Testing Welds

Weld Tests Not Yet Standardized—Microscopic Examination of Structure and Bending Test Gives Most Accurate Indications of Quality

AT THE September meeting of the Chicago Section of the American Welding Society S. W. Miller, proprietor of the Rochester (N. Y.) Welding Works, read a paper, of which the following is an abstract, on the development and value of different methods in use for testing welds.

As in all other developments, welding first received its principal impetus from the practical man. Of late, however, the tendency has been to investigate more carefully and more fully and by means not available to the ordinary welder. This means that scientists of all kinds have been called into consultation and that almost every conceivable method of test has been suggested to determine what methods and materials would make the best welds from a standpoint of security as well as service and cost.

Although the testing of metals, aside from welds, using the customary tensile, compression, shock, alternating-stress tests, etc., is quite well developed in practice, the microscope has been found to be of tremendous help in the study of metals as well as welds. While no one method of test shows everything desired to be known, the microscope is probably the most powerful single method of investigation in the case of metals, and in the study of welds it is particularly valuable because

of the methods of their formation. A weld is a casting and is subject to all the defects found in castings, which are, however, exaggerated in the case of welds.

The welding of steel is frequently considered as not being especially difficult and it is also sometimes considered that steel is steel and that no different treatment is required in the case of different qualities and varieties of steel. It is not as well known as it should be that a comparatively small variation in the percentage of carbon in the material being welded makes a very great difference in the results of either a bend or tensile test. It has been found by experience that the higher the carbon the more difficult it is to get a satisfactory weld and the more danger there is of injuring the metal being welded. It is also evident that a weld made with a given welding rod or electrode can have only a given strength. If this strength is greater than that of the material being welded, the test pieces will always break outside of the weld, and if weaker of course the weld itself will rupture. It is necessary to know accurately the character of the material being welded to be able to use the right steel alloy for welding. Also the method of test in any given case depends on the use to which the welded piece is to be put.

There are no standards at present for weld tests, but it is advisable, whenever possible, to follow those of the A. S. T. M. Inasmuch as a welded piece is not of uniform character, it is not possible to use the elongation and reduction of area as commonly measured. Where the break occurs in the weld, the elongation of the whole test piece tells very little about the quality of the weld, and it is useful to take the elongation of each inch, two inches, etc., of the gage length, beginning at the center inch which includes the weld, and plotting these figures against the gage length.

The best test, in the opinion of Mr. Miller, to determine quickly the general character of a weld is to grind it off level with the surface of the pieces and clamp it on an anvil, with the center of the weld level with the top of the anvil and the bottom of the V toward the anvil so that the top of the weld is stretched when the projecting end is struck with a sledge. The blow should not be too heavy and the number of blows and the angle to which the piece bends before cracking are quite an index of the value of the weld. It is true in this test, as in the tensile test, that the quality of the material itself has a great influence on results. If a welded piece were to be used in a place where it might become red hot, such as, for instance, in a locomotive fire-box crown sheet, it would be entirely proper to test the weld at a good red heat.

In many cases the defects in welds are easily visible to the naked eye under test. In other cases they are not, and while it would seem plausible that the visible ones were more dangerous, the hidden danger due to the ones that are hard to see is a matter that must not be overlooked. For many years the dangerous defects in steel rails have been those which were not visible and which have usually been very small at the start. There has recently been developed a method for testing rails for these hidden defects which has been devised by A. M. Waring. It consists of etching deeply a polished surface of the material. For instance, a section of a weld might be cut out with a hacksaw, machined or filed to a true surface and polished on various grades of emery paper, ending with No. 00 Manning. It is then placed in a warm solution of 25 per cent hydrochloric acid for from half an hour to an hour. The acid will eat away the defects, making the edges of the material at them taper, so that rather large grooves and pits would be visible, where the defects prior to the etching would be only microscopic. The bending test, hot and cold, and the etching test are of the greatest value in ordinary shop practice where it is desired to find out rapidly and quite accurately what the quality of the work is done by different welders.

Some of the defects in welds are visible under the microscope, but others are invisible until the weld is strained. A small bending machine that can be placed on the microscope stage is very useful, because after etching the piece can be bent and examined and the effect of the strain can be seen. In the case of bare-wire electric welds, the rupture, according to Mr. Miller's experience, always occurs at the grain boundaries even where no defects are visible there at the highest powers of the microscope. Of course, where there are defects visible, the rupture takes place first at these. Where there are no defects, the distortion occurs by slipping in the grains as in normal steel.

An electric weld that will bend very little may be made much more ductile by heating in a reducing atmosphere at a low red heat for one or two hours, indicating that the weakness at the grain boundaries has been removed. Again, heating an electric weld in an oxidizing atmosphere makes it more brittle.

These rough tests, while satisfactory for determining the general quality of the work, do not answer as a basis for design and more refined tests must be used, as before referred to. The most important of these are the tensile and alternating-stress tests. The tensile test can be made in any shop provided with the usual tensile testing machine. The alternating-stress test is not as yet standardized even for unwelded material. The ordinary machine for determining the resistance to alternating stress uses a rather small test piece about ⅜ in. x 2 in. in section which is vibrated at about 1,000 alternations per minute.

Arc-Weld Rail Bonds

Successful Method Described of Rail Bonding Involving a Bond Which Has a Direct Weld Between Copper and Steel

THE extended use of electric-arc welding in the shops and on the tracks of electric railways has resulted in the development of rail bonds which can be applied with the electric arc in one form or another.

The American Steel & Wire Company has developed an arc-weld bond terminal which has a direct weld between the copper and the steel. This eliminates any possibility of the union being disturbed by the heat of the arc. The steel contact surface is in plate form, about ⅛ in. thick throughout, and a large area of copper is provided as a backing for the steel-welding surfaces. They are produced in various forms for application to different parts of the rail, but in all cases the designs are fundamentally the same. The steel of the terminals is in shell form. All parts which are exposed to the arc are of steel about ⅛ in. thick and the steel casing extends to form the terminal sleeve around the conductor where it enters the terminal. For the head of the rail a steel-terminal bond has also been designed.

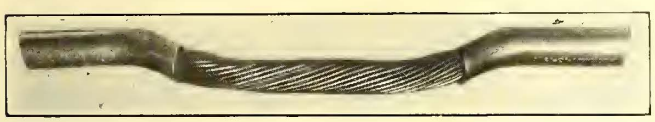
The joining of the copper to the steel at the factory, leaving a steel to steel weld to be made in the field, is

thought to be a big forward step in the art of bonding. The bonding becomes an adjunct of the welding art of necessity and metallic-electrode bonding is in no sense peculiar to the bonds. It is exactly like any other steel weld with which all arc welders are familiar.

Before welding, the terminal makes contact with the rail head along a comparatively thin edge, thus exposing for welding the major part of the rail surface opposite the bond terminal. This enables the terminals to be placed low on the rail heads, with ample clearance for the wheels above and the splice bars below. It is of great advantage on thin rail heads. The welding surface of the terminals of these bonds is concaved so that there is a wide welding angle at the bottom. Less steel is required to attach the bonds than is the case where the welding surface is 90 deg. to the rail. Also the steel current path is kept at the minimum for practical welding. This results in a minimum consumption of welding rod per square inch of contact area and consequently minimum time for installation.

The fundamental argument in favor of the welded bond is the permanency of the contacts. The metallic arc-welding process enables the bonds to be shaped for and applied to all parts of the rail without the need of special equipment. No molds are required and clamps are not essential. They are generally used to hold the bonds in position long enough to "tack" them fast with the arc. The attachment to the rails with steel imparts great mechanical strength to these bond and their theft is therefore discouraged.

The metallic-electrode process enables the bonds to be



ARC-WELD RAIL BOND SHOWING SLEEVE CONSTRUCTION OF STEEL TERMINAL

applied with any form of arc-welding apparatus, motor generator, or any form of ballast resistance set, and the electrode may be positive or negative. The advantage is apparent where there may be several kinds of apparatus on a property. Bonding can be done with each welder, wherever it may happen to be located, thus removing any necessity to transport special apparatus for bonding to every location where repairs are needed.

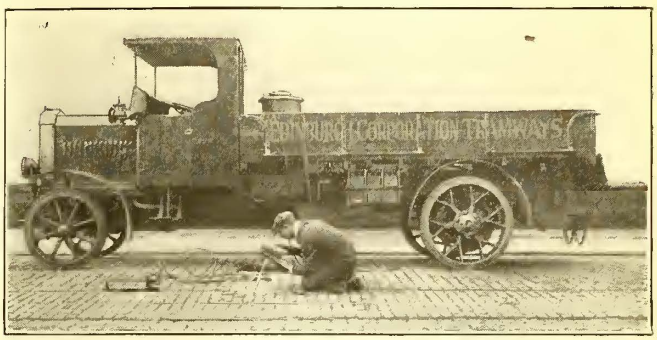
Gas and arc-welding bond steel terminals were described on page 199 of the Feb. 17, 1920, issue, and on page 796 of the April 17, 1920, issue of the ELECTRIC RAILWAY JOURNAL.

New Crane and Hoist Controller

THE Allen-Bradley Company of Milwaukee, Wis., has developed a new line of crane and hoist controllers to supplant its types Q, R and S controllers for the same service. The new controller, made in sizes ranging from 1 hp. to 150 hp., is known as the "clapper-type controller," primarily because all switching and contact making is done with a clapper-switch contactor. The controller is simplified by the use of a graphite compression resistor, mounted within the controller, avoiding the use of grids or wire-wound resistors and the need of step contacts. All speed control is obtained by pressure variation upon the resistor column applied by the control lever. A single lever gives full control in either direction and also actuates the clapper contactors. Steel frame construction is used with pressed steel enclosing covers, reducing the controller weight. Switch cams positively open and close the switch clappers in either direction.

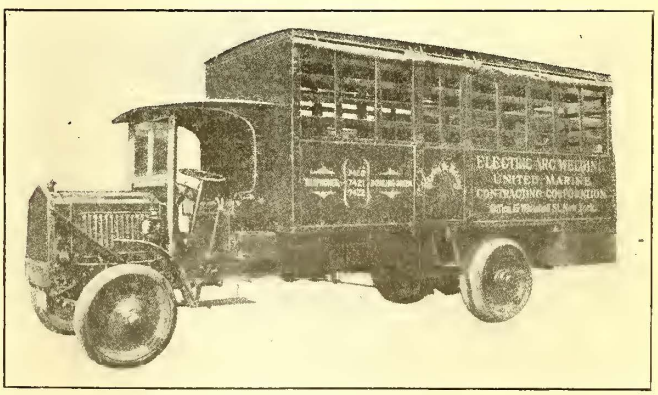
Welding Plant on Motor Trucks

ACCOMPANYING illustrations show two types of self contained portable electric arc-welding outfits mounted on motor trucks. The first of these is used by the Edinburgh (Scotland) Corporation Tramways for making repairs to its lines which are operated by



BUILDING UP RAIL JOINTS FROM WELDING OUTFIT MOUNTED ON MOTOR TRUCK

cable, and where electric power is not available. They have also found this welding outfit of use at other parts of their lines as work can be carried out without interfering with normal operation. The second illustration is a portable electric arc-welding outfit used by the United Marine Contracting Company of New York City. Its object is to serve economically both marine and land requirements, and by mounting the equipment on a motor truck it can travel from job to job quickly, and in the case of marine repairs, which constitute the greater part of the work done, such an outfit can be run conveniently alongside boats that require repairs. The equipment of this outfit consists of an electric generator



ROOMY WELDING OUTFIT FOR MISCELLANEOUS REPAIRS

driven by a 40-hp. gas-kerosene engine, which produces direct current of 150 amp. for each welder at 50 volts. The capacity of this machine is two welders.

The body is equipped with two reels for carrying 1,200 ft. of copper leads. Welding supplies, such as short lengths of welding wire, welding glasses, hammers, etc., are carried in small compartments built on the underside at the rear of the body. A 40-gal. spare fuel tank is provided, as is also a tank for 65 gal. of lubricating oil for the machinery. The equipment used by the Edinburgh Corporation Tramways delivers from 150 to 250 amp. at 60 volts.

Commissioners Discuss Valuation

National Association Report Shows Majority Favor Investment Basis or Liberal But Not Peak Reproduction Cost

A REPORT of most of the sessions of the convention of the National Association of Railroad & Utility Commissioners held last week in Washington was given in last week's issue of this paper. That which follows completes the report of this convention in so far as it pertains to electric railways.

Report on Special Valuation Resolution

At the Thursday morning session of the convention there was a report of the special committee appointed to consider the following resolutions which had been presented by Paul P. Haynes of Indiana at the 1919 convention at Indianapolis:

Whereas in recent years the cost-of-reproduction method of evaluation has in many instances become the controlling factor in determining the fair value of the property of public utilities, and

Whereas during the past few years there has been an unprecedented increase in the cost of materials and supplies entering into the construction of utility properties, and

Whereas the cost-of-reproduction method of evaluation, although applied with moderating averages, arbitrarily attaches to properties constructed before the high-price period, values greatly in excess of the actual prudent investment therein, in many instances from 25 to 100 per cent greater than such investment, and

Whereas under present abnormal conditions the cost-of-reproduction theory has ceased to perform the service which it was designed to perform, and now leads to unwarranted and unreasonable values which offer little guidance in determining the fair value of the property of public utilities, and

Whereas the continuance of the cost-of-reproduction theory as the controlling factor in public utility valuations will in the future undoubtedly cast a burden upon those utilities which were required by public necessity to make substantial plant investments during the high-price period; now, therefore, be it

Resolved, by the National Association of Railway and Utilities Commissioners, that a continued disposition on the part of commissions and courts to consider cost-of-reproduction or cost-of-reproduction-less-depreciation as the controlling factor in determining the value of the property of utilities will tend to impair scientific and equitable regulation, to permit the establishment of unwarranted and unreasonable values, and ultimately to diminish public confidence in commissions and courts and thereby impair their usefulness; and be it further

Resolved, that one of the obligations of commissions and regulatory bodies is to protect and preserve, in so far as it lies within their power, honest and prudent investment in utility properties, and that, in view of abnormal price conditions now prevailing, equity, justice and a proper regard for the interests of utilities as well as the public seem to demand that in the valuation of public utility property greater weight should be given to the honest and prudent investment therein; and be it further

Resolved, that it is not intended by this resolution to hold that the fair value rule should be abandoned or impaired, but rather that under the fair value rule and in view of abnormal conditions prevailing, a greater measure of justice and equity will be secured by giving greater weight to the honest and prudent investment, and less weight to the cost-of-reproduction or cost-of-reproduction-less-depreciation.

The committee reported that it had sent the resolutions to each state commission and had received thirty-four replies, twenty-one of which favored the resolution, two were unfavorable, four were non-committal and seven gave no expression of their attitude. The following states indicated that they were favorable to the resolution: Texas, New Jersey, Oregon, Oklahoma, Washington, Massachusetts, Kansas, Georgia, Wisconsin, North Dakota, New Hampshire, New York, First District; South Carolina, Michigan, Virginia, Wyoming, Montana, Connecticut, Louisiana, West Virginia and Ohio. New York, Second District, and Nevada reported unfavorably; non-committal replies were received from Maine, Utah, Illinois and Minnesota; acknowledgment of receipt was received from but no action taken by California, Porto Rico, New Mexico, Florida, Maryland, District of Columbia and Vermont.

The committee recommended that no formal action on this report was necessary or desirable. It says: "The investigation has served a useful purpose in that it has brought together the minds of practically all the commissions on this very important question."

In the discussion which followed the report of this committee the consensus of opinion seemed to be that current prices should not be used on account of their very high level; that rate of return should, in general, not be raised too high, but that a liberal policy with respect to valuations finally determined should satisfactorily take care of the present, and probably temporary, situation of high prices and high interest rates. Favorable consideration was given to the proposal recently made by Hagenah & Erickson, valuation engineers, Chicago, that reproduction costs of today be figured on prices projected from a trend-of-prices curve beginning with 1896, but no action was taken except to defer the general subject to the main valuation committee for its consideration.

