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Liberty is Asking for Billions of Dollars

OUR poster this week tells its story. Now is the time, when the enemy is faltering and falling back, to emphasize the determination of America to use "force to the uttermost" to settle the questions involved in the war, since this is the only kind of argument which the Hun understands. Every electric railway manager should ask himself this coming week: "Is my organization prepared in the best possible way to assist all of its employees to subscribe to Liberty bonds?" Every individual should raise the question in his own mind: "How large a subscription can I make to help bring this war to a victorious conclusion?" The poster which accompanies this issue has been drawn especially for the McGraw-Hill Company by the same artist who was responsible for our previous war posters. We suggest that each subscriber put it up in some place where in his opinion it will do the most good.

Government Gives Car Standardization a Boost

THE announcement last week that at the request of the United States Housing Corporation a number of car design experts are getting their heads together to evolve a design of car which can be used in locations in which the corporation is interested deserves more than passing notice. It is a step, although possibly but a short one, in the direction of ultimate general standardization.

The impelling reasons for standardization in this case, however, are different from those which are effective in normal times. Ordinarily the arguments which are germane are that standard cars ought to be cheaper than others, and that it should be possible to procure them more promptly because the manufacturing operations are standardized and the parts can be kept in stock. In the present instance the government is purchasing cars, directly or indirectly, on large scale. These are for the transportation of war industry workers. They may or may not be needed at the close of the war on the properties now operating them. These cars should, therefore, be of such a type or of such types as readily to be available for use on other properties.

Regardless of the purpose of the present proposed standardization, however, such standardization cannot but be of value to the industry as an object lesson. It will, if successful, indicate what could be done on a larger scale if the necessary centripetal force could be brought into action. There is too much individuality still in car design, but the tendency is to swing away

from it. We cannot afford it. At the same time it would not be safe to ignore the importance of keeping the inventive talent stimulated. There must be a "happy medium" between stagnation and non-essential variation. The Housing Corporation's committee may help us in finding this.

Save Paper and Gas the Hun

THE War Industries Board has issued an urgent call to this country to economize in the use of paper. All magazines, including the ELECTRIC RAILWAY JOURNAL, have been instructed to reduce their consumption of paper 10 per cent as compared with last year but with no guarantee of adequate supply under the reduced tonnage. The War Industries Board has also formulated a number of regulations designed to promote economy in the use of paper by magazines, such as discontinuing exchange and complimentary copies of the paper, stopping all subscriptions promptly at the date of expiration unless the subscriptions are renewed and paid for, and other rules. All of these regulations this paper is pledged to carry out and it is glad to do so. But it believes that by the arrangements which it has made it can fulfill all these rules without impairing in any way the service which it is giving to the electric railway industry.

Economy in the consumption of paper is desired for many reasons. In the first place, paper making requires a large amount of fuel, labor, capital and transportation space, all of which can be used for war purposes. Paper manufacture also requires chemicals, notably sulphur in the form of SO_2 , and there should be no shortage of sulphur because it is used in great quantities in the manufacture of war munitions, especially of poisonous gas. Hence, economy in paper will help this country to carry on its gas warfare against the Germans and thus turn their original invention against themselves.

But magazines and newspapers are not the only consumers of paper. It is being used far more extensively than ever before by all of the government departments in the form of stationary, posters, and boxes for shipments of munitions, foodstuffs and other supplies overseas. It is important for all users of paper, whether publishers or others, to keep all paper waste to a minimum. Electric railway companies may not be as great consumers of paper as many other corporations, yet they also should see what they can do to limit the amount actually used and to conserve the paper not actually employed by seeing that it is sold to the junkman and thus made available for reuse. Perhaps the most extensive use of paper by electric railway companies is

for transfer tickets. On the largest properties the number of transfer tickets printed for each day's use runs into the millions, but of this number only a portion are actually issued. Paper is going to be more expensive in the future even than now, so that each company has a material object in reducing waste as well as a patriotic motive to help the rest of the country. Examination should be made also to determine whether all of the forms employed in tabulating operating records are necessary. There may be a chance here for economy as well as in the use of stationary by single spacing typewritten letters, using both sides of the paper for carbon copies and in other ways.

Let the slogan be "Save waste paper but don't waste paper."

High Rentals Do Not Mean An Excessive Rate of Return

COMMISSIONS, like individuals, are human, and consequently they sometimes say and do strange but excusable things. In general, however, regulation has reached such a state of development that it is extremely difficult to excuse any evidences of a misunderstanding or lack of understanding as to simple fundamentals.

We are led to enter upon this discussion by the following remarks of the Board of Public Utility Commissioners of New Jersey in its recent decision covering the Public Service Railway fare case:

Should, in future proceedings, an investigation be made to ascertain the fair value of the property and the return received by the petitioner, undoubtedly the underlying leases under which the petitioner operates will be and should be carefully analyzed and the rentals paid thereunder investigated, for in ascertaining the fair return upon the property not only would the return received from the rates of fare as at present charged be pertinent, but it should also be determined whether the fixed charges are excessive.

Zounds—words almost fail us! Why must fixed charges be considered in connection with the determination of a fair return? Courts and commissions without number have ruled that a utility is entitled to charge rates sufficient to pay a fair return upon property used and useful in the public service. Once a fair valuation is made—which the New Jersey commission presupposes—fixed charges or any phases of corporate capitalization have nothing to do with the determination of a fair return by the commission.

The reasons are so simple that it seems a waste of time to state them, but apparently it must be done. The Public Service Commission for the Second District of New York in the recently decided fare case of the United Traction Company had the basic point in mind when it remarked: "It makes no difference in fixing rates whether a road was built with the proceeds of bonds or altogether by the sale of capital stock." It might with equal truth have added: "or whether it is operated under lease or directly by the owner." For if a fair return is allowed on the value of the used and useful property, it is none of a commission's concern whether this return goes to many bondholders and few stockholders, or to few bondholders and many stockholders, or mostly to lessors and little to security holders.

Property operated under a long-term lease is valued along with property built by means of money from stocks and bonds. Perhaps the rental is high, in the

light of present utility conditions, but that has no bearing upon a fair return on the property as a whole. If the lessors are receiving too much and security holders too little, that is a problem for the company and its owners to work out. For a commission to interfere in the internal affairs of a utility and refuse a fair return on the property because of believed inequities in the corporate financial structure would be a lamentable usurpation of authority.

But suppose no detailed valuation is made and the commission is considering the grant of emergency rates. Should the fixed charges then be scrutinized? Yes, but two cautioning remarks should be made. First, if the bondholders seem to have received a high return; if the lessors seem to have been likewise favored—these facts mean nothing by themselves. The vital point is this—have all the security holders combined been receiving too high a return on a reasonable estimate of the value of the utility property? Second, if the utility has presented an appraisal estimate by a competent engineer, a commission has no moral right to disregard it utterly. It should be willing to accept every reasonable indication of utility value and grant provisional relief pending later examination, if such is needed.

The public does not yet understand the simple basis of rate-making. Hence, when it hears tales of leases with high rentals, it jumps to the conclusion that it is being robbed. It can be taught differently in time, but the work would be easier if regulatory bodies did not sometimes do such muddled thinking.

Every Shop a Reclamation Shop—But Not a Factory

IN THESE TIMES of shortage and expensiveness of materials needed in the electric railway maintenance shop it is no wonder that reclamation work is more conspicuous than in normal times. Some things must be done now that might not have been economical before. At any rate, every master mechanic in these days is lying awake o'nights in order to scheme out ways of making existing equipment and supplies go as far as possible.

In the issue of this paper for Aug. 31 there appeared an account of a centralization of reclamation work which had been brought about on the property of the Connecticut Company. The principles involved in the plan were not novel, but the ways in which they were applied in this case were interesting and suggestive. On every live property, large and small, something of the same kind is going on. The principal lesson from the Connecticut Company's experience, it seems to us, is the importance of developing what might be termed "reclamation specialists" who can apply, to the local work in hand, the best reclamation methods which are available to him.

There is plenty for a reclamation specialist to do in keeping up with the very rapid progress in this work in all fields. He can learn from manufacturers as well as from maintenance men, from shipbuilders, from locomotive repair shop men. Take, for example, this matter of gas and electric welding and cutting. What a world of progress has been made in the past few years! "There is nothing new under the sun," at least very

little, in this field as in others, yet it has taken the present crisis and the conditions immediately preceding it to get engineers really to appreciate what could be done with this form of concentrated heat. Now any master mechanic will tell you that it is a "life saver" for him.

At the moment unusually rapid progress is being made in this art under government stimulus, and some one in every electric railway shop organization ought to be keeping up with it. The technical papers of all countries are full of the subject, and there has just been published by the Emergency Fleet Corporation an elaborate report on electric welding, under the auspices of its electric welding committee. This report covers resistances, spot and arc welding.

Welding has been mentioned specifically as an illustration of reclamation work, but it is only one of several means at hand to the reclamation specialist. Nothing will reflect greater credit upon the master mechanic on any property than the effective use of all of these means for saving something.

But right here we feel impelled to suggest another but kindred line of thought, namely, that a maintenance shop should not also be a factory. There is a great and apparently an increasing tendency on the part of mechanical departments to manufacture things. Now there is a danger here that we shall fall into the pernicious practice of the jitney—to take off some of the cream of the manufacturing business, leaving skim milk to the legitimate manufacturer. We do not refer to the making of patented articles, a practice which is beneath the dignity or the principles of a railway company, although occasionally indulged in. We have in mind the making of supplies in a field well covered by responsible makers of equipment.

This paper has always stood for any shop practice which is for the long-run good of the electric railway. It is for this good that we condemn competition with manufacturers where these are satisfied with a reasonable profit, considering all proper charges. Such charges include allowances for development work, fixed charges, selling cost and something for the manufacturer himself. Company bookkeeping in this regard is apt to be like municipal bookkeeping in connection with utility operation, namely, in the ignoring of charges which are really part of the manufacturing cost. Where a railway company, which is not organized for manufacturing and can do so on only a small scale, estimates that it can manufacture supplies, all things considered, cheaper than a manufacturer who is organized for just that work can sell those same articles, the chances are that something is wrong with the estimate. In such a case we advise the company to search diligently for bookkeeping entries in which some "overhead" has been omitted.

But even if some articles can be made for less than they really cost to buy in finished form, it is a fair question as to whether it is even then the best policy to make them, unless an extortionate price is asked. Manufacturers who enjoy a good trade with a company on a variety of articles on which a reasonable profit is made are more apt to put themselves out to supply some special demand of that company, if one should be made, than if the railway came to them only when it had a favor to ask.

Nearly Time to Shift the Clock Hands Back an Hour

LITTLE more than a month remains of the operation of the "daylight-saving" law. On Sunday, Oct. 27, the clocks which were turned ahead one hour on March 31 last will be set back and Mr. Average Citizen can stretch his limbs for sixty minutes longer in the morning and gradually get back into the habit of turning in an hour later at night.

This measure, passed after long debate in Congress, has undoubtedly been very effective in conserving the health, wealth and mineral resources of the nation. While no dependable figures are available on the total fuel saving resulting therefrom, it has been estimated that this law will have been responsible for the conservation of from 1,000,000 to 1,500,000 tons of coal during the seven months of its operation. Electric railways have had some of the benefit of this economical measure, and the people as a whole probably have profited to an unappreciated degree by the enjoyment of extra leisure during daylight hours.

The fundamental principle or purpose of the daylight-saving plan is to synchronize the period of work with the rising of the sun rather than with the time (noon) when the sun reaches its meridian, so that during the summer when the days are long, the period of recreation after work can be taken while there is natural light rather than during a time of artificial light. As the sun rises some three hours earlier in June than in December in the latitude of New York, the present plan, in which work is begun only one hour earlier in summer than it is in winter, does not fully make up for this variation in the time of sunrise. However, it does so to some extent, and as well as could be done with any system involving only two changes of time, one in the spring and the other in the autumn.

The suggestion has been made by some enthusiasts for the present daylight-saving plan that it should be continued throughout the year. They believe that people are now so accustomed to rising an hour earlier than they otherwise would that they would continue cheerfully to do so during the winter. These advocates however, overlook the fact that such a plan would require most people to get up a considerable time before sunrise. They would thus have to use artificial light in the morning instead of in the evening so that there would be no saving. Moreover, such a measure would be very unpopular because while most people do not object to sitting up in the evening with artificial light they do object to being obliged to use it after rising in the morning. We are afraid that if the plan were followed throughout the year the tendency in winter would be gradually to delay the times for beginning and ending work, and the hours being thus fixed for winter conditions could not easily be changed back during the summer.

Another point worth mentioning, a psychological one, is that if people used much light in the morning they would forget to turn off this light until some time after the necessity for it had ceased. They could not be expected to keep the matter constantly on their minds; hence another incidental advantage and economy in shifting the clock hands back to their normal place in the winter time.

Some Practical Points in Pole and Tower Erection and Support

By Charles R. Harte

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These Points Have Particular Reference to Erection in Marshy Ground and Also Cover the Procedure in Raising Steel Towers of Different Types

IN THE cases of pole settings described in a previous article it has been assumed that the soil is of reasonable bearing capacity, at least $\frac{1}{2}$ ton per square foot. It is generally a very good investment to go around any area of softer ground that cannot be "jumped" by a long span. When, however, the difficulty must be met directly, special construction is required.

The simplest plan is to attach the poles to a trestle or bridge, but frequently there "is no such animal," and where there is one, if it is owned by other parties there is often refusal to permit its use, or a prohibitory rental is demanded. If the structure and the line are built at the same time, as is often the case where they are for the same property, it is a simple matter to provide for the pole attachment, but if the structure already exists it may be difficult to get clearance. Sometimes this latter is effected by leaning the poles outward. With pin insulators this tends to lower the wet weather resistance; with suspensions it may necessitate special construction to maintain the normal clearance.

Setting Poles in Soft Ground

When the line must stand on its own feet the treatment depends primarily on the character of the soft ground to be crossed. With open water, or in a swamp of some depth and lacking a firm top, practically the only possible treatment is to use piling, to which the pole is bolted either directly or through some intermediate structure. How to handle the piling is often a very serious question. It is surprising with how light a hammer a pile can be "worried down" into soft material, and with but a few inches of open water a light-draft barge can be rigged up that will serve every purpose. It is of chief importance to give the piles holding power against a pull or push on end, for three piles which sway greatly at a touch, if they have a batter of 3 in. or more to the foot, can be tied together at the tops to form an exceedingly firm support.

Where there are only a few poles to be driven, it is often possible to work them down by setting them in place, loading them as heavily as possible, and then, by means of several lines tied to the top with a man on the other end of each line, rotating the top in a small circle. There are two difficulties to look out for. So long as the motion continues the pile will go down, unless of course it has reached hard bottom other than sand, but if it is allowed to stand for a short time the material settles back and makes further "driving" all but impossible. The other point is the danger of an upset in the early stages if the load is very heavy and the head is pulled much out of plumb. This method can sometimes be used to advantage in the case of soft

swamps which cannot be navigated by scows, but on the other hand are too soft to carry the pole on surface supports. Incidentally, it will often permit the putting down a pile or a pole in a sandy bottom under water which would completely resist driving by hammer unless a water jet was used.

Special Treatment Needed on Long Stretches of Marsh

It should, of course, be understood that these treatments are particularly for the cases where the stretches of bad ground are comparatively short, and separated from each other by some distance. If the adverse conditions are extensive the situation will warrant some study and often considerable investment in plant specially designed to meet the case.

Many swamps have firm bottom overlaid by "mush" of no stability whatever. Single poles rested on this firm base will be perfectly good against the load so long as they stand plumb, but unless their penetration into the hard material is practically to the depth which would be given in setting them on dry land, or other preventive treatment is given, they are very apt to sway badly in the wind and presently to overturn. Such poles may be steadied by guys, with concrete, stone or metal anchors, in which case the guys must be of such material or so protected as to guard against corrosion.

Of higher first cost, but usually much cheaper in the end, is the use at each pole of three piles, battered at least 3 in. to the foot, 120 deg. apart and projecting about 8 ft. above normal water level. At their tops these are bolted to the pole, the butt of which rests on and is bolted to a framework carried by the piles just above water level. An experienced crew finds little difficulty in driving batter piles, though the pile driver may not have been built for such work, but where the men are all green a plumb structure may be used, the piles forming a triangle or square about 12 ft. on a side. In this case the piles should extend roughly one-third of their length above the water and the adjacent ones should be tied together by X-bracing for this length to prevent swaying. The pole may be carried as in the case of the battered triangle, or it may rest on the top platform and have braces from the pile tops to a point near the bottom crossarm.

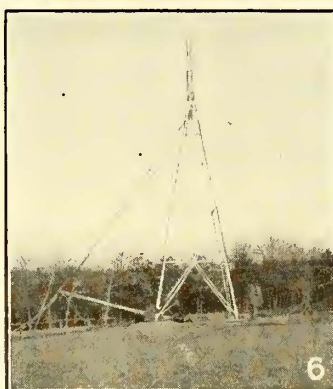
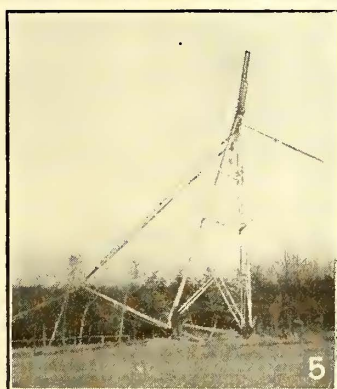
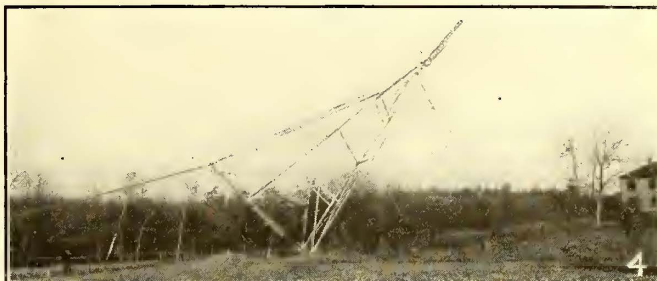
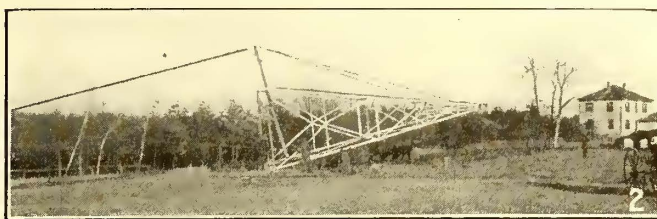
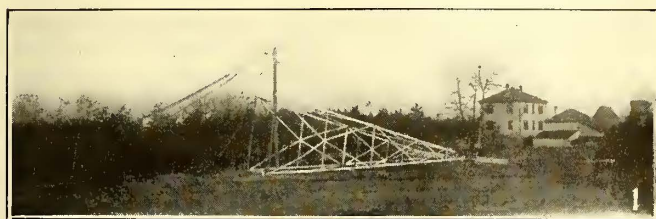
Some Meadows Are Particularly Treacherous

Morasses of the open water type are obviously danger points, and while their treatment may require quite a little study they are not at all likely to be overlooked.

"Cats of entirely different color" are the meadows with a more or less firm top covering all sorts of iniquity. If the crust is thin the treacherous character is fairly evident, but when, as is often the case, the crust is firm to a depth of several feet, it is easy to

make the mistake of supposing that the firmness holds all the way down, with consequent later regrets. Swampy character of the surface and the presence of black or brown soil are always a warning to test with a sounding rod. For pole-line purposes a few short lengths of $\frac{1}{2}$ -in. iron pipe with a solid point to screw on the end are excellent. With a solid surface 3 ft. or 4 ft. thick, a pair of sections of old pole 8 in. or more in diameter and 8 ft. or 10 ft. long, or their equivalent, (a pair of railroad ties are excellent) bolted through the center to the pole at ground level, will give the necessary additional support. For thinner crusts the bearing area needs to be correspondingly increased. Specifically, the probable maximum dead weight is that of the pole, the attachments and the half spans each

The purpose of the support arms is particularly to give support to the vertical load, and whenever practicable guys should be used to prevent overturning. The crust of a meadow owes its strength very largely to the network of living roots of the plants growing on it and, like a piece of cloth carrying a load, fails badly as soon as any break occurs in the fabric. If support arms are relied upon to take the place of guys, the pole, tending to turn at the ground line, throws the entire effort on the end of the arm. This gives a pressure which is equal to the bending moment of the pole at the ground line in pound-feet divided by the distance from the pole to the end of the arm in feet. (It will be remembered that the bending moment at the ground line is the sum of the resultants of each



SUCCESSIVE STEPS IN THE ERECTION OF A TRANSMISSION LINE TOWER

Fig. 1—Ready to start.
 Fig. 2—Tower being lifted, gin pole acting as a lever.
 Fig. 3—Gin pole practically at the end of its duty.
 Fig. 4—Gin pole pulling away as the attachment at the top gives greater leverage.
 Fig. 5—Holding back the top while a man adjusts the foot connections.
 Fig. 6—Tower up, foot connections being bolted up.

side, with the ice load for the district. The area of support must be such as will give a pressure per square foot on the surface covered not over one-fourth the pressure the surface can stand.

What that pressure may be can be roughly determined by loading a 6-in. x 6-in. stick held vertically by small guys. The weight which forces this through the crust is approximately the pressure allowable per square foot. In making such a test, enough time must be allowed to bring out the facts. Marsh crusts will usually carry for a short period a load much in excess of that which would break through in a longer time. A fair procedure is to add 50 to 100 lb. each time, and to allow three or four days to elapse between successive additional loads. If, however, time does not permit this, daily loads of 200 lb. each will give fair indications, and will be on the safe side.

element of pressure multiplied by its distance above the ground line.)

This arm pressure tends to force the end of the arm into the earth, increasing the area pressed, and at the same time to lift the pole bodily, the arm end acting as a fulcrum, until the forces balance. The fulcrum can be given sufficient area to bring the pressure per square foot within safe limits by putting cross timbers or mudsills under the arm ends. But in choosing these the cross-section must be not only strong enough to transmit the load from the arm to the surface without breaking when new, but must have a large factor of safety to cover the reduction of strength which is apt to be rapid because of the conditions.

Where the arms are depended upon for cross-line support, they will usually be 3 in. x 8 in. or larger, in pairs, through-bolted to the pole, which should be

slightly flattened to give a good bearing. Paired diagonal braces, 2 in. x 6 in. or heavier, and making an angle of 60 deg. or more with the horizontal, have their tops through-bolted to the slightly flattened sides of the poles. The lower ends go between the arms close to the ends and are there bolted, a block of the proper thickness being used to fill any space left between them. The bottom of the arms should be about 1 ft. or the thickness of the mudsills, if these are used, above the meadow surface, and particularly if arms or braces are less than 4 in. wide filler blocks should be bolted between at intervals of about 5 ft. All parts of these frames, as well as the pole to a point above the upper brace attachment, should have some form of preservative treatment, and particular attention must be given surfaces in contact and to holes or cuts made after treatment, to insure that they are properly closed.

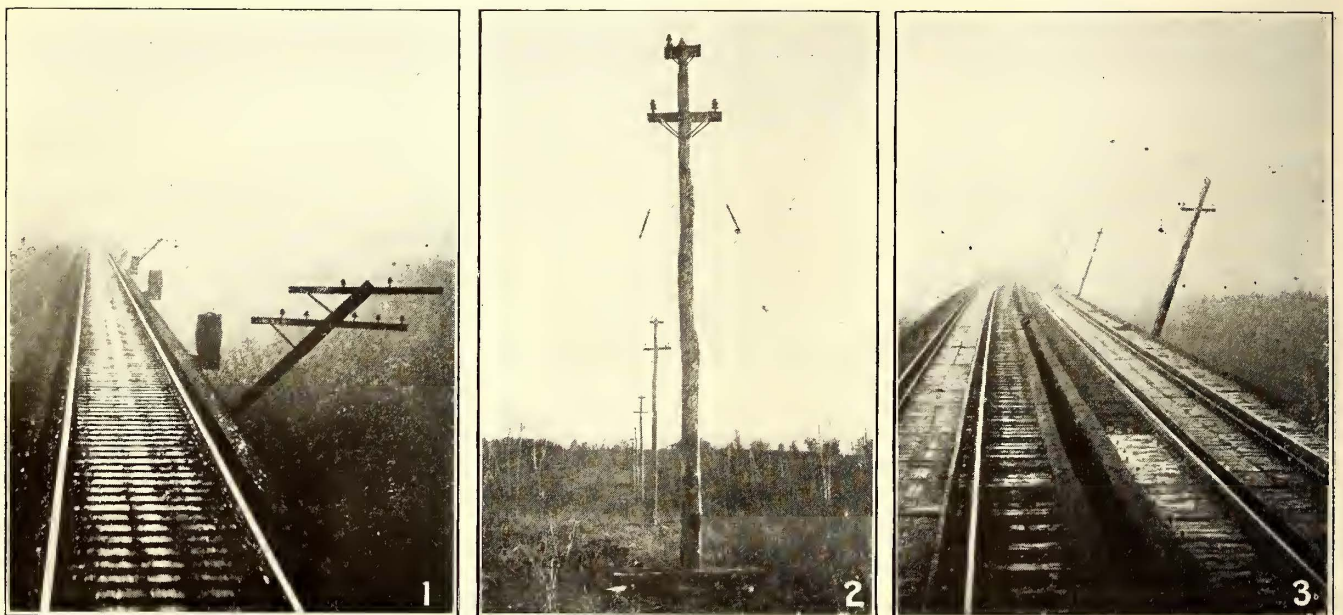
Sometimes 1-in. or 2-in. plank is driven under and

had personal experience with concrete poles used in very soft ground, but it would seem that conditions which warranted the use of a concrete pole line across such territory would also warrant the use of piles and brackets similar to these for wood poles but in reinforced concrete.

Steps Involved in Putting Up the Steel Tower

Tower erection usually involves three steps; placing the footings, assembling the tower and, finally, erection proper.

The early towers followed windmill practice, and employed masonry or concrete footings extending from below the frost line to at least 6 in. above the surface, and carried anchor bolts by which the tower base plates were held rigidly in place. The top, for an area of that of the base plate, was level with edges beveled to shed water. Footings of this type are still used for



FIGS. 1 AND 3—POLES ATTACHED TO TRESTLE AND INCLINED OUTWARD TO SECURE STABILITY. FIG. 2—POLE IN SWAMP WITH TIE SUPPORTS AT BASE

at right angles to the mudsills. It is a question, however, if this really protects the bottoms of the mudsills proper from decay, and if the latter are not of uniform thickness they are worse than useless until the uneven pressures are balanced, this generally occurring by breaking the heavily loaded planks.

In the long run it will almost invariably pay to use piling for the support of the ends of the arms, in which case the latter are framed and through-bolted into the piles. Good results, however, may be had with mudsills, which should be 6 ft. to 8 ft. long, with a vertical thickness of at least as many inches as the length in feet.

Concrete poles in firm soils are set to about the same depth as wood poles, but their weight and the impossibility of using ordinary pike poles practically compels the use of a derrick. In moderately soft earth a concrete footing is used, a plain or reinforced slab of sufficient strength to carry the weight of the pole and its loads being first cast in the bottom of the pole. If practicable, this is allowed to set for at least ten days before the pole is placed on it. The writer has not

anchor and other special towers but require much accuracy in location. For the smaller towers, because of the large *relative* amount of forms and the small amount of concrete, they are very costly. Where they are used a "wrinkle" from steam-engine practice can be borrowed to advantage. Instead of placing concrete close around the bolts, a piece of tin rain leader of diameter 2 in. or 3 in. larger than the bolts, and of proper length to reach to the top of the footing, is slipped over each bolt, resting on the big washer at the bottom. The bolts, with these sleeves centered on them, are then hung from the templates and the footings are poured. The tops of the bolts can then be moved to meet any lack of agreement between tower base and template up to the limits of the large hole in the concrete, which is grouted full after the tower is bolted down.

The next step was the substitution for the base plate of the tower and the anchor bolts, of an extension of the tower legs to which the tower proper was spliced. At first this extension was bedded in the heavy form of footing, but very soon the latter was cut down to a

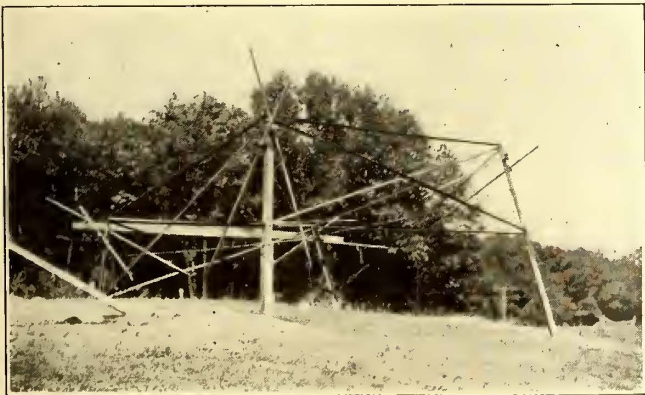
sort of mushroom anchor. On at least one good-sized line these were cast in yards and after curing were teamed to the points of use. While this effected a large economy in labor costs it was found that unless the coating was reinforced, in which case the saving was largely lost, it cracked off in handling.

To-day for good soil it is very general practice entirely to omit the concrete. The ground stubs, as they are generally known, consist of about 8 ft. of the section used for the tower leg, with a crossbar about 3 ft. long at right angles to it on the bottom. This stub should be protected with a heavy galvanizing or other treatment, although many are actually set with only the shop coat of paint.

Do Not Neglect Proper Refilling of Foundation Holes

It is essential that the refilling be of good material, preferably with some heavy pieces of rock on top of the crossbar, and if the setting is carefully done no difficulty need be feared. There occurred, however, a very costly failure on a Western line as a result of poor judgment of material. The line in question crossed a flat valley having a soil which, while very hard when dry, lost all strength when wet. The holes, dug in dry weather, were blasted out, and the hard lumps were used as filling without ramming. When a little later a heavy rain flooded this low land, the lumps melted down like soaked sugar, and a long stretch of line went down, tower after tower, merely from the pull of the conductors.

Pre-cast foundations and ground stubs are usually set by template. One of the best forms consist of a square or rectangle, having at its corners short sections of the same angle as is used for the tower legs and at the same inclination, together with a pair of rods or pipes in clamps. The angle sections are drilled as are the tower legs, and extend such a distance below the sides of the rectangle that the tops of the sides are an even number of feet below the lowest conductor, while from diagonal braces is hung a plumb bob at

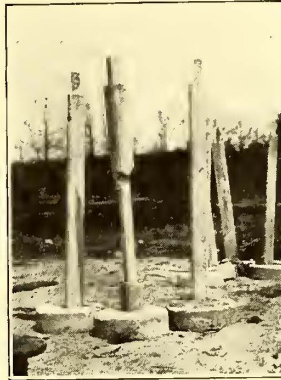


TEMPLATE FOR SETTING TOWER FOOTINGS

Note paired support at each leg, now lifted, on which the template is adjusted before the footings are set

the center. The template is centered on the tower center by the bob, squared with the line by center marks on the two sides, leveled at the proper height and supported on the adjustable rods. The template shown in an accompanying cut has pointed rods, which have to be well driven to prevent later settlement. A flat

foot about 6 in. square is better but, of course, in such case care must be taken that the material beneath is reasonably firm and that any moss, leaves or the like have been removed. Incidentally, flat-footed supports readily permit the recentering and relining which is almost invariably necessary after leveling up. The



PRE-CAST MUSHROOM TYPE FOOTINGS

Note how the concrete has broken off in handling

footings are now bolted to the template legs, the holes for them having been dug before the template was set. The holes are then filled in and tamped, keeping the re-fill at about the same stage in each hole and working completely and uniformly around the stubs to avoid springing them out of place.

By having the sides of two overlapping parts suitably drilled, the size of the rectangle can be adjusted for a very considerable range of tower heights, while the substitution of leg sections with base plates properly drilled makes it available for such foundations. In the best form of base plate the anchor bolt passes through the base plate proper and extends up through a second plate or bracket nearly a foot above, thus obviating the tendency to bend the bolt in the threaded portion, and this long bearing in the template holds the bolt against displacement as the concrete is poured. If the base is of the older type, in which the bolt extends only 2 in. or 3 in. above the top of the concrete, it will pay to have temporary extensions, readily made from heavy pipe, to screw onto the bolts, and fitting in guides on the template to hold them firmly in place. As they are vertical, they can hang from the template without such control and if sufficient care is taken there will be no trouble. With the bolt firmly held, however, displacement is practically impossible except by deliberate intent, and the insurance is well worth the trouble.

Towers Are Usually Tipped Up Into Place Complete

Although there is pretty wide diversity in tower design, the shipment, assembly and erection of the types differs comparatively little. The flexible forms are usually shipped complete, and rigid types are shipped knocked down, the parts for each tower together. Bolts and small parts are bagged; other members are tied in bundles. Each bag or bundle is marked with the tower number and the nature of its pieces, and each piece with its erection mark. It is therefore a simple matter for the checker to make sure that, barring a shortage of parts in a bundle, all the material for any tower is on the ground.

The assembly gang, following the men setting foundations, usually set up opposite sides flat on the ground. They first lay out the two adjacent legs the distance apart they will be and at the angle they will make when assembled, with the bottoms close to the foundations, then set the other leg of each side and finally put in the diagonal. In the case of those towers which, like the Milliken, have legs which are pyramids, the

entire half tower can be so erected. With towers having long connections from leg to leg only the sides are first set up. The parts are then turned on edge and the assembly is completed. Moderately high towers are often put up in two sections; heavy towers are almost always erected piece by piece in place.

The earlier method of erection was by some form of gin-pole or derrick which lifted the tower bodily into place, but to-day the practice of tipping it up on its base is almost universal. Certain designs have the necessary stiffness; for the others temporary wooden braces are fastened between the legs. A cable is then made fast near the top of the tower and to the top of a tilting pole set up at the tower base. This pole is about one-third as long as the tower height and, in addition to the cable back to the tower top, it has fast to its top the hoisting falls which lead to an anchorage about the tower's length from the foundation. A hold-back from the tower top to a good "snub" or anchor completes the rig.

When all is ready two men "stand by" at the foundation and one at the snub; a pull on the falls tips down the top of the tilting pole and through the cable tilts up the tower until falls and cable are in the same line. After this the tilting pole simply hangs on the line and the pull is directly on the tower. As the latter comes near the vertical it is checked by the snub until what have been the upper two legs can be connected to their stubs by one bolt each. The tower is then rotated on these bolts as pins until the other legs can be connected to their footings, when all are bolted up. With foot-plate foundations, if the tower is tilted up it is necessary to put blocking to the level of the bolt top and then to lower the tower after it has been lined up. General practice, however, confines foot plates to towers which are built in place or to those which, as when along a railroad or highway, can be handled bodily by a derrick. Where free access can be had to the foundations a truck or car derrick is by far the best device for erection. As a rule, however, much of the line comes where a derrick cannot be readily taken. The labor of handling and guying a gin pole of sufficient capacity makes it less economical than tilting pole.

Towers so heavy as to require piece by piece erection follow ordinary structural steel erection practice with riveted connections throughout. The smaller towers—except the A-frame or flexible type, which are usually riveted in the shop—are almost invariably bolted together.

Ventilation of Manholes

Every manhole built by a certain Middle Western company is fitted with at least one opening for ventilation. The smallest manholes measure 5 ft. x 7 ft. x 6 ft. high. Holes of this type in which there are no transformers or which contain units of small size are equipped with a 10-in. tile running to the nearest pole, and an 8-in. pipe is then extended from the tile up the pole. For manholes containing transformers rated at 25 kw. or more two such ventilating openings are installed. In this case one vent opens near the top of the hole and one near the bottom, and on the pole the openings are at different levels to create a temperature difference and cause circulation of air.

"Jenney" Versus "Deadman"

Convenience Should Be Sacrificed to Safety in Raising Poles

BY G. H. MCKELWAY

Engineer of Distribution, Brooklyn Rapid Transit System

IN THE Aug. 17 number of the ELECTRIC RAILWAY JOURNAL, Charles R. Harte continued the series of admirable articles on overhead construction which he has been contributing by explaining the proper way to set wood poles. I have found these articles the best and most helpful that I have ever seen on the subject.

In the latest article he mentions the "jinny" as a "substantial prop of Y-shape about 7 ft. long." While that name may be the one commonly used for the tool in Connecticut, it is a misnomer so far as some other parts of the country are concerned. In order to assure



SETTING A STEEL POLE WITH A "JENNEY"

myself of the fact, I looked the tool up in several catalogs of line material which are distributed over all of the United States, and found that in them the "jenny" or "jenney" is made in the shape of an X rather than a Y, and is therefor built to rest with two feet on the ground.

The prop of Y-shape is generally spoken of as either a "mule" or, more commonly, a "deadman." While the latter is the more universally used, principally because of its greater convenience, yet the other type, which is not mentioned in Mr. Harte's article, is the safer, though undeniably the more clumsy. With the ordinary deadman there is always the possibility of a pike or piker slipping or something else occurring, which will throw the entire weight of the pole to one side. In such a case it is very difficult to keep the deadman upright and there is great liability of the pole tumbling to the ground and seriously injuring one of the men who are attempting to raise it. When the jenney is used the occurrence of such an accident is practically impossible, because the two feet when resting on the ground brace it from both sides so that it is very difficult to overturn.

Owing to the fact that one or two serious accidents occurred while poles were being raised with deadmen, their use was forbidden several years ago on the railway system with which the writer is connected. Since then there have been no such accidents.

Subsoil and Its Important Relation to Track Construction

The Author Analyzes Track Development Since the Beginning of Electric Railway Operation—He Explains Why Subsoil and Ample Drainage Are Prime Requisites in Track Construction

By R. C. Cram

Assistant Engineer, Way and Structure Department,
Brooklyn Rapid Transit Company

Among the many depraved traits that inanimate matter possesses, none has caused greater surprise or reflected more severely on the skill of engineers than the behavior of rails and joints since they were made to do service under electric cars, and notwithstanding that a great amount of inventive genius and experimental effort has been expended in improving details of foundations, ties, rails and joints, street railway companies everywhere feel more or less solicitude lest they fail to secure the highest standard of excellence desired.

Although no construction with which we are acquainted meets all requirements in a fully satisfactory manner under all conditions, great advances have been made, and this line of engineering, which heretofore has been considered an humble branch of the profession, is now receiving the attention of the best engineering talent in the country, and some of the modern arrangements represent notable and important improvements over former practice.

THE foregoing quotation might have been written yesterday in comment on present-day track construction, but it really was written in 1892 by the late C. B. Fairchild in his memorable work on "Street Railways."

An editorial in the *ELECTRIC RAILWAY JOURNAL* not long ago commented upon the important report recently submitted by the committee on stresses in track of the American Railway Engineering Association as follows:

It is well known that railroad track is a structure which has been evolved from previous practice and experience rather than from study and experimental data along scientific lines. It has remained for this committee to earn the enduring regard of the engineering profession through its

On the contrary, their design calls for the exercise of extreme care and engineering skill in the selection and utilization of a number of different materials which must be united in one structure, just as a great office building must be assembled with materials from many sources. In order successfully to design either a building or a track structure there must be an appreciation of the qualities and strengths of materials combined with the knowledge of their performance under varying conditions which mainly comes with long experience. The principal materials in a track structure before assembly are: Soils, gravel, crushed stone, sand, cement, timber, iron and steel, together with a multitude of paving materials such as granite, wood block, brick, sandstone, slag-brick, pitch and various combinations of bitumen with stone. Some of these items, such as rails, ties, concrete and pavements, assume the position of added items when considered in their assembled state.

It will be the purpose of this and subsequent articles to consider these materials in their relation to the track structure.

Modern Track Dates from the Beginning of Electric Operation

Street railway tracks have been in process of development for more than eighty years, and during the first half of that period progress was exceedingly slow. In fact, there was no radical change in the construction of tramway tracks during the period extending

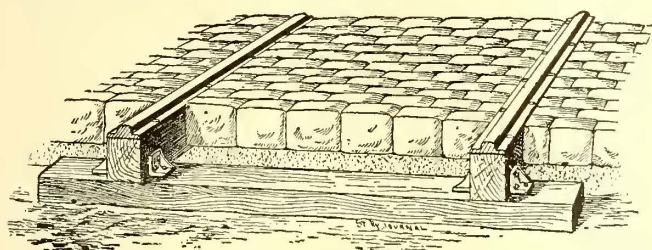
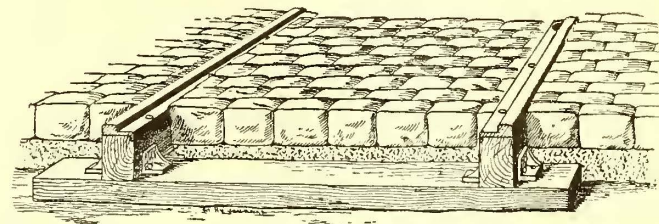


FIG. 1.—ORDINARY STRINGER CONSTRUCTION FOR HORSE CAR LINES, WITH CENTER BEARING AND SIDE BEARING TRAM RAIL



demonstration that track is subject to known laws and scientific treatment in common with other engineering structures. The proof that track is an elastic structure acting in accordance with Hooke's law is of itself a material contribution to the sum of engineering knowledge.

In the light of this editorial statement we may judge that electric railway engineers need not feel that there is so much reflection upon their skill after all, since it has taken steam road engineers such a long time to discover some of the fundamental laws governing their track construction.

Study of Strength of Materials Necessary in Track Design

At last the fact is becoming recognized that the design of tracks is not a simple matter, whether they are located on private right-of-way or in paved streets.

from the introduction of horse cars (about 1832) to the important change in motive power from horses to electricity which began about 1888. With the advent of electric power came the real beginning of the change in track construction which led to the generally accepted types of track in use to-day. It is of interest to note that even in 1892 the main features of the present type of construction were advocated and used to some extent. In fact, a report on proper track construction was presented to the American Street Railway Association in that year which, if it were edited a bit, could just as well bear this year's date, since it pointed out practically all the essentials which are considered valuable to-day.

We may think we are very modern in our use of

concrete in track construction but it was used with tramway tracks in Great Britain thirty or more years ago (see Fig. 5). Even the steel anchor chair for a concrete base, which has been used in the past by the surface lines in Philadelphia, had its predecessor in tracks in Bristol, England, as early as 1892 (see Fig. 6).

The American Street Railway Association report

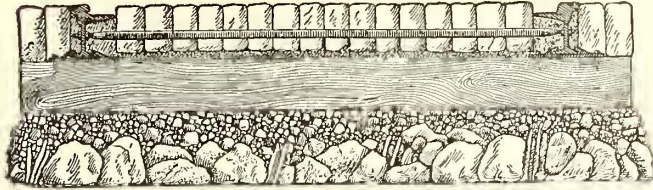


FIG. 2—EARLY ELECTRIC TRACK CONSTRUCTION; STONE BALLAST, 6-IN. RAIL SPIKED TO TIES

herein referred to also settled the mooted question of "Use of T-rails in paved streets" by saying that they were the best rails to use and should be adopted wherever municipalities would permit. Even the matter of standardization of rails was considered in that year, and it was suggested that there was no need for more than six different rail sections, but it was not until 1914, twenty-two years later, that the association finally

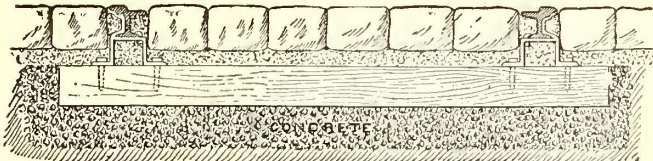


FIG. 3—EARLY ELECTRIC TRACK CONSTRUCTION, 6-IN. RAIL ON CHAIRS, CONCRETE BALLAST

adopted four standard girder rails, two guards and two tangent rails. Truly the mills of the gods grind slowly. What a long time the rail mills were occupied in rolling "personal" rail designs for street railway engineers!

Wherever we see a track which is giving good service, we cannot learn why it does so from a casual examination of it as a unit, especially if it is in a paved street.

TABLE I—BEARING VALUES OF SOILS
(Compiled by American Concrete Institute, 1914)

Material	Safe Load in Tons per Square Foot
Quicksands and wet soils	0.1 to 1.0
Dry earth according to depth below surface	1.0 to 3.0
Moderately dry clay, confined	2.0 to 4.0
Dry, stiff clay	4.0 to 6.0
Sand, confined	2.0 to 6.0
Sand, compact and cemented	4.0 to 8.0
Gravel, cemented	8.0 to 12.0
Rock	25.0 to 200.0

TABLE II—CLASSIFICATION OF SOILS
(Compiled by United States Department of Agriculture)

Key	Material	Size		Screens	
		mm.	mm.	Pass through	Retain on
1	Fine gravel	2.	1.	No. 10	No. 18
2	Coarse sand	1.	0.5	No. 18	No. 32
3	Medium sand	0.5	0.25	No. 32	No. 70
4	Fine sand	0.25	0.10	No. 70	No. 160
5	Very fine sand	0.10	0.05	No. 160	No. 230
6	Silt	0.05	0.005		
7	Clay	0.005	0.000		

By the number of sieve is meant the number of meshes per lineal inch, of wire cloth, woven from brass wire, having the following diameters for

Sieves Nos.	Diameters
Sieves Nos. 10 and 18	0.0165 inch
Sieve No. 32	0.0112 inch
Sieve No. 70	0.0045 inch
Sieves Nos. 160 and 230	0.0024 inch

It is necessary to inquire into the details of construction which are combined in the unit. From this detailed examination we may learn how the various elements are combined and we soon find that there are quite a number of factors which have an influence in the design of track structures. Most of them will be found essential in the consideration of both open and paved track, but those which apply to paved track only will be easily recognized. The following list of factors of design is taken from the 1914 report of the committee on way matters of the American Electric Railway Engineering Association upon the subject of proper foundation for tracks in paved streets.

"Factors Influencing Design—From Report of Committee on Way Matters, 1914; (1) Character of subsoil. (2) Bearing power of soils. (3) Drainage of subsoils. (4) Effect on electrolysis. (5) Forms of substructure. (6) Live and dead load to be carried. (7) Forms of track superstructure. (8) Pavement. (9) Headway and speed of trains. (10) Street improvements. (11) Subsurface structures. (12) Street and car traffic."

No. 7, forms of track superstructure, is subdivided into five factors which have a further influence upon design; these are: (a) Ties; (b) rail; (c) rail fastenings; (d) rail joints, and (e) pavement.

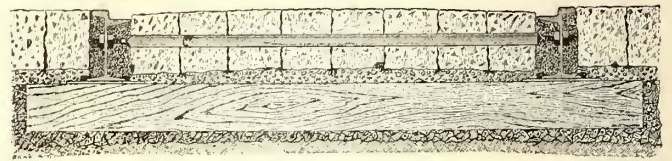


FIG. 4—EARLY ELECTRIC TRACK CONSTRUCTION (ABOUT 1892), 9-IN. TRAM GIRDER RAIL SPIKED TO TIES

There is little question but that the most important items are those relating to character, bearing power and drainage of subsoil. The 1914 way committee report above mentioned classified subsoil as the controlling factor in design and submitted a table giving data on the bearing values of soils (see Table I). In 1915 the committee again emphasized these factors and presented a classification of soils (see Table II), as determined by the Department of Agriculture, with a conclusion that the classification of soils found in city streets is desirable. Meanwhile the committee on stresses in track of the American Railway Engineering Association was carrying its experiments forward and

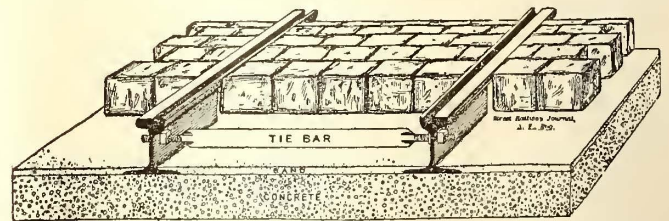


FIG. 5—BIRMINGHAM (ENGLAND) TRAMWAY CONSTRUCTION, USING CONCRETE WITHOUT TIES, ABOUT 1890

now has in preparation a report on bearing values of soils which should be of great service.

The 1892 report presented to the American Street Railway Association previously mentioned had the following to say in regard to subsoil and drainage:

The depth of the excavation must be determined by the depth of the rail and tie, plus the space allowed for tamp-

ing. The condition of the soil must govern the latter exclusively, but in the reconstruction of the roadbed, where the operation of cars will permit, and in all new work, unless the soil is of sandy character, the following plan will not only provide suitable subdrainage but will also insure permanency: Remove earth to a depth of 8 in. below bottom of tie; roll thoroughly with a heavy horse or steam roller; spread a layer of cinders, crushed rock, gravel or furnace slag 6 in. to 8 in. in thickness and again roll until same is well bedded and leveled. . . . The fact that the material so placed provides a splendid subdrainage is the best argument in its favor and will commend its adoption where soil demands it; for it must be remembered that it is far more expensive to open up and retamp poorly-constructed track than to properly construct and provide subdrainage at the outset.

We would not think of constructing a building of importance without determining beforehand the nature of the soil upon which we were to lay the foundation. If it is good practice to do this in connection with the design of a building, it is no less so when the design of tracks is under consideration, and the premature failure of many miles of so-called permanent track in the past may be laid to either the lack of information relative to the subsoil conditions or to the failure fully to appreciate such information as was obtainable. The fact that tracks designed with due regard to meeting all the controlling elements of design have been made to stand up, after reconstruction, in places where earlier tracks had failed before their time is sufficient

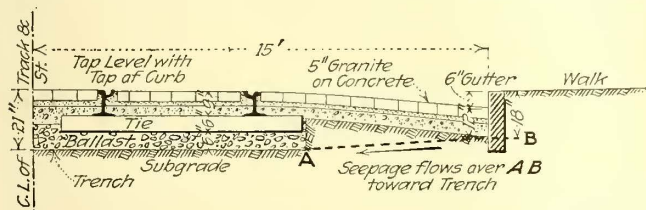


FIG. 7—HOW A TRACK TRENCH MAY RECEIVE WATER FROM ADJACENT ROADWAY

track structure and paving materials. This trench usually has a depth of from 15 in. to 21 in., depending upon the depth of the rails and ballast, and it will be seen from Fig. 7 that the bottom of the trench may be 9 in. below the bottom of a 6-in. macadam or other shallow pavement even at the gutter. With deeper pavements this depth becomes less, but even with a

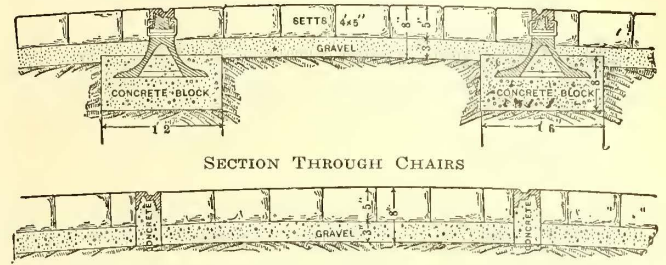


FIG. 6—EARLY USE OF STEEL YOKES OR RAIL ANCHORS IN CONCRETE IN BRISTOL, ENGLAND

5-in. granite pavement on concrete, and 7-in. rails, wood ties and 6 in. of ballast, the difference in levels may be at least 1 in. Hence, there is great opportunity for stray water from the surrounding surface of the street and adjacent property to seek the track trench.