Why Coal Car Assignment Was Discontinued

At this session, also, there was a revival of the car distribution discussion started the previous day. Commissioner Funk and Judge Reed were reinforced in their questions by Commissioner Lewis of Indiana, and M. H. Aylesworth, executive manager National Electric Light Association, presented the case of the utilities, saying in effect that previous to the discontinuance of orders 9 and 16 on Oct. 15 public utilities were getting their contract coal, but that since that date they were getting no coal at all.

Chairman Clark and Commissioner Aitchison of the Interstate Commerce Commission defended the change in rules and made the statement that the change had been brought about largely on account of the abuse of the assigned car privilege granted them. Commissioner Aitchison said that this privilege had been granted for obtaining contract coal for current use, but that many utilities not only tried to pile up reserves through the exercise of this privilege but even went to the extent of reassigning shipments to their advantage. He said that data presented to the commission proved that in three districts alone the coal ordered by consigned cars was equal to the total average consumption of all the utilities in the United States.

Mr. Aylesworth said for the utilities that the utilities would "police" a reissuance of the car assignment order or, failing the confidence of the commission to "police" the order themselves, would finance any "policing" the commission might authorize.

At the Friday sessions important reports were heard from several committees, among them the main valuation committee, which referred chiefly to the railroad valuation work of the Interstate Commerce Commission; the committee on publication of decisions and orders of state commissions, and the committee on statistics and accounts of public utility companies. The last-named committee presented suggestions for standard classifications for gas corporations and for electric

corporations. It has this to say with reference to other systems, including, presumably, electric railways:

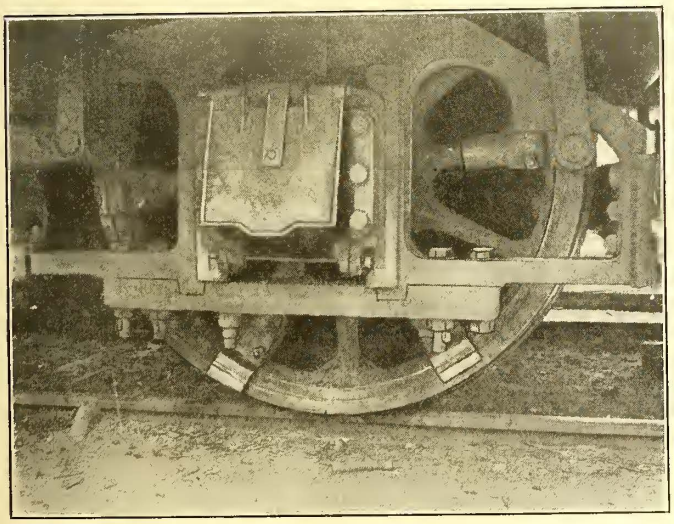
"When it became apparent that the inevitable lack of time necessarily would restrict the number of classes of utilities for which uniform systems could be completed the committee centered its efforts on the electric and gas systems, believing the greatest good could be accomplished through conducting its work in this order, and it was further influenced in this belief through the number of suggestions favoring the adoption of the Interstate Commerce Commission's systems, wherever prescribed, subject to future revision, the essentials of which would still leave the Interstate Commerce Commission's systems substantially intact."

APPOINTMENT OF COMMITTEES

The president-elect, J. A. Perry, announced the appointment of the executive committee for the coming year, as follows: Chairman, Carl D. Jackson, Wisconsin; Joseph B. Eastman, Interstate Commerce Commission; E. I. Lewis, Indiana; Clyde M. Reed, Kansas; R. Hudson Burr, Florida; Alfred M. Barrett, New York; J. J. Murphy, South Dakota; James A. Perry, president (ex officio); James B. Walker, secretary (ex officio).

Bringing in a Crippled Locomotive

THE Inland Empire Railroad has a number of alternating-current locomotives which are used in heavy freight service on its Colfax-Moscow line. Recently one of these locomotives fractured a tire when out on the road and the master mechanic, M. G. Charles, had on his hands the problem of getting the machine into



EMERGENCY RETAINING CLAMP FOR FRACTURED ELECTRIC LOCOMOTIVE DRIVING-WHEEL TIRE

such shape that it could be brought back into the shop. How he did this is shown in the illustration.

The device consisted simply of a set of split clamps placed on alternate spokes. These clamps were roughly forged from strap steel in such form that they bind the spokes tightly and at their outer end form guides for the tire so that it cannot slip off. The fracture in the tire was also welded to insure continuity.

A revised edition of the standard specification for portland cement has been issued by the British Engineering Standards Association, the office of which is 28 Victoria Street, S. W. 1, London, England.

Symposium on Lightning Protection

Manufacturers' Engineers Explain Present Status of New Types of Arrester and Operating Engineer Gives Results of Investigations

THE 365th meeting of the American Institute of Electrical Engineers, held at the City Club, Chicago, Ill., on Friday, Nov. 12, in conjunction with the Western Society of Engineers, was devoted to the subject of lightning protection. Four papers, presenting different phases of the subject, were read. The titles and authors of these were as follows: "Lightning Arrester Spark Gaps," by C. T. Allcutt, Westinghouse Electric & Manufacturing Company; "Life and Performance Tests of 'O.F.' Lightning Arresters," by N. A. Lougee, General Electric Company; "Studies in Lightning Protection on 4,000-Volt Circuits," by D. W. Roper, Commonwealth Edison Company, and "Electrostatic Condensers," by V. E. Goodwin, General Electric Company. The meeting was held under the auspices of the Chicago section, of which J. R. Bibbins is chairman, and the protective devices committee, of which Mr. Roper is chairman.

The investigation reported by Mr. Roper was declared to be one of the most comprehensive studies based on actual experience ever recorded on this broad subject of lightning protection in power and lighting work.

President A. W. Berresford, of the Institute, was present. He spoke on the subject of the Federated American Engineering Societies, pointing out that thus far there has been accomplished only a broad enabling act to make the Federated Societies possible, and under which the details of operation will be worked out. He said that the object of the federated organization is to provide the engineering profession with a body competent to represent it in a broad way.

F. K. Copeland, president Western Society of Engineers, which has not yet joined the federated movement, addressed the meeting briefly as to the position of the Western society, indicating that the society was taking a neutral position until there has been time to consider the proposition from all angles.

The meeting was preceded by a reception and dinner at which J. R. Bibbins presided and presented Mr. Berresford, who took charge of the technical session in the evening. During the day following the meeting arrangements were made for inspection trips to the Mark Plant of the Steel & Tube Company of America, to one of the automatic substations of the Chicago, North Shore & Milwaukee Railroad, at Lake Bluff, Ill., and to the Northwest Station of the Commonwealth Edison Company in Chicago. Announcement was also made by a representative of the Chicago, Milwaukee & St. Paul Railway that one of the new electric locomotives was on exhibit near the loop for the benefit of the engineers who were interested.

Abstracts of the four papers presented at the meeting are given below.

Mr. Allcutt's paper was a supplement to one on the same subject presented by him before the Institute in June, 1918. This was abstracted in the issue of the ELECTRIC RAILWAY JOURNAL for Aug. 10, 1918, page 241. In the earlier paper he described a type of lightning arrester spark gap which will discharge a high-frequency disturbance at a voltage considerably less than the normal-frequency discharge voltage. This type of lightning arrester, which has now come to be known as the "impulse gap" arrester, was then in the experi-

mental stage. It has since come into extensive commercial use and the purpose of the present paper was to present data as to its operation and to discuss some of the features upon which the protective value of the gap depends.

Mr. Allcutt explained that a handicap to the electrolytic arrester is that it must be connected to a line through a spark gap, as permanent connection to the line will result in overheating and ultimate destruction of the arrester. It is necessary that the spark gap which connects the arrester to the line be so adjusted that it will not discharge normal line voltage. It is highly desirable, however, that the spark gap should discharge high-frequency disturbances at the lowest possible voltage in order to obtain a high degree of protection against such dangerous disturbances. Herein lies the value of the impulse gap.

The gap proper consists of two sphere-horn electrodes, which are connected respectively to the line and to an electrolytic arrester in the usual manner. In addition to these main electrodes, an auxiliary electrode is provided which is connected to one of the horns through a condenser and to the other horn through a similar condenser and a high resistance. If the auxiliary electrode is placed half way between the main electrodes, the gap will be virtually cut in half for high-frequency disturbances because the impedance offered by the resistance element is very much greater than the impedance of the condensers. Obviously, the result is a gap which is most sensitive to high-frequency discharges and consequently can have a higher voltage setting for normal frequency. In practice actual condensers are not used, but pin insulators having the necessary electrostatic capacity take their places in maintaining the auxiliary electrode at the proper potential. The unbalancing resistance is furnished by resistors inclosed in porcelain tubes mounted on a porcelain pillar. The auxiliary electrode is a pointed brass rod 0.08 in. in diameter, mounted on a substantial iron arm. Mr. Allcutt gave in his paper the results of many tests of modified forms of impulse-gap arresters and promised more data at a later date.

Mr. Lougee gave the results of tests made with the oxide-film (O.F.) lightning arrester developed more than two years ago.* He said that several hundred arresters of this type, up to 73,000 volts rating, are now installed on both indoor and outdoor circuits. Higher voltage units will soon be in service. This arrester consists of cells with lead peroxide filler. The cells consist each of two sherardized steel disks on the sides of a porcelain ring, the interior space being filled with the peroxide. One of the disks is covered with a varnish film, or both may be covered.

Mr. Lougee summarized the results of tests made to duplicate, in a short time, actual operating conditions encountered during an extended life in normal service. Some arresters which have been subjected to this sort of intensive test during the past two years or more, corresponding to several times this period in actual service, have shown up well. Sample oscillograms given by the author indicated some of their characteristics.

The paper by D. W. Roper continues the account of investigations recorded in a paper by him presented before the Institute in 1916. The primary object of that paper was the reconciliation of the differences between laboratory experiments and experience in service in this field. A main purpose of the investigations forming the basis of both papers was the determination of the relative merits of the several types of lightning arresters installed on the 60-cycle distribution system of the Commonwealth Edison Company in Chicago. Data obtained from practice over a long period were used by Mr. Roper in the preparation of curves showing the relation of "density of arresters"; that is, number per square mile, and the rate at which transformers were burned out, or fuses were blown. He also outlined a specification which he thought summarized the results of experience with several types of arresters. These were as follows:

1. The arrester must consist of a number of gaps in series with a resistance, with the number of gaps and the amount of resistance properly adjusted to the line voltage so that the dynamic arc following a lightning discharge will be quickly broken without damage to the arrester.
2. The resistance rod must have the resistance uniformly distributed throughout its length, so as to prevent the progressive short-circuiting of the rod with heavy lightning discharges and the destruction of the arrester which will follow.
3. The amount of resistance in the resistance rod should not be seriously affected by repeated heavy discharges.
4. The leads for connecting the arrester to the line should leave the arrester so that they will form drip loops, and the leads should be so arranged that the arrester can be connected to a line wire on either side of the arrester.

For low maintenance cost the following features are desirable:

5. The enclosing case should be of fireproof insulating material that is not affected by the weather; and it should be constructed so as to protect effectually the metal parts from the weather, and to prevent accumulation of dust on the gaps.
6. The gaps in the arrester should be between parallel plates, disks, or rings instead of between cylinders or spheres so as to permit repeated heavy discharges without seriously altering the length of the gaps.
7. The arrester should be constructed so that in the event of the failure of the arrester to interrupt the dynamic arc the enclosing case will be shattered by the heat so as to give some visual evidence of the trouble and result in the opening of the circuit.
8. The arrester should be without moving parts or parts which require inspection, renewal or adjustment and should preferably be made in the form which cannot be inspected or repaired without removing it from the pole.

Mr. Roper said that experience with the arresters covered by his investigation indicates that several types are now available which comply with the above specifications. He closed with a summary of conclusions, but cautioned against the attempt to compare the results secured by lightning arrester protection in Chicago with those in other localities without giving due consideration to all of the performance factors.

The last paper in the series, by Mr. Goodwin, was a plea for greater appreciation of the condenser in practical work. This, he said, has a wide field of application in electric circuits, for power-factor correction, for improvement in line regulation, for protection from lightning and high-frequency disturbances, etc. He listed the following advantages of the electrostatic condenser for power work:

1. As the apparatus is stationary, it requires no attention.
2. The power loss is small because the equipment has high efficiency.
3. With reliable condensers the maintenance cost is practically nil.
4. The corrective kilovolt-amperes can easily be increased or decreased by cutting sections in or out.
5. The outfit can be connected to any parts of the system and thus provide correction at the points where the greatest saving can result.
6. Condensers are noiseless and require no special foundations.
7. The first cost for small installations is low.
8. Condensers can be used to improve line regulation.

*See issue of ELECTRIC RAILWAY JOURNAL, July 20, 1918, page 101.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

Toledo Board Named

Board of Control Will Supervise Enforcement of New Service-at-Cost Ordinance

The members of the board of control for the operation of the new cost-of-service franchise at Toledo have been named by the commission which drafted the ordinance. David H. Goodwillie, former service director of the city and head of the commission which placed the valuation on the railway property of the Toledo Railways & Light Company, has been selected to fill the six-year term. W. W. Knight, vice-president of the Bostwick-Braun Company, wholesale and retail hardware, and one of the most aggressive members of the cost-of-service commission, has been appointed for the four-year term. Henry C. Truesdall, president of the Toledo Clearing House Association, of the Union Savings Bank, and vice-president of the Northern National Bank, will serve for the two-year term.

The appointees are considered both by the public at large and by the officials of the Rail-Light to be well qualified for their work. It is the general opinion that they represent the spirit of the cost-of-service commission.

Will Begin Work Soon

The first duties of the board when it is legally empowered to do business upon the acceptance in writing of the ordinance by the Toledo Railways & Light Company, and the Community Traction Company, and the formalities involved in the transfer of railway property from the former to the latter and the filing of an agreement with the city, will be to select a transportation commissioner to represent the city and the re-routing of the present car lines.

The Central Labor Union submitted eleven labor representatives to be considered in the selection of the three members of the board of control but they arrived too late for consideration by the commission. The eleven names submitted by the Mayor included one woman—Mrs. S. M. Jones, wife of the former Toledo Mayor of "golden rule" fame.

In announcing the result of their choice, the service-at-cost commissioners said:

> We wish first, however, to voice our sincere appreciation of the confidence you place in our judgment by expressing your intention to appoint the men we select. It is a responsibility we might well evade, were we not so deeply concerned in knowing the city's and the car riders' interests under this ordinance will be capably and honestly protected.
>
> Our commission is particularly pleased to be able to suggest men of such diversified experience, and hence exceptional fitness for all of the various responsibilities which will devolve on the board of control, and to have them willing to serve.

The final date for the franchise ordinance to go into effect will be Jan. 30. It may be put into effect at an earlier date if the companies involved in the transfer of property fulfill the three qualifications for acceptance of the ordinance.

Traction Settlement Applauded

The passage of the cost-of-service plan has been received with the most enthusiastic commendation by the city's business men. The local railway situation has kept the lines from expanding and has hampered city growth for nearly fifteen years. Prospects of relief from a condition of that kind within a year have brought a new feeling into the business life of the city.

Officials of the Toledo Railways & Light Company are pleased at the victory scored at the polls. They have been working for nearly ten years in an effort to get some kind of a settlement of the traction question. Henry L. Doherty at one time during the negotiations admitted that the cost-of-service measure drawn by the Milner commission was the best that he had seen. However, he has felt rather dissatisfied with the proposition on account of the fact that he was almost forced to yield to a valuation of $8,000,000.

This brings up one of the most interesting of the historical phases of the present situation. In 1914 there was agitation for municipal ownership and a valuation of $9,000,000 was placed upon the lines. During the last year—it is just a year ago since the famous "ouster" went into effect—negotiations have involved a valuation under city auspices. The city-appointed commission headed by Mr. Goodwillie fixed the valuation at $7,110,000 on a pre-war basis of prices. They admitted that the replacement valuation would exceed $12,000,000. Mr. Doherty dropped his price to $9,000,000.