How much water actually reaches the trench in this way is dependent upon the character and condition of the

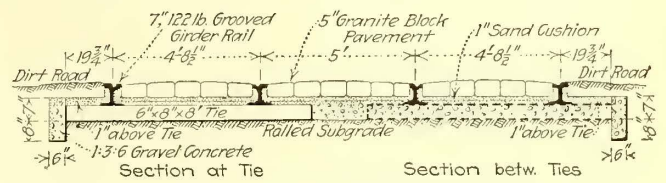


FIG. 8—A METHOD FOR PREVENTING DAMAGE TO ROADBED FROM SEEPAGE OF WATER

warrent for the foregoing statement. However, some consideration must also be given to the not infrequent situation which formerly obtained wherein the funds provided for original construction were not sufficient to permit the engineers to incur the expense which would have been necessary fully to meet the conditions.

Ample Drainage Prime Requisite in Track Construction

Ample drainage is the prime requisite in track construction. This must be provided not only for the subsoil but for the surface in order to prevent infiltra-

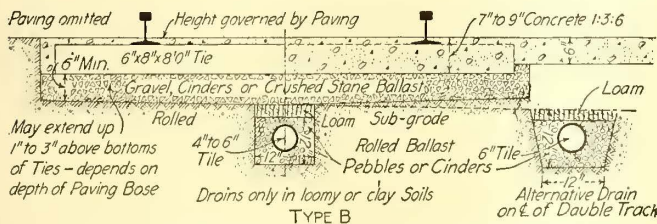


FIG. 9—TYPE B—BALLASTED TRACK CONSTRUCTION RECOMMENDED BY THE AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION

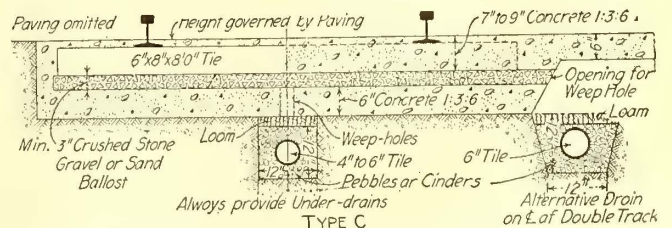


FIG. 10—TYPE C—CONCRETE SLAB SUB-BALLAST TRACK CONSTRUCTION PROPOSED FOR USE WITH VERY POOR SOILS

tion of surface water. Moisture in any form is the chief enemy, and water and frost will cause more damage to tracks than any other agency, bad joints not excepted. It should not be forgotten that the track trench takes on the form of a drainage ditch for the rest of the street, even though it is backfilled with the

was taken to consolidate it thoroughly by rolling with a 10-ton roller.

In most cases where the soil is of such a character that ballast of gravel or crushed stone must be used, it will also be found that the ballast alone should not be depended upon to provide sufficient under-drainage.

If the ballast is well compacted, especially by rolling, water will not flow through it readily. Furthermore, the soil works up through it more or less after a time and tends to prevent the passage of water. It is for these reasons that most of the designs for modern ballasted tracks now make due provision for subsoil drainage by means of tile drains. It will be seen from the foregoing discussion of drainage provisions that dependable data upon the bearing value of soils will be

upon railway companies by municipal authorities in many instances where such an expensive construction would be unnecessary. However, it is a type which is used voluntarily to a considerable extent under soil conditions which almost demand its use. Thus the concrete slab feature was employed recently in Chicago, as will be seen from Fig. 11, which is reprinted from an article describing its use, which appeared in this journal for March 30, 1918. The article in question,

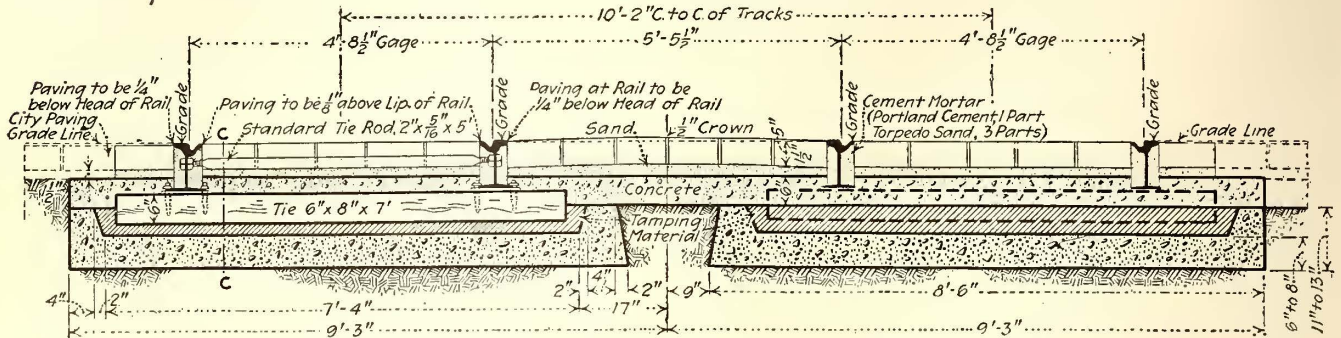


FIG. 11—CROSS-SECTION OF TRACK CONSTRUCTION ON TWELFTH STREET, CHICAGO

of great assistance in connection with the design of tracks. Meanwhile, the classification of soil by mechanical analysis combined with the tentative bearing values of soils now available should be used by track engineers in every case where there is any doubt as to how to meet uncertain soil conditions.

In treating subsoil preparatory to laying the tracks, it will often be found that the practice of rolling will be of material assistance. It is stated by the way committee that a more even distribution of load is effected, that the bearing power of the subsoil is increased, that rolling should be done wherever practicable under working conditions, and warranted by the kind and condition of the subsoil, and that it is especially desirable wherever there has been much disturbance due to sewers and cross trenches under the tracks. Since uniformity is desirable in the track structures as a whole, it seems to be a fundamental principle of track design that the first place to secure uniformity is in the subgrade upon which the track is to be founded. There is no question but that this can best be done by rolling, with most soils. Occasionally it is necessary also to add broken concrete upon which to operate the roller. Even where the ballast is to consist, in part, of a concrete slab as sub-ballast, the rolling is just as essential in order that the slab will obtain a uniform bearing throughout. It should not be forgotten that even though the subsoil can be stabilized by rolling, it is essential that it be kept in this state by ample drainage provisions.

An example of the type of track construction wherein drainage is properly provided is shown in Fig. 9, which is the recommended, type B design as adopted by the American Electric Railway Engineering Association in 1915. In the meantime the way committee presented another design known as type C, utilizing a concrete slab sub-ballast with similar provision for underdrain, as shown in Fig. 10. It was intended for use on very heavy water-retaining soils and other uncertain ground.

The Engineering Association did not care to adopt this as a recommended design, although its merits were recognized, because of the fear that it might be forced

unfortunately, does not state what provisions were made for under-drainage other than to say that the construction was built upon a lake sand fill about 9 ft. in depth which was used to fill up cellars of houses over which, through a street-widening scheme, it was necessary to lay the tracks.

Standard Rail for Australia

American Association Form of Groove and Guard Adopted—Rails to Be Rolled in Australia

A CONFERENCE of Australian electric tramway engineers was held during May, 1918, in Sydney, N. S. W., to consider the adoption of a standard grooved girder tramway rail for use by electric tramway undertakings in the Commonwealth. Owing to the difficulty—due to the war—of importing rails from overseas, the manufacture of rails in Australia has become necessary.

The Broken Hill Proprietary Company, Ltd., which has steel works and rolling mills at Newcastle, N. S. W., has stated that it will consider the installation of a plant to roll grooved girder rails if a standard is adopted.

The conference passed the following resolutions:

1. That a standard girder rail be adopted for the tramways of the various states of the Commonwealth.
2. That the weight of the girder rail for tangent track shall not be less than 90 lb. per lineal yard, the exact weight being subordinated to the design.
3. That the height of the girder rail be not less than 6 in.
4. That the width of the flange shall not exceed the height of the rail by more than 1/2 in.
5. That the conference is agreed that the form of groove and guard of the rail should take the form of the present standard of the American Electric Railway Engineering Association.
6. That the tread of the proposed section of rail shall approximately conform to that shown in blueprint No. 3365 of the Adelaide Municipal Tramways Trust.
7. That Mr. Cowdery, engineer for permanent way

New South Wales Government Tramways, be asked to get from the manufacturers the chemical and physical tests of steel that they can guarantee for tramway purposes, and that it be left to him to design a rail in conformity with the resolutions of the conference.

The tread referred to in resolution 6 is struck to a radius of 12 in. with a $\frac{5}{16}$ -in. radius on the running edge, which the conference believed would tend to give a longer life both to wheels and rails.

New Ballasted Track Standards and Construction at Dallas

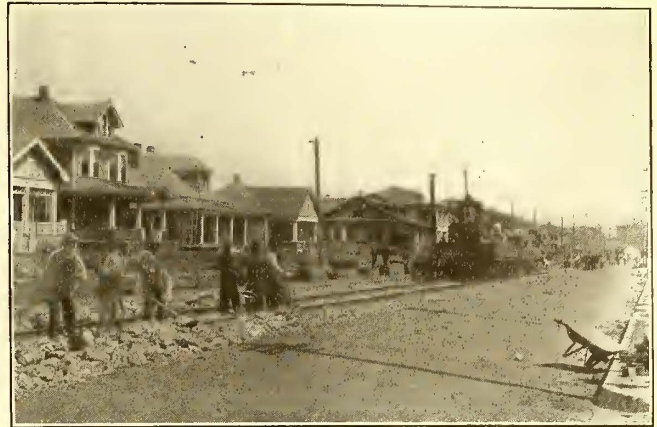
Company Has Already Spent \$200,000 for Rehabilitation Under Service-at-Cost Plan—More Work Is Now Under Way

THE Dallas (Tex.) Railway, under the immediate direction of B. R. Brown, engineer of way and overhead construction, is employing about 250 men to rebuild 8 miles of track, construct 5 miles of extensions and also carry out various special work betterments.

For these activities the company since Oct. 1, 1917, has adopted a new series of constructions designated as types A, B, C and D in the accompanying illustration. In these a concrete sub-base is favored only where the soil is waxy or treacherous; with good sand or loam a 6-in. coarse gravel ballast is favored. The first construction of this latter sort consisted of 1000 ft. of double track put down on Elm Street between Ervay and Harwood. This track has held up so well that up to May, 1918, it received no other attention than the use of a reciprocating grinder to remove a little cupping.

Still more conclusive evidence to the company of the merits of ballasted construction for Dallas was its

capped by a monolithic, aerated concrete called "Vibro-lithic." This is a local paving favorite which the railway is obliged to use. Obviously the company would be better off were it permitted to use blocks of some kind, even only as headers, for rail vibration is likely



REMOVING OLD SINGLE TRACK FOR NEW DOUBLE TRACK ON COLUMBIA AVENUE IN DALLAS

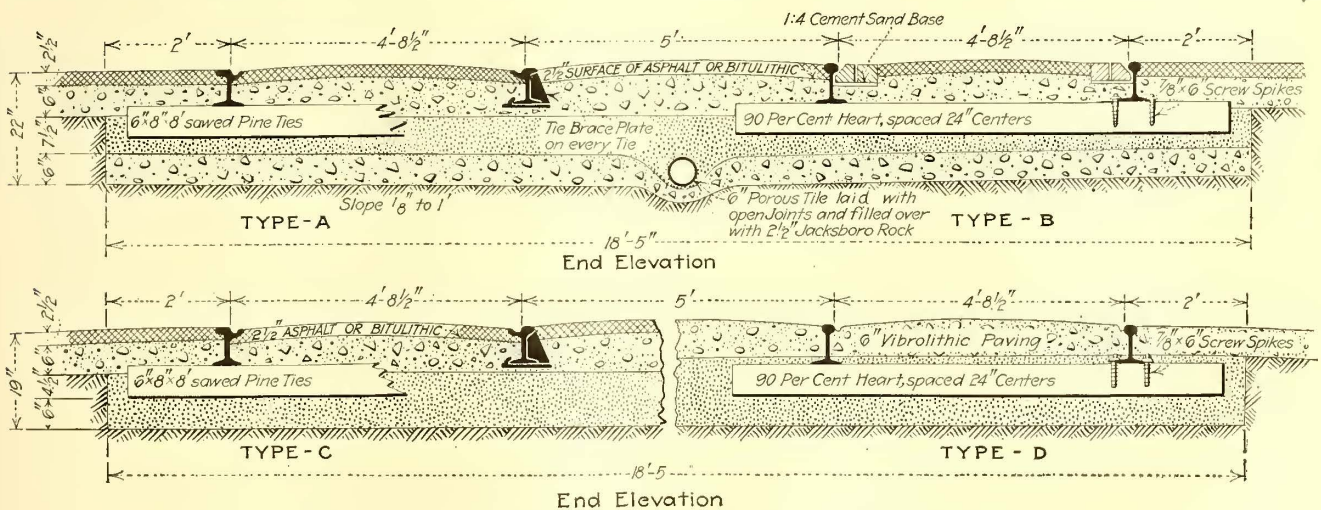
soon to break up the paving and so put the railway to much costly maintenance which was beyond its control to avoid.

The following is a list of some of the rehabilitation and new work which has been completed or is in process in Dallas:

Rerouting for South Belt cars on Second Avenue and building of Second Avenue extension with rearrangement of Fair Park Terminal, costing \$121,000.

Special work changes at Cantegral and Bryan Streets to permit trailer operation over the Bryan Street line, costing \$12,805.

Special work changes at Cantegral and Live Oak Streets.



NEW TYPES OF CONSTRUCTION IN PAVED STREETS OF DALLAS

experience with a big piece of special work put down at Elm and Lamar Streets, one of the busiest sections of the city. The material used was simply gravel ballast, wood ties and creosoted pine blocks on a mortar cushion. When this had to be disturbed late in May to weld a broken frog, the fastenings of the intersection as a whole were found in excellent condition.

It will be observed that tile drains are used with the concrete sub-base types and that brace plates go with girder sections. Type D T-rail construction is handi-

Removal of single track and installation of double track on Columbia Avenue, costing \$76,860.

Installation of special work at Commerce and Lamar Streets, to permit the running of Oak Cliff cars on cross-town routes, costing \$20,720.

Several hundred Apex welded joints have already been installed with an Indianapolis welder, and about 2000 of these joints are on hand or on order. All concrete work is done with the new 13-ft. Koehring mixer.

To date about \$200,000 has been spent for track rehabilitation under the Dallas service-at-cost plan.

Diagnosing and Correcting the Causes of Low Vacuum

By *Hartley Le H. Smith*

Chief of Testing Bureau
Brooklyn Rapid Transit System

Eternal Vigilance in the Matter of Maintenance of Surface Condensers and Auxiliaries Is the Price of Keeping Up a Good Vacuum and Therefore of Getting Good Results in the Turbine or Engine Room of the Power Plant

THE task of the power-plant engineer who is charged with the maintenance of high vacuum in surface condensers is one requiring attention to maintenance, day in and day out. He must apply in performing his task a combination of scientific diagnosis of the causes of variation from the best vacuum practically attainable, and he must also prescribe the best lines of attack in correcting abnormal conditions. He must also secure the co-operation of skilled maintenance men who can, with minimum waste of effort and time, reach the offending parts and radically better their performance. The whole matter seems to me to be analogous to the dual rôles of the medical specialist who excels in diagnosis and the practicing physician whose field is that of medicine.

Good Vacuum Means High Turbine Economy

It must be kept in mind that the best obtainable vacuum in any plant and with any definite type of equipment varies very greatly throughout the year. In a former article I pointed out that the only vacuum worth anything in a turbine plant is the vacuum in the turbine exhaust nozzle. It is this vacuum, and this alone, which affects the turbine economy. Of course, there is no other object to be attained in vacuum maintenance than the keeping up of high turbine economy.

Turbines differ from engines in that they actually do expand the steam down to the vacuum in the exhaust nozzle. Steam engines do nothing of the sort. The maintenance of a given vacuum in an engine exhaust means nothing but that the back pressure on the exhaust stroke is thereby established. The ratio of expansion during the working stroke, which is the most important factor in steam economy, is left entirely unaffected in any direct manner. With a steam turbine this is not the situation, for the ratio of expansion is the ratio of the absolute pressure on the turbine side of the governor valve to the absolute pressure in the turbine exhaust.

Having noticed the close relationship of the turbine exhaust vacuum and its relation to the turbine economy, we may pass on to another point. The turbine economy itself is determined partly by the design of turbine and condenser, and partly, and secondarily, by the standard of maintenance.

For instance, if a power plant had in it two turbines and two condensers of the same size, and if the condensers were of identical design but one of the turbines was of an older pattern while the other was modern, the modern turbine would show the higher vacuum in

its exhaust nozzle, even though the standard of condenser maintenance were the same. This would be due to the fact that the modern turbines possess characteristics due to the accumulated experience of the designers.

From the above facts it is evident that before the quality of a vacuum can be judged properly it is necessary to accumulate and to analyze the records of actual vacuum performance of *each* turbine, or at least each type of turbine and condenser of identical joint design. Thus, as these data accumulate, the performance of a machine may always be judged against the *best performance previously attained*.

The Turbine Load Affects the Vacuum Also

In considering steam turbine exhaust vacuum not every engineer gives adequate weight to the effect of the turbine load at which the vacuum is measured. All other conditions being equal, the vacuum in a turbine exhaust falls off at an increasing rate with increasing loads.

If the vacuum is plotted against the load the resulting curve will be seen to have the form of a parabola. Those mathematically inclined will recognize this in the form of the following formula:

$$V = a - bL - cL^2$$

In this formula V is the vacuum (corrected for standard barometric pressure), L is the generator load in kilowatts, and a , b and c are coefficients determined by experiment.

The numerical values of b and c for a typical turbine and condenser, the condensing equipment being in first-class condition, with respect to supply of ample condensing water and properly low entrance temperature, normal air leakage, and excellent air removal, would surprise anyone not conversant with the matter.

Of late years turbine and condenser contracts have taken this rapid falling off of vacuum into account, but at one time not so long ago they did not do so.

I call attention to this matter of relation of vacuum to load, although in practical, every-day work in the power plant, while the relation outlined is well understood, it is customary to make observations at some standard load when possible. When this is not possible the engineer approximates the condition as nearly as he can, and then allows for the unavoidable (but not too great) variations from the standard load.

What Is the Best that the Condenser Can Do?

Without desiring to go into the theory of this subject unnecessarily I think that it will be well to consider briefly the ideal performance of a condenser, that is, the degree of vacuum beyond which it is impossible to

go. This condition is shown by what is known as the elementary heat balance equation of the turbine and condenser as a combined unit. Let us look at this equation a moment.

In order that we may write it, let us use the following abbreviations:

S = steam consumption of turbine, in pounds per hour.

L = turbine load, in kilowatts.

W = quantity of condensing water, in pounds per hour.

H = total heat above 32 deg. Fahr. in steam delivered to the turbine in B.t.u. per pound.

t_1 = entrance temperature of condensing water, deg. Fahr.

t_2 = discharge temperature of condensing water, deg. Fahr.

t_3 = temperature of water leaving condenser hotwell, deg. Fahr.

E = combined electrical and mechanical efficiency of the generator and the mechanical efficiency of the turbine, expressed as a fraction.

With these symbols we may write an equation, putting on the left an expression for the total heat entering the condenser and on the right the total heat removed from the condenser, using as a basis the quantities corresponding to one hour of time. It will be remembered also that one kilowatt-hour is equal to 3412 B.t.u. The heat equation is then:

$$\left[SH - \frac{3412}{E} L \right] + W(t_1 - 32) = W(t_2 - 32) + S(t_3 - 32)$$

In this equation SH is the total heat entering the turbine, and $\frac{3412}{E} L$ is the total heat converted first into mechanical energy at the turbine shaft and later, for the most part, into electrical energy. The difference between these two terms is obviously the total heat delivered by the turbine to the condenser. The remaining term on the left-hand side of the equation is the total heat brought into the condenser by the entering condensing water.

The terms on the right-hand side of the equation are the total quantities of heat rejected from the condenser by way of the condensing water discharge and the hotwell discharge.

The left-hand side of the equation, therefore, represents the total heat entering the condenser, while the right-hand side represents that leaving it. If we neglect the amount of radiation from the turbine and the condenser, a negligible quantity, the amount of heat which enters the condenser must be equal to that which leaves it and the possibility of writing the heat balance equation is established.

The great significance of an equation representing on one side all of the heat entering a condenser and on the other side all of the heat leaving a condenser, hardly needs to be emphasized.

By simple algebraic transformation the equation may be written in the form:

$$S[H - (t_3 - 32)] - \frac{3412}{E} L = W(t_2 - t_1)$$

This is a very useful form of the equation. The right-hand member represents the total heat trans-

mitted through the tubes from the steam to the condensing water. This form of the equation is also useful under certain circumstances for calculating the quantity of condensing water which is circulating.

The main point to be emphasized, however, is the very great significance of the temperature of the condensing water as it enters the condenser. The variation in this temperature, t_1 , is the most important element in influencing the working performance of the condenser, as is evident from the heat balance equation in the form first written above.

This fact may be made clear by considering the term $W(t_1 - 32)$, appearing in the equation in its first form, and the term $W(t_2 - t_1)$ appearing in the equation in its second form.

The first term is the total heat brought into the condenser by the entering circulating water; the second term is the total heat transmitted through the condenser tubes by reason of the condensation of the steam and absorbed by the circulating water. It is true, although not often realized, that the first heat quantity exceeds the second heat quantity during the greater part of the year. That it actually does so is evident from a comparison of the terms $(t_1 - 32)$ and $(t_2 - t_1)$. As W is common to both terms, it cancels out.

For example, suppose that in summer the maximum value of t_1 is 78 deg. Fahr., and that in winter the minimum value of t_1 is 36 deg. Fahr. Also assume that the mean temperature of the entering water throughout the year is halfway between these two values, that is, 57 deg. Fahr. Assume further that the value of $(t_2 - t_1)$ is 17 deg. Fahr. This difference may, for the purpose of the argument, be considered as independent of the season of the year, and it does, in fact, undergo but little seasonal variation throughout the year.

Then at the maximum in summer $(t_1 - 32) = 46$ deg., at the mean temperature of the year it is 25 deg., and at the minimum temperature in the winter it is 4 deg. At the maximum temperature in summer and during the greater part of the whole year it very much exceeds the value of $(t_2 - t_1)$ which has been assumed equal to 17 deg., and is not affected by seasonal variation, whereas at the minimum temperature in winter it is very much less than $(t_2 - t_1)$.

This great fluctuation in relative magnitude of the total heat brought into the condenser by the circulating water and the total heat transmitted through the tubes and absorbed by the circulating water gives to the entrance temperature of the circulating water, t_1 , the rôle of premier variable in the entire condenser performance.

Entrance Temperature of Circulating Water Is of Prime Importance

For the reasons outlined, the principal guide in studying the vacuum in a power plant, for the purpose of maintaining it at the highest possible value, is the relation of turbine exhaust vacuum and entrance temperature of circulating water. These variables should be plotted against each other over one, two, three or more years and should be given first consideration in judging of any one day's performance.

This graph establishes the best performance so far attained at every entrance temperature of circulating

water, and also indicates the numerous performances in which the record is not the best at the same temperatures. With each new day's observations before him, the engineer asks: "Does this vacuum, considering the entrance temperature of the circulating water, equal the best previous performance, does it establish a new record, or does it fall far short of the best?"

Getting at the Root of the Trouble

If the vacuum is notably defective under the conditions controlling it, the natural question is: "Why?" The analysis of this condition may properly proceed about as follows:

First comes the question of the quantity of circulating water. Our heat balance equation may be rearranged in this form:

$$W = \frac{S[H - (t_3 - 32)] - \left(\frac{3412}{E}\right)L}{t_2 - t_1}$$

The quantities H , t_3 , and L may be measured at the time the vacuum observation is taken in addition to t_2 and t_1 , the discharge and entrance temperatures of the circulating water.

In practice, however, H is not specifically measured, because even with considerably varying turbine admission pressure and superheat, its variation is practically negligible. The load L is naturally measured because every effort is needed to see that it has some standard value. The sensitiveness of turbine exhaust vacuum to load variation has been commented upon earlier in this article. Hence, the almost inevitable, although slight, departures from standard loads are noted down.