Striking Linemen Return

A strike of linemen employed by the Tri-City Railway & Light Company, Davenport, Iowa, has been settled. The men have accepted a wage scale of 77½ cents an hour. This is the scale offered the men a few days after they went out on strike in April. At that time the linemen refused the offer and demanded $1.25 an hour. The union men are now willing to return to work with the non-union men. Twenty-eight men went on strike last April. Twelve have returned to work. At the time the strike was called the scale was 70 cents.

City Ownership Proposed

F. W. Strickland Suggests that City Purchase Dallas Railway—Rate Increase Alternative

Municipal ownership of the Dallas (Texas) Railways or granting by the city of a rate sufficient to give the present company a fair and reasonable return on property value, is proposed by J. F. Strickland, president of the Dallas Railway, as the only means of meeting the present conditions that are retarding the development of the local transportation system. Mr. Strickland sets forth his views in a communication addressed to the Mayor and Board of City Commissioners.

In reply to Mr. Strickland's letter, the Mayor and Board of Commissioners have announced that any alteration of the present franchise of the Dallas Railway or a new franchise will receive consideration of the municipal authorities only under certain conditions, and that any proposed changes would be submitted to the voters at the election to be held next April for their approval.

City Asks Guarantees

The company is also informed that no action of any kind will be taken on any proposal to amend the present franchise or grant a new franchise until commitments have been received from the company that it will make extensions and improvements necessary for the growth of the city.

Mr. Strickland states that 17.86 per cent of the company's gross receipts have been invested in maintenance, although the company is required to invest only 10 per cent. This investment has amounted to $1,189,572. The letter says in part:

> As you know, since the beginning of operation under the present franchise on Oct. 1, 1917, the company has been under the supervision of your utilities department, and reference to the monthly reports which have been submitted by the company to the supervisor of public utilities will show that for the thirty-six months of operation, beginning Oct. 1, 1917, and ending Sept. 30, 1920, the company has failed to earn its permitted return of 7 per cent on the established property value, by $618,574. The average rate of return on property value for the thirty-six months has been 4½ per cent, while the rate of return for the month of September, 1920, just passed, was only 3.41 per cent. . . .
>
> It would seem, therefore, that the solution of the problem resolves itself into the following alternatives:
>
> Either the purchase of the railway property and operation of the same by the city of Dallas, or the granting by the city to the Dallas Railway Company of such a franchise as will permit it to earn a return on its investment sufficient to establish its credit and attract new capital to the enterprise.
>
> Should it be the desire of your honorable body to enter into negotiations with the company looking toward the purchase of the railway property, we would be very glad to discuss the same at any time designated by you.

Graduated Return to Induce Economy

Proposed Service-at-Cost Franchise for Akron Lines Provides Return Based on Fare— Buses for Outlying Sections

A new franchise embracing a number of unique features has been agreed upon between the Northern Ohio Traction & Light Company, Akron, Ohio, and the city of Akron, for the operation of the company's local lines. This franchise is the result of several weeks of negotiation between officials of the company and the members of the public utilities committee of the City Council, assisted by the city administrator and a traction expert. It was presented to the Council on Nov. 9, and while no vote has been taken it is said to meet the approval of practically all members of that body. The grant is for a term of twenty-five years and is based on the service-at-cost plan. It provides for the appointment of a public utilities commissioner, who is to "act as the technical adviser of the City Council and all city officials in all matters affecting the interpretation, construction, meaning or application of any of the provisions of the ordinance and all action thereunder affecting the quantity or quality of service, the cost thereof, or the rate of fare."

THE ordinance mentions no fixed valuation at present, but there is a section which provides that the valuation shall be fixed by an appraisal board, consisting of one appraiser to be chosen by the city, one by the company and a third by the United States District Court. The unusual features of the contract are:

1. Incentive for economical management. The basic rate of return is 7 per cent, but if the fare is held at 4 cents the rate of return is to advance to 8 per cent; if held at 5 cents it is to be 7½ per cent. The present rate of fare is 5 cents.

Feeder Bus Lines Planned

2. Provides for an "auto bus system" to be operated by the company. In sections of the city where transportation, aside from street railway transportation, is deemed necessary the company is to operate the buses under city control.

3. New paving between tracks is to be done by the city, but the company is to keep this paving in repair.

4. An amortization fund is to be established after the franchise has been in effect fifteen years which shall be sufficient to meet the capital value at the expiration of the franchise period —twenty-five years.

5. Arbitration upon all points of disagreement, the United States Circuit Court of Appeals to select the third arbitrator.

6. The city is given the right to purchase or lease the property upon one year's notice at the valuation fixed by the appraisal plus subsequent additions to the capital value.

The initial rate of fare is fixed at 5 cents for a period of thirty days from the effective date of the ordinance, or until the valuation appraisal is made. The schedule of fares fixed in the contract is as follows:

4 cents cash,	5 tickets for 20 cents.
5 cents cash,	10 tickets for 45 cents.
5 cents cash,	5 tickets for 25 cents.
6 cents cash,	10 tickets for 55 cents.
6 cents cash,	5 tickets for 30 cents.
7 cents cash,	10 tickets for 65 cents.
7 cents cash,	5 tickets for 35 cents.
8 cents cash,	10 tickets for 75 cents.

It is further provided that the rate shall be adjusted above and below the steps in this schedule in like reductions and increases as such reductions or increases may be necessary under the service-at-cost plan, except that unless otherwise agreed the fare shall not exceed 10 cents. No rate is fixed for "owl" car service, but the contract provides that the public utilities commissioner is to designate the rate charged between 12:30 a.m. and 4:30 a.m.

Return Varies with Fare

The section governing fare changes and rates of return provides that whenever the rate of fare is 6 cents straight or higher the rate of return to the company on the property value of the system shall be 7 per cent; but that as the fare decreases in the fixed steps the company's allowed rate of return is increased for each lower step ¼ of 1 per cent above the rate of 7 per cent for the period only during which lower steps of fare shall obtain. The minimum period during which a given fare shall obtain is fixed at three months. In other words, the rate of return for the corresponding ticket rates of fare will be 7 per cent for 6 cents or higher, 7¼ per cent for 5½ cents, 7½ per cent for 5 cents, 7¾ per cent for 4½ cents and 8 per cent for 4 cents.

The contract stipulates that no contribution, subscription, gift or donation by the company shall be charged to operating expenses and that employees of the general offices shall not be given free transportation.

The company operates interurban lines in and out of Akron. Its terminal building is included in the valuation of the property and power shall be sold for use on the city system at the rate of 1½ cents per kw.-hr. for a period of five years, after which a new agreement is to be made as to the cost of power.

Service Quality Guaranteed

In the matter of service the company pledges itself to operate cars of a modern design equipped and furnished with such improvements and appliances as shall be deemed by the city to be necessary and proper for the safety, health, convenience and comfort of the passengers and the public, and to operate cars in such numbers, at such intervals and under such rules and regulations as the city may from time to time require. The city reserves to itself the entire control of the service, including the right of fixing schedules and routes, the character of new cars, the right to increase or diminish service, and the right to order reasonable changes in routes and terminals of interurban cars.

Either the company or the city may propose extensions, betterments or permanent improvements. Should they fail to agree upon such extensions a court of arbitration is to be available. The city may at any time build extensions to tracks and distribution facilities of the city system and upon the capital value of such additions the city is to receive the same return as the company.

At any time when the ordinance or any renewal or extension has less than ten years to run the company is given the right to create an amortization fund by making monthly charges to operating expenses and deducting the amounts from gross revenues, which amounts, together with the interest and other accumulations, if any, shall at the termination of the grant or at the termination of any renewal or extension equal a sum corresponding to the then property value less an estimated salvage value. This amortization fund shall be under the joint control of the city and the company. In the event the grant is renewed or extended the amount at that time in the amortization fund may be used for extensions, betterments or permanent improvements, the value of which shall not be added to the property value, or the money may be used for the purpose of reducing the then property value.

Monthly Accounting Provided

Any discount and expenses resulting, or commission and expenses paid in the furnishing of money by the company for extensions, betterments and permanent improvements or for refunding shall be amortized monthly and included in the operating expenses over the life of the securities sold to provide any or all of the necessary money. If at any time the cost of money furnished by the company for extensions, betterments and permanent improvements expressed in annual percentage exceeds the rate of return allowed, then the difference between the allowed rate of return and such annual cost shall be charged to operating expenses. All renewals or replacements are to be added to the property value and all property sold shall be deducted from property value.

The city reserves to itself and the company grants to the city the right to purchase and take over at the end of any two-year period from the effective date of the ordinance the entire city system by giving the company not less than one year's written notice. When the city purchases the property it shall pay the then property value but no franchise value. The same terms apply in case the city desires to lease the property.

The city is given the right to use free of charge the poles of the city

system for fire alarm, patrol or public lighting purposes.

In case the company fails to conform to any of the conditions of the contract a penalty of $40 a day is incurred. The company is also required to furnish a bond of $250,000 for faithful performance of the contract.

Hydro-Radial Terminal Planned

In giving further evidence during the week ended Oct. 30 at the sitting of the Canadian Hydro-Radial Railway Commission F. A. Gaby, chief engineer of the Hydro Commission, admitted that the site of the old Union Depot, now used by the steam railways, had been considered by the commission as a possible terminal for the radial lines which will be run into the city of Toronto from the east and west of Ontario.

The daily increase of traffic on the Danforth and Gerrard lines of the Toronto Civic Railway during August was at the rate of 12,000,000 passengers a year. The Hydro-radials expected to handle about 25 per cent of this traffic when the lines are run downtown to the terminal in the heart of the city. The fare will be 5 cents for a distance of about 5 miles.

It was stated by Mr. Gaby that the proposed London, Stratford and Guelph radial line was to be abandoned following upon the plans now being considered for acquiring the Toronto Suburban, which runs from Toronto to Guelph. It is expected that arrangements can be made to secure running rights over the Grand Trunk Railway tracks between Guelph and Galt and Galt and Elmira.

Public Trustees Attacked

Mayor Roscoe Walsworth of Revere, Mass., has appealed to Governor Calvin Coolidge to hold an inquiry into the management of the Revere District of the Eastern Massachusetts Street Railway with a view to a reduction of fares and an improvement of service. Mayor Walsworth asks for a public hearing on the conduct of the affairs of the district by the public trustees of the railway, and calls for the removal from office of such of the trustees as may be proved incompetent.

Fares on the Bay State lines were recently increased through the elimination of transfers and the raising of the ticket rate, the cash fare remaining 10 cents. The advance was made necessary by the award of an increase of 11 cents an hour to the railway's employees by a board of arbitration. The wage advance will add approximately $1,400,000 annually to the cost of operating the system. The only district exempted from the fare increase was that including the city of Fall River, which has been paying its way under the "home rule" plan.

The Mayor of Lawrence at a recent meeting of the City Council demanded that the members of the "home rule" committee which has been in charge of the Lawrence Division of the Bay State, tender their resignations.

Highest Court Denies Injunction

Plea of Detroit United Railway Refused by United States Supreme Court—City Orders Equipment, Disposes of Bonds

The injunction asked by the Detroit (Mich.) United Railway prohibiting the city of Detroit from continuing with steps already taken leading to the acquisition of municipally owned street railway facilities has been denied by the Supreme Court of the United States. The suit was brought by the D. U. R. on the grounds that the municipal-ownership ordinance is confiscatory and contrary to the Federal constitution. Two motions are now before the Supreme Court on the appeal of the suit of the D. U. R. for an injunction. The appeal had been denied by the District Court. A brief has been filed by Charles Evans Hughes, who has been retained as counsel for the Detroit United, asking that the city be enjoined from selling bonds for the financing of the municipal street railway and from proceeding with construction. If the injunction is not granted, it is asked that the case be advanced for trial.

CORPORATION Counsel Wilcox for the city of Detroit asks that the case be dismissed as no federal question is involved. A second motion asks that if the first be denied, the court affirm the judgment of the District Court, whose decision was to the effect there was no basis for the D. U. R.'s suit. Finally it is asked that if neither of the first motions be granted, the case be advanced for trial. Jan. 3 has been set by the Supreme Court as the date for hearing the arguments in the case.

City Going Ahead

In answer to the contention of interests opposed to the proposed municipal system in Detroit to the effect that the State Public Utilities Commission has no power to grant a municipal line rights to cross the tracks of a privately owned utility, it has been stated by the city street railway commission that no trouble is anticipated on that point.

The reason that no municipally owned line has been laid across the D. U. R.'s tracks is given as the fact that the special trackwork needed for such a crossing has not yet been received. This work is under contract but has been deferred as winter work which can be done when other work must be suspended.

No legal controversy on the question is expected by Corporation Counsel Wilcox. It is held that if the Public Utilities Commission should decide that it lacks the power to grant this right to cross, the situation would revert to the time before the formation of the commission, when one public utility had the right to cross the property of another. No difficulty ever occurred in the scores of times such situations occurred before.

City lines will cross non-franchised lines and day-to-day agreement lines of the D. U. R. where, according to Corporation Counsel Wilcox, the city's rights are unquestioned. The new D. U. R. Northwestern belt extension will also cross one of the city lines.

In case of attempted obstruction on the part of the D. U. R. there are many lines, according to Mr. Wilcox, which could be pursued to make such obstruction unlikely, one of which would be to bar all interurbans from entering the city. This could be done by a councilmanic ordinance limiting the weight of all cars running on city streets.

The street railway commission's recommendation that twenty-five one-man safety cars be bought for the municipal railway has been concurred in by the Council, despite the adverse report of Councilman Kronk, who investigated the value and use of these cars on a recent trip to Eastern cities where one-man cars are being used.

It was the opinion of some of the Councilmen that according to the city charter the Council could only accept or reject tentative routes but could not decide on equipment and that therefore there was nothing else to do under the charter but to concur in the commission's recommendations in regard to the cars. The one-man cars are planned for use on the light traffic lines only.

More Bonds Sold

Acting upon the recommendation of the city comptroller the Council has authorized the sale of $1,000,000 worth of street railway bonds to a New York firm for further financing the municipal system. The bonds are 5½ per cent bonds, but at the price bid, 103.17, the interest rate to be paid by the city will be approximately 5¼ per cent. The recent bids are reported as the first in which a private party has been high bidder on the street railway bonds. This authorized sale brings the amount of bonds authorized up to $2,750,000 and leaves $12,250,000 yet to be sold.

In discussing the local traction situation, the Detroit United Railway through its publicity department states that the opponents of service-at-cost settlements have never been able to produce a single valid argument against the merit of fundamentals underlying the proposal. A plan of unified operation and unified fares without the taxpayers having to dip into their pockets, made slim by a multitude of taxation requirements and demands, awaits the people of Detroit.

The piece-meal undertaking, according to the D. U. R., is in itself a service-at-cost proposition—if the city charter is not persistently violated by the authorities—the big and important difference between the two being that under municipal piece-meal all the costly extravagances of municipal spending must be met while the service-at-cost contract with a company to enter the service gives to the riders, through lessened costs, the economies practiced by private companies.

Indiana Committee Working with Commerce Bodies

The Indiana Committee on Public Utility Information, of which Charles L. Henry is chairman, is endeavoring through the local utility men in various communities to bring about the passing by chambers of commerce, boards of trade, rotary clubs, etc., of resolutions recognizing the difficult situation in the public utility industry, that good public utility service is a paramount issue, that the utilities are entitled to a measure of co-operation on the part of the public and that in general those who provide such service are entitled to rates that will cover the operating expenses and give them a reasonable return on their investment. The effort to secure the adoption of such resolutions in various cities was inspired by action of this character taken by the Chamber of Commerce of South Bend, Ind., recently.

Wage Rehearing Again Denied

Denial of a motion for a rehearing of its recent wage award of 5 cents an hour increase in the pay of employees of the United Railways of St. Louis has been announced by the Public Service Commission of Missouri. The decision was unanimous. The employees had asked for 35 cents an hour increase, the commission sitting as a board of arbitration in the case. The men are now paid 50, 55, and 60 cents an hour, according to the length of service. This was the second denial of a motion for a rehearing by the commission. The second motion was filed after the carmen's union had unanimously voted not to accept the award.