The efficiency value E may be guessed at and is known to be about 0.95. It remains practically constant and in the equation has no great importance. The quantity S , however, has very great importance. Many turbines are now provided with steam-flow or hot-well meters, from which the value of this quantity may be read directly. Where there are no such meters but where steam economy tests have at some time been made, the value of S may be estimated from the test results using the observed values of load (and of vacuum for the purpose of using the vacuum correction). Where no tests have been established the guaranteed economy may be used, supplemented by conventional rules for vacuum correction.

In one or another of these ways the quantity of condensing water in circulation may be calculated. It will be found in some cases to undergo wide and rapid fluctuations. Whether it does so or not depends, of course, upon the cleanliness or dirtiness of the condensing water supply. Important here are the nature and effectiveness of the arrangements for freeing the water from dirt and trash before it gets into the condenser, particularly the intake screens.

Amount of Circulating Water Need Not Be Calculated

Another and an abbreviated way of considering the influence of the quantity of condensing water omits the actual calculation of it and depends upon the fact that it is very nearly inversely proportional to the rise of tem-

perature of the circulating water. The equation for W may be written:

$$W = \frac{1}{(t_2 - t_1)} \left(S[H - (t_3 - 32)] - \left(\frac{3412}{E}\right)L \right)$$

As it is necessary to bring the load L to some standard value with fairly close approximation preliminary to making the vacuum observations, it follows that the main source of variation of the turbine steam consumption S will have been eliminated. This leaves only the effects of steam pressure and superheat variation (which themselves affect H but in relatively slight degree) and the effect of vacuum variation at approximately standard load.

This last, although not negligible, has a variation range which is quite small compared with daily variation, often quite wide, of $(t_2 - t_1)$ and hence its reciprocal $\left(\frac{1}{t_2 - t_1}\right)$.

There remains, then, only the variation of the hot-well temperature t_3 . This is bound to have a wide seasonal variation and a much smaller variation due to the observed vacuum and the actual load. Its total effect, however, is quite small, as may be seen from the equation, because it subtracts from H , which has a large and nearly constant numerical value.

Summing up, then, it appears that the quantity of condensing water circulating is approximately inversely proportional to the rise of temperature of the circulating water. If necessary, it may be assumed to be so and calculations may be omitted.

Looking for the Cause of Circulating Water Shortage

The next step in the process is to consider the causes which may explain inadequacy in the supply of circulating water. First and most obvious is circulating pump speed. This speed is naturally measured during or close to the time of vacuum observations and any notable departure from the speed considered normal for the season of the year would be corrected before the completion of observation.

The total hours of condenser operation since the last thorough cleaning of the tubes is next considered. There is a probability that there is some interference with heat transmission through the tubes, caused by reduction in the velocity of the water in the tubes through trash accumulation in the intake water box. There may also be a reduction of water velocity in the tubes due to obstructions in the tubes themselves.

It is a much quicker and cheaper operation to clean water boxes than to clean tubes. However, if the tubes are dirty, cleaning the water boxes will not notably restore the condenser vacuum, whereas if the tubes are cleaned the water boxes are incidentally cleaned.

The hours of condenser operation since the last tube cleaning, therefore, enter as an important factor in forming judgment, together with the seriousness of the departure of the temperature rise of the circulating water from normal.

The suddenness of departure from normal temperature rise may also hint strongly the nature of the obstruction.

Obstruction of circulation from accumulations in the

tubes is apt to be a fairly gradual process, whereas the condensing water supply, if a river, may suddenly carry trash which will quickly close the entrances of tubes by accumulating upon the tube sheets. For instance, such conditions may arise when a wind storm has blown many small leaves into the river.

Cleaning the tubes of a large condenser is a slow and costly process, while cleaning the water boxes can be done very expeditiously. Hence, many cases arise where, among several condensers upon which observations have been made during the same day and which show notable falling off from proper circulating water supply, the worst of them is scheduled for tube cleaning and the remainder for mere cleaning of water boxes. This naturally has a bearing upon the vacuum which can be maintained.

The subject, of air leakage and effectiveness of air removal ranks next in importance to adequacy of condensing water supply. Where the source of condensing water is relatively free from dirt and trash, or where modern revolving intake screens make possible the use of finer screen mesh than is possible with stationary screens, the air problem ranks first in importance.

Actual quantitative measurements of air leakage with an air bell may be rapidly made on several condensers in succession if the air bell is fixed in position and permanent piping and valve connections are provided for all condensers in the plant. As a supplement to such quantitative measurements the speeds of the air pumps are to be included as important items to be noted simultaneously with the vacuum measurements and any inadequacies of speed immediately corrected.

Of vastly more importance, however, is the question of effectiveness of air pump action within proper range. Not very much in high vacuum maintenance outranks this in importance. It is useless to have low air leakage into a condenser if the effectiveness of air-pump action is poor. With many condenser air-pumping equipments there is such ample displacement capacity that if effectiveness of the pump action is good even rather rapid air leakage into the condenser produces only trivial effect on the vacuum in the turbine exhaust.

The effectiveness of air-pump action is easily determined, and the determination should be a matter of daily routine. It is only necessary to shut off the pump from the air suction line from the condenser, and to observe the pump vacuum at normal speed, correcting the observed vacuum carefully for barometric pressure and for temperature of the mercury column used in the vacuum measurement. In other words, the absolute pressure which the pump can produce within its own cylinder or casing while working with a closed suction valve should be determined accurately. A log should be carefully kept of these absolute pressures.

There is not much in the whole field of high vacuum maintenance which is more difficult than the speedy cor-

rection of ineffectiveness of air-pump action. It cannot be done unless some man in the maintenance force has opportunities by constant practice to become quite expert at the work. He should develop this expertness under the direction of the engineer who is competent to analyze the causes of trouble. These remarks apply especially to reciprocating dry-vacuum pumps. These pumps, aside from maintenance, are very satisfactory in that they create high vacuum with very low steam consumption. On the other hand, certain forms of rotary pumps have high steam consumption and furthermore withdraw no inconsiderable quantities of steam from the condenser (particularly when the condenser air leakage is low). This steam would otherwise appear in the hot well and would thus be used for boiler feed.

The list of symptoms to be considered in connection with condensers in need of maintenance work is not exhausted without giving attention to the temperature difference between the entering steam, coming from the turbine exhaust nozzle, and the circulating discharge water. While this does not alone measure the ease or difficulty of heat transmission through the tubes it is an item of great importance in relation to this heat transmission.

The temperature of the circulating discharge water itself constitutes a variable very close in its connection with the vacuum in the turbine exhaust nozzle, to produce a high value of which is the ultimate object of all vacuum maintenance work. There is practically no air present in a turbine exhaust nozzle. Even in cases where large air leakage occurs through the cylinder casing joint or the turbine shaft glands, the air, while present, cannot be detected. It is utterly "drowned" in the enormous quantity of steam coming through the nozzle from the turbine. The presence of air cannot be determined in a condenser except in its lower regions where the largest part of what entered as steam has been condensed to water.

Therefore at the top of the condenser it may be said that the steam temperature is the vacuum. This is true even if careful measurements of temperature and pressure in the turbine exhaust nozzle show lack of agreement with saturated steam values listed in steam tables. The lack of agreement may be in one direction in the turbine exhaust nozzle (possibly due to undercooling of the steam during turbine expansion), and in the other direction just a bit further down where the nozzle delivers steam to the condenser and the steam strikes the tube bank with a great blast. The latter condition may possibly be due to superheating through sudden arrest of velocity and conversion of kinetic energy. But the disagreement, whatever its cause, is not due to air.

Therefore the temperature of the steam is the fundamental thing and the temperature of water in close physical proximity to it (the discharge circulating

Some High Spots in Mr. Smith's Article

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The turbine economy itself is determined partly by the design of turbine and condenser, and, secondarily, by the standard of maintenance.

The performance of a machine should always be judged against the best performance previously attained.

The principal guide in studying the vacuum in a power plant is the relation of turbine exhaust vacuum and entrance temperature of circulating water.

water) is of great importance also. If the entrance temperature of the circulating water is high or low, if the quantity of condensing water circulating is ample or restricted, if the load departs one way or the other from the standard load aimed at during testing, if these abnormalities occur jointly or severally, the discharge temperature of the circulating water is at once affected. By reason of this and of the close link between water temperature and steam temperature due to the intense heat transmission at the condenser top, the steam temperature is affected and hence the vacuum.

The difference in temperature between steam and water, therefore, bears closest watching. It varies characteristically between winter and summer, due to varying heat absorption by the upper tube bank. This heat absorption in turn is varied by the absorption in the lower tube bank which changes greatly with entrance temperature of circulating water. It varies with varying congestion of heat absorption in the upper tube bank due to varying "drowning" effect of the lower tube bank in a cloud of air. The height of this air cloud is established jointly by the rate of air leakage and the effectiveness of air removal.

When gradual increase of the temperature difference between entering steam and discharge circulating water is not to be accounted for by the two categories just mentioned, the engineer prescribes the cleaning of the outside of the tubes by filling up the whole condenser steam space with a suitable chemical solution, such as sodium bisulphate. This, when allowed to stand in the condenser for several hours, has an excellently cleansing effect without being injurious.

Excessive Ash in Coal Handicaps the Power Plant

Removable Impurities Should Be Discarded at the Mines in the Interest of Freight Car and Power-Plant Equipment Conservation

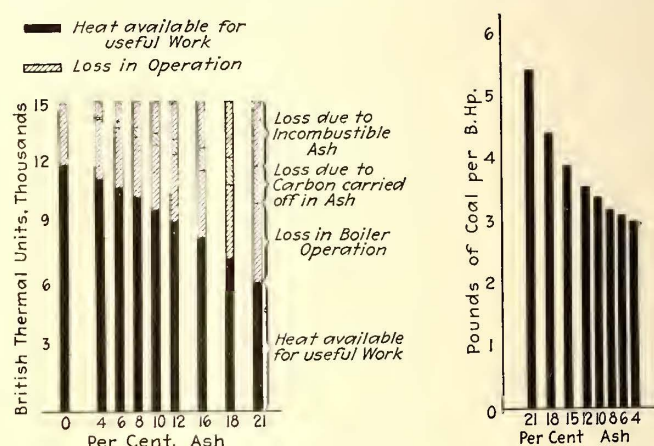
A STUDY made by the J. G. White Engineering Corporation for the National Research Council sums up in an impressive fashion, substantially as follows, the losses which are incurred by the use of high-ash coal. The presence of ash reduces the heating value of the coal, increases the coal consumption, reduces boiler capacity and increases the freight-car equipment required for transportation. Each per cent of avoidable ash in the nation's coal adds 5,000,000 tons of unnecessary freight per annum.

The percentage of ash has a distinct influence on the boiler efficiency. As it increases the fireman has more difficulty completely to burn the combustible, hence whereas with a low percentage of ash and good firing we expect about 25 per cent of the weight of the ash to be unconsumed combustible, with coal containing a high-ash percentage it is rarely possible to reduce the combustible in the ash to less than 50 per cent.

One of the accompanying charts shows the effect of varying percentage of ash on coal consumption per boiler-horsepower. It will be noted that for the best coal, with 4 per cent ash, 3 lb. is required, while with 10 per cent ash, the average amount in normal times, less than 3½ lb. is required. Beyond this point the increase is very rapid until for 21 per cent ash the

coal consumption amounts to 5.45 lb. per boiler-horsepower. The increase in the ash content of coal seriously reduces the capacity of steam boilers. Power plants to-day are in a serious condition because whereas the load is increasing the capacity of their boiler plants has been greatly reduced due to the poor coal obtainable. Where formerly boilers could be operated at from 200 per cent to 250 per cent of rating during peak periods it is now difficult to secure more than from 150 per cent to 160 per cent. For example, if in a given case eight boilers could do the work of a plant with coal containing 6 per cent ash, nineteen or twenty boilers are required if the coal contains more than 18 per cent ash.

This matter is very serious from the transportation standpoint as is evident from the fact that, considering the lower heating value of high-ash coal, it is possible that 40 per cent of the cars may carry worthless material. Coal containing 21 per cent ash requires 65 per cent more cars than coal containing 10 per cent ash. The trouble is not excessive until 10 per cent to



DIAGRAMS SHOWING DELETERIOUS EFFECTS OF EXCESSIVE ASH IN COAL

12 per cent ash has been passed. If therefore we might limit the percentage of ash to the average of 10 per cent, we should reduce our transportation equipment to a practical minimum. We should be able to operate all boilers at a reasonable efficiency and could reduce the number of boilers operated to a little more than one-half the number required with the dirty coal (that is 18 per cent ash or over).

Coal Storage Regulations Revised

The storage regulations prescribed by the state fuel administrators for public utilities, limiting the amounts of bituminous coal which may be stored in different sections of the country, were given on page 372 of the issue of this paper for Aug. 31. Under date of Sept. 14 the United States Fuel Administration has issued a revised list as follows:

Days of permissible storage for consumers in class 2: Maine, 120; Massachusetts, Vermont, New Hampshire, northern New York, 90; Connecticut, Rhode Island, southwestern New York, 75; southeastern New York and New Jersey, 50; Delaware, eastern Pennsylvania, Maryland, District of Columbia, Virginia, Florida, western Ohio, 40; western Pennsylvania, West Virginia, eastern Kentucky and eastern Ohio, 30; lower Michigan, 75.

Applying Engineering Principles Properly in Motor Selection

By C. W. Squier
Electrical Engineer

The Author Shows How to Compare Motors Which Appear to Have the Necessary Characteristics for the Service Designated and to Select the One Best Adapted to Meet Given Requirements

IN DISCUSSING in this series of articles the considerations which enter into the choice of railway motors I have up to this point outlined, first, how the operating requirements constituting any particular class of service are determined; second, how the various technical calculations which enter into the determination of the service and equipment are made, and third, how the numerous graphs which form the basis for deciding on the motors are constructed. By following these steps carefully we are now in a position to make an actual choice of equipment for a definite service.

How a Preliminary Selection of Motors Is Made

In making a preliminary selection of motors that appear to have the required characteristics for the service, as given in my article in the *ELECTRIC RAILWAY JOURNAL* of April 20, I have made use of the operating characteristic graph shown in Fig. 1. This gives the

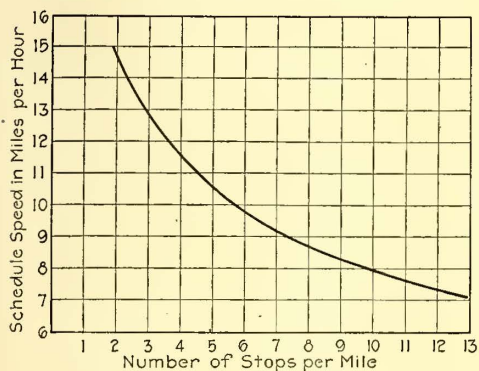


Fig. 1—Relation of Schedule Speed and Number of Stops per Mile

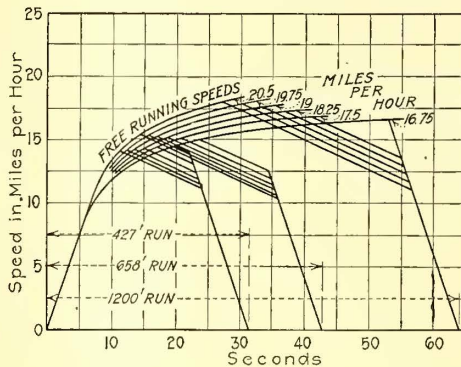


Fig. 2—Variation of Coasting Time with Free Running Speed

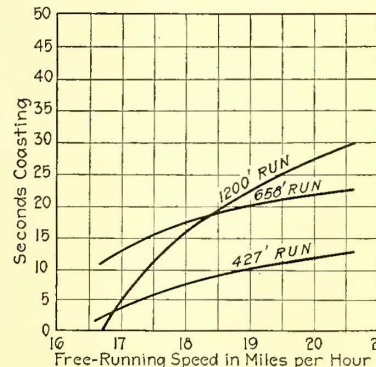


Fig. 3—Relation of Coasting Time to Free Running Speed

GRAPHS SHOWING OPERATING CHARACTERISTICS AND EFFECT OF FREE RUNNING SPEED ON COASTING TIME

relation between the number of stops per mile and the schedule speed at which the car is operated. By comparing this graph with similar ones obtained from manufacturers of railway motors, or given in publications descriptive of their motors, I have selected three motors of different size that appear to be capable of performing the service. Characteristic curves of these motors, arranged for the size of wheels, average voltage and gear ratio that I have found necessary are presented in Figs. 4, 5 and 6.

Balancing Speeds of Motors Compared Must Be the Same

In laying out the speed-time graphs for comparing motors of various capacity, it is essential that the balancing speeds of the motors be the same. As the average line voltage and the diameter of the driving wheels

in this case are fixed, the only thing that can be varied is the gear ratio. For the motors under consideration I have chosen a balancing speed of 19½ m.p.h. and have arranged the gear ratios of the three motors so that they will have this balanced speed.

In order to decide intelligently as to just what this balanced speed should be, I took the characteristic curves of one of these motors which would perform the service most economically and plotted a series of speed-time graphs for different gear ratios which would give free running speeds from 16.75 m.p.h. to 20.5 m.p.h. This series of graphs is shown in Fig. 2. From these it was possible to determine the number of seconds that the car could coast and still make the schedule speed for the different length runs specified. These figures of coasting in seconds plotted against the corresponding free running speed in miles per hour give the graphs of Fig. 3.

From an operating standpoint it is advisable not to reduce the amount of coasting time below ten seconds. With the short runs of 427 ft. this requires a free running speed greater than 19½ m.p.h. With 19½ m.p.h. the amounts of coasting obtained are ten and one-half,

twenty and one-half and twenty-four and one-half seconds, respectively, for the different typical runs. These figures when compared with the speed at cut-off and the power input required are most satisfactory.

The three motors chosen are rated at 40 hp., 55 hp. and 67 hp., respectively, at 600 volts. They are the latest types of ventilated motor but are not arranged for tapped-field control. When we have determined which of these is best suited for the requirements we can make some further comparisons with motors of similar capacity arranged with tapped-field control, and can then decide whether the latter have advantages that will make them more desirable for use in this service.

The first analysis should be kept as simple as possible, however, and the various typical run graphs with non-field-control motors are somewhat simpler to construct than would otherwise be the case.

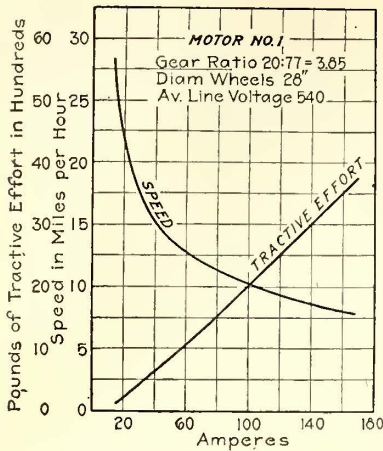


Fig. 4—Motor No. 1—10 hp. at 600 Volts

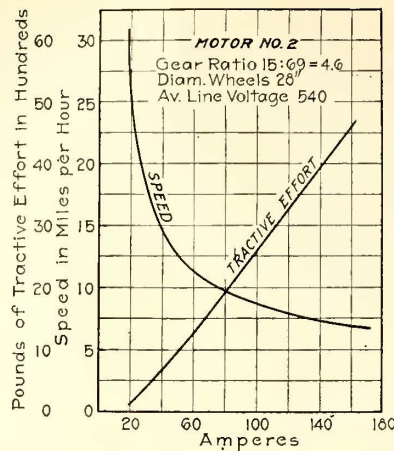


Fig. 5—Motor No. 2—55 hp. at 600 Volts

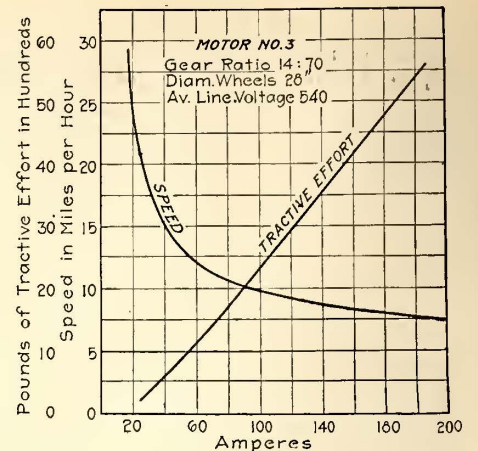


Fig. 6—Motor No. 3—60 hp. at 600 Volts

CHARACTERISTIC CURVES OF NON-FIELD-CONTROL MOTORS

The average lengths of runs for the service we are considering are 1200 ft., 658 ft. and 427 ft., respectively, for the suburban, residence and business sections as given in my April 20 article. Using the characteristic curves for the motors chosen for comparison, I have plotted graphs for speed time, heating current, power input and voltage for each of these typical runs. These are shown in Figs. 7, 8 and 9, and they were constructed by following the methods and calculations described in my previous articles. From these graphs values of heating current power input, average voltage, etc., have been calculated and are given in Table I for comparison. These determine our preliminary selection of a motor. For convenience these motors are referred to as motors Nos. 1, 2 and 3.

the duty on the motors is most severe for the shortest runs of 427 ft., as these runs take from 16 per cent to 26 per cent greater average heating current than the long runs of 1200 ft. It is this service through the business sections with frequent stops that determines the choice of size necessary to prevent overheating. Motor No. 1 is evidently too small for the service, as the square-root-of-the-mean-square currents are 40.1 amp., 43.9 amp. and 48.4 amp., respectively, while the continuous rating of the motor is but 38 amp. Under the average conditions of service the equipment will be required to operate in the most severe service for 37 per cent of its total mileage. The cooling effect of self-ventilation is also less in this service, and for this motor the heating current is 10 amp. more than its continuous rating. This motor, therefore, should not be considered for the service.

Let us first consider the heating currents taken in the three typical runs. A comparison of these shows that

TABLE I—COMPARISON OF PERFORMANCE OF THREE MOTORS OF DIFFERENT SIZE, WITH NON-FIELD CONTROL

Motor No.	Horsepower Rating at 600 Volts	Continuous Rating, Amperes	Weight of Motor with Gear and Gear Case, Pounds	Length of Run, Feet	Schedule Speed, M.p.H.	Coasting Time, Seconds	Square Root of Mean Square Current, Amperes	Kilowatt-Hours		
								For Run	Per Car-Mile	Average Volts per Motor
1	40	38	1990	1200	11 1/2	25.2	40.1	0.456	2.01	489
				658	9	20.7	43.9	0.294	2.35	436
				427	7 1/2	11.5	48.4	0.255	3.15	410
2	55	53	2360	1200	11 1/2	23.6	35.4	0.442	1.94	463
				658	9	18.8	37.8	0.278	2.23	448
				427	7 1/2	10.0	41.1	0.241	2.97	427
3	67	60	2630	1200	11 1/2	25.0	38.1	0.452	1.99	493
				658	9	19.2	41.3	0.293	2.35	453
				427	7 1/2	11.0	44.9	0.246	3.04	424

TABLE II—COMPARISON OF PERFORMANCE OF FIELD-CONTROL MOTORS WITH NON-FIELD-CONTROL MOTOR

Motor No.	Horsepower Rating at 600 Volts	Continuous Rating, Amperes	Weight of Motor with Gear and Gear Case, Pounds	Length of Run, Feet	Schedule Speed, M.p.H.	Coasting Time, Seconds	Square Root of Mean Square Current, Amperes	Kilowatt-Hours		
								For Run	Per Car-Mile	Average Volts per Motor
2	55	53	2360	1200	11 1/2	23.6	35.4	0.442	1.94	463
				658	9	18.8	37.8	0.278	2.23	448
				427	7 1/2	10.0	41.1	0.241	2.97	427
4	55	54	2400	1200	11 1/2	29.0	37.0	0.419	1.84	492
				658	9	20.5	39.1	0.265	2.12	453
				427	7 1/2	11.2	42.2	0.238	2.94	433
5	55	48	2400	1200	11 1/2	34.6	41.0	0.421	1.85	467
				658	9	25.1	43.3	0.278	2.23	410
				427	7 1/2	15.0	47.0	0.241	2.97	384

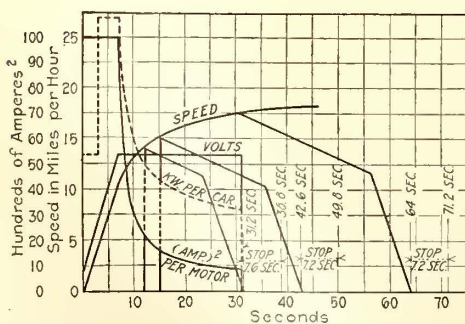


Fig. 7—Typical Runs and Most Satisfactory Operation with Car Equipped with No. 1 Motors

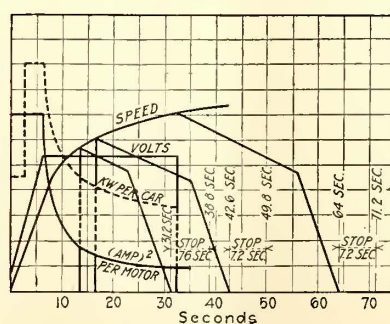


Fig. 8—Typical Runs and Most Efficient Operation with Car Equipped with No. 2 Motors

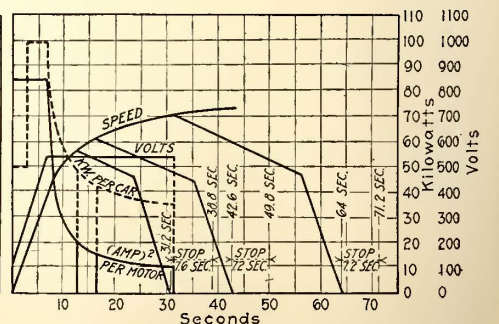


Fig. 9—Typical Runs and Most Satisfactory Operation with Car Equipped with No. 3 Motors

Both the motors Nos. 2 and 3 will perform all classes of the service without overheating and the square-root-of-the-mean-square current for the most severe run of 427 ft. is but 77 per cent of the continuous rating of motor No. 2 and but 75 per cent of the continuous rating of motor No. 3. Our choice will then lie between these two motors.