The men declared that David E. Blair, a member of the commission who heard the presentation of the case, resigned before a decision was reached and did not vote on the decision, but that the deciding vote on the award was cast by Mr. Blair's successor, John Kennish, who had heard none of the case. Edward Foristel, attorney for the men, said that he felt the award was disappointing, but that he would advise the men to stand by the decision, inasmuch as they had agreed previously to accept whatever decision the commission rendered. He said he would present the claims of the men to the commission in December, when the present rate of fare expires and the company appears before the body.

May Build Oklahoma Interurban

Plans for building an electric interurban line from Oklahoma City to Muskogee, Okla., via Henryetta, which were begun before the war but were halted, have again been taken up and it is believed they will be carried through to completion at an early date. R. D. Long, promoter of the enterprise, has already spent about $50,000 on preliminary surveys. Mr. Long has just returned from the East and he reports that he has been assured co-operation of Eastern financiers.

Plans contemplate the erection of a large power station near Henryetta in the heart of the coal fields for supplying current for the entire line and for cities touched by the railway. The road and power plant, it is estimated, would cost in excess of $24,000,000. Plans contemplate bringing the line into the cities on elevated tracks, thus eliminating all traffic delays and making unusually fast time possible.

Persons interested in the project will hold an early meeting in Muskogee for the purpose of taking action looking to something definite with regard to building the road.

News Notes

Service Restored in Paducah.—Electric railway service is practically normal again in Paducah, Ky., after a cessation of more than three weeks. New generating units have been installed at the power house of the Paducah Electric Company to replace those wrecked by an explosion at the plant a month ago. It has been found necessary to take off cars at night to conserve lighting for commercial purposes.

Ask More on One-Man Cars.—Employees of the Eastern Pennsylvania Railways, Pottsville, Pa., are demanding double wages for the operation of one-man cars. The company has stated that although one-man operators are entitled to an increased scale, it is unable to meet the demands of the men. The dispute had its beginning in September of this year, when the employees declared that the Eastern Pennsylvania Railways had no right to operate this type of car. After the company refused to arbitrate the issue the men struck and the entire system was tied up for five days. Later wage arbitration was agreed upon.

City's Plans Take Shape.—Grover A. Whalen, Commissioner of Plant and Structures of New York City, is completing arrangements for taking over the lines of the Staten Island Midland Railway, Richmond borough. Under the terms of an agreement approved by the Board of Estimate the city will operate the road for a period of one year beginning about Dec. 1. John J. Kuhn, receiver of the Richmond Light & Railroad Company, has signed a contract whereby the latter company will permit the city to use its tracks through St. George and Tompkinsville. The Richmond Light & Railroad Company will also supply the city with current at cost.

"Scribner's" Has an Article on Utilities.—James Edwards has contributed to *Scribner's* for November an article "The Public Utility Field." To the man actively engaged in public utility work there is nothing particularly new in what Mr. Edwards has written, but he has presented some of the utility problems in a way that should help to a better understanding of the problems of the industry by the general public. He says that it is fundamentally true that the people as a whole have a keen sense of justice and in the long run will arrive at a correct decision, and while they are entitled to and will insist on reasonable rates they are willing to pay for good service.

More Authority for Toronto Commission.—At a meeting of the City Council of Toronto, Ont., on Nov. 9 an ordinance was passed vesting in the Toronto Transportation Commission complete control of the city streets with respect to the construction and operation of tubes or of motor buses. The commission was recently appointed in connection with the proposed taking over of the Toronto Railway at the expiration of the latter's franchise next September. The city already has power under the city of Toronto act of 1910 to construct, build, maintain and operate a system of underground railways for the carriage of passengers and freight and may acquire any necessary land therefor under the provisions of the law.

Service Halts in Braintree.—The Eastern Massachusetts Street Railway, Boston, Mass., recently discontinued service in Holbrook and Braintree, Mass., owing to the refusal on the part of the towns involved to revoke jitney licenses. The trolley situation in these sections served by the Eastern Massachusetts Street Railway was discussed at a meeting in Braintree on Nov. 3, at which representatives from Braintree, Holbrook and Weymouth were present. Although it was pointed out that jitneys had given good service the citizens expressed appreciation of a dependable railway system. At a later meeting authorization was given to the Board of Selectmen of Braintree to call on the trustees of the Eastern Massachusetts Street Railway to see what could be done in the matter of having service restored. The board later passed an ordinance regulating the buses, following which service was restored.

Charge for Power Before Commission.—Application has been made to the Public Service Commission by the International Railway, Buffalo, N. Y., for an order determining the just and reasonable rate for electric energy to be charged by the Tonawanda Power Company for operation in Tonawanda, North Tonawanda, Lockport, Wheatfield, Pendelton and Newfane after Jan. 1, 1921. A contract made fifteen years ago by the International Railway with the power company expires at that time. The railway alleges the power company seeks an increase in rates after Jan. 1 of approximately 43 per cent. It is the contention of the railway that such an increase in the cost of electricity will cause a burden on operating conditions and an additional hardship on traffic in the territory. The company says the proposed rate is unjust, unfair and unreasonable.

Financial and Corporate

More 10-Cent Cities

Statistics Compiled by American Electric Railway Association Indicate Tendency Toward Basic 10-Cent Fare

Statistics compiled by the American Electric Railway Association showing the rate of fare in effect on Nov. 1, 1920, in the 288 cities of the United States having a population of 25,000 or more, indicate a continuing upward trend in street railway rates and a distinct movement toward a base charge of 10 cents.

The association's figures show that a larger urban population is now paying a 10-cent base rate than is paying the former nickel charge. New York City has been omitted from the calculations because, owing to a complicated political situation, the principal surface lines are in the hands of receivers and various rates, from 8 cents to a flat 5 cents, are in effect, making comparisons impossible.

Fifty-two Nickel Cities

The 287 cities, excluding New York City, have a combined population of 32,173,312. Forty-nine cities having a combined population of 4,992,414 are on a 10-cent base rate; two cities with a population of 189,085 have a 9-cent base rate; twenty-seven cities, population 5,191,725, have an 8-cent base rate; eighty-four cities, population 10,415,175, have a 7-cent base rate; fifty-five cities, population 5,283,100, have a 6-cent base rate; fifty-two cities, population 4,222,307, have a 5-cent base rate; and eighteen cities, population 1,879,506, have zone systems which make the rate higher than 5 cents.

The increase in fares as compared to February, 1920, when the association issued a similar statement, is most significant. The 1920 census added some fifteen cities to the group under consideration without, however, affecting the general divisions. Cities in the 25,000 group paying more than a 5-cent fare increased from 192 to 235; the 10-cent cities increasing from twenty-three to forty-nine; 8-cent cities from fourteen to twenty-seven, and 7-cent cities from fifty-eight to eighty-four, while 6-cent cities decreased from seventy-one to fifty-five; 5-cent cities from eighty to fifty-two, and zone system cities from twenty-six to eighteen. Of the fifty-two cities charging a 5-cent fare only four have a population of more than 100,000 and of these there is immediate prospect of increase in two.

Dime Fares in Many Cities

Chicago (on its elevated lines), Boston, Pittsburgh, Seattle, New Haven, Bridgeport, Hartford, Fall River, Lowell, Cambridge and Lawrence are among the large cities having a 10-cent base, while for cash passengers securing transfers, at certain points, the fare in Philadelphia is 10 cents, as it is in Washington for riders transferring between the two separately-owned systems. In certain of the zone-fare cities, such as Providence, Worcester, San Diego, Springfield and New Bedford, the fare for all but the short-ride passengers is 10 cents or more.

With regard to the basic 10-cent fare the association's statement says:

> A study of the statistics prepared by the association and comparison with previous tabulations of the same kind together with the applications for increases pending in various cities seem to indicate that the street car fare in the United States is gradually gravitating toward a flat rate of 10 cents in order to catch up with increased operating costs, which it is claimed by the industry have more than doubled since 1914.

Profit of 0.267 Cent per Fare

The 8-cent fare on the Chicago (Ill.) Surface Lines produced the revenue in August and September indicated in the accompanying statement. The half-fares collected from children brought the average rate per revenue passenger down to a unit slightly below 8 cents. The average rate of fare per passenger for September was 4.47 cents; in other words, 78 per cent of the revenue passengers used transfers. As to the disposition of the revenue per passenger, the first item in the table shows that 4.308 cents is taken for labor alone.

DISPOSITION OF FARE BY CHICAGO SURFACE LINES

	August 1920	September 1920
Passenger revenue	$ 5,021,478	$ 4,940,323
Revenue passengers carried	63,138,188	62,044,885
Total passengers carried	113,396,053	110,488,632
Average fare, per revenue passenger—cents	7.953	7.962
Disposition:	Cents	Cents
Wages	4.269	4.308
Material, power and other expenses	1.494	1.472
Taxes	.250	.256
Damages	.282	.287
5 per cent on purchase price	1.060	1.045
55 per cent to city	.329	.327
45 per cent to companies	.269	.267
	7.953	7.962

This throws interesting light on the possibility of Mayor Thompson's campaign for 5-cent fares. The total profit after deducting operating expenses and the 5 per cent allowance for interest on bonds is 0.267 cent, of which 55 per cent goes to the city and 45 per cent to the companies for dividends. Recently the Public Utilities Commission decided that the allowed rate of return on the value of the property should be 7.5 per cent. This will reduce the amount available for profit in future months.

Income Increase Shown

$15,000 Net Gain in September Compared with Results in July, $28,000 with August

The net income of the Minneapolis (Minn.) Street Railway increased $15,363 in September, as compared with July, and $28,261 compared with August, according to a report submitted to the City Council by President Horace Lowry. The quarterly income statement is required by the ordinance which granted the company authority to increase the fare from 5 cents to 6 cents Aug. 16.

The report of Mr. Lowry showed the total operating revenue was $571,150 in July, $596,728 in August and $657,066 in September, making a total of $1,824,945 for the quarterly period. The total operating expenses were $383,181 in July, $422,286 in August and $458,390 in September, a total of $1,263,859 for the three months. The net operating revenue was $187,968 for July, $174,442 for August and $198,675 for September, making a total three months' net revenue of $561,086. The total non-operating income was set forth as $1,993 for July, $2,042 for August and $2,567 for September, a total of $6,603 for the three months.

Net Income $66,729

The gross income was shown to be $133,551 for July, $120,088 for August and $146,700 for September, a total of $400,340. The total deduction for miscellaneous rents, interest on funded debt, interest on unfunded debt and miscellaneous debits amounted to $82,185 for July, $81,520 for August and $79,970 for September, a total of $243,677, leaving the net income $51,366 for July, $38,567 for August and $66,729 for September, a total of $156,663 for the three months.

Mr. Lowry explained that with fifty-nine additional cars in service at the end of September, the comparisons with July and August regarding the net income would in the following month naturally show a decline, for the service improvement was accelerated in September until the maximum shown in the report was reached.

At the same time, Eugene Lund, city street railway inspector, submitted a report showing an increase of fifty-nine cars operated from Aug. 17 to Sept. 30. In that period, according to the report, 1,015 more car miles were operated on the average weekday.

To meet the rush-hour demands and in carrying out the promise of the company for improvement in service, Foster Hannaford, general manager of the railway, said twenty-five improved type trailers would be in operation this winter. The order for these trailers, similar to one tried on the Nicollet Avenue line, was placed on Oct. 22.

The company is committed to a plan of placing 300 front exit cars in service by early in 1921 and the first six of these cars, remodeled at the Snelling Avenue shops, will be in operation soon, Mr. Hannaford said.

P. R. T. Gaining

Receipts Increase Approximately 20 per Cent Under 7-Cent Fare—Ten Months' Deficit $1,702,120

The gross passenger earnings of the Philadelphia (Pa.) Rapid Transit Company for the first fourteen days of November totaled $1,735,000, an increase of $319,000 over the same period a year ago. Of this amount, $222,400 represents the increase in revenues over and above that which would have been secured through the normal business under the former 5-cent fare without change of the exchange ticket and free transfer privileges. This indicates an increase of approximately 20 per cent in the daily earnings under the 7-cent cash fare, with four tickets for a quarter, effective Nov. 1.

SUMMARY OF OPERATIONS OF PHILADELPHIA RAPID TRANSIT COMPANY

Month ended Oct. 31, 1920		1920	1919	Percentage Change Over 1919
Operating revenue		$3,336,595.71	$3,165,552.88	5.4
Operation and taxes		2,445,370.67	2,140,411.79	14.3
Operating income		891,225.04	1,025,141.09	—13.1
Non-operating income		53,958.52	45,216.09	19.3
Gross income		945,183.56	1,070,357.18	—11.7
Fixed charges		819,815.43	813,550.95	0.8
Net income		125,368.13	$256,806.23	—51.3
Deferred wage adjustment—one month	$187,500.00			
Five per cent return on P. R. T. paid-in capital — one month	125,000.00	312,500.00		
Amount by which gross revenues are insufficient to provide for operating expenses, taxes, fixed charges, and the 5 per cent return upon P. R. T. stock		$187,131.87		

Ten months ended October 31, 1920		1920	1919	Percentage Change Over 1919
Operating revenue		$31,191,329.44	$29,160,983.65	7.0
Operation and taxes		23,005,600.94	20,029,040.98	14.8
Operating income		8,185,728.50	9,131,942.67	—10.4
Non-operating income		476,309.61	441,311.35	7.9
Gross income		8,662,038.11	9,573,254.02	9.6
Fixed charges		8,176,658.71	8,109,495.08	0.8
Net income		485,379.40	$1,463,758.94	—66.8
Deferred wage adjustment—five months	$937,500.00			
Five per cent return on P. R. T. paid-in capital — ten months	1,250,000.00	2,187,500.00		
Amount by which gross revenues are insufficient to provide for operating expenses, taxes, fixed charges, and the 5 per cent return upon P. R. T. stock		$1,702,120.60		

RESULTS EXCEED EXPECTATIONS

In announcing the company's receipts for the first two weeks of the 7-cent fare officials of the company intimated that the results under the new rates far exceeded their expectations. On the basis of the results thus far obtained, the 7-cent fare is expected to increase the company's revenues approximately $7,000,000 annually. In 1919 the company collected $34,739,589 on a straight 5-cent fare. The 7-cent rate, it is estimated, will give the P. R. T. more than $10,000,000 in excess of that figure. The usual increase in the number of passengers carried results in a gain of between $3,000,000 and $4,000,000 annually, so that $7,000,000 is a conservative estimate of actual increases from the new fare.

The company officials said that they did not regard the period taken as a complete test. It comes at the time of the year when the traffic is especially heavy. They contend that January and February must be passed before they will be able to reach a final decision regarding the success of the new rate. On the other hand, receipts are expected to take a marked jump during the rest of November and December. These two months of each year mark the high-water point in the number of passengers carried by the company. The latter part of this month and all of December are expected to result in perhaps $10,000 daily being added to the present receipts of $120,000.

Eighty-four per cent of the P. R. T. riders are using 6¼-cent tickets, leaving only 16 per cent paying the 7-cent cash fare. On Nov. 1, the first day of the higher fare, the sale of tickets approximated $250,000. Every effort is being made by the company to speed up the service so that more space will be available. Schedules have been rearranged and several lines have been rerouted to eliminate delays. On routes 3 and 27 the increased efficiency resulting from these changes will make possible twenty-five additional trips daily.

The income statement of the P. R. T. for October shows that the company will have to overcome a total deficit for the first ten months of 1920 of $1,702,120. If present conditions continue it is expected that more than half of this deficit will be wiped out by the end of the current year. This deficit includes the 5 per cent dividend to the P. R. T. stockholders. The deficit for the month of October was $187,131. The company's net income for the month amounted to $125,368 as compared with $256,806 during the same period one year ago.

Deficit at Rochester

Commissioner Barnes Reports for First Full Month of Service at Cost—Total Loss $33,793

The operating revenue of the Rochester lines of the New York State Railways for September was $4,627 less than sufficient to meet operating expenses and other obligations, according to a report submitted on Nov. 9 by Commissioner C. R. Barnes to the Mayor and the Common Council. Charges for renewals and depreciation were eliminated from the calculations that yielded this deficit or it would have been larger. Under the contract between the city and the company a balancing fund of $300,000 was to be created for the purpose of taking care of losses and profits from operating revenue. The present 7-cent fare was to be reduced should the balancing fund exceed $400,000 or increased should the fund fall below $200,000.

TOTAL DEFICIT $33,793

The contract also specifies that each month at least 2 per cent of the fixed valuation of the physical property shall be placed in a "renewal and depreciation" fund, but this provision may be disregarded by consent of both the company's authorities and the commissioner of railways. Pending the appraisal of the property a valuation of $17,500,000 was established for the purpose of the contract. Under this valuation the minimum amount to be placed in the renewal and depreciation fund each month is $29,166. This charge was made upon the operating revenues of the company in August, but was eliminated in September.

For August a deficit of $71,000 was created. The contract became effective on August 1, but the increased fare was not put in force until August 28. Because of this delay it was decided to spread the August deficit over a period of months. Had this loss been made up immediately and an appropriation made in September for the renewal and depreciation fund, it would have been necessary to increase the fare at once.

A summary of the income statement for the month of September is as follows:

Railway operating revenue	$408,648
Railway operating expenses	302,285
Net revenue from railway operation	106,362
Auxiliary operation, deficit	23
Net revenue from operation	106,339
Taxes assignable to operation	23,728
Net revenue	82,610
Non-operating revenue	1,761
Gross income	84,372
Return on investment	89,000
Deficit	4,627

In accordance with the service-at-cost contract, the above deficit is made up from the balancing fund.

The report of Mr. Barnes follows in part:

A charge for renewals and depreciation, which under the terms of the contract should be at least $29,166.66, has been excluded from the September statement. This is done by mutual consent, as authorized in the contract, for the reason that the net revenue was not sufficient to provide for such charge. . . .

During the month of August $29,166 was accrued for . . . reconstruction of track on Main Street east now taking place. The original cost of the track being replaced, less salvage, is a complete loss and such loss is charged against this accrued amount. * * *

STATISTICS OF OPERATION
(City lines only)

	Number of Passengers, September
Revenue passengers	5,878,006
Free passengers	119,969
Transfers	1,976,526
Total passengers	7,974,501

Free passengers as shown here are principally employees of the company who ride on free tickets. In addition firemen and policemen in uniform are carried free.

During September 60.64 per cent of the city revenue was derived from tickets; 33.62 per cent of the city revenue passengers used transfers.

In September there were 7.7 city revenue passengers carried per city passenger car mile.

The average rate of fare for full-fare passengers was 6.68 cents, an increase of 33.6 per cent over the 5-cent fare.

Comparison of passenger car miles on city lines operated in September, 1920, with September, 1919, is as follows:

September, 1920	766,585
September, 1919	652,367
Increase	114,218
Percentage increase in service	17.5

The number of revenue passengers carried during September, 1920, on the city and suburban lines included in the service-at-cost contract was 6,092,949. The cost per revenue passenger carried during September, 1920, on these lines was as follows:

	Cents
Labor	3.5740
Power	.3833
Material and supplies	.4957
Casualties	.2680
Miscellaneous expense	.2407
Taxes	.3894
Return on investment	1.4607
Total	6.8118
Average revenue from all sources per revenue passenger	6.7358
Deficit per revenue passenger	.0760

The above expenses do not include any charges for renewals and depreciation which if included would have made the deficit .5547 cents per revenue passenger.

To improve the service generally, especially in the matter of regularity, changes have been made in the operating methods. Inspectors are located at the important points on all lines to regulate and record the movement of cars. At the heavy loading points, additional men are stationed to assist in loading and despatching cars. Four men from the mechanical department are placed at different parts of the city to make immediate possible repairs to cars which become disabled on route. During the rush hours emergency trucks are stationed on the street at various points on the system for the purpose of facilitating their work in removing obstructions from tracks, repairing broken wires and caring for derailed or disabled cars. In addition to the above the service is under the constant supervision of this department, especially during the morning and evening hours. These and other changes made in the operation have resulted in material improvement in regularity of service. . . .

In the month of September of this year compared with the same month in 1919 there was an increase of 114,218 city car miles run, or 17.5 per cent, while the city passengers carried in September compared with thirty days in August of this year shows a falling off of 125,869 or 15.5 per cent.

Collateral Sale Nets $265,000

The 181,860 shares of common stock of the American Railways, Philadelphia, Pa., pledged as collateral for the National Properties 4 and 6 per cent bonds, were sold at public auction on Nov. 8, by order of the United States District Court, at the Federal Building, Wilmington, Del., by Francis de H. Janvier, special master. The stock was bought in by the bondholders' protective committee, of which Evan Randolph is chairman, for $265,000, this being the only bid made. The petition filed in the United States District Court at Wilmington in behalf of the above sale was denied by Judge Morris. The court fixed Nov. 19 as the latest date on which objections might be filed.

Attorneys representing the minority bondholders' committee have filed an involuntary petition in bankruptcy seeking to have the affairs of the company investigated. A representative of the minority bondholders is quoted as saying: "When a company is adjudged a bankrupt a referee in bankruptcy is appointed. Such officer would have authority to make investigations as to what caused the company to become bankrupt and make other investigation of its condition we desire."

Bay State Deficits Continue

The report of operations of the Eastern Massachusetts Street Railway, Boston, Mass., for September shows that only three of the eleven "home rule" districts of the company had a surplus after deducting the total cost of service, including an allowance of 6 per cent on the valuation of the property. The remaining eight districts had deficits ranging from $3,747 to $17,612 for the month. All districts, however, showed revenues in excess of operating expenses and taxes. The only districts having surpluses were those including Fall River, Lynn and Taunton.

The above table shows in detail the September operations by districts.

RESULTS OF OPERATIONS, EASTERN MASSACHUSETTS STREET RAILWAY, SEPTEMBER, 1920

District	Total Revenue	Operating Expenses and Taxes	Six Per Cent on Property	Total Cost of Service	Surplus or Deficit
Chelsea	$127,556	$114,568	$20,100	$134,668	Def. $7,112
Melrose-Woburn	80,587	69,665	21,050	90,715	Def. 10,128
Lynn	144,664	112,989	21,550	134,539	Sur. 10,125
Salem	101,235	99,147	19,700	118,847	Def. 17,612
Lowell	125,503	105,900	23,250	129,150	Def. 3,647
Lawrence	77,925	71,098	14,600	85,698	Def. 7,773
Haverhill	41,485	37,768	9,850	47,618	Def. 6,133
Quincy	68,849	58,027	16,200	74,227	Def. 5,378
Brockton	127,558	114,757	28,800	143,557	Def. 15,999
Taunton	40,275	26,743	8,950	35,693	Sur. 4,582
Fall River	120,089	99,442	17,400	116,842	Sur. 3,247

G. E. Plans Stock Issue

The directors of the General Electric Company at a meeting in Boston on Nov. 12 authorized the issuance of $27,500,000 common stock to be offered to stockholders of record Dec. 8 at par at the rate of one share of new stock for every five shares of stock then held. Subscription to the new stock must be made on or before Jan. 20, 1921, and payments are to be made either in four equal installments on Jan. 20, April 20, July 20 and Oct. 20, 1921, or in full at time of subscription. The directors declared the regular quarterly cash dividend of $2 a share and the regular semi-annual dividend of 2 per cent in stock, both payable Jan. 15 to stock of record Dec. 8.

Foreclosure Decree Postponed

Issuance of a decree of foreclosure sale of the properties of the New York (N. Y.) Railways under the provisions of the first real estate and refunding mortgage, the interest on which has been in default for several interest periods, has been postponed by Judge Julius M. Mayer in the United States District Court to the third Monday in January. The junior bondholders' protective committee, represented by B. H. Blanc, opposes the issuance of a decree at this time on the ground that changing conditions are making an improvement in the situation of the company and that a dissolution of the properties at the present time would work an injury not only to the junior bondholders but to other creditors. Joseph P. Cotton, representing the holders of the first real estate and refunding 4s, opposed any further delay and told the court that the interest of the first mortgage bondholders was being curtailed by the accumulating tax liens now amounting to approximately $2,700,000 on the property.

J. G. Bouvier, who represented the creditors' committee, which has claims aggregating $1,500,000 against the company for damages, also opposed the issuance of a decree at this time. Judge Mayer in setting the third Monday of January for final argument in the matter expressed the opinion that recent political events had created a change in the state of mind of the public and that with assurances stated to the newspapers by Governor-elect Miller of his interest in the transit problems the creditors of the company had much more to hope for now than at any time since the receivership began. He asked that a conference of the creditors be called for Nov. 22 to discuss further measures to obviate any necessity for a final foreclosure.

Progress in Ontario Negotiations

Negotiations which have been carried on by Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, for the acquisition of radial railways and power companies in and around Toronto controlled by Sir William MacKenzie, have reached the point where the bondholders must be consulted. Sir William MacKenzie is now on his way to England for the purpose of placing before the bondholders two alternative propositions—one to

discount their holdings and sell out for cash and the other to allow the Hydro Commission to assume all outstanding obligations.

The price mentioned is in the neighborhood of $35,000,000, which represents securities sold. If it can be arranged, either the city of Toronto or the Hydro-Electric Commission will take over the obligations, so that very little cash will have to be provided.

Four companies are concerned in the negotiations—the Electrical Development of Ontario, which owns the generating plant at Niagara Falls; the Toronto & Niagara Power Company, owning the transmission lines from the Falls to Toronto; the Toronto Electric Light Company, which distributes light and power; and the Toronto & York Radial Railway, owning and operating the Metropolitan, Scarborough and Mimico Divisions. The capital stock of all these subsidiaries is owned and controlled by the holding company known as the Toronto Power Company.

Westinghouse Offers $30,000,000 of Notes

Kuhn, Loeb & Company, New York, N. Y., have made a public offering of $30,000,000 of 7 per cent eleven-year bonds of the Westinghouse Electric & Manufacturing Company at 94¾ to yield 7¾ per cent. The purpose of the issue is to secure working capital for a fixed period, and the proceeds of the sale of the bonds are to be applied to the payment of more notes payable. The New York Stock Exchange has admitted the notes to trading when issued.

For the six months ended Sept. 30, 1920, billings amounted to $78,771,675, and it is believed for the fiscal year to end March 31, 1921, will exceed sales billed for the previous fiscal year. Income for the six months ended Sept. 30, 1920, after deductions for depreciation, federal and other taxes, amounted to $8,164,875, while interest charges for that period amounted to $751,852.

As of Sept. 30, 1920, current assets were $128,630,880, while current indebtedness, consisting mainly of accounts payable, not due, advance payments on contracts and accruals for interest, federal and other taxes, after applying as of said date the proceeds of the sale of the bonds, amounted to $31,112,486.

Consolidation Still Under Consideration

Any possibility of a consolidation of the traction lines of the Spokane & Eastern Railway & Power Company, Spokane, Wash., and the city lines of the Washington Water Power Company is still well in the future, according to F. E. Connors, vice-president of the former company, who has returned to Spokane from Chicago. Mr. Connors said:

> Nothing will be done in the consolidation matter until President Taylor comes to Spokane and he will be unable to do this for some time. Therefore I do not expect anything definite on the consolidation soon. I went east especially to visit my family and spent most of the time with them. No action was taken on the consolidation matter.

The question of the consolidation of the two lines through purchase by the Washington Water Power Company has been up from time to time in the past. Some months ago engineers of the two companies were set to work to figure out the traction valuation, the cost of connecting the two lines physically, the competing lines that would be eliminated and the resultant saving. While it is assumed that this work has been completed, the results are being held pending consultation of the representatives of the companies.

Financial News Notes

New Director Named.—James Dean has been elected a director of the Manchester Traction, Light & Power Company, Manchester, N. H.

Memphis Doing Better.—The September report of the Memphis (Tenn.) Street Railway shows a surplus of $12,257 for the month. The company has paid renewals and replacements amounting to $19,012 and taxes amounting to $21,338. The report showed that 4,514,393 passengers were carried during the month, only 20 per cent of whom took advantage of the 6½-cent fare.

Will Redeem Bonds.—The entire outstanding issue of three-year 7 per cent collateral trust sinking fund gold notes of the Republic Railway & Light Company, Youngstown, Ohio, dated Jan. 15, 1920, amounting to $1,233,000, has been called for redemption Dec. 6 at 100½ and interest from July 15 to Dec. 6, amounting to $27.42 for each $1,000 note, payable at the First Trust & Savings Company, Cleveland, Ohio.

Road to Be Sold.—Judge George E. Hinman, in the Superior Court, has authorized Robert W. Perkins, receiver of the Shore Line Electric Railway, to sell the property of the Norwich & Westerly Traction Company, Norwich, Conn., and has given him until Jan. 15 next to make the sale, placing the "upset" figure at $191,000. The court also advised that the road be kept in operation until Dec. 1.

Offers Line to City.—J. A. Cusick, president of the Bay Shore Street Railway, Green Bay, Wis., has notified the Green Bay City Council that unless relief is immediately forthcoming for the railway, the company will have to tear up its tracks and sell the cars, ties and rails as junk. Mr. Cusick has offered to sell the property to the city. The company operates about two miles of track.

Abandonment Approved.—The Public Service Commission for the Second District of New York has approved a declaration of abandonment by the Orange County Traction Company, Newburgh, of a portion of its line in the city of Newburgh. The commission denied the petition on Jan. 6, 1920, when the company applied for complete abandonment of its line on Bridge Street, but suggested that the company file a new petition, submitting a declaration of abandonment of a portion of the Bridge Street line.

Property Assessment Protested.—The receivers of the Memphis (Tenn.) Street Railway have given notice that they will seek a reduction in the assessment returned against their property by the State Railroad and Public Utilities Commission and upon which the company must pay taxes to the city. The amount at which the railway's property within the corporate limits of Memphis is assessed is $10,449,887. The holdings of the Memphis Gas & Electric Company are assessed at $9,104,600. The total amount at which the city's public utilities are assessed is $37,009,738.

Reorganization Plan Held Up.—It is reported that the operation of the reorganization plan of the Schuylkill Railway, Girardville, Pa., is being held temporarily in abeyance pending the determination of the ability of the company to meet the obligations required thereby. The interest deferred on Oct. 1, 1919, on the Schuylkill Traction first mortgage 5s of 1943 was paid on Dec. 31, 1919, and has been paid at maturity since that date. No interest has been paid on the Schuylkill Railway first consolidated 5s of 1935 since the maturity of April, 1919. Fares were increased on Oct. 1, 1920, from 5 to 6 cents cash for the modified zone, with twenty tickets for $1 instead of six tickets for 25 cents.

Winnipeg Company Offers Stock.—René T. Leclerc, investment banker, Montreal, Que., is offering for subscription at 90, to yield 7¾ per cent, an issue of $3,000,000 7 per cent cumulative preferred stock of the Winnipeg, (Man.) Electric Railway, of par value $100. The issue was recently authorized by the shareholders of the company to retire notes and bank loans. It carries a bonus of 30 per cent in common stock. It is stated that the average annual net earnings of the company for the three pre-war years ended Dec. 31, 1914 (which would have been available for dividends under present issue of preferred stock), were $1,148,193. The average annual net earnings for the three years ended Dec. 31, 1919, were $496,637. The estimated net earnings for the current fiscal year, based on actual figures for the first eight months, are $630,000. The shareholders of the company will vote on Dec. 1 on a proposal to give voting power to the holders of the new issue and to provide that no additional issue of preferred stock shall be made without authority from at least two-thirds of such stock outstanding. At the same time, the shareholders will approve an increase in the common stock from $10,000,000 to $11,000,000.