Motors May Be Too Large for Economy as Well as Too Small for Safety

Next let us compare the power taken by these two motors. Motor No. 2 gives the most economical operation as its power consumption is from 1,943 to 2,975 kw.-hr. per car-mile, while motor No. 3 takes 1,991 to 3,041 kw.-hr. per car-mile. Motor No. 2 possesses a further advantage due to its size and weight. It weighs but 2360 lb. against 2630 lb. for motor No. 3, or a saving of 540 lb. per car. The weight of the car, which was previously assumed at 39,000 lb. was based on a motor weighing 2727 lb. Of these three motors No. 2 is the best adapted for the service required.

The results obtained in the amount of coasting for the various runs, and the close agreement of this time for the different motors while operating on the same-length run, are due to having the free running speed the same for all motors. The average voltage per motor varies from 410 to 493.

Field-Controlled Motors Most Economical for City Service

To determine the advantages that field-controlled motors might have over the motor selected, I have chosen two additional motors for consideration. Motor No. 4 is the same as No. 2 except that it is arranged for field control, and motor No. 5 is a tapped-field motor of the same size but built by a different manufacturer. The characteristic curves of these motors, arranged to meet the service conditions we are considering, are shown in Figs. 10 and 11, and speed-time, power-input, heating-

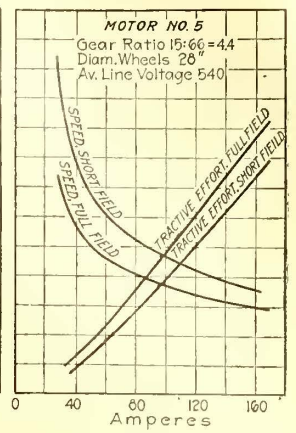
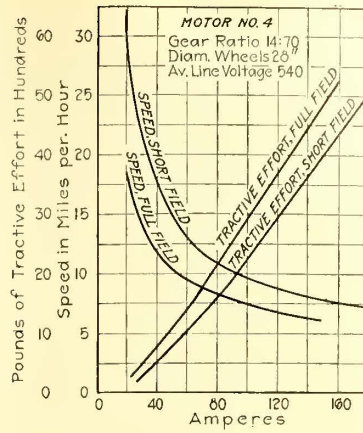


Fig. 10—Motor No. 4—55 hp. at 600 volts Fig. 11—Motor No. 5—55 hp. at 600 volts

CHARACTERISTIC CURVES OF MOTORS ARRANGED FOR FIELD CONTROL

current and voltage graphs using these motors are given in Figs. 12 and 13. In order to compare their performance with motor No. 2 more readily I have tabulated the results in Table II. Both motors will perform the service satisfactorily without overheating, and both show a decreased power consumption over that of motor No. 2. Motor No. 4 is the more efficient, however, and shows a decrease in power consumption over motor No. 2 of about 5 per cent.

A comparison of the graphs shown in Figs. 8 and 12 indicates the advantages of field control for reducing the rheostatic losses during the acceleration period. The rate of acceleration is the same in both cases. With the tapped-field motor the rheostats are entirely cut out at a speed of 8.3 m.p.h., in five and one-half seconds from the starting of the car, while with the non-field-controlled motor the rheostats are not cut out till a speed of 9½ m.p.h. is reached, and they remain in circuit for six and one-fifth seconds. The current taken by the

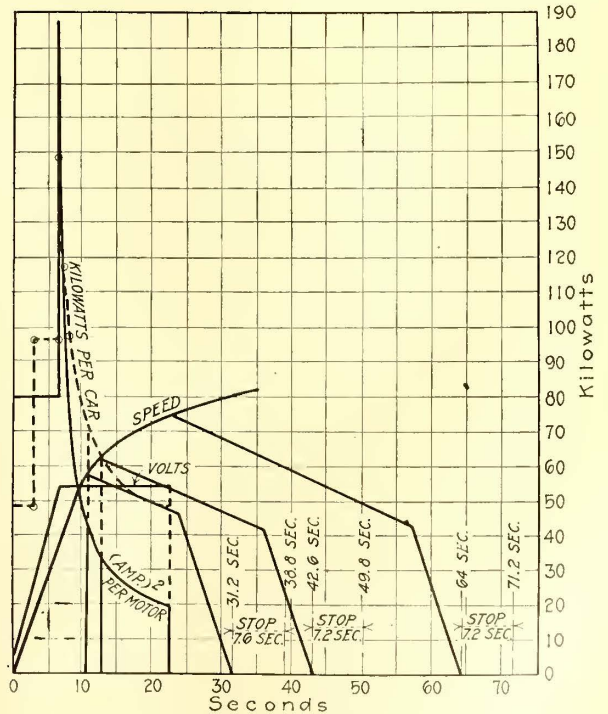
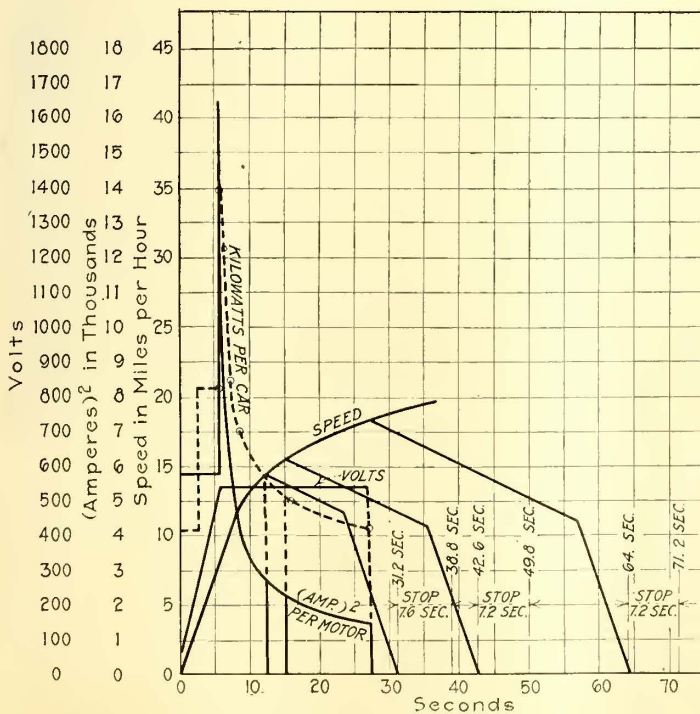


Fig. 12—Operation with Motor No. 4

Fig. 13—Operation with Motor No. 5

SPEED-TIME AND POWER-INPUT GRAPHS FOR CARS EQUIPPED WITH TAPPED-FIELD MOTORS

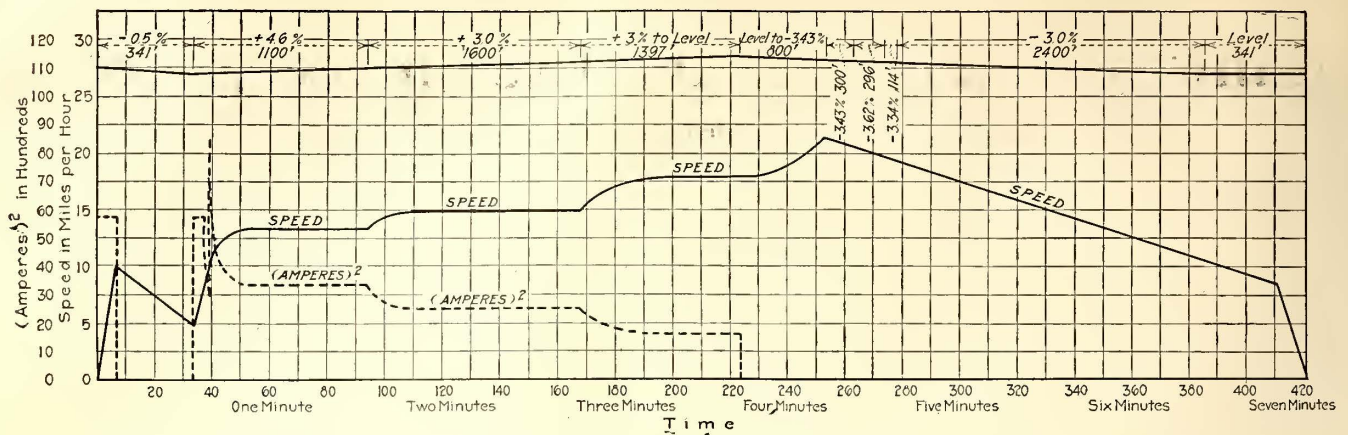


FIG 14—SPEED-TIME AND POWER-INPUT GRAPHS FOR OPERATION OF CAR IN BRIDGE SERVICE

field-controlled motor is also less during this period, being but 76 amp. as against 84 amp. for the non-field-controlled motor. The reasons for these economies are seen by comparing the motor characteristic curves for these two motors. These show that the speed of the field-controlled motor, with tapped field is about the same as the motor without field control, while its speed with full field is about 25 per cent less. The full field is used in accelerating so the rheostatic losses will be cut out quicker and thus greatly reduced. The tapped field is used for running and so the car is able to attain the same speeds as can be attained with the non-field-control motor.

By the use of field-controlled motors a means is provided for rapid acceleration with a minimum amount of loss in the starting rheostats. The maximum current peak is higher with the tapped-field motor due to the swing that takes place when changing from full to tapped field. The first cost of tapped-field motors is also somewhat higher, but this and the preceding disadvantage are offset by its resulting advantages. Of the five motors considered for this service No. 4 with tapped-field control is the one that should be selected.

Motor Ventilation Is an Important Advance

In the first part of this article I stated that the motors selected for consideration were of the self-ventilating type. In order to determine the resulting advantages of ventilated motors I plotted several graphs for the typical runs we are considering, using non-ventilated motors, and I find that the continuous current rating with ventilation was increased from 10 amp. to 12 amp. with some motors. This permitted the use of the next smaller size of ventilated motor than would have been necessary without ventilation.

Since the amount of air circulated in a self-ventilated motor depends on the speed of the fan, it follows that in a service with low motor speeds the results obtained are not as great as in a high-speed service with few stops. The consensus of opinion of those who have had wide experience in the operation of ventilated motors seems to be that, in a combined city and suburban service such as we are considering, the modern ventilated motor has an increased rating of from 25 per cent to 35 per cent in sizes up to 55 kw. and from 35 per cent to 80 per cent in larger sizes.

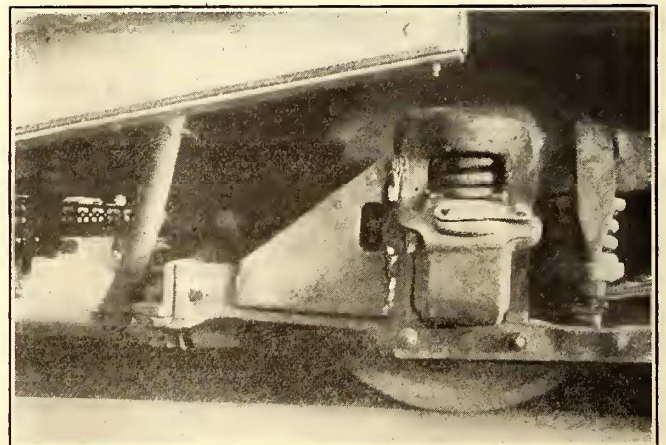
As stated in my article in the April 20 issue of the ELECTRIC RAILWAY JOURNAL, in addition to the service

through suburban, residence and business sections the equipments are called upon to operate across bridges with severe grades at each end.

In order to ascertain if motor No. 4, which we have chosen, will perform in this service satisfactorily I have plotted the graphs in Fig. 14 for a trip across the most severe of these bridge runs. From this it is evident that the bridge service is not a limiting condition as regards the heating of the motors, for the average heating current for this run is but 35.7 amp. The ability of the equipment to stop and start on the grades must be considered also, and in this the motors under discussion are satisfactory.

Weld Reinforcement for Truck

THE accompanying illustration shows how F. P. Maize, master mechanic Portland (Ore.) Railway, Light & Power Company uses the electric welder to make a truck stronger than it was originally. This particular type has a penchant for breaking in the lower



TRUCK WITH PLATES WELDED ON BOTH SIDES TO INCREASE STRENGTH OF REPAIRED SECTION

side member near the end and just beside the journal box.

In carrying out such a repair, Mr. Maize makes the truck stronger than before by welding on a stiffening plate along the side frame and the pedestal as shown in the illustration. This plate forms a brace in the angle formed between the pedestal and the side frame.

None of these welds has disclosed any evidence of further fracture.

Railway Builds Cars for Use on Steep Grades

The Omaha & Council Bluffs Street Railway Puts in Service Forty Semi-Steel, Home-Built, 34,000-Lb. Cars—They Were Designed for Prepayment Service, Seat Forty-five Persons and Operate on a Maximum Grade of 10½ per Cent

THE Omaha & Council Bluffs Street Railway, which operates over 163 miles of track in Nebraska, chiefly in the city of Omaha and, as the name indicates, connects this city with Council Bluffs, Ia., has recently added to its stock of more than 450 cars by building forty light-weight, semi-steel cars in its shops.

These cars, as indicated in the accompanying plan, are 45 ft. over all in length, 8 ft. 5½ in. over all in width, 11 ft. 3½ in. from top of rail to top of roof, and weigh completely equipped approximately 34,300 lb. The cars were built as light as service requirements and maximum grades of nearly 10½ per cent would permit. The design is for prepayment service, single-end operation and provides for a seating capacity of forty-five passengers.

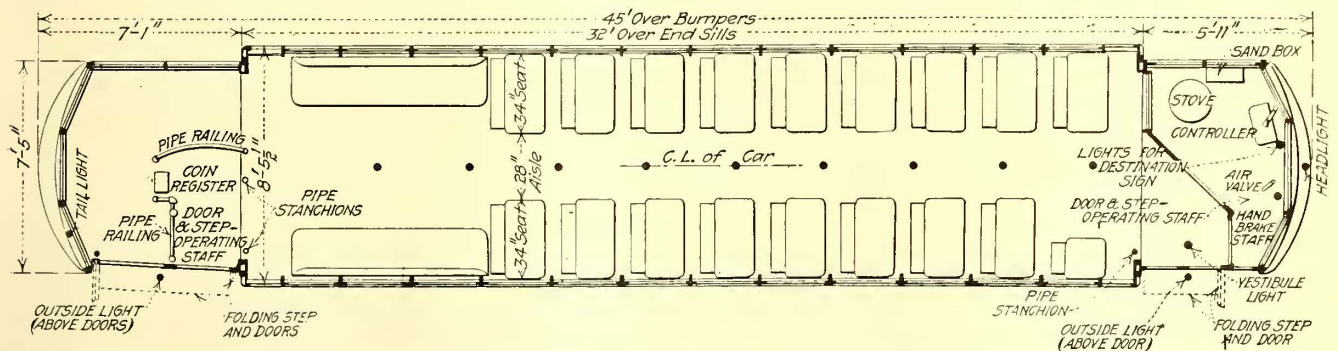
SIDE SHEATHING, WITH STIFFENING, FORMS GIRDER

The underframe construction consists of side sills formed of steel angles, 2½ in. x 2½ in. x ⅜ in., with 5-in.,

6½-lb. channels for the cross sills and two steel angles, 2 in. x 2 in. x ⅜ in., and one plate, 14 in. x ½ in., for the end sills.

The body corner posts are made of steel angles, 3 in. x 2 in. x ¼ in., and the intermediate posts are of wood. The carlines are of wood riveted to the tops of the side posts, and the side sheathing below the belt rail is ⅜-in. structural plate, 32 in. deep, reinforced vertically by stiffener angles, 1½ in. x 1½ in. x ¼ in. and horizontally by stiffener angles, 1 in. x 1 in. x ⅜ in. The vestibules are sheathed with wood and the letterboards are also of wooden construction. The roof is of wood, 7/16 in. thick covered with canvas. The side sill angles are connected at the ends by 6-in., 8-lb. steel channel bumpers.

Special attention is called to the rake given to the sides from the window sill to the water table. This provides an adequate overhang of the water table with maximum width of aisle space.



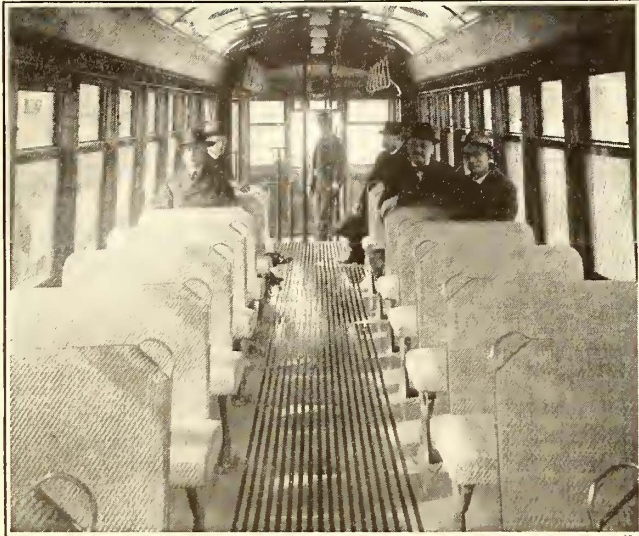
PLAN OF CAR BUILT BY OMAHA & COUNCIL BLUFFS STREET RAILWAY



LIGHT-WEIGHT SEMI-STEEL CAR BUILT IN OMAHA SHOPS

The upper steel sashes of all side windows are stationary, while the lower sashes lift into roof pockets. Heavy wire grills are placed outside the windows and each window is provided with a Pantasote curtain. The headlining is of Agasote and the car interior is finished in cherry. The floor is of $\frac{3}{4}$ -in. yellow pine with maple strips for the aisle matting.

Double out-folding entrance and exit doors and folding steps, manually operated according to the American Car Company's design, are provided at the rear, and a



INTERIOR ARRANGEMENT OF OMAHA HOME-BUILT CAR

single folding exit door and step at the front end. There are thus door openings of 5 ft. at the rear and 2 ft. 4 in. at the front.

The conductor's station is on the rear platform, and fares are collected and recorded from entering passengers by means of the International fare box and register. The arrangement of the rear platform railings is shown in the drawing. The bulkhead arrangement at each end provides successive steps from top of rail to car floor of 14 in., 13 in. and 10½ in., with a 2-in. ramp from the end of the body sill to the end of the bolster. The seats are rattan, with a single pressed-steel pedestal at the aisle end of each cross-seat, the opposite end being fastened to the wall with brackets. In addition to the cross-seats there is a 7-ft. longitudinal seat on each side of the rear end, nine 34-in. transverse seats on the left side and one 17-in. transverse and eight 34-in. seats on the right side. A 28-in. aisle is provided between the transverse seats, and a 4-ft. 4-in. aisle between the rear longitudinal seats. Sanitary hand straps for standing passengers are furnished in this rear part of the car.

In the roof are eight American Car Company's ventilators, four along each side. The lighting system includes ten 36-watt lamps, arranged in series along the center line of the roof, in Electric Service Supplies Company's safety car lighting fixtures, with Gleason-Tiebout Company's "Camia" reflectors. There are two similar units on the rear platform and two on the front platform. On the same circuit are one lamp equipped with a Benjamin steel reflector, on the outside of the car above each door, two lamps in the front destination sign and one tail lamp. These lamps, with fuses on each circuit, are controlled from a cabinet in the front

vestibule by means of 10-amp. snap switches. The rear side destination sign is illuminated from the interior car lighting. The signs are of the Electric Service Supply Company's hood type, the signal system is the "Faraday," with passenger's button on each side post, and the headlight is a "Golden Glow."

The front platform, excepting the exit passageway, is shut off by an Agasote bulkhead partition open at the top and bottom, with a grating in it behind the stove. A swinging door is provided for the motorman.

In the motorman's compartment are a Westinghouse K-35-G-2 controller, an Allis-Chalmers AA-7-a airbrake valve, a Dayton handbrake staff, the front door and step operating staff, a home-made sheet-iron sand box, equipped with Keystone sand trap, and a Peter Smith hot water heater.

The car bodies are mounted on Brill 76-E trucks, with 4-ft. 6-in. wheelbase and 30-in. cast-iron wheels on 4½-in. axles. There are four Westinghouse 506-C-2 motors, outside hung, geared 14 to 90, with solid gears. Other specialties of the car equipment include Tomlinson couplers, Anderson slack adjusters, H-B lifeguards and Earll trolley catchers.

Home-Made Lantern Rack and Carrier

IN THE Salem (N. H.) shops of the Massachusetts Northeastern Street Railway the home-made lantern rack shown is used. The rack is composed of three 8-in. x 1-in. discarded car running boards, with holes cut to hold the lower part of the lanterns. These are spaced just far enough apart to prevent striking in quick insertion and withdrawal. When mounted on the wall in three rows about 2 ft. apart vertically, storage space for about seven dozen lanterns is secured in a horizontal distance of about 25 ft. To facilitate carrying

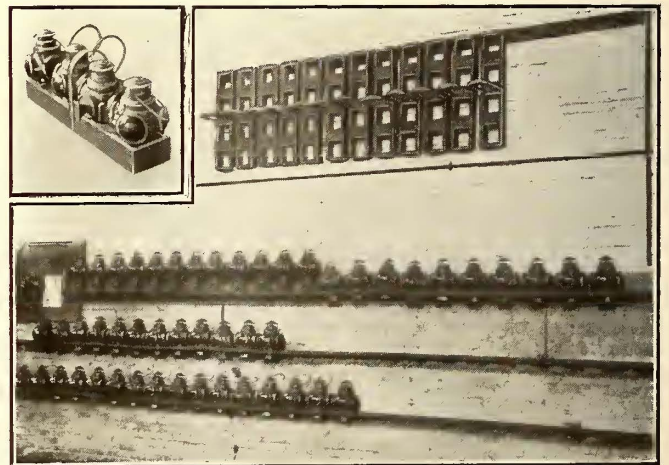


FIG. 1—CARRIER FOR FOUR LANTERNS FIG. 2—RACKS FOR LANTERNS AND CARRIERS

the lanterns out of the shop to passing cars, holders like that shown in the inset, Fig. 1, have been constructed from discarded car-sign stock. Each holder carries four lanterns and is fitted with a strap-iron handle. The lamps are seated in the holder far enough to bring their center of gravity down well below the tipping point. When the holders are not in service they are conveniently mounted on pins carried on a horizontal wooden strip fastened into the carhouse wall above the lantern storage rack.

Depreciation and Rate Making

The Use of An Undepreciated Value With Sinking-Fund Accruals for Depreciation Is Not Only Justified by Precedent and Correct Accounting Principles but Is Desirable On the Ground of Public Policy

BY L. R. NASH

Stone & Webster, Boston, Mass.

THE paper on "Some Pitfalls in Regulating Depreciation" by John Bauer in the Aug. 24, 1918, issue of the *ELECTRIC RAILWAY JOURNAL* invites a few words of comment upon a much-discussed but little understood subject. Professor Bauer takes as his text a rate decision of the Colorado Public Utilities Commission, rendered in October, 1917, in which an undepreciated value is determined as a rate base in connection with a sinking fund accrued for depreciation reserves. He fears that this decision will become a bad precedent in rate valuations, and that the commission has been led into serious error and confusion in its arguments.

COLORADO DECISION NOT NOVEL

While the commission in the decision in question may not have stated its case in the clearest possible way, it has described and adopted a procedure which is by no means new in regulatory practice, so that the decision does not harbor the menace to utility patrons which is apprehended. The first leading case in which the same principles were established was decided by the Second District New York Commission in April, 1913 (*Fuhrmann vs. Cataract Power & Conduit Company*, 3 N. Y. (II) P. S. C. 656,714). The opinion in this case by Commissioner Stevens discusses clearly and at considerable length the advantages of an undepreciated value in connection with a sinking-fund accrual over a depreciated value with a straight-line accrual. Mr. Stevens' opinion, from which there was no dissent, agrees fully with that in the recent Colorado case, that either method, if properly and consistently applied, is perfectly fair to all parties at interest. Decisions from other commissions in more recent years have embodied the same principles, those of the California commission being most noteworthy.

OUTLINE OF COLORADO CASE

A careful reading of the Colorado decision (P. U. R. 1918 B 86) does not disclose the uncertainties and inconsistencies to which Professor Bauer refers. The utility involved was of comparatively recent origin, and it was possible to determine the original purchase price and the cost of the comparatively large subsequent additions to the physical property with an unusual degree of accuracy. Differences between the engineers of the commission and of the utility in their determinations of the rate base were confined very largely to overhead and intangible elements. Furthermore, this utility had been operating under the present public service law during the major part of its history and, if it had conformed to the accounting requirements of this law, it had annually set aside an accrual for depreciation on the sinking-fund basis embodied in

its rate case. The Colorado act is one of the few that prescribe depreciation accounting procedure with such definiteness. The matter is not left to the discretion of either commission or utility. It should therefore be assumed that the commission in deciding the rate case in question simply fixed a rate base which is consistent with the utility's established accounting practice.