Traffic and Transportation

Des Moines Value Fixed

Appraisers for City Report That Fare of 5¾ Cents Would Yield 7 Per Cent Return

The report of the appraisers appointed in August by the City Council of Des Moines, Iowa, to make an appraisal of the property of the Des Moines City Railway was made public this week. The report was filed a week ago, but announcement was made by the city attorneys that it would not be made public immediately but "would be held as a club over the heads of the traction company in future litigation." However, after severe criticism of the city's attitude by the daily newspapers, the report was given out in full.

According to the report the present depreciated value of the railway's property is $6,089,989. This is based upon prices in effect Aug. 1 of this year. The report estimates that it would cost to replace the entire property, new, $9,089,989. The actual value of the property on Aug. 1, 1915, which was placed in the franchise granted the Des Moines City Railway at $5,000,000, could not have been more than $3,201,570 and was probably nearer $2,025,678.

Fare Results Estimated

The report follows a survey of the property continuing over three months and fills 1,000 pages. It does not contain an audit of the books of the company which is to be made later under the direction of the City Council. The report does not attempt to fix the rate of fare which should be charged in Des Moines but sets out how much should be charged to secure given rates of return upon the capital.

Based upon the service being furnished in Des Moines at present the appraisers find that a 5½-cent fare would pay 6 per cent return on a valuation at the present price level and that in order to get a 7 per cent return 5¾ cents a passenger would be sufficient. Going into the question of increased service the appraisers state that if the present service were increased by 50 per cent a 7.2-cent fare would yield 7 per cent, 7.1 cents 6 per cent and 6.9 cents 5 per cent.

City officials and attorneys have announced that they are satisfied with the results of the appraisal and that they feel it will lead to a settlement of the local railway controversy. City Attorney C. W. Lyon declares that his policy in securing a settlement of the question will be to first consider the question of service and that he will favor a sliding scale of fares with a reserve fund.

F. C. Chambers, general manager and operating receiver of the Des Moines City Railway, holds that he could see no way in which the report of the appraisers would serve to bring about a settlement of the dispute with the city. Mr. Chambers states that with the exception of the present reproduction value, which he estimates to be from 10 to 15 per cent too low, the values announced by the appraisers are "little short of ridiculous." He calls attention to the fact that the Des Moines City Railway has never paid a dividend and has created no depreciation fund. The depreciated value as of Aug. 1, 1915, he says is "entirely out of the question," as the power-plant alone was worth half the figure announced as the total depreciated value by the appraisers.

Mr. Chambers further states that for the appraisers to offer figures to show what rate of fare is necessary to bring a 5 per cent return on the capital is merely a waste of time, considering the conditions of the financial market at the present time as regards interest rates. The appraisal was made at an expense of $10,000 to the city, which will have to be paid by the taxpayers of Des Moines.

Seattle Bus Operators Seek Compromise

Judge Walter French of the Superior Court has denied a motion of the city of Seattle, Wash., to dissolve the temporary injunction restraining the city authorities from prohibiting the operation of jitneys. The ordinance barring the buses from the streets was adopted by the City Council several months ago to afford relief to the Seattle Municipal Railway. Pending a final decision by the courts as to the legality of the measure, the buses have continued operation. The city will appeal the case to the State Supreme Court. It will be several months before a final opinion can be rendered.

Since the rejection by the voters at the election on Nov. 2 of a proposition to give the jitney men a practically free hand in so far as the fixing of fares and routes was concerned, the bus operators have adopted a more conciliatory attitude. The Sound Transit Company, among others, has offered to accept traffic regulations which it formerly opposed. These regulations have been drawn up by Carl H. Reeves, superintendent of public utilities, and prescribe routes and termini for the buses.

A recent check of jitney traffic made by the city authorities indicates that operation of the buses is resulting in a loss of between $600 and $900 daily to the Seattle Municipal Railway.

Favors Galveston Increase

Special Master Finds Nickel Fare Confiscatory—Company Seeks Injunction to Restrain City

The Galveston (Tex.) Electric Company is entitled to an increase in fare in its Galveston city lines. This is the decision reached by Henry J. Dannenbaum, special master, who has been taking testimony in the case of the Galveston Electric Company vs. the City of Galveston. The company is seeking an injunction against the enforcement of a municipal ordinance limiting the fare to 5 cents. Mr. Dannenbaum finds that the return earned by the company under the 5-cent fare is "insufficient and confiscatory."

Dispute of Long Standing

The Galveston fare controversy dates back more than a year. At that time the company made application to the City Commission for authority to increase fares to 7 cents. Its petition was granted. Later a change was made in the city administration and the 7-cent fare ordinance was repealed. The company then went into the United States District Court and asked an injunction against the city to restrain the enforcement of the ordinance repealing the 7-cent fare and to restrain the city authorities in all efforts to prevent the collection of a 7-cent rate. The injunction was sought on the ground that the 5-cent fare, as demanded by the city, was confiscatory and did not permit adequate return on the company's investment.

Mr. Dannenbaum was appointed as special master to hear evidence in the case and to report his findings to the court. Further action on the issue of granting the injunction prayed for is to be taken by Judge J. C. Hutcheson of the United States District Court at Houston and will be based on the report and recommendations filed by the special master.

Net Return 1.86 Per Cent

According to figures allowed by the special master, the Galveston Electric Company earned for the year ended June 30, 1920, the sum of only $50,249, or 1.86 per cent on the value of its property. Estimating an earning capacity of 8 per cent, allowed on contention of the complaint, a deficit of $123,000 is shown between the company's earnings of $548,477 for the year and the cost of operation.

The total required revenue is arrived at as follows: Operating expenses, less maintenance, $314,073; maintenance, $80,322; depreciation allowance, $66,824; taxes (including income tax), $37,008; fair return on value, $173,404.45; total, $671,631. The value of the property for rate-making purposes is set down at $2,167,805. The company's figures regarding reproduction costs, depreciation and other items were accepted in the main by the special master.

Summary Withdrawal of Service Barred

Commission Rules Connecticut Company Must Run Cars in Waterbury Pending Hearing—Fare Increase Gives Good Results

The Connecticut Public Utilities Commission on Nov. 17 directed the Connecticut Company to continue service on its lines in Waterbury pending a public hearing on the transportation situation in that city. The company had previously announced that, because of continued jitney competition, it would withdraw all cars from its Waterbury Division on Wednesday evening. Following the receipt of the commission's order the company rescinded the instructions to its employees to "lay up" the cars at 6 p.m. The commission ruled that the railway must obtain its permission before making a suspension of service, and that permission to discontinue operation could only come after a formal hearing on all phases of the matter.

THE commission, in ruling against the summary withdrawal of service, said:

It has come to the attention of the Public Utilities Commission, through the public press, that you propose to discontinue street railway service in the city of Waterbury and vicinity today, Wednesday, Nov. 17, 1920.

This commission recently granted a substantial increase in rates applicable to Waterbury and other cities and territories served by your company. The proposed arbitrary suspension, practically without notice to the community, and without any notice to this commission, appears to be unwarranted.

Wherefore, by the virtue of the power vested in this commission you are hereby summarily ordered and directed to refrain from discontinuing public street railway service in Waterbury and vicinity until this commission shall authorize same, after an investigation and hearing had, showing the necessity therefor.

On Nov. 15 President Storrs notified the city authorities of Waterbury that unless steps were immediately taken to bar jitneys from the principal streets containing electric railway tracks, the company would discontinue all service on its Waterbury Division beginning Nov. 17. This action by Mr. Storrs followed the repeal by the Waterbury Board of Aldermen of an ordinance regulating buses within the city limits.

Bus Ordinance Unacceptable

The board on Nov. 15 passed an ordinance forbidding jitneys to run in part over streets followed by electric cars and forbidding them to enter the center of the city, but allowing them to parallel the trolley routes and to operate in part over streets containing railway tracks. The measure as passed by the Board of Aldermen was unacceptable to the Connecticut Company because of its alleged failure to comply with the conditions laid down by Mr. Storrs. The company therefore announced service on the Waterbury lines would be withdrawn Wednesday.

The introduction of a flat 10-cent fare on the company's lines throughout the State of Connecticut has resulted in a considerable increase in the company's revenues. This fact is indicated by officials of the company, who state that during the first two weeks of November the company's passenger receipts were materially larger than under the former zone fare system.

The management also announced the volume of traffic had not been seriously affected by the increase in fare. While some city riders who formerly paid 7 cents have ceased to patronize the trolleys, this loss is more than made up by the fact that many more persons are now using the electric cars in the suburban districts. On outlying lines the 13-cent fare has been reduced to 10 cents, thus holding out an inducement to suburban riders.

Good Results from New Fare

The company is doing everything in its power to improve the quality of its service. It will be some time, however, before the railway can put additional rolling stock in operation. Explaining the situation Charles Cheney, a trustee of the Connecticut Company, said:

We are doing and have been doing the best we can to better the service, but it must be remembered that for three years there was no chance of a fare increase. The money is now coming in well, but it will take time to make improvements.

The anti-bus ordinance passed last week by the New Haven Board of Aldermen became law on Nov. 16. Mayor Fitzgerald approved the measure with the exception of a clause relating to Temple Street.

No jitneys are now operating in Hartford. The Hartford city authorities recently enacted an ordinance barring buses from the streets. The local association of jitney operators appealed to the Superior Court for an injunction prohibiting the enforcement of this measure, but, as previously stated, the court refused to grant them relief. They have now taken their case to the Connecticut Supreme Court and, pending decision by that tribunal, will refrain from operating their vehicles.

The city of Hartford has protested to the State Public Utilities Commission against its order allowing the Connecticut Company to increase its fare. The commission was scheduled to hold a hearing on this matter at Hartford during the week. A number of citizens of New London have also protested against the raising of the fare in that city.

Court Approves Double Fare

The Appellate Division of the Supreme Court of the First Judicial District of New York has reversed the order of Lewis Nixon, former Public Service Commissioner for the First District, requiring the Brooklyn City Railroad to cease charging two 5-cent fares from the city line to Manhattan

The effect of the court's decision is to compel many patrons in the more distant zones to pay three fares to go to or from Manhattan by elevated or subway instead of one 5-cent fare as under the former system of free transfers between the surface and the elevated lines of the Brooklyn Rapid Transit Company before its subsidiaries were lopped off as the result of a receivership. In summing up the situation the opinion says:

The Brooklyn Heights Railroad while operating this (the Flatbush) line was required to give free transfers from the various lines owned or operated by it. It voluntarily fixed a 5-cent fare on this line. These provisions were binding upon it so long as it controlled or operated the line. When, however, the lease terminated, and the owner resumed possession, it took the property with all the rights and subject only to the limitations originally imposed by its franchise which could in no way be limited by any act or obligation of the tenant.

Therefore, we hold that the Brooklyn City Railroad in charging a second fare on that portion of the Flatbush Avenue line beyond the limits of the city line of Brooklyn, as it existed in 1860, is within its legal rights.

Nine-Cent Fare in Cincinnati

Under the terms of the service-at-cost franchise of the Cincinnati (Ohio) Traction Company the present 8-cent fare is to be increased ½ cent. Effective on Dec. 1 the new fare will be 8½ cents by tickets and 9 cents cash.

Figures in the office of W. C. Culkins, Director of Street Railways, show that the accumulated deficit of the company up to Sept. 30, 1920, is $332,758. The franchise provides that should there be a deficit in the cost of operation for two successive months the company must present a financial statement to the Director of Street Railways and give notice of an increase in fares on the 15th of the month following the two months where the losses in operation occurred.

The company's income statement for September follows:

	September 1920	September 1919
Total revenue and income...	$765,798	$672,052
Cost of service:		
(*a*) operating expenses....	559,898	460,487
(*b*) taxes and other deductions.....	274,854	242,818
Balance, deficit.....	$68,954	$31,252
Fare, cents.....	8	7 (ticket 6½)
Revenue passengers, number	9,561,608	9,972,289

The decrease in the number of revenue passengers was about 400,000 for the month of September, 1920, as compared with the same month of last year. Under the franchise the company is compelled to make up any deficit which may accrue in the first month of a new quarter from the receipts of the succeeding month, in addition to showing a surplus for the second month.

Officials of the railway express the fear, however, that unless revenue passengers for the next nine months show a decided increase additional advances in fares can hardly be avoided. These increases, in the event of their materialization, would take effect on the first day of March, June and September when the fare would reach 10 cents.

Transportation News Notes

Higher Fare in Greeley.—A 7-cent fare went into effect on the lines of the Greeley & Denver Railroad, Greeley, Col., recently. The fare was formerly 5 cents. The increase was authorized by the State Public Utilities Commission.

Fares Up on Interurban.—Fares on the Rockford & Interurban Railway, Rockford, Ill., between Beloit and Janesville, Wis., were recently raised 20 per cent by authority of the Wisconsin Railroad Commission. The increase in fare amounts to 7 cents between the two cities. The old fare was 35 cents.

Eight Cents Asked in Joliet.—The Aurora, Plainfield & Joliet Railway, Joliet, Ill., has petitioned the Illinois Public Utilities Commission for an 8-cent cash fare. The company asks for permission to sell four tickets for 30 cents or ten for 70 cents. The Evanston Railway, Evanston, has applied to the commission for authority to charge a straight 7-cent fare. The company seeks to discontinue the sale of five tickets for 30 cents as required under the present arrangement.

Approves Reading Increase. — The Pennsylvania Public Service Commission has handed down an order authorizing the Reading Transit & Light Company, Reading, to raise its fare from 7 cents to 8 cents. The company filed a tariff calling for the 8-cent rate some time ago. As a result of protests from the city the company announced that it would suspend the increase pending action by the commission. The new rate took effect on Nov. 8 under authority of the commission's order.

Lower Fares on Suburban Line.—A reduced fare schedule went into effect on the Preston line of the Louisville (Ky.) Railway between the city limits and Camp Zachary Taylor on Nov. 1. Between the city limits and Audubon Park or intermediate points a cash fare of 5 cents instead of 7 cents is now charged. The new plan will give the occasional rider a fare of 10 cents instead of 12 cents and will give to the regular rider a fare of 8 cents by use of special tickets.

Wants More in Rockford.—The Rockford (Ill.) City Traction Company has filed a petition with the Illinois Public Utilities Commission for a 10-cent cash fare with four tickets for 30 cents and twenty school tickets for $1. The matter of increased fare was first taken up with the city officials and discussed, an agreement being reached that the company should petition the commission. The city has asked permission to have the city auditors check the figures presented by the company.

No More "Owl" Cars.—"Owl" service on the lines of the South Covington & Cincinnati Street Railway, Covington, Ky., was discontinued on Nov. 15. The company took action to curtail service because of the refusal of the municipal authorities in Covington, Newport and other cities of northern Ohio to allow the railway to increase its fares. The company contends that it is in need of increased revenue because of a recent advance in the wages of its employees.

Safety Cars in Janesville. — The Janesville (Wis.) Traction Company on Nov. 5 placed five new one-man safety cars in operation and thereby reduced the headway from twenty minutes to twelve minutes. Coincident with this improvement in the service, the Wisconsin Railroad Commission permitted the company to install a fare of 10 cents cash with seven tickets for 50 cents. The increase was granted contingent on the introduction by the company of the twelve-minute headway service.

Must Reduce Bridge Speed.—The transportation department of the Dallas (Tex.) Railway has fixed 8 miles an hour as the speed limit for cars in crossing the Oak Cliff viaduct and the Trinity River bridge. Several minor accidents and derailments recently have brought to the attention of the public and the transportation department the danger of loss of life on these bridges, and a speed limit that insures absolute safely has been fixed and will be rigidly enforced.

Service Improved in Baltimore.—The United Railways & Electric Company, Baltimore, Md., has recently effected some changes in its routing system and has established one entirely new line to better the transportation facilities of the city. The new route, known as the Hudson Street line, will extend from the eastern section to the center of the city. The lines rerouted are the North Avenue, Wolfe Street, Pennsylvania Avenue and Third and Eighth Streets lines.