If this preliminary statement of the facts in this case serves to clear up some of the criticisms of the commission's procedure, there will still remain several features of Professor Bauer's discussion which need attention. They may be summarized as follows: (1) His inability to see the consistency of an undepreciated investment with a depreciated physical property; (2) The contention that an investment with a sinking-fund accrual for depreciation should sometimes be depreciated; (3) A denial of relationship between valuation and future methods of accruing for depreciation.

MISTAKES OF ECONOMISTS

It is not surprising that people unfamiliar with public utility matters should instinctively think about depreciation in connection with value, because their conception of value is ordinarily associated with sales or taxation. It is a matter of concern that there are modern students of economics who still contend that the public can only be protected from the greed of public utilities by scaling down their investment in rate cases in proportion to the theoretical physical condition of the property. The unvarying and successful practice of public service commissions for a generation, the well-known "hen" analogue, the numerous books, papers and exhaustive reports on the subject have apparently failed to convince such students that the rate base in modern regulatory practice may be quite different from the older concepts of value. It is unfortunate that "value" has been admitted to rate case nomenclature, even though it may be necessary in associated litigation.

Public utilities should be distinguished from other industries by their unlimited life. Other enterprises may serve the purpose for which they were created and liquidate. Their average life is, in fact, only a very few years. Public utilities, on the other hand, quickly become an integral part of the community life and their removal would be a calamity not to be contemplated. In the course of time they reach a stable physical condition. Daily some elements are worn out or become obsolete and are replaced; daily also new elements are added for expansion of service. A typical public utility is neither new nor old. Its efficiency does not decrease with the years but, rather tends to increase with its more modern, new elements. The

investor puts in his money expecting it to remain indefinitely, at any rate not to be returned on the installment plan. He trusts that the utility will protect his investment by maintaining and renewing the physical property. He assumes that such funds as are needed will be provided for that purpose but he is not concerned with the specific method by which they are accumulated as long as he is not affected.

Contrary to the popular impression, which also seems to have crept into Professor Bauer's paper, the utility is by no means synonymous with its investors. Its affairs are to a limited extent directed by certain investors, but they are also subject to the control of the community served and, in most cases, are under the supervision of a public service commission. In a sense, the utility is a trustee, furnishing to the public such service as the latter cares to pay for, and paying to the investor a return on funds placed in its hands. The income received by this trustee and its apportionment to service, taxes, replacement, returns, etc., may be very largely fixed by the commission, which thus also intervenes between investor and public.

UNDEPRECIATED RATE BASE—SINKING-FUND ACCRUAL

From the many available discussions and authorities with voluminous tables and formulae it should be perfectly clear that in the long run it makes no direct difference to either investor or patron whether the rate base is depreciated or not, provided the appropriate depreciation accrual method be correctly used. There are periodic differences which may affect the patron when depreciated value is used, and these differences tend to retard the development of the business in its early years. They would hopelessly confuse the average patron if consistently recognized in rate adjustments. In a rate case, requiring the fixing of the percentage of accumulated depreciation by a commission, the difference which would almost inevitably exist between the opinion of the commission and the accrual practice of the utility would work hardships upon either the utility or its patrons.

Irregularity in rates, uncertainties and injustice are all avoided by the undepreciated rate base and a sinking-fund accrual. Nor are there any circumstances under which the rate base can be properly depreciated when the sinking-fund accrual is used. If, as assumed in the paper, the depreciation reserve is invested in the property instead of elsewhere—and this is the usual procedure—the total investment cannot be scaled down for rate-base purposes, because the invested depreciation reserve must earn a return for its own accretion. The investor is entitled to a return on his own actual investment, but not, of course, upon the depreciation reserve investment. The patrons pay a return upon both these elements in the rate base. If the investment is scaled down, the adequacy of the depreciation reserve is impaired. Proper accounting would not permit any confusion between investors' funds and the depreciation fund, even though they should be represented in one property account.

It is not difficult to show by a simple illustration that the sum of return and depreciation annuity is the same whether a depreciated or undepreciated value is used.

A property without growth ultimately reaches a theoretical condition of 50 per cent depreciation. With due allowance for salvage value and the usual consistent growth in utility property, the average actual condition should not be lower than 75 per cent. On the assumption of a useful life of twenty years and a fair return of 8 per cent, the patrons would pay in the case of depreciated value 8 per cent on 75 per cent of the investment or 6 per cent on the whole, plus 5 per cent for depreciation, or 11 per cent for both. In the case of undepreciated value they would pay 8 per cent on the full investment plus the equivalent sinking-fund accrual of about 3 per cent, or the same 11 per cent total. At certain stages in the utility's history, with other rates of return or with a different average life, the circumstances of equality would be different, but always excesses and deficiencies would in the long run offset each other. The differences would be wholly due to the irregularities arising from the use of varying depreciated values. Clearly if such values serve no useful purpose, they should be avoided.

Perhaps suspicion of the undepreciated rate base procedure lies in the possibility that greedy investors may appropriate more than their share of the return on the total investment, leaving inadequate accumulation in the reserves. Without restraint it is possible that they would go still further and pay out the entire accrual for depreciation in dividends. It is one of the functions of the public service commissions to guard against such diversions, through accounting instructions, reports and investigations. If such means are not effective or have not been established long enough to cause the accumulation of suitable reserves, the commissions have ample authority to compel necessary maintenance and replacements of property. It thus appears that the public is protected against excessive charges and inadequate service.

PRESENT VALUATION AND FUTURE DEPRECIATION

As to the relation between present valuation and future depreciation accruals, it is true that relationship is not necessary, but it is by no means absurd. With an undepreciated rate base one almost instinctively expects to use a sinking-fund accrual for depreciation. A straight-line accrual would involve the unusual practice of crediting income with the return on invested reserves. With a depreciated rate base one similarly expects to accrue for depreciation on the straight-line basis. The substitution of a sinking-fund accrual, while possible, would involve a change in depreciation accounting methods and the determination of a new rate of accrual which would provide for remaining value in remaining life expectancy.

In spite of the above statements, the possibility is here pointed out of conducting a rate case without necessary reference to actual past or future depreciation accounting methods, other than to establish their adequacy. If the actual, undepreciated, total investment is taken as the rate base and a fair return allowed thereon plus a sinking-fund accrual for depreciation, substantial justice will be done to all parties at interest. If in the past the utility in question has paid continuously a fair return on the full investment and accumulated a full straight-line depreciation reserve,

a rate decision on the proposed basis might properly reduce the future accruals, even to the point that the future sinking-fund accruals would be only the amounts necessary to provide for remaining value in remaining life expectancy. On the other hand, for equal accuracy the opposite procedure should be followed in the case of deficiencies in past accruals. No useful purpose would be accomplished by changing the rate base instead of the depreciation accrual.

Briefly, the accurate application of this method in a rate case requires the determination of revenue sufficient to provide for operating expenses, taxes, a fair return upon the full, actual investment, and a depreciation accrual on the sinking-fund basis to accumulate in the years of remaining life of the various property elements that part of their cost not already accumulated. To these factors should be added if necessary a return upon past deficiencies in fair return or an amortization thereof. A utility subject to rate regulation on this basis might still follow the less complex straight-line method of accrual in its actual accounting, the result being that there would be deficiencies in return in the early years and excesses in later years with respect to specific property elements. When the property as a whole had reached maturity, with elements of widely varying ages and length of useful life, the combined differences would not be appreciable.

DEPRECIATION SHOULD BE PROVIDED FOR

It is the regular duty of the public service commissions to see that suitable provision is made for depreciation. Under their supervision, accruals may be decreased or increased from time to time as actual useful life is found to be greater or less than previously estimated. As long as obsolescence and inadequacy play their present important part, in the usefulness of utility elements, great refinement in estimating accruals or present condition is futile. If the latter can be entirely avoided, the problem of rate adjustments is materially simplified. In view of this simplification and the equal fairness of rate regulation based upon undepreciated rather than depreciated values, it hardly seems necessary to find fault with the utilities for favoring the more straightforward and understandable method. Undoubtedly one motive in the choice is a desire to relieve the apprehension aroused among investors by the strange doctrines which have been propounded in this particular field since the advent of regulation.

To a surprising degree, academic discussion fails to recognize that most public utilities are constantly growing and needing new capital. The strict regulation and frequent criticism of utility activities, the "fair return and no more" (writer's italics) sentiment, reiterated in the paper under discussion, all make it difficult for utilities to compete successfully in the money market for new funds and to hold what they already have. The resulting increased cost of money means a higher ultimate cost of the service rendered. An adherence to established and tried business principles instead of experimentation with unseasoned theories would do much to restore confidence in public utilities as a safe investment, to improve the service rendered and to reduce its cost.

LETTERS TO THE EDITORS

Testing and Treating Power-Plant Feed Water

BROOKLYN RAPID TRANSIT COMPANY

BROOKLYN, N. Y., Sept. 8, 1918.

To the Editors:

One of the readers of the ELECTRIC RAILWAY JOURNAL has written me asking to be referred to a text-book that will explain the methods of testing boiler feed water for salinity, hardness, alkalinity, etc. He also inquires as to the manner of taking samples of boiler water and schedule of testing. These questions were raised by reading my article on "Testing and Treating Power-Plant Feed Water" in the ELECTRIC RAILWAY JOURNAL of April 20. As there may be other readers of the paper who are interested in these points, I am

BROOKLYN RAPID TRANSIT CO.
TESTING BUREAU LABORATORY

T. B. ORDER No. 19

To Mr. Chief Engineer.
..... Power Station.

The following is a report of analysis of boiler water collected and made on 19

The boilers indicated below to be blown down as directed.

Boiler No.	Na Cl Parts per 100,000	Inches to be Blown	Boiler No.	Na Cl Parts per 100,000	Inches to be Blown	Boiler No.	Na Cl Parts per 100,000	Inches to be Blown	Boiler No.	Na Cl Parts per 100,000	Inches to be Blown
1		19			37			55			
2		20			38			56			
		34						70			
17		35			53			71			
18		36			54			72			

REMARKS:

.....

.....

.....

Note—This form to be made out in triplicate—Original to Chief Engineer on date of analysis before 5:00 P. M. Duplicate to Superintendent of Power and Triplicate for Testing Bureau files.

Signed..... Chemist Approved..... Chief of Testing Bureau

FORM USED FOR ASSEMBLING FEED WATER TEST DATA

sending you the substance of my reply to his inquiry for such use as you may care to make of it.

The book "Examination of Water" by William P. Mason contains valuable information on pages 18, 19 and 20, concerning the test relationships which distinguish between bi-carbonate, normal carbonates and hydrates in water. There is also much of value in the book "Test Methods for Steam Power Plants" by Edward H. Tenney. The chapter on water for boiler feed purposes contains, on pages 79 and 80, a discussion of the determination of chlorine. There are available, as a matter of fact, many references covering the matter.

Boilers of the multiple-drum type sometimes show large differences in the concentration of water in the several drums. When water for sampling purposes is taken from the mud drums of such boilers, excellent average concentration values are obtained. Average values, however, are not of first importance. When differences of concentration occur in the several drums of a multiple-drum boiler it is of urgent importance to determine by testing the maximum concentration value, since it is the maximum value which is most in need of control.

One way of taking water from a boiler drum is by means of a tee on the water column blow-down line, but this is not the best practice. When such a line is "blown" a considerable amount of steam comes down from the steam space in the water column, and this steam condenses in the line and makes the water show salinity which is too low. It is much better to have steam-drum sampling lines entirely submerged.

Another matter which must be kept in mind is that when water is sampled from a line part of it flashes into steam on account of the high temperature of the water. If this is allowed to occur to any appreciable extent it makes the salinity too high. The proper way is to blow the line and then shut off the valve and allow it to remain shut for a sufficient time to cool the water in the line by radiation. Then if the valve is merely "cracked" open, a sample of water may be obtained which will show the true salinity of the drum water.

Boilers fired with underfeed stokers are apt to need more frequent sampling than where the average steaming rate is not high, and samples taken once a day may not be too frequent. It all depends, of course, upon the quality of the feed water. If make-up water is of indifferent quality, or if surface condensers are used and trouble is experienced with leakage of salt water into the hot-wells, frequent testing of the boiler water is desirable. The accompanying printed form shows a scheme for listing salinity values of boiler water with accompanying recommendations as to the numbers of inches of water, measured on the gage glass, which should be blown off. The recommendations for blowing are so proportioned as to reduce the salinity of the boiler water to some suitable standard value. Where the salinity is found greatly to exceed the chosen standard it is necessary to blow in installments. The effect of salt introduced when the water level is pumped up after each installment of the total blow should be taken into consideration, at any rate it should be considered if the salinity of the feed water is other than quite low.

H. LE H. SMITH,

Chief of Testing Bureau.

How to Base Fares According to Distance

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA., Sept. 9, 1918.

To the Editors:

To provide a basis for charges on the zone system, why not have either:

(a) Each car equipped with a mileage register which would show the total distance traveled for each trip; or

(b) Each car equipped with a large clock indicating the time traveled; the clock to be adjusted so that it operates only when the car is in motion?

The conductor could then issue a ticket to each passenger when he enters the car, punched to indicate either the place or the time of boarding. The fare would then be collected when the passenger left the car and would be based upon the distance traveled as shown by the punching on the ticket. For example, suppose the fare for a 10-mile run, which has a running schedule of 100 minutes is 10 cents or 1 cent per mile. If the passenger boarded the car at any point between the first mile and the second mile and left the car at a

point between the sixth and seventh mile, or got on at any point within the first ten minutes after the car left the terminal and left the car at any point between the sixty and seventy-minute time sector, his fare in either case would be 6 cents. By such a plan, there would be a charge proportioned to the distance traveled and the cost of operation. In addition to the foregoing, a "readiness to serve" or minimum fare charge should be made for any distance traveled under 2 miles. This minimum charge might be as low as 2 cents.

It is believed that such a scheme would not be difficult to inaugurate, the public being already educated to the charge-per-mile basis, and, further, it should not be difficult to form public opinion in favor of a plan that can be shown will give fair treatment of all.

A. H. MASTERS,
Assistant to Sales Manager

AMERICAN ASSOCIATION NEWS

Three War Board Bulletins This Week

UNDER date of Sept. 16, the American Electric Railway Association War Board has issued bulletins Nos. 30 to 32.

The first relates to the operation of the draft and contains the text of a letter, dated Sept. 9, from Provost Marshal General Crowder to employers generally. Included are statements from the War Industries Board and the United States Railroad Administration bearing upon the situation.

Bulletin No. 31 is a reprint of the foreword to Circular No. 20, Preference List No. 2, War Industries Board, making clear the basis for the determination of priorities. Electric railways and related manufacturers are listed by the Board in Class II.

The third bulletin calls attention to the restrictions upon non-war construction, as covered in Circular No. 20, issued by the priorities division of the War Industries Board. Chairman McCarter points out that the priorities division construes this bulletin to apply to all extensions, improvements, repairs, etc., of electric railways.

National Electrical Safety Code Now Under Revision

THE present edition of the National Electrical Safety Code designated as Circular No. 54 of the Bureau of Standards has been exhausted, and before re-printing the text of the rules will be revised. This revision is now under way and the Bureau of Standards is anxious to secure from all interested parties comments and suggestions for changes in, or for additions to, the present rules which will reduce accident hazards. These changes or additions must be reasonable and practicable, and they should be supported by citation of specific instances or other evidence when possible. They should be addressed to the Bureau of Standards, Washington, D. C.

A list of proposed changes to Part 3 of the Safety Code has already been prepared and copies have been

sent to the committees of technical and utility associations, state commissions and others who have been cooperating with the bureau in the formulation and revision of the rules. Similar lists of proposals for the other parts of the code are now being prepared.

I. C. C. Lays Down Valuation Principles

Decision on Texas Midland Upholds Single Sum Value—Original Cost Will Be Reported as Fully as Possible

IN ITS recent report on the valuation of the Texas Midland Railroad the Interstate Commerce Commission—five years after the passage of the federal valuation act—has taken the important step of passing upon a number of moot points. The Texas Midland case is the first one in regard to which the commission has rendered a report even approaching a final determination of value, and with respect to fundamentals it is therefore a test proceeding.

A perusal of the entire report will be advisable for those interested in utility valuation work. The details are too voluminous to be reproduced here, but an indication of the scope of the decision can be given through a mention of some of the findings. These are as follows:

Single Sum

The valuation amendment authorizes the commission to find a single sum as the value of the common carrier property for purposes under the act to regulate commerce; and the commission will ultimately make such finding as to the property of each carrier, supplementing tentative valuations already made in which a single sum is not stated by such findings.

Original Cost

Original cost to date, which generally cannot be ascertained from accounting records alone, will be reported as fully as possible from the best available evidence in each particular case. When the original cost of portions of the common-carrier property, but not of the whole, can be stated, the ascertained facts will be reported; when the cost of no portion of the property can be identified, the carrier's investment account will be shown. Estimates will be resorted to, within comparatively narrow limits, as to minor portions of the property, the cost of which can not be ascertained from records.

In requiring a report as to the original cost to date of "each piece of property" owned or used by a carrier, the act can not be narrowly construed. A reasonable construction requires that original cost should be reported in all reasonable detail, and the words refer to various sections of the railroad, rather than the individual ties, rails and similar elements.

Cost of Reproduction

Cost of reproduction new of the common-carrier property is ascertained upon the assumed basis of the non-existence of the railroad while all other conditions in the same territory were taken as existent on valuation date. The most practicable and economical construction program is employed, and to an inventory of items making up the physical property are applied cost prices fairly representative of conditions on valuation date, with the addition of the estimated cost of placing the items in position as of valuation date, and certain overhead charges.

In ascertaining the cost of reproduction new the commission is not to ignore expenses which would be incurred by reason of the fact that the physical plant, other than land, would have to be built, and is not limited merely to the reporting of an inventory value.

No allowance is made in the estimate of cost of reproduction new for contingencies as such, but the quantities and prices employed reflect various construction contingencies and fairly represent the amount of money necessary to reproduce the identical property.

The percentage plan of stating engineering in the cost

of reproduction new is adopted. In stating the cost of reproduction new by the percentage method engineering should be computed on the amount of the investment in the road accounts, exclusive of engineering and land.

The percentage method of estimating general expenditures, other than interest during construction, is adopted in determining the cost of reproduction new, and the percentage adopted in the present case is applied to the road accounts, exclusive of land.

In estimating cost of reproduction new, the property to be reproduced is taken as the existing property as it was when put into its present service; and if secondhand materials were used, the cost of reproduction new is estimated for the same kind of materials in the same condition as when installed.

Interest During Construction

In estimating interest during construction, for the purpose of stating the cost of reproduction new, it has been assumed that the credit available is good and uniformly the same and that money is obtainable at the same rate of interest and supplies can be purchased at equally advantageous prices; 6 per cent per annum is assumed as the interest rate and is taken as covering the cost of obtaining money.

The period used in determining interest during construction in estimating the cost of reproduction new is taken at one-half of the estimated construction period required for reproduction, plus three months, as to road and general expenditures; and at three months for equipment.

Working Capital and Land

Materials and supplies and cash on hand are not included in the estimate of cost of reproduction new; but the amounts on hand, as shown by the carrier's inventory and its general balance sheet, are stated in the tentative and final valuation.

The present value of the lands owned or used for common-carrier purposes is stated by ascertaining the number of acres and multiplying this acreage by a market value determined from the present fair average market value of similar adjacent and adjoining lands, due allowance being made for any special value which may attach by reason of the peculiar adaptability of the land to railroad use.

Nothing additional is added for the expense of acquisition, for severance damages, for engineering, and for interest during construction. The reproduction cost of carrier lands, and the present cost of condemnation and damages, or of purchase, of a carrier's lands, are not estimated.

Depreciation and Appreciation

In estimating the cost of reproduction less depreciation, depreciation has been treated as covering the lessening in the number of units of capacity for service as compared with those existing in the same elements when installed; and upon ascertaining what part of the remaining capacity for service remains, the depreciation which has already accrued is subtracted from the cost of reproduction new and the remainder is given as the cost of reproduction less depreciation. Due consideration is given to existing salvage or scrap value. Depreciation is not taken merely as the equivalent of deferred maintenance or loss of service efficiency.

While the valuation act evidently intends to require a statement of all the cost values and other circumstances which might bear upon the value of the property, at least for rate-making purposes, and appreciation is a fact which may affect the final value of the property, the record in the present case does not warrant any definite finding as to either the cost or the value of such appreciation as has resulted from maintenance, operation and the effects of time upon the roadbed.

Other Elements of Value

The finding in the tentative valuation that "no other values or elements of value were found to exist" is approved upon the record in the present case, in the light of the fact that in the cost of reproduction new and the cost of reproduction less depreciation figures requisite consideration was given to the fact that the property constitutes a railroad and is doing business, and is not merely an aggregate of materials.

W. L. Davis, auditor Lehigh Valley Transit Company, has issued to conductors and agents on this property a calculating table in handy pocket form for use in making computations with the new 6-cent fare unit.

Brooklyn Unionists Fight Discharge

Former Employees of B. R. T. Elevated Subsidiary, Discharged for Serious Violations of Rules, Allege Discrimination—Drag War Labor Board Into the Case, Despite Absence of Controversy with Remaining Men

A CHARGE that labor agitators are trying to make use of the War Labor Board to create industrial discord in Brooklyn was made on Sept. 19 by President T. S. Williams at a hearing before this board. The case concerned allegations of discrimination made by a few former employees of the New York Consolidated Railroad, which operates the elevated lines of the Brooklyn Rapid Transit System. President Williams averred that certain men had been discharged for infractions of rules and not for union membership, but that no controversy exists between the elevated company and its employees and that the board is not justified in proceeding with the case.

To the company's proposal that the question of reinstatement of the men be left to the employees' association of the company or to a board of arbitration chosen from employees, Messrs. William H. Taft and Frank P. Walsh, joint chairmen of the board, ruled that a charge of discrimination had been made and that the board could not hand over to any other body its duty of rendering a fair decision. The evidence presented, it was said, would show whether or not the charge was justified.

MAYOR HYLAN INTERVENES

The Department of Labor several weeks ago called upon the War Labor Board to investigate the claim that the Brooklyn company was interfering with the right of its motormen to join the Brotherhood of Locomotive Engineers. Under the principles of the board, workers are protected in their right to join unions and to bargain collectively through chosen representatives with their employers, and employers are forbidden to molest workers in the exercise of the right. To determine whether this principle had been violated, the case was referred to a section of the board consisting of the joint chairmen.

Hearings were held during the last of August before examiners of the board, and a report was made to the chairmen. Subsequently, however, Mayor Hylan of New York City wrote to the board to the effect that there was "immediate danger of a strike because of the discriminatory methods used against the men who are exercising their inalienable right to organize." The board, therefore, reopened the case for another hearing on Sept. 19.

POSITION OF COMPANY

In reply to the allegation that additional discharges for union membership had been made since the hearings before the examiners closed, President Williams outlined his company's position as follows:

The proclamation of the President creating the National War Labor Board defined its "powers, functions and duties" as covering "controversies arising between employers and workers in fields of production necessary for the effective conduct of the war."

No controversy existed in this case between employers and workers at the time the War Labor Board instituted an inquiry, and no such controversy now exists. There would have been no interruption of service had the War Labor Board not intervened, and there is no indication of such interruption now as justifies the Mayor in calling upon the War Labor Board to re-open this case.

The only threat of a strike came from men outside our employees and representatives of a labor organization that had for years been unsuccessfully trying to represent our men in their relations to the company. This outside talk of a strike was pure bluff, founded upon the expectations that it would bring to the assistance of a losing cause the influence of the national government. All but four out of the 450 employees affected have signed a statement that—"There is no controversy between our employer and ourselves upon the questions of wages, working conditions, hours of labor, discrimination, intimidation or otherwise."

NOT IN INTEREST OF INDUSTRIAL PEACE

The situation presented therefore is that the functions of the National War Labor Board have been appealed to—without the knowledge of the National War Labor Board, I presume—not, as defined by President Wilson, to settle a labor controversy but to incite one; not in the interest of industrial peace but in the interest of industrial discord.

Such an injection of discord where harmony now prevails would seem to be incredible. It is difficult enough for electric railways in times like these to discharge properly their duties to the public without exposing the public and the war activities of the government to the added injuries which would follow a serious interruption of transportation service.

The principles to be observed by the National War Board, as defined at its creation, specifically stated:

"In establishments where union and non-union men and women now work together, and the employer meets only with employees or representatives engaged in said establishments, the continuance of such condition shall not be deemed a grievance."

NO STRIKE IN NINETEEN YEARS

That is our situation. For about a score of years our employees have had an association of their own, designed originally for purposes of insurance against death and illness and for social welfare. About two years ago the functions of this association, in order to procure greater co-operation between employer and employees, were extended by the selection of departmental trustees for the adjustment of working conditions.

Owing to the sympathetic and co-operative relations between company and employees, there has been no labor strike upon our system for nineteen years, our system standing alone among New York transportation companies in this record. Among our elevated and subway employees there has never been a strike since these railroads became a part of our system.

The particular matter which the board has been called upon to consider is not one involving wages or hours of labor, but whether certain employees who have been dismissed from the service of the New York Consolidated Railroad shall be reinstated, and whether motormen of that company shall be given the right to join and take an active part in the organization of the Brotherhood of Locomotive Engineers "without fear of intimidation or dismissal from the service," as well as the right to bargain collectively.

GOOD REASONS FOR DISCHARGES

The evidence taken by the examiners of the board indicates that no men have been discharged except for good and sufficient reasons. As to the question of "intimidation," there is just as much proof or more of intimidation of our employees by these outside labor organizers as there is of intimidation by the company against its employees.

The company does not, however, look with favor on

any attempt to substitute for the existing association representing all of its employees an organization controlled essentially by men who are not in its employ. It does not hesitate to inform its employees of this conviction, or to persuade them that their interests do not lie in that direction.

Such an organization, dominated by outside influences and prejudices, too often establishes a barrier between employer and employee. It makes for discord instead of harmony. It destroys co-operation and sympathetic relation. It brings outside troubles into local affairs. It substitutes the judgment of uninformed and often selfish outsiders for the judgment of experienced and well-informed insiders.

WOULD CALL IN TRUSTEES

The first purpose of the War Labor Board was that the employers and employees of private industries should not attempt to take advantage of the existing abnormal conditions to change the standards which they were unable to change under normal conditions. Our employees have not attempted to take advantage of any such abnormal conditions to change existing standards, but outside agents, who vainly for two years have attempted to change the principles upon which our industrial relationship was founded, are now attempting again with the hope of support from the War Labor Board to inject discord into a peaceful situation.

In behalf of this industrial relationship, in behalf of the principles which underlie it, in behalf of a continuance of peace, in behalf of the people whom we serve, and in behalf even of the government itself, whose war operations will be seriously embarrassed by any labor disturbance, we ask you to think twice before you will lend your influence and support to those who would disturb and destroy the principles and results which long years of co-operation have established. We ask you to announce, and to announce promptly, that there is no situation presented here which calls for the exercise of your powers of recommendation.

If in your judgment the evidence taken by the examiners indicates the possibility of any injustice done to employees who have been discharged, we suggest that the facts in each case be presented to the departmental trustees, whom the employees have themselves selected to represent them, and we pledge ourselves to observe the recommendations of such trustees as to the reinstatement of these recently discharged employees.

The remainder of the hearing was devoted mostly to testimony of former employees and company officials. The motormen asserted that they had been discharged on account of excessive demerits which had rapidly accumulated after they joined the union. Company representatives, however, showed that the men had received demerits before and that the immediate cause of discharge was serious infractions of the rules, such as running at excessive speed around elevated curves. It was averred that the union members had in no way been subjected to discrimination. The complete records of all men called up for demerits and warning or discharge in the last three months were promised to the board. The hearing was then adjourned, and a decision was promised at the earliest possible date.

GENERAL NEW YORK HEARING ASKED FOR

In connection with the opening of the Brooklyn hearing, James H. Vahey, counsel Amalgamated Association of Street and Electric Railway Employees of America, asked that the War Labor Board hear alleged complaints on the part of employees of the New York Railways and the Third Avenue Railway. Mr. Taft remarked that the board had received a request for Charles B. Hubbell, chairman Public Service Commission for the First District of New York, to assist the commission in handling the New York transportation situation. He added, however, that the board would have to consider the question of jurisdiction, and definite complaints must be filed so that the issues might be clear.

Four Tramway Topics Absorbing to Britishers

Tramways & Light Railways Association Holds Conference on Labor, Industrial Councils, Fuel and Higher Fares

THE annual meeting of the Tramways & Light Railways Association of Great Britain, which was held in London in July, took the form of a conference. Informal discussion on topics of pressing importance to the industry were the features. It appears that the problems agitating the tramway managers of the British Isles are substantially the same as those in the foreground in this country, although the details differ materially.

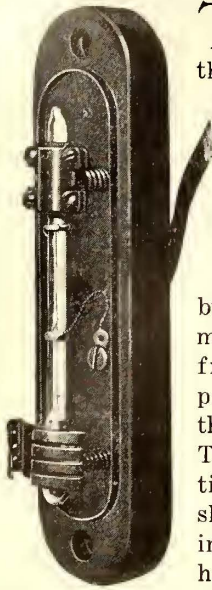
In the matter of national awards of tramwaymen's wages it appeared from the discussion that the tramways had been embarrassed by their lack of right to organize so as to deal as a unit with the National Transport Workers' Federation. It became necessary to appoint a representative committee to present the tramways' side of the controversy to the National Committee on Production. The result was first an award of an all-round war bonus of 20 shillings per week. Later, after the men had presented claims for an increase of 12½ per cent in the basic rate, the bonus was raised to 25s. In this same connection the discussion indicated that progress is being made with plans for national councils of labor and the industries, including the corporate and municipal tramways, for the purpose of reaching agreement on fundamental economic relations.

The speakers at the meeting expressed concern over the coal restriction order of the government sent out by the tramways committee of the Board of Trade reducing the coal allowance of tramways in southern England by 15 per cent. From the technical standpoint interest centered in the possibility of supplementing the coal supply with coke or coke breeze. It was pointed out that a 15-per cent reduction in fuel means more than this reduction in service on account of the necessary standby losses in the power plant.

The discussion on increased fares is now of little interest because it was preliminary to the House of Commons bill abstracted in the issue of this paper for Sept. 7, page 418. It seems that the members hoped for a better allowance for the owners of the tramway properties than was actually allowed in the bill, although the bill itself was the outcome of the work of this association and the Municipal Tramways Association. Five per cent on stock was an allowance favored, but the bill provided maximum dividends not to exceed three-fourths of the pre-war rates.

During the past year more than 7,000,000 copies of the weekly bulletins have been printed and distributed by the National Safety Council, 750 original bulletins having been prepared. Forty-seven local councils are now actively pushing safety work. Eight "Safe Practices" pamphlets have been printed and distributed, three others are in press and twelve more are in preparation. The national headquarters staff at Chicago now comprises thirty-one persons. In the words of W. H. Cameron, general manager of the Council, "Safety work in the United States has arrived."

New Form of Thermostatic Heat Regulator for Cars



THE accompanying halftone shows a new form of thermostat made by the Railway Utility Company, Chicago, Ill. The makers guarantee a regulation of temperature within 1 deg. by its use as compared with 4-deg. range which was secured with the type previously made by the company.

It consists, as shown, of a mercury bulb and tube securely but flexibly mounted so that the action will be free from the effects of vibration. Extra protection is afforded the bulb itself through the guard which incloses it. The thermostat is mounted in an airtight case, the cover of which (not shown) engages with the ridge projecting from the back casting. The cover is held in place by two screws passing through the holes shown in the back.

As will be evident from this description the mounting has been so designed as to render the thermostat as nearly "foolproof" and "tamperproof" as possible.

Making Temperature Trip the Circuit Breaker

THE fact that most electrical apparatus can withstand momentary overloads without danger has gradually led operators to push up the current values at which electromagnetic protective devices will operate, or to dispense with them entirely, rather than undergo the inconvenience of having them disconnect the machinery on momentary peaks.

A method of visual protection on the basis of temperature has been in use for some time. Exploring coils are built into the apparatus and used to indicate the temperature of hot spots by electrical means.

The Westinghouse Electric & Manufacturing Company has now brought out the type CT relay, which automatically trips the circuit breaker when the temperature reaches the danger point under excessive current. This device may be used to protect any alternating-current apparatus from excessive heating if the apparatus is so arranged that exploring coils can be installed.

The type CT temperature relay operates on the Wheatstone bridge principle. Two arms of the bridge are copper exploring coils arranged to be placed in the oil or embedded in the windings of the apparatus to be protected, the other two arms are unchanging resistance mounted in the relay. The current for the bridge is supplied by the current transformer connected in the circuit of the apparatus to be protected. The relay has two windings which co-operate to produce torque in a manner similar to the current and voltage coils of a wattmeter. The main winding is a coil operated directly by the current transformer. The auxiliary coils are connected to the Wheatstone bridge arms similarly to a galvanometer connection, and thus receive current the magnitude and direction of which depends upon the resistance of the search coils. Above a certain tem-

perature the torque of the relay is in the contact direction and below it, in the opposite direction. To close the contact, two predetermined conditions must co-exist: excess current and excess temperature.

Keeping an Accurate Record of Energy Consumption at San Diego

ONE of the greatest sources of energy waste on many electric railways is failure to meter or otherwise keep account of the energy used by different departments as in carhouse lighting, shop tool work, track welding, etc. This charge cannot be brought against the San Diego Electric Railway, which has realized for years past that lack of accounting means indifference and carelessness. This company does not allow the feeling to exist that the power station is the "easy mark" of the system. The care given by the company to what has now become more important than ever is indicated by the following sample monthly report prepared by Homer MacNutt, superintendent of motive power:

WHERE AND HOW POWER WAS USED		Kilowatt-hours
37 E	San Diego Electric Railway Machine shop, Sixteenth and L Streets.....	2,430
37 E	Pit wheel grinder, M Street carhouse.....	1,240
38	Shifting cars between M Street carhouse and machine shop	120
39	Shifting cars between Adams Avenue carhouse and machine shop	526
39	Shifting cars for pit wheel grinder.....	30
71 D	Shifting cars, track to track at M Street and Adams Avenue houses	434
71 B	M Street carhouse, outside lights	180
71 B	Adams Avenue carhouse, outside lights.....	180
23 E	Automatic sectionalizing switches.....	2,265
67 H	Electric track switches.....	155
72	Signal lights, First and Spruce, Fifth and K Streets, Fifth and University Avenue.....	110
78 D	Lights at ends of lines:	
	Fortieth and M Streets.....	100
	S. D. & S. E. Railway Bridge, Thirty-third and M Streets	60
	Exposition terminal loop.....	60
	Mission Cliff Gardens, toilet and waiting room....	120
	Kensington Park, Adams Avenue line.....	60
	Fort Stockton Drive and Trias Street.....	60
	Old Town line at Ramona's Home.....	60
	Park Boulevard and Adams Avenue.....	60
	Ferry wharf, San Diego side.....	9
	Ferry wharf, Coronado side.....	0
81 A	Mission Cliff Gardens, Pavilion house.....	0
	S. D. & Coronado Ferry Company, S. D. side, lights and heater in building.....	72
	S. D. & Coronado Ferry Company, oil pump at Coronado	16
	S. D. & Coronado Ferry Company, machine shop at Coronado wharf	0
	Hotel del Coronado, sewer pump.....	233
	Christ Episcopal Church, Coronado.....	10
	S. D. & South Eastern Railway shops.....	3,530
	California China Products Company, National City. Construction cars (in a separate report).....	0
	Bonding cars (in a separate report).....	
78 A	Wrecker car No. 12 charged at 3 kw.-hr. per mile when in use.....	0
78 A	Tent City sewer pump, holes 2 and 3.....	347
	Thirtieth and Woolman.....	60
	Roseville	60
	Ocean Beach	60
	Lights in machine shop	60
	Armature oven	357
	Total	13,244

"Economy" watt-hour meters have recently been installed to check the energy consumption.

The American Institute of Electrical Engineers has published an article by Frank T. Baum, consulting engineer, San Francisco, Cal., on a simple method for determining the economic proportion which should exist between hydroelectric and steam power in a plant utilizing both. Mr. Baum gives in non-mathematical form the principle underlying his plan and illustrates its application by means of curves and numerical calculations. The article appears in the September issue of the A. I. E. E. Proceedings.

News of the Electric Railways

TRAFFIC AND TRANSPORTATION

FINANCIAL AND CORPORATE • PERSONAL MENTION • CONSTRUCTION NEWS

Philadelphia in Review

Conditions Are Such That Company Can Continue for Present Without Fare Increase

T. E. Mitten, president of the Philadelphia (Pa.) Rapid Transit Company, has written to the Public Service Commission, setting forth in detail the amazing growth in stability and prosperity of the company under the Stotesbury management and giving the assurance that the timely assistance of the government, in supplying funds for needed equipment, and the abnormal increase in earnings are serving to meet the immediate wants of the company.

FUTURE UNCERTAIN

The communication, however, gives what amounts to a notice that while the improved financial condition of the company will not necessitate an increased fare before Jan. 1, 1919, some form of relief will have to be applied whether the pending operating lease with the city shall be approved or rejected by the commission. For under the lease an increase is automatically assured when the need shall arise; without it, the company announces that it will be prepared to submit a program for some sort of a zone system, by which long-distance riders will have to pay more than the "base fare of 5 cents."

In his letter Mr. Mitten said:

"The company's position has been greatly improved, although its every step in the later years of this management has been made difficult by the uncertainty of the city's plans and the consequent impossibility of establishing a definite program for the future. Under such a handicap this management has increased its facilities so that it carried, in greater comfort than heretofore, 741,140,856 passengers during the year ended June 30, 1918, at an average fare of 3.96 cents per passenger, as against a total of 432,884,253 passengers during the year ended June 30, 1910, at an average fare of 4.15 cents per passenger."

RESERVE FUNDS TO BE USED

Under the Stotesbury management, the net increase in the capital obligations of the company has been \$12,854,792 and fixed charges increased about 13 per cent, yet the proportion of gross earnings required to pay fixed charges, which was 46 per cent in 1910, was only 32 per cent for the latest fiscal year. Earnings provided \$4,103,639 of the cost of new cars.

The renewal reserve, which at the outset of the Stotesbury management

"consisted of securities having an estimated value of \$1,200,000," and has since received 15 per cent of gross earnings to insure upkeep of the property "now contains a balance of \$2,625,000, of which \$1,434,391 is in cash." Mr. Mitten then adds, "We shall dip very deep into this reserve during the next few months, while putting our cars and tracks into condition, but it must be understood that we have accumulated this money for just such an emergency."

During the eight-year period ended June 30 last the aggregate gross revenue of the company and its disposition is given as follows:

Interest and rentals.....	\$74,895,127
Wages to employees.....	69,502,064
Materials and expenses of operation, maintenance and renewals, claim reserve, etc....	29,588,437
Taxes, including payments to city, State and federal governments.....	15,272,389
Undistributed surplus.....	4,884,078
New cars from earnings, renewal account.....	4,103,639
Philadelphia Rapid Transit, dividends.....	2,847,933
Gross earnings, distributed as shown.....	\$201,093,667

Seattle Plans Municipal Railway Work

Plans for the development and extension of the Seattle Municipal Railway have been furthered by the passage by the City Council of a resolution introduced by Councilman Oliver T. Erickson, chairman of the city utilities committee, directing the judiciary committee to apply to the capital issues committee for approval of a bond issue of \$150,000 "for the extension of the municipal railway on East Marginal Way from West Spokane Street to the south city limits." The resolution also provides for securing approval of \$300,000 of utility bonds to buy equipment and build terminals for the road, as well as \$500,000 of the \$3,700,000 utility bonds authorized by the Council for improvements of the city water system.

Councilman Erickson also recently secured passage of a series of ordinances providing for the equipment for the new elevated railway line. One ordinance provides for the purchase of six single-truck and twenty-five double-truck cars for \$217,000; another provides for securing this money from the general fund until a bond issue can be provided. A third resolution provides for the appropriation of \$500 to pay the expenses of Superintendent of Utilities Thomas F. Murphine on a trip to St. Paul to inspect cars offered the city by the United Railway & Logging Company.

Middlesex Strike Settled

Chairman of Massachusetts Committee on Public Safety Acts as Mediator

The strike of the employees of the Middlesex & Boston Street Railway, operating through about twenty cities and towns in the suburban district west of Boston, was settled on Sept. 10 by Henry B. Endicott, executive manager of the Massachusetts Committee on Public Safety, after an extended conference with representatives of both sides.

DECISION EFFECTIVE UNTIL JULY, 1919

The "blue-uniform men," to whom the company was willing to grant an increase in minimum wage from 30 to 35 cents an hour and increase the maximum from 40 to 42, receive substantially these advances at the hands of Mr. Endicott. The executive board of the union had agreed to give the offer of the company a trial until Nov. 1, provided the company would agree that after that date either party might refer the case to the War Labor Board, to which the company demurred. It was understood that the decision of Mr. Endicott is to hold until July 1, 1919, at least.

The miscellaneous employees, car-house men, linemen, trackmen and others, who received from 28 to 42 cents an hour, wanted a minimum of 42 cents, whereas the company was willing to give them 2 cents more an hour than they were getting.

The strike was declared on Aug. 30. It occurred in direct violation of the employees' agreement with the company to arbitrate wage and other disputes by the usual joint selective method, the men insisting that the controversy in this case be settled by the War Labor Board. The company announced its willingness to have this board adjudicate the issues provided questions of working conditions were also included, but the employees were unwilling to submit any matter other than wages to the federal authorities.

SERVICE RESTORED WITH LOYAL EMPLOYEES

The company operated such cars as possible during the strike by utilizing the services of loyal employees, but only a small percentage of the usual car-mileage was run. Plants in the district working on war orders resorted to automobile and motor-truck transportation, supplemented by steam railroad service, to meet the situation created by the strike.

Seattle Sale Plans

Negotiations Apparently Proceeding Satisfactorily for Disposal of Railway to City for About \$15,000,000

The offer of the city of Seattle, Wash., to purchase the railway lines and system of the Puget Sound Traction, Light & Power Company for the sum of \$15,000,000 was reported in Seattle this week as having been accepted by the Stone & Webster interests in Boston, but at the office of Stone & Webster in Boston it was officially stated on Sept. 18 that no basis for sale had yet been reached.

200 MILES OF RAILWAY INCLUDED

The property under negotiation embraces more than 200 miles of railway, with overhead trolley system, 500 cars, some of them practically new; eight carhouses and a large assortment of general railway equipment.

Any transfer would not involve the power and lighting systems of the company, which would continue business in light and power as well as operate the Everett and Tacoma interurbans, which trackage agreements into the city will be worked out by city and traction officials.

If the deal is arranged the city officials also plan to lease or purchase the city lines of the Seattle & Rainier Valley Railway, giving the city of Seattle complete control, through ownership, of its entire transportation system. Representatives of the Seattle & Rainier line have assured the Council they will accept any reasonable proposition.

An inventory and appraisal of the property to be taken over will be commenced at once by the city.

Official authority for the city to take over the lines will be provided in an ordinance authorizing an extension and improvement of the present municipal railway system. Payment is to be made in twenty-year utility bonds, bearing interest at 5 per cent. The bonds are to be paid out of the earnings of the railway. There will not be a lien on any other city property. It is the purpose of the city officials to try the operation of the lines on a 5-cent fare, and if that is not sufficient, raise the fare to an amount that will bring in the required revenue.

UNIFICATION WILL SAVE \$1,000,000

Traction officials assure the city that unification of the railway systems of the city will save at least \$1,000,000 yearly in expense. The elevated line which the city is building through the industrial district is expected to further reduce the operating expenses. Another means of increasing the income that it is expected will be put into effect is the elimination of jitneys from sections of the city where railway cars can handle the traffic. Jitney competition is said to have been one of the principal causes of reduction in the company's income.

It is expected that the acceptance of

the city's offer will greatly clarify the local situation with regard to employees of the company, who have been negotiating for increase in pay. Under a tentative agreement, it is understood that the new arrangement means that effective on Aug. 1 the company was to pay its men on the basis of 50, 55 and 60 cents an hour, and that this scale will be continued by the city after transfer of its lines. Failure of the negotiations for the sale of the lines will mean that the wage question will be submitted to the War Labor Board for adjustment, with possibility of greatly impairing the railway service by reason of the men seeking more remunerative employment elsewhere.

A contract with Stone & Webster, who control both the local railway and the power company, is proposed to be entered into by the city for sufficient power to operate the railway until the city's Skagit River power plant is finished. This station will probably not be ready for three years. The city will pay for the power at the rate of 1 cent a kilowatt, the price at which the city electrical department sells current to the municipal line.

VALUATION BASED ON COMMISSION FIGURES

The price of \$15,000,000 for the railway named in the negotiations is based on the State Public Service Commission's valuation of the property and estimate of the City Public Utilities Department, which recently completed an investigation of the properties.

Thomas F. Murphine, Superintendent of Public Utilities, expressed the belief that few, if any, additional new places in his department would be required to handle the affairs of the railway. The City Utilities Department now has a railway operating organization which Mr. Murphine believes could be expanded to meet the new demands. Most of the present 1800 operating officials and employees of the traction company would probably be retained, if they desire to stay with the city.

The purchase of the railway by the city would conclude a long struggle between city and the company over matters of service and franchise obligations. A tremendous amount of litigation has resulted, in most of which the city has been victorious. Some weeks ago, negotiations were undertaken with a view of finding some means whereby better service could be furnished the shipyard workers. The company insisted upon securing an increase in fares. This move was resisted by the city. A counter-offer of the city to lease the railway lines was rejected. A. M. Taylor, in charge of the housing and transportation division of the United States Shipping Board, who has been in Seattle for several weeks, has assisted toward the settlement of

the transportation problems now proposed. In discussing the possible acceptance of the offer, A. W. Leonard, president of the company, said:

"We realize that the city, with its legislative power, has many advantages over a private company in the operation of a railway. Seattle would acquire a splendid piece of property, and with the breadth of view shown by the Mayor and the City Council, we feel sure the city would succeed in developing a fine operating system."

Attacks on Chicago Bills

Attempts to block a vote on the new traction ordinance in Chicago were made during the week ended Sept. 14 when two suits were filed seeking to enjoin printing of the question on ballots for the Nov. 5 election. Arguments on both petitions were made in the Circuit Court on Sept. 17. Both petitions assail the right of the City Council to order the traction ordinance to be submitted to the voters. Both also charge the ordinance is illegal because it contains legislation which the Aldermen are powerless to adopt.

Louisville Wage Negotiations Ended

In the matter of the wage dispute between the union of railway employees and the Louisville (Ky.) Railway negotiations have practically ended and as the matter now stands it will be taken before the War Labor Board for adjustment. The company concluded a letter to the union in part as follows:

"We decline to grant you the wages you demand. It is impossible to do so. We decline to enter into any agreement to submit the matter of wages to the War Labor Board. If and when you shall demand of the War Labor Board to take up the question of differences between you and this company, and we are informed of that fact by the War Labor Board, and are invited to join you in submitting to the War Labor Board the matters in controversy, we will then make a reply to the War Labor Board, but in any event, we shall insist that if there is to be an appeal to the War Labor Board, all questions are to be considered as open between us and that we are not to be bound to enter into any contract with you except such as may be required to be entered into by the War Labor Board."

Independent of any arbitration as to permanent increase in wages, the railway made the following announcement to its employees:

"Negotiations between the employees and the company were broken off yesterday afternoon. In considering the matter the company has concluded that it is just as a war-time measure to advance the wages of conductors and motormen 7 cents an hour and other employees paid by the hour in the same proportion based on their wages July 1, 1918. This advance is to take effect Sept. 1, 1918."

Turning the Tables

Kansas City Smiling at the "Star,"
Which Knocked Fare Increase but
Increased Its Own Price

The Kansas City public has got a good deal of amusement—and satisfaction—out of the efforts of the Kansas City (Mo.) Railways to tell its side of the story of increased fares, in answer to the Kansas City *Star's* criticisms of the railway and others concerned in bringing about such increase.

COMPANY'S PAPER STATES FACTS

Every week the railway has presented the subject of higher fares in its bulletin circulated on the cars, making response, with facts, to the attacks of the newspaper. As different cities went to higher fares, and as evidence accumulated of the necessity for public service corporations and public service departments of municipalities, charging more for the service, the bulletin marshaled

The railway displayed on the front of its cars for a week the following placard:

"Owing to War Conditions the *Star* Reluctantly Increases Its Price and Still Knocks the 6-Cent Fare."

The paper answered this placard, with an editorial saying that it "is not knocking 6-cent fare if 6-cent fare is just." The railway company thereupon changed its placards, which then read: "Even the *Star* is for the 6-cent fare now."

Other placards called attention to *The Railwayman*, the weekly bulletin that would be on the cars on Sept. 9, in which the whole matter would be discussed. This bulletin contained direct and forceful statements—the first edition of 30,000 was exhausted by noon, and a second edition of 20,000 was exhausted on Tuesday.

Cleveland Terminal Hearing

A public hearing was held on Sept. 11, on the plan to erect a union passenger station on the Public Square at Cleveland, Ohio. Attorney J. L. Cannon, representing the Cleveland Union Terminals Company, indicated that full information was wanted before any important steps were taken. Objection was made to the removal of the proposed depot from the group plan or mall, of which the new courthouse and city hall form a part. The change proposed would necessitate an important revision of the plans. Instead of a handsome structure, a freight yard would face the buildings which have already been erected.

Mr. Cannon said the sponsors of the plan want to get an expression of public opinion. If a union depot on the Public Square is not wanted, it will be an easy matter for the voters so to decide. He could not say whether all the railroads would agree to use a station in that location, but if they did not, there would be no depot. This probably means the interurban electric railways as well, for these roads are to be provided for in the terminal plans.

As soon as the plans of the new company were announced, several members of Council thought it would be a good plan to insist upon the electrification of all steam roads entering the city. Mr. Cannon informed them that such a requirement would kill the project at once. The plan of the projectors is to provide for terminal facilities as soon as possible and then erect as much of the depot building as the government will approve. They do not believe that the entire plan can be carried out until conditions change, because government approval of any plans so extensive as those under consideration could not be secured.