Speed Limit Fixed.—The City Council of Sioux City, Iowa, has passed an ordinance for the regulation of vehicular traffic in that city. Under the terms of the new law electric cars are classed as vehicles and will be subject to the same restrictions. No car will be allowed to stop in the central district of the city any longer than is necessary to load and unload passengers. No vehicle or electric car shall be operated at a speed to exceed fifteen miles an hour in the business district or to exceed twenty miles an hour in other sections of the city.

Sparks Service Costly.—The Reno (Nev.) Traction Company recently filed a statement with the State Public Service Commission to the effect that for the past eight months operation of its line in Sparks had caused a loss of $1,000 to the company. This action was taken by the company in answer to charges of insufficient and inefficient service. In connection with improving its lines and equipment the Reno Traction Company has retained J. C. Linabary, a railway expert, who will have charge of car operation and maintenance of shops.

Jacksonville Hearings Concluded.—The Florida Railroad Commission has concluded hearings on the application of the Jacksonville Traction Company, Jacksonville, for an increase in fare. The company, in applying to the commission for financial relief, did not specify the amount of the increase desired, but intimated that a 10-cent fare would be needed. G. V. Ramsey, a civil engineer, who made a survey of the company's property, testified that the value of the system for 1920, amounted to $8,074,145. He placed a service appraisement on the property for 1914 of $3,628,454.

Fare Hearing Postponed.—Consideration on the matter of an increased fare by the Manhattan & Queens Traction Corporation, New York, N. Y., has been deferred for two weeks. During that time engineers instructed by Public Service Commissioner Barrett for the First District will make an investigation of the roadbed and the actual conditions of the rolling stock. The company recently informed the commission that unless immediate action were taken the road would have to shut down. The company's deficit has been increasing and it is contended therefore that an increase in the rate of fare is imperative.

Through Freight Service Soon.—The Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., has announced that through freight service is to be started immediately between Indianapolis and all Ohio points reached by interurban via Richmond, Ind., and Dayton, Ohio. The new service of the T. H., I. & E. company will include solid cars for Dayton, Ohio, leaving Indianapolis in the morning and assuring delivery the following day. It also includes direct transfer at Dayton for Springfield, Columbus, Zanesville, Lima, Toledo, Cincinnati and intermediate points. The company has announced to shippers that it can provide cars on short notice.

Eight-Cents in Butte.—The Montana Public Service Commission has granted permission to the Butte (Mont.) Electric Railway to charge an 8-cent cash fare until June 1, 1921. In June of this year the commission allowed the company to raise its cash fare to 8 cents on the condition that tickets would be sold at the rate of 7 cents each. This 8-cent fare expired on Oct. 15 and since then the company has been operating on a 7-cent basis. The commission decided upon the continuance of the 8-cent cash fare after an investigation of the company's statement of earnings, which showed a loss of more than $6,000 during September.

Jitney Ordinance Amended.—At a recent meeting of the City Council of Seattle, Wash., amendments to Ordi-

nance 40,886, dealing with the jitney problem, and under which the Council last spring rejected all applications for jitney permits, causing an appeal to the courts and a restraining order against the city, were introduced by Chairman Oliver T. Erickson of the judiciary committee. A special meeting of the Council will be held shortly to vote on the amendments, which establish a maximum fare of 25 cents on runs after 1 o'clock, and a fare of 15 cents on long runs. Provision is also made for canceling permits for failure to operate, except in case of accident or emergency.

Mayor Asks Better Service.—At a recent meeting of the City Council of Lawrence, Mass., Mayor White stated that he would give the Eastern Massachusetts Street Railway, Boston, one week to improve the service on its Lawrence Division. If action were not taken within that period, said the Mayor, he would call on the city government to make changes in the transportation facilities. Mayor White asked the members of the "home rule" committee, which has been in charge of the affairs of the division for several months, to resign, basing his request on the ground that they had failed to produce results. The Mayor announced his intention of demanding a reduction in the fares in effect on the Lawrence Division.

Railway Checks Reckless Driving—The Dallas (Texas) Railway through its safety and efficiency department has been playing a conspicuous rôle in the safety movement in Dallas. So thoroughly has it engaged in the campaign for checking reckless auto drivers that it has gained the co-operation of several business concerns operating auto trucks. In the case of automobile and auto truck collisions with electric cars the safety and efficiency department of the railway follows up the matter and takes active participation in the discharging or putting on probation of careless drivers who were at fault. Clubs and schools have assisted in this "drive" and it is believed that the railway's efforts have already been rewarded in the noticeable decline in automobile accidents.

Voters Reject Fare Increase.—The voters in Kalamazoo, Mich., at the general election on Nov. 2 rejected the proposal to allow the Michigan Railway to charge a 6-cent fare on its Kalamazoo city lines. A three-fifths majority was needed to carry the proposition. An ordinance providing for the bonding and regulating of jitney buses was repealed by a small majority. Motor buses will now be allowed to operate in Kalamazoo without bonding restrictions. This is the third occasion upon which the Kalamazoo citizens have refused to allow the company an increase in fare. Fares reverted to a basis of 5 cents cash with six tickets for twenty-five cents on Nov. 9. The 6-cent fare had been in effect since September under a temporary agreement between the City Commission and the company as a result of labor difficulties.

New Publications

Wiring for Light and Power,

By Terrell Croft. Published by McGraw-Hill Book Company, New York, N. Y. Flexible cover, 448 pages, illustrated.

This second edition is a thoroughly overhauled and enlarged handbook, containing much new text and many added illustrations. Considerable rearrangement has been necessary due to the extensive changes in the 1918 edition of the National Electrical Code. In its present form it is a valuable handbook for those laying out and installing electrical wiring and apparatus.

Indicators for Carbon Dioxide and Oxygen in Air and Flue Gas

By L. H. Milligan, D. O. Crites and W. S. Wilson. Technical paper 238, United States Bureau of Mines, Washington, D. C.

An excellent gage of efficiency in combustion of fuels is the percentage of carbon dioxide in the flue gas. A simple and accurate instrument for indicating the carbon-dioxide content of air and flue gas, which was designed in the chemical research laboratory of the Bureau of Mines at Pittsburgh, is described in this pamphlet.

Electric Traction and Transmission Engineering

By Samuel Sheldon and Erich Hausmann. Second Edition. 307 pages, illustrated. D. Van Nostrand Company.

In this second edition of "Sheldon and Hausmann" the plan of analyzing and reducing the problems of electric traction to their fundamentals used in the first edition has been followed but the text is based on more recent practice. The problems incident to a complete railway installation are presented and solved and the economics and engineering of transmission lines are also treated. The utility of hyperbolic functions in connection with the solution of transmission-line problems is clearly demonstrated.

The Making, Shaping and Treating of Steel

By J. M. Camp and C. B. Francis. The Carnegie Steel Company, Pittsburgh, Pa. 614 pages. Flexible leather binding.

This book has been written especially for the non-technical employees of the Carnegie Steel Company and others who may desire to secure a general knowledge of the metallurgy of iron and steel. The volume is divided into three parts, which take up successively the making, shaping, constitution, heat treatment and composition of steel. The first chapters are devoted to an elementary treatment of physics and chemistry which lead up to metallurgy. The various processes used in the manufacture of steel are described in considerable detail. Parts which are of particular interest to electric railway employees are those describing the rolling of rails, the Carnegie-Schoen method for manufacturing steel wheels and the forging of axles, shafts and other round shapes. The book is being sold by the Carnegie Steel Company.

Business Finance

By William H. Lough. The Ronald Press Company, New York, N. Y. 631 pages. Cloth.

Mr. Lough has a genius for writing readable books on business subjects. He was formerly professor of finance in New York University, School of Commerce, Accountants and Finance, and is now president of the Business Training Corporation, New York City. This new volume is along somewhat different lines from "Corporation Finance," which established Mr. Lough's reputation as an author. Business Finance is a complete working guide for the financial manager or organizer and a thoroughly practical manual of finance for the business man. It is also very useful for investors. In fact, the volume is designed to prove useful to executive officers, directors and organizers, to bankers, bond dealers and others who must investigate the financial management of enterprises and to engineers, lawyers, accountants and other professional men who are often called upon for financial advice. The subject matter of the book is divided into five parts. 1—Finance and Business. 2—Capital. 3—Securing Capital. 4—Internal Financial Management. 5—Financial Abuses and Involvements.

Traveling Publicity Campaigns

By Mary Swain Routzahn. 151 pages, illustrated. Russell Sage Foundation, New York.

The publicity train, electric car or truck has a number of advantages in the way of conducting an educational or selling campaign within a district. The book mentioned describes two campaigns of this kind conducted by trolley for child welfare and food conservation by women's committees of the Council of National Defence in Massachusetts in 1918 and in the same year in Michigan. The files of this paper have described several other similar campaigns for the education of farmers in improved agricultural methods. In the opinion of the reviewer, the trolley car, in some respects, seems to possess advantages over either of its principal rivals for this service, *i.e.*, the steam railroad train and the truck. As compared with the former, it can travel through the main streets of the city and get the incidental publicity possible thereby and then be sidetracked in an accessible point. As compared with the motor truck, there is less interference from bad weather and more space available for exhibits, lectures, etc. The author has given a number of very suggestive hints on how best to arrange such a tour, advance publicity desirable, arrangement of exhibits in the car, method of receiving visitors, follow-up work, etc. For any organization which intends to conduct a tour of this kind on traveling publicity campaigns the book should be invaluable.

Personal Mention

Director of Ohio Committee Long in Newspaper Field

Benjamin E. Ling, who has been chosen director of the Ohio Committee on Public Utility Information, is a newspaper man of wide experience. He was born in Cleveland and was educated at St. Ignatius College. As soon as he had completed his schooling Mr. Ling entered newspaper work. His first connection was with the Cleveland *Leader*, since merged with the *News*. He did work of a general reportorial nature for that paper for about three years. He then went with the Cleveland *Press*, a Scripps-McRae publication. There he filled about every desk, but steadfastly refused every offer of an inside position. The desire in him for contact with events in the making had become too strong for Mr. Ling to overcome, although he did consent to do semi-editorial news writing. All this time he had devoted himself more particularly to public utility affairs and to politics, until in Cleveland, and in fact all northern Ohio, Mr. Ling had come to be looked upon as probably the best informed newspaper man on utilities in that part of the state. Everywhere in Cleveland keen appreciation is expressed of "Ben" Ling as a fair and impartial observer of events.

When the desirability became apparent of establishing a bureau of information in the interest of the public utilities of the state agreement was unanimous among all the various interests that Mr. Ling was the man best qualified for the job. His paper was loath to lose him, but his superiors readily acknowledged that the new work upon which he was about to enter opened up greater possibilities for Mr. Ling than were offered in newspaper work, particularly as he insisted upon having a part in the making of history rather than being a mere recorder of events. Mr. Ling was in the service of the government at Washington during the war with the rank of Captain. While there he had a large part in the work of preparing "America's Munitions." He is thirty-two years old.

George Carson Joins Washington State Interurban

George Carson has been appointed claim agent of the Seattle & Rainier Valley Railway, Seattle, Wash. Mr. Carson will continue to serve as manager of the Pacific Investigation, Adjustment & Lawyers' Service Bureau, which he recently organized. He was formerly claim agent of the Fifth Avenue Coach Company, New York City. At one time he served as claim agent of the Puget Sound Traction, Light & Power Company. He is a former president of the Pacific Claim Agents' Association and of the American Electric Railway Claims Association. He removed to Seattle about two months ago.

J. A. Perry Elected

Georgian Chosen President of the National Association of Railway and Utilities Commissioners

In selecting James A. Perry for its president for the coming year the National Association of Railway and Utilities Commissioners has chosen a man who has proved that he will exert himself to the utmost to strengthen the prestige of the state regulatory bodies. Mr. Perry is a stanch supporter of the rights of the state commissions. He strongly opposes any curtailment of their powers at the hands either of the Federal Government

J. A. PERRY

or of municipalities. He has long been active in the work of the association and prior to his election as president occupied the office of first vice-president.

Mr. Perry has for ten years past been a member of the Railroad Commission of Georgia. He has done much to build up its organization and to place its work on a basis of efficiency. As a member of the commission he has had a voice in deciding many important questions affecting the utilities of the State. The commission recently completed an exhaustive study of the affairs of its Georgia Railway & Power Company, Atlanta, and as a result of its investigation granted the company a substantial increase in rates, including an advance in cash fares on its Atlanta lines to 7 cents.

Mr. Perry was born in Gwinnett County, Georgia, on Jan. 11, 1875. He obtained his early education in the rural schools of that county and was graduated from the Law School of the University of Georgia in 1898. Two years thereafter he was elected Mayor of Lawrenceville, Ga., and later in the same year was elected to the State Legislature. In addition to his public duties Mr. Perry has conducted a law practice in Lawrenceville. He is now president and treasurer of a large industrial enterprise in Lawrenceville.

Richard J. Higgins, general counsel for the Kansas City Railways, Kansas City, Mo., presented his resignation on Nov. 6 to Judge Kimbrough Stone, before whom the recent receivership proceedings were filed. Mr. Higgins has become associated with a Chicago law firm, and will represent E. F. Swinney and the Continental & Commercial Trust & Savings Bank, Chicago, trustees for $28,000,000 of the bonds of the Kansas City Railways.

Obituary

H. C. King, president of the Mason Safety Tread Company, Boston, Mass., died on Oct. 28. Mr. King had been president of the company since 1912. Prior to that time he served as its treasurer.

Augustine S. Cooley, formerly president and treasurer of the Canandaigua (N. Y.) Street Railway, now the Ontario Light & Traction Company, died at his home in Canandaigua on Nov. 9. Mr. Cooley was born in Canandaigua sixty-four years ago.

Arthur E. Hauck, president of the Hauck Manufacturing Company, Brooklyn (N. Y.), manufacturers of oil-burning appliances, furnaces and forges, died in Brooklyn on Oct. 30, aged forty-one years. One of his principal patents is the method of vaporizing kerosene in a torch with proportioned heat-resisting nozzle, the form of vaporization reducing carbonization. Another is the method of atomization through proportioned pipes and openings and with composition nozzle.

Arthur M. Waitt, consulting engineer and railroad specialist, died on Nov. 10 at his home in Sharon, Conn., from the after effects of an operation performed several months ago. Mr. Waitt was a member of the commission which planned the electrification of sections of the New York Central & Hudson River Railroad. He was born in Boston in 1858, a descendant of Governor Hinkley of the Plymouth Colony. After graduating in 1879 from the Massachusetts Institute of Technology he spent many years with various railroads. While with the New York Central he was superintendent of motive power and rolling stock. In 1902 he was elected president of the American Railway Master Mechanics' Association. As a member of the Connecticut Assembly he wrote the automobile laws of that state.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER.

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

Commission Discontinues Data on Coal Costs

Too Few Operators Report Voluntarily —Test Case Pending Will Decide Authority to Require Data

Since as now handled the monthly reports of the Federal Trade Commission on mine costs of coal are more expensive than they are worth, in the opinion of the commission, they have been discontinued. During the war the reporting of coal costs and sales realization by operators was required as an aid to fixing prices by the Fuel Administration. When the coal operators were released from Fuel Administration control, early in 1920, there was a desire to be free from all federal restriction.

Accordingly, the National Coal Association brought a "friendly" test suit against the Federal Trade Commission in the Maynard Coal Company case before the Supreme Court of the District of Columbia early in 1920. As a result an injunction was served prohibiting further requirement of reports from coal operators by the commission. The latter then requested voluntary reports from operators, to which request a good response was at first received.

The number of operators furnishing data gradually dwindled to about 550 on the June report, however, too small a number to furnish representative figures. This lack of co-operation by the mines was partly due to fear of their reports being used as a basis for possible future price fixing or control by Congress and partly to natural apathy in keeping the necessary cost records. Despite this, a considerable number of operators still favor the continuance of the commission's reports. The latter, in view of the great cost and reduced value of its monthly statistics, however, decided to discontinue their issuance until a decision is reached in the Maynard Coal Company case. In the event of a decision upholding the commission's authority to require reports on coal costs, it is stated, the work will be resumed later.

Good Deliveries of Metal Safety Treads

Orders from Electric Railways Not Extra Heavy, but Demand Is Large —Raw Material Is Plentiful

Demand on the part of traction companies for safety metal treads, while fair, is apparently not extra heavy. One manufacturer, though reporting a recent large order for shipment to California, and smaller ones for central and western states as well as two or three for New England, says that the demand for step treads for electric cars is rather below normal. On the contrary, it is stated the call for treads for steam railroad cars is fully sustained and on the increase. Another company states that orders for street cars are placed only as needed, in small lots from time to time, except where an occasional purchase for new equipment is made, as electric railways do not lay in a large stock of treads for replacements.

The demand for anti-slip treads for general purposes has been gradually increasing and today it is heavy, according to a representative producer. This company's plant is being constantly increased and at present, it is understood, is capable of turning out 60,000 lb. of this one product daily. Another important manufacturer reports that sales to electric railways constitute a comparatively small percentage of the business, as orders for general building and repair work are far beyond what is customary at this season.

Stocks of raw material are said to be ample for all needs, but in some instances no stocks of the finished product are maintained, as orders usually specify certain shapes and sizes. Because of the large factory stocks of steel that are kept on hand, as well as the long-term contracts that in some cases protect the supply of raw material, several manufacturers state that they have passed through the period of advancing steel prices without making substantial price increases and that therefore no fluctuation is expected for some time. The labor situation has eased up materially both as to supply and the attitude of workers. No trouble is experienced in filling any vacancies that occur.

Deliveries in general, it is claimed, can be made as fast as traction companies require the material. Where fabricated stock can be supplied orders can generally be filled immediately from distribution centers. On specification orders, however, shipments are made in from one to four weeks, depending on the size of order.

Factors Governing the Future of Railway Equipment Prices

Because of Lack of Quantity Production Principal Recession Must Come from Greater Efficiency in Management and Labor—Reductions Must Be Gradual

No question is of more absorbing interest to buyers today than that of price trends. Of course prices are coming down, but when? There is no categorical answer, but it is possible to analyze the governing economic conditions. This has been done for the ELECTRIC RAILWAY JOURNAL by a prominent sales representative of one of the well-known electric manufacturing companies, who says that "it's a good bet to gamble on that prices are coming down, but it's a decided risk to say at what rate the reductions will be and at what level they will reach six months or a year hence.

"The people," he continued, "want lower prices and have wanted them for some time, but prices have been very slow in responding. The economic forces that have been working to keep prices up are, among other things, cost of labor, expansion of credit, taxes and, in general, greater demand than supply, the latter, of course, resulting in excess profits on some commodities. While all of these causes and effects may be read by the railway operators and manufacturers and understood by some of them, both are face to face with the same cold fact that cost of operation and of manufacture does not indicate any appreciable weakening.

"Reductions in labor costs that appear possible, and they will be very gradual, are those reductions that will accompany increased efficiency of labor. As a guess, these may be reflected in a 2 per cent to 5 per cent reduction in prices during the next six months.

"Reductions in prices of raw material are much more difficult to deal with —some have come down, some have gone up and others have stood level during the past few months. However, aside from those special cases where stocks had to be converted into cash it is fair to assume that the principal reductions, if any, that occur in raw material will also be those which accompany greater efficiency of labor.

"Many of us overlook the fact in considering 'labor' and 'material' costs that the principal factor in 'material costs' is also labor, hence reductions in material costs must, of necessity, be those which are brought about by greater efficiency of labor or a reduction in labor rates.

"On account of the limited supply and an abnormal demand in some in-

dustries there have undoubtedly been some abnormal prices. A lessening of the demand will and has brought such prices down. On the other hand, many broad-minded business men realize that an immediate general reduction of 10 per cent to 15 per cent on all machinery prices would be nothing short of a calamity for the country.

"It is pretty well known that at the present time a vast number of manufacturers of standard supplies and machinery have about all of their assets in their inventories. A shrinkage in value of 10 per cent to 15 per cent would spell bankruptcy for a great majority of them. A condition of this kind would simply mean another panic. It seems therefore that notwithstanding the desire of every one to see prices come down buyers must be patient, for it will be some considerable time before any considerably lower levels are reached on standard supplies and machinery.

"There will, of course, be instances of appreciable reductions in this and that line for some time due to such things as:

"1. Demand dropping off, causing stocks to be put on the market in order to secure cash urgently required.

"2. Demand dropping off, resulting in reduced prices and reduced profits with no reduction in costs.

"3. An effort to encourage buying so as to avoid shutting down.

"Materials and machinery used principally by electric railways are of the standard or specialties class and none of the manufacturers serving them, with one or two possible exceptions, has ever been able to engage in what is commonly referred to as 'quantity production.' In other words, there has been no great 'demand' for supplies or machinery on the part of electric railways for years. Therefore it seems very reasonable to assume that the principal reductions in costs for both the railway operator and the manufacturer are those which, as previously mentioned, accompany greater efficiency in both management and labor."

Should Traction Companies Buy from the Manufacturer or Jobber?

By Scheduling Purchases Several Months Ahead Investment in Stock Can Be Reduced—Field for Larger Co-operation Defined

Every electric railway purchasing agent must decide for himself as to the extent to which he will buy material and supplies direct from manufacturers or through the jobber. Such a decision should be reached, it seems, only after an extended study of the service possibilities of each source of supply, the relation between seasonal and emergency demands, the cost of getting materials, and the possibilities of saving money through what might be called the commercial diversity factor. The increased cost of maintaining stocks in repair shops and elsewhere on traction systems justifies thorough examination of the opportunities for utilizing the facilities of the jobber, in order to cut down the total inventory of spare parts and extra material on hand from time to time

As a large buyer, the electric railway of good size is in a position to obtain liberal concessions on price from the manufacturer, or should be. But idle material standing in bins and filling shelves adds to overhead charges so fast that it is a moot question where to draw the line on reserve equipment parts, track and line material, office supplies, power plant merchandise, etc. The feeling is growing in the trade that if a more scientific study should be made by many companies as to the desirable size of their stocks of supplies as related to seasonal and emergency demands from year to year, it would show clear-cut opportunities for scheduling such purchases more accurately and thus offering the electrical supply jobber a chance to be of greater service. At the same time the manufacturer might become better informed as to the demands to be made upon his facilities for months to come, and would thus be enabled to put through orders more economically, bettering his own production load factor and tending toward ultimate lower costs and prices.

Advantages of Group Buying

Spasmodic buying of small supplies from scattered manufacturers lacks the precision attainable when such purchases are handled either individually or pooled through the jobber. To buy quality goods at lowest cost is of first importance to the traction company, but through the co-ordination of purchases the size of necessary reserve stocks can certainly be cut down, even granting the jobber his legitimate profit for maintaining the storehouse for one or more operating companies in his territory.

Some of the material required by electric railways is also useful to central stations. It follows that by anticipating and combining orders, both classes of utilities may be served advantageously. Just as interconnection of power plants has reduced the operating cost of stations when judiciously handled, and as it has cut down the amount of idle reserve equipment necessary, the plan of joint purchasing or of centralized material ordering indicated here offers real opportunities for saving in overhead and running costs. Central stations need to conserve capital at this time as never before, and foresight in purchasing supplies of joint usefulness such as poles, cross-arms, moderate voltage insulators, interior wire, fuses, dry cells, lamps for building service and many other items will repay the railway purchasing agent.

Considerable analysis will no doubt be necessary to establish for individual companies the limits of practical economy in buying through jobbing houses and in purchasing direct from manufacturers. But if the needs of the railways are studied more intensively by special salesmen detailed by the larger jobbing houses to acquire a more intimate knowledge of the life and cost of traction supplies (especially in the repair shop and power plant), it is believed that real savings will become possible. The railway companies will purchase virtually as much material in the long run as ever, barring improvements in practice resulting from the detection of inefficiencies in design and application of equipment parts. The manufacturer will also handle larger orders at a time, and the jobber's overhead and running expenses per unit of product handled will decrease. It is the old story of looking far enough ahead to take advantage of the economic benefits of mass production.

Rolling Stock

The Pacific Gas & Electric Company, Sacramento, Cal., recently received from the St. Louis Car Company six new street cars, costing about $36,000. Delivery of the cars, which seat thirty-four passengers, has been expected since last August.

The Pacific Electric Railway, Los Angeles, Cal., announces that a shipment containing nineteen of the new safety cars, announced in the Aug. 21 issue as being purchased by the company, are en route to the shops, where the cars will be assembled for service on suburban lines of the company.

The Springfield (Ill.) Consolidated Railway Company has received the first of the seventeen one-man street cars which it plans to install. Sixteen others are expected to arrive soon, the total cost of the cars, it is stated, being $117,000. The present twelve-minute schedule on the company's lines is expected to be reduced to nine and ten minutes with the operation of the new cars.

The Staten Island Midland Railway, New Brighton, N. Y., which, following its discontinuance of operation, as mentioned in recent issues of this paper, is being taken over by the city of New York, will be ready to resume operation by Dec. 1, it is hoped. Eight of the twenty-eight new safety cars ordered from the J. G. Brill Company about four or five weeks ago, at a cost of $7,050 each, have been delivered and the rest are said to be on the way.

Birmingham (Ala.) Railway, Light & Power Company, mentioned in the Oct. 9 issue as expecting delivery of fifteen new safety cars about the middle of October, will probably place these cars in operation on the Twentieth Street and Avenue B loop lines. Shipment of the first car was made from Cincinnati early this month, it is announced, and daily shipments will be made until the

order is completed. Two more cars of the large "260" type were expected to be placed in operation on the North and South Highlands line last week.

Twin City Rapid Transit Company, Minneapolis, Minn., mentioned in the issue of last week as rebuilding cars into trailers, is reconstructing twenty-five of these trail cars to be placed on No. 11 trucks with standard 26-in. wheels. The trailers will be one step lower than formerly and will weigh 24,960 lb., compared with 42,300 lb. for the standard cars. The trailer conductor will manage the rear entrance door, while the front exit will be operated by the conductor of the motor car, the same as in the two-car unit 2,000 previously described.

Track and Roadway

Washington Railway & Electric Company, Washington, D. C.—The Washington Railway & Electric Company is planning to improve its track and roadway next year. The tracks on G Street from Fourth to Eleventh Street, Northwest, will be rebuilt and also the tracks on North Capitol Street from Massachusetts to New York Avenue.

Capital Traction Company, Washington, D. C.—The Capital Traction Company has proposed an extension of its line from N Street to Pennsylvania Avenue to relieve congestion on the Fourteenth Street line; also an extension on L or M Street, south, between Eleventh Street, east, and Seventh Street, west, and on New Jersey Avenue from E Street, south, to L or M Streets, south, to provide additional facilities for Navy Yard employees. The commission will consider these proposals at the next hearing.

Trenton & Mercer County Traction Corporation, Trenton, N. J.—The Trenton & Mercer County Traction Corporation has completed its extension into the heart of Trenton Junction, and cars are now running over that division. For many years the traction company was unable to secure a right of way across the tracks of the Philadelphia & Reading Railway at Trenton Junction, and finally a tunnel was built under the railroad tracks at that place.

Muskogee, Okla.—Plans are again under way for the construction of an electric line from Oklahoma City to Muskogee This plan is referred to on page 1074 of this issue.

Philadelphia (Pa.) Rapid Transit Company. — The double-tracking on Cobbs Creek Parkway from Spruce to Market Street by the Philadelphia Rapid Transit Company has been delayed. Citizens of West Philadelphia have protested on the ground that boulevards that cost millions of dollars should not be used for street cars.

Wellsburg, Bethany & Washington Street Railway, Wellsburg, W. Va.—It is expected that in the near future the Wellsburg and Bethany line will be extended to Washington, Pa., which will develop one of the richest coal fields in the United States. It is reported that the property of this railway will soon be acquired by the West Penn Traction Company.

Power Houses, Shops and Buildings

Paducah (Ky.) Electric Company.—The Paducah Electric Company has installed new generating units in its power house to replace those wrecked by an explosion of a month ago.

Los Angeles (Cal.) Railway.—The Los Angeles Railway is planning to build two new substations which will cost about $100,000. One will be located near Vernon Avenue and Pacific Boulevard and the other on Buchanan Street. They will improve the power conditions in the districts near by.

Pittsburgh (Pa.) Railways. — The United States District Court has approved the improvement plan suggested by the receivers of the Pittsburgh Railways. The program includes the construction of two new carhouses at a cost of $159,000. One carhouse will be erected in Ross township and the other in Carrick, a suburb of Pittsburgh.

Rutland Railway, Light & Power Company, Rutland, Vt. — The Rutland Railway, Light & Power Company has built a new siding for the purpose of handling cars. It was constructed at the expense of the Vermont Milling Products Corporation, which in the starting up of a new factory greatly increased the freight business of the Rutland Railway.

Trade Notes

The Central Railway Signal Company, Chicago, Ill., has filed plans for the construction of a one-story building at a cost of about $23,000 at Hammond, Ind., to replace a structure destroyed by fire.

The Black & Decker Manufacturing Company, Baltimore, Md., advises that its net sales as of Oct. 31, 1920, are 163 per cent of the total net sales of the year 1919. The company expects its net sales for the year to exceed those of the year 1919 by almost 100 per cent.

The Chickasaw Shipbuilding & Car Company, Birmingham, Ala., is adding a pressed steel car works department to its plant which, it is said, will have a daily output of from twenty to twenty-five cars. Nearly $500,000 is being invested in the car plant.

American Di-Electrics, Ltd., New York City, manufacturers and engineers in the field of electrical insulation, announces that James C. Barr, 84 State Street, Boston, Mass., has been appointed railway representative for the New England States, handling the company's line of insulating varnishes and compounds.

The Austin Machinery Corporation, manufacturer of earth-moving and concrete-mixing and handling machines, announces that ten primary district offices and warehouses and upward of fifty subsidiary offices and agencies have been established throughout the United States. A distinctive trademark has also been adopted by the company.

Galena-Signal Oil Company, New York City, is issuing $4,450,000 of 7 per cent convertible debtenture bonds due April 1, 1930, in denominations of $100 and $1,000. The price given is 93.5 and interest, yielding approximately 8 per cent. The consolidated net earnings of the company and constituent companies available for interest and federal taxes, after making allowance for depreciation, for the nine months ended Sept. 30, 1920, were given as $2,302,154, being at an annual rate of about five times the annual interest charges on the total funded debt now outstanding, including this issue.

George H. Walbridge and Lyman P. Hammond have opened an office at 120 Broadway, New York City, and will undertake special executive work in the investigation, organization, reorganization and financing of public utility and industrial corporations for various investment and commercial banking institutions. They have resigned as vice-presidents of Bonbright & Company, Inc., but continue as active officers of the Colorado Power Company, The Arizona Power Company, Pacific Gas & Electric Company of Phoenix and as directors of other public utility and industrial corporations in which Bonbright & Company are interested.

Stanley W. Midgley and J. M. Borrowdale have organized the firm of Midgley & Borrowdale, with offices in the McCormick Building, Chicago, for the purpose of acting as sales representatives in the Middle West for manufacturers of products for electric and steam railways. The firm will handle the products of the Superior Steel Castings Company, the Pneumatic Safety Valve Company, the Henry Giessel Company, manufacturer of sanitary filters and coolers for passenger coaches; the Trumble Waste Manufacturing Company and the Steel Fabricating Company, manufacturer of sectional steel buildings. Mr. Midgley was Western sales manager of the Curtain Supply Company, from 1906 to 1914. Subsequently he became general sales manager of the Acme Supply Company, Chicago, and since January, 1918, he has been connected with the Liberty Steel Products Company. Mr. Borrowdale's activities have been largely in the steam railway field.

New Advertising Literature

Meters.—The Economy Electric Devices Company, Old Colony Bldg., Chicago, recently issued bulletin No. 70, describing the work of the Economy Meter in reducing energy consumption by electric cars.