In connection with his visit to Cleveland for the inspection of railroads and their facilities, W. G. McAdoo, director general of railroads, inquired into the project for building a new union station on the Public Square.

Conductresses for Detroit

Detroit United Railway Short More
Than 300 Men, Will Put Women
On the Cars

The Detroit (Mich.) United Railway announced on Sept. 12 that it had found it necessary to employ women as conductors and that it would begin to receive applications for these positions on Sept. 13. The women will be assigned to the Woodward Avenue line first and gradually other lines will get their share of them. It is likely that between 200 and 300 will be employed.

The women will be paid the same scale of wages as the men, as follows: first three months, 43 cents an hour; next nine months, 46 cents an hour; after one year, 48 cents an hour. The company has set no age limits, merely prescribing that applicants must be of good health; have good hearing and eyesight, and must be of good moral character. For the present they may wear such clothes as they choose, but a cap, bearing a number, will be furnished by the company. Later the women will wear uniform coats.

The company is inviting wives and daughters of former employees now in military service to apply for the positions. Such applicants will be given the preference.

For several weeks past the company has been short from 300 to 350 men. In an announcement the company said:

"We are firm in the belief that these women conductors—patriotically offering their services to replace men who are now on the battlefields of France or who will soon be—will receive the hearty co-operation of the general public and will speedily prove their worth."

Successful women applicants will receive three or four days' preliminary training before they are put on cars.

Ohio Interurbans to Aid

Samuel Lake, connected with the Federal Railroad Department, has been in Ohio for several days, inspecting interurban railways with a view to making recommendations for an increase in their carrying facilities wherever necessary in order to furnish the desired aid to steam roads. He and J. B. Dugan, representing the Ohio Public Utilities Commission, spent several days in and around Toledo and also visited other points in Northwestern Ohio.

Toledo, being an important interurban center, may be selected as the location for a large freight station. If it is found necessary to have such a building, one may be leased or built. The Toledo Terminal Railroad already has a building which would serve well for this purpose, should the location be suitable. To just what extent the interurban railways will be able to furnish aid will depend upon the increase in equipment that can be secured, after the present facilities have been developed up to the limit.



THE STAR AS OTHERS SEE IT
(From *The Railwayman*)

an increasing array of testimony for the advance in Kansas City.

The climax of the company's display of evidence backing up a fare increase came in September. The *Star* announced on Sept. 1 that its price of 10 cents a week for morning, evening and Sunday papers by carrier would be advanced to 15 cents, and that its street sale price would be raised from 1 cent to 2 cents. The announcement mentioned the advances in the cost of production, and referred to correspondence with the War Industries Board, which board had called the attention of the *Star* to complaints from competitors of the low price of the paper.

From the point of view of the railway, the situation was particularly opportune, because of a phrase the *Star* had used editorially:

"WHO'S NEXT?"

"Street railway, electric light company, gas company—who's next?"

It was apparent that the *Star* itself was the next agency furnishing a public service (of a sort) to advance its price.

News Notes

Wage Increase in Dallas.—Effective from Sept. 1 the Dallas (Tex.) Railways granted a war bonus of 4 cents an hour to its conductors and motormen. The bonus will remain in effect during the war. This is the second increase this year.

Offices in New Location.—The offices of the Columbus Railway, Power & Light Company, Columbus, Ohio, so long located at 14 North High Street, have been moved to 104 North Third Street, where more space and better facilities have been secured.

Priority for Subway Construction.—The Public Service Commission for the First District of New York has secured from the War Industries Board at Washington priority certificates sufficient to insure the completion of essential parts of the dual subway system.

Trenton Company Removes Office.—The general office of the Trenton & Mercer County Traction Corporation have been removed from the American Mechanic Building, Trenton, N. J., to the Broad Street Bank Building, where the entire seventh floor is occupied.

Free Rides to Soldiers and Sailors.—William L. Smith, general manager of the Dayton (Ohio) Street Railway, has announced that hereafter soldiers and sailors may ride free on the line. The company is having 1,000,000 transfers printed containing Liberty Loan advertisements.

Mr. Witt on Municipal Ownership.—Peter Witt on Aug. 26 addressed the Public Ownership League at Trenton, N. J., in which he advocated the public ownership of electric railways and other utilities. Director of Public Safety George B. LaBarre, Trenton, N. J., spoke along similar lines.

Montgomery Strike Settled.—An agreement has been entered into between the Montgomery Light & Traction Company, Montgomery, Ala., and its trainmen under which the strike in that city has been settled. The company has conceded the right of the men to organize. Service has again returned to normal.

Offers Inducements for Patriotic Saving.—The Toledo Railways & Light Company, Toledo, Ohio, has offered the married employee who shows the largest savings for the year invested in thrift stamps a present of a \$100 Liberty Bond. The unmarried man who makes a similar showing will receive a \$50 bond.

Increase in Wages in Fort Worth.—The Northern Texas Traction Company,

Fort Worth, Tex., increased the pay of its employees effective on Sept. 1, 5½ cents an hour. Under the new schedule, beginners will receive 38 cents an hour. Since the United States entered the war, the aggregate increases in wages amount to 60 per cent of the former wage and the increases since the beginning of the war in Europe amount to 75 per cent.

Interurban Increases Wages.—Commencing on Sept. 12 and thereafter for the duration of the war or until further notice, the wages of motormen and conductors of the Washington-Virginia Railway, Washington, D. C., will be as follows: First three months, 43 cents an hour; next nine months, 46 cents; thereafter, 48 cents. Extra men will receive one-half pay from time of reporting for work until excused for the day or assigned to a run.

Women for Johnstown.—Unable to secure sufficient men to operate its cars, the Johnstown (Pa.) Traction Company is planning to employ women as conductors. E. M. du Pont, general manager, says that although the trainmen have been granted a wage increase of 12 cents an hour, the company has not been able to get motormen and conductors. The new wage of 45 cents an hour increases the company's payrolls about \$7,000 a month.

Texas Electric Increases Wages.—The Texas Electric Company, which operates the interurban lines from Dallas to Denison and Sherman, from Dallas to Waco and from Dallas to Corsicana, and the local lines in Sherman, Denison, Waxahachie, Corsicana and Waco, announced an advance in pay of motormen and conductors effective from Sept. 1. The raise amounts to 4 cents an hour. It is granted as a war bonus because of the increased cost of living.

Kansas City Labor Agreement Renewed.—The Kansas City (Mo.) Railways has renewed its agreement with its trainmen and other employees, all features being covered except that of wages. The agreement as signed expressly provides that the wage question shall wait the action of the War Labor Board, which will take up the Kansas City Railways' problem during September. The agreement is practically the same as that made a year ago, except for a few changes in language.

Gasoline Replaces Steam.—The Railroad Commission of California has authorized the Los Angeles & San Diego Beach Railway, San Diego, Cal., to cease operating its steam trains between San Diego and La Jolla, and to make three round trips a day by gasoline motorcars. The commission found that the increased costs of operation, and the increasing use of privately owned automobiles and the competition furnished by a stage line now operating between these points, did not justify the continuation of the steam line.

Cleveland Subway Report in Six Months.—It is believed that Barclay Parsons & Klapp, New York, engineers, in about six months will be able to complete a survey of the city of Cleveland for the purpose of constructing a subway or rapid transit system. A study of the growth in population will come first, after which the occupational location of the people will be considered. After this a study of the building activities for several years back will be made and this will be followed by an investigation of the traffic situation with special reference to relief from congestion.

English Tramways Will Need Rebuilding.—Quoting a Boston business man who has just returned from a stay of several months in England and France the Boston *News Bureau* says: "Business in the tight little isle is humming as never before. An indication of the expansion already accomplished is afforded in the figures of steel capacity, which has increased from 4,000,000 tons annually before the war to 12,000,000 tons now. A large steel manufacturer expressed the opinion that the steel business of the country will be tremendous for years after the war. For four years there has been nothing but the most necessary repair work. The railways and tramways will have to be practically rebuilt."

Wages and Fares Coupled.—It is the purpose of the Virginia Railway & Power Company, Richmond, Va., to make applications promptly to the municipal governments in Richmond, Petersburg, Norfolk and Portsmouth for a 6-cent fare. As soon as this relief is assured and additional revenue provided, the company will advance the scale of wages of its motormen and conductors throughout the system to a minimum of 41 cents an hour and a maximum of 45 cents an hour and other employees in proportion, which increases will remain in force so long as the additional revenue provided by the increased fare is effective. The matter of a straight 5-cent fare for the company in Richmond has been before the Council there for some time.

Labor Differences Adjusted.—The differences between the motormen and conductors in the employ of the Atlantic City & Shore Railroad, Atlantic City, N. J., and the officers of the company, have been settled by the granting of an increase of 5 cents an hour to the platform men, and the recognition of the union by Receiver Clarence L. Cole. The increase became effective on Sept. 1. The crews running between Atlantic City and Longport and the Inlet will now receive 36, 38 and 40 cents an hour, and the men on the Ocean City division, 33, 40 and 45 cents an hour. Overtime will be paid for at the rate of time and a half. The pay is for a day of ten hours, which must be completed within twelve hours. There will also be a revision of swing runs.

Financial and Corporate

Great Expectations

Utah Company Shows How Commission Erred on Increased Fares—Lose 464,161 Riders in Month

That estimates of results expected with increased fares, particularly in small or medium-sized cities, frequently do not even approximate the results actually obtained is strikingly illustrated in the case of the Utah Light & Traction Company, Salt Lake City. In *Kar-Fax* for Sept. 14, published by the company, appears the following comment:

SOME OF THE ESTIMATES

"Last fall, and again this summer, the Public Utilities Commission took measures to save the Utah Light & Traction Company from bankruptcy by authorizing a raise in rates. By its first action the commission estimated that the company's revenue would be increased about \$10,000 a month, and by the second—the adoption of the 6-cent fare and the 5-cent commutation ticket—the commission estimated a further increase of \$11,000 a month, making a total of \$21,000.

"But, like the divisional chief, they didn't figure on the pile of sand. They based their calculations on what they had good reason to believe was a solid "take-off" for the company's running jump to safety, or in other words the volume of business of the company during 1917. But, as a matter of fact—almost overnight, so to speak—it has proved a pile of sand.

"Instead of increasing, as might have been expected, or at least remaining stationary, the passenger traffic is decreasing to an alarming extent. We have already given the figures showing this for the period of April through July. Figures for August prove that the loss in patronage is getting even greater.

SOME OF THE RESULTS

"The total decrease for last month, as compared with August, 1917, was 464,161 passengers. This is a greater loss by 131,670 over that of July, the decrease during that month, as compared with July, 1917, being 332,491 passengers.

"The result is that, in spite of the advance in fares granted on two occasions by the Public Utilities Commission, the Utah Light & Traction Company is worse off than it was a year ago. Instead of an added revenue of \$21,000 for the month of August, 1918, as compared with the same month in 1917, it has suffered an actual loss of \$4,055.

"It is true that this loss tapered off somewhat the latter part of the month, and the showing may be better for

September. But the prospect is anything but cheerful. Even though the 6-cent fare comes up to the most sanguine expectations of the commission in point of ratio to the 5-cent commutation rate, it is difficult to see how, with men—street car passengers—continually being called in the draft, and with no adequate compensation in traffic, the Utah Light & Traction Company can maintain its present service on its present revenue."

Abandonment Threatened

The city of St. Thomas, Ont., has entered an action in court to recover \$8,000 from the London & Lake Erie Railway & Transportation Company, claiming that amount as rental for the use of streets and of

TABLE I—COMPARATIVE INCOME STATEMENT FOR SUBSIDIARIES OF COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY IN CALENDAR YEARS 1916 AND 1917

	1917	1916	Increase	Per Cent Increase
Gross receipts.....	\$19,723,736	\$16,962,606	\$2,761,129	16.28
Operating expenses.....	11,078,632	8,374,620	2,704,011	32.29
Gross income.....	\$8,645,104	\$8,587,986	\$57,118	0.67
Fixed charges, including taxes and dividends on outstanding preferred stocks of subsidiary companies.....	6,495,479	5,936,244	559,235	9.42
Net income, available for dividends, replacements and depreciation.....	\$2,149,625	\$2,651,742	*\$502,117	*18.94
Dividends on preferred stock.....	1,077,010	1,019,170	57,840	5.68
Balance.....	\$1,072,615	\$1,632,572	*\$559,957	*34.30
*Decrease.				

the tracks of the municipal railway. The company responds with claims for work done and materials provided, which the defendants assert will nearly offset the bill. The London & Lake Erie company has repeatedly indicated its intention to abandon operation and scrap the road which runs between London and Port Stanley. An official of the railway was quoted by a Toronto newspaper recently as saying that it is only a matter of a few days until this course will be taken. The railway

Commonwealth Splits Even

Rise in Expenses Balances Revenue Gains—Interurban Passenger Earnings Increase 22 Per Cent

The gross earnings of the Commonwealth Power, Railway & Light Company, Grand Rapids, Mich., for the twelve months ended Dec. 31, 1917, amounted to \$3,041,130, a substantial decrease from the figure of \$3,458,729 in 1916. Deductions for expenses and interest increased from \$806,980 to \$891,505, so that the net income available for dividends, replacements and depreciation dropped from \$2,651,742 in 1916 to \$2,149,624 in 1917. Preferred stock dividends of \$1,077,010 were paid in the last year, comparing with \$1,019,170 in 1916, and the balances in the two years were \$1,072,614 and \$1,632,572.

The combined results of operations for all the subsidiaries in the last two calendar years are shown in Table I. The cost of labor increased \$571,313 or 24 per cent, the cost of coal and oil \$1,610,050 or 84 per cent, and taxes \$304,955 or 33 per cent. The receipts

and expenses both increased about \$2,700,000, but owing to the rise in fixed charges the net income available for dividends, replacements and depreciation showed a falling off of \$502,117 or 18.9 per cent.

The proportionate shares of the various classes of subsidiaries in making up the gross receipts are shown in Table II. While the city lines showed a slight decrease, the interurban passenger receipts increased 22.32 per cent. The city traffic in revenue passengers fell

TABLE II—DIVISION OF GROSS RECEIPTS FOR SUBSIDIARIES OF COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY IN 1916 AND 1917

	1917	Per Cent of Total	1916	Per Cent of Total	Increase	Per Cent Increase
Gross receipts.....	\$2,504,996	12.70	\$2,125,925	12.53	\$379,070	17.83
Gas.....						
Gas residuals and miscellaneous.....	1,186,568	6.02	739,856	4.36	446,711	60.38
Electric.....	7,594,242	38.50	6,297,088	37.12	1,297,153	20.60
Heating and water.....	535,928	2.72	465,168	2.74	70,760	15.21
Railway:						
City.....	4,243,042	21.51	4,275,014	25.20	*\$31,972	*0.75
Interurban.....	2,838,033	14.39	2,329,099	13.68	517,934	22.32
Freight and miscellaneous.....	820,924	4.16	739,452	4.37	81,471	11.02
Total.....	\$19,723,736	100.00	\$16,962,606	100.00	\$2,761,129	16.28
†Electric sales to subsidiary railways are eliminated.						
*Decrease.						

has lost money since the city of London electrified its paralleling steam road. St. Thomas took its bill to court only after the company had failed to send a representative to discuss the situation with the City Council.

off 635,859 or 6.87 per cent, but the interurban traffic gained 1,798,157 or 17.37 per cent. Part of the interurban increase was due to the extension of lines to the cantonments at Rockford, Ill., and Battle Creek, Mich.

Parent Company Responsible to Public

Court Holds Receivers Should Pay Fixed Charges of Underlying Company Only from Surplus Funds

The receivers for the Pittsburgh Railways have been authorized by Judge Charles P. Orr in the United States District Court to pay \$247,075 fixed charges due its chief underlying company, the Consolidated Traction Company, for August, and \$31,465 for similar charges for the month of September. No mention is made, however, of \$216,582 in fixed charges due in August to other underlying companies.

CITY AND ONE RECEIVER PROTEST

The payments had been protested by the City of Pittsburgh, near-by boroughs and one of the three receivers for the company. They maintained that the money should be expended for needed improvements.

The matter of the payment of the fixed charges came before the court in the form of a petition for advice on what to do regarding payment. In a supplemental petition Receiver Fagan protested against the payment. This brought forth a petition from the Consolidated Traction Company, backed up by the majority receivers, that the fixed charges due the company be ordered paid. The court upheld the right of the Consolidated Traction to intervene because of its claim to ownership of a considerable part of the property embraced in the Pittsburgh Railways system. The court said in part:

"The legal position of the Consolidated Traction Company is that the receivers of the Pittsburgh Railways cannot retain the property of the Consolidated Traction Company in their possession and also keep the income derived by the receivers from the operation of such property. The discussion of this legal position at any length is unnecessary.

"Before receivers are required to elect whether or not they will affirm a lease entered into by an insolvent corporation prior to their appointment, they are entitled to a reasonable time to determine whether the assumption of the obligations of the lease would be beneficial to the trust. What is a reasonable time within which receivers may declare such election varies in almost every case. The present case is one necessarily involving great perplexities.

SOME UNDERLYING COMPANIES DESERVING

"These underlying companies want some share of these returns as compensation for the use of their properties. Some produce a substantial net income while some do not. At the present time all properties comprising this system operated by the Pittsburgh Railways are being valued. Until such valuations are obtained, it will be difficult even to take the first step toward a solution of any of the perplexing problems which confront the parties

interested. There should be no election therefore by the receivers to affirm or disaffirm any of the contracts entered into by the Pittsburgh Railways with subsidiary corporations until after the valuations of the various properties comprising the system have been completed. Therefore, the Consolidated Traction Company is not entitled at present to the return of its properties.

"Nor is the petitioner entitled, as a matter of right, to the alternative of the prayer. In other words, it is not entitled to have payment of the sums named in the lease because its property is retained by the receivers. If it be entitled to any moneys at all, because of its interest, it will be entitled to them solely because the receivers have more money in their hands than they will be able to spend within a reasonable time, in placing the various properties under their control in condition properly to perform the duties owing to the public. At the time of the hearing the court expressed the view that the interests of the public were paramount to all others.

DUTIES TO PUBLIC PARAMOUNT

"The principle is well recognized that before moneys shall be applicable to the payment of interest to bondholders or dividends to stockholders, the duties toward the public should be performed. Therefore, in the present case it is the duty of the receivers to discharge the obligations of the Pittsburgh Railways to the public before discharging the obligations to investors.

"The receivers have in their hands now more money than they can spend at the present time or in the near future, and the moneys in their hands are increasing greatly. To withhold all of said moneys from those who own the properties would be to penalize them for something for which perhaps they are not responsible. If enough and more, that is to say sufficient funds, are retained in the hands of the receivers to meet the expenditures which they can within the near future incur in the performance of their duties as herein outlined, the surplus tributed from time to time in the distributed from time to time in the discharge of obligations to investors.

"The order for the payment of this money is not to be deemed an order for a continuance of similar payments to the same company as they may mature hereafter. There may be other underlying obligations that may require similar treatment. Such payments as may be made will be made by order of this court and should be separately charged against the particular properties to which they may be applicable, so that upon any reorganization the respective charges and the respective values may have consideration. Let an order be drawn in conformity with this opinion."

Approving immediate compliance with joint demands for better service made by officers of the army and navy and the Public Service Commission, Judge Orr in United States District Court in handing down an order on Sept. 16 on another phase of Pittsburgh Railway receivership, directed the receivers to pay \$38,760, mostly for car trust securities, but to defer \$72,495 for charges on other underlying bonds.

Loans to Municipal Lines

Under an agreement which was reached recently between A. M. Taylor, director of housing and transportation of the United States Shipping Board, and Mayor Ole Hanson, Seattle, Wash., arrangements were made whereby the city may borrow the sum of \$392,000 for municipal railway improvements, of which sum only \$330,750 will have to be repaid by the city. Payments are to be made in five annual installments, beginning one year after the close of the war, and bearing interest at the rate of 5 per cent.

The agreement provides tentatively that the city extend its elevated line, now in course of construction, from Spokane Street and Whatcom Avenue west to First Avenue, at an estimated cost of \$50,000.

The Fleet Corporation will loan the city \$217,000 for the purchase of thirty-one cars, title of the cars to remain with the Shipping Board until the loan is repaid, with 5 per cent interest.

A double-track railway is to be furnished the plant of the Seattle North Pacific Shipbuilding Company. If possible, the city will electrify the Northern Pacific siding and connect it with the Lake Burien line. This improvement will cost \$75,000. The Fleet Corporation will advance the money. The city will repay 75 per cent of this amount, and the Shipbuilding Company will repay the city 40 per cent.

The city of Tacoma will obtain a loan from the Emergency Fleet Corporation of \$237,000 to double track the tide-flats railway and purchase ten additional cars.

Gasless Sunday Helps

The passenger earnings for the Philadelphia (Pa.) Rapid Transit System for Sept. 1 amounted to \$75,960 as against an average of \$68,845 for the Sundays during the month of August. This increase of \$7,115 represents approximately 175,000 additional passengers, which increased riding was due to two factors—first, the discontinuance of automobile operation, and, second, the most favorable weather conditions. Willow Grove Park also reflected the increase. The total receipts from the amusements and concessions there amounted to \$20,000, an increase of approximately 15 per cent in the patronage of the park. The automobiles checked at the park decreased to less than fifty from about 800 for a normal Sunday.

Financial News Notes

Road Being Scrapped.—The Adirondack Lakes Traction Company's road at Gloversville, N. Y., set to be sold under auction last June, has been abandoned and is now in the process of being scrapped. The Adirondack Lakes Traction Company, a 5-mile road, was the successor to the Mountain Lake Railroad. Reference to the affairs of the company was made in the *ELECTRIC RAILWAY JOURNAL* for May 11, page 930.

Would Purchase Columbus Property.—Councilman Fred Zimpfer on Sept. 10 introduced a resolution in Council at Columbus, Ohio, which provides that a request be made to the Capital Issues Committee at Washington to allow the city to issue bonds for the purchase of the railway property of the Columbus Railway, Power & Light Company. This request is to be made on the ground that the company has failed to furnish the public with proper service and that the public interests have suffered as a result.

St. Louis Valuation Planned.—J. L. Harrop, chief engineer of the Public Service Commission of Missouri, has announced that the work of valuing the property of the United Railways, St. Louis, Mo., will be begun by the commission as soon as the valuation of the property of the St. Joseph Railway, Light, Heat & Power Company has been completed. The valuation of the St. Louis property was ordered when the matter of increased fares for the United Railways was before the commission recently.

Offers to Sell to City.—The street railway committee of the Commercial Club of Fort Collins, Col., held a meeting on Sept. 6 at which plans were discussed for the taking over of the property of the Denver & Interurban Railroad in Fort Collins consisting of 7.5 miles of line, or so much as it is desired to purchase, the company having made the city a definite offer. It is

understood that the railway has made a definite proposition to sell the local system for \$75,000, or any part of the line at the invoiced value.

Income Bond Interest Passed.—Announcement has been made that no interest will be paid on the adjustment mortgage income 5 per cent bonds of the Third Avenue Railway, New York, N. Y., for the six months ended June 13, 1918. The interest is due and payable on Oct. 1, next. Interest was paid regularly from January, 1913, to April 1, 1917. For the six months of 1917 only 1¼ per cent was paid. The interest for the last six months of 1917 was passed. Interest on these bonds is cumulative. There is now due on this issue 6¼ per cent.

Pittsburgh Announces Interest Payments.—J. I. Foster, treasurer for the receivers of the Pittsburgh (Pa.) Railways, announces that coupons due on July 1 and on Aug. 1, from the first mortgage bonds of a number of Pittsburgh Railways subsidiaries will be paid. These include the Bloomfield Street Railway, Washington Electric Street Railway, Duquesne Street Traction Company, Central Traction Company, Pittsburgh-Canonsburg-Washington Railway and Pitcairn-Wilmerding Street Railway. Permission has been granted the Pittsburgh Railways to spend about \$375,000 on pressing repairs.

Renewal of Notes Denied.—The California Railroad Commission has denied the application of the Los Angeles & San Diego Beach Railway, Los Angeles, Cal., to issue notes in renewal of outstanding notes, and to issue and pledge bonds to secure the payment of the notes. The company has \$83,261 of notes outstanding. The payment of \$49,393 of these notes is secured by \$68,500 of the company's first mortgage 5½ per cent bonds. The company wanted to secure the payment of all the notes which it desired to issue for the purpose of renewing notes outstanding by first mortgage bonds in the ratio of \$100 of bonds to \$70 of notes.

Receiver for Bowling Green Company.—At Bowling Green, Ky., Judge J. McKenzie Moss has appointed Master Commissioner W. R. Speck as receiver for the Southern Traction Company. The receiver has put one car

in operation and hopes within the next few days to have the entire system in operation. The company discontinued service because officials said operation was being carried on at a loss. The City Attorney filed suit for a receiver. Upon the promise of the company to put the cars in operation at once the case was held in abeyance awaiting the fulfillment of the promise. The cars were not put in operation in the time specified and the receiver was appointed.

Bids Rejected.—The property of the Richmond & Chesapeake Bay Railway was offered for sale recently at public auction at the Richmond terminal of the line. L. W. McVeigh, auctioneer of the property, announced that the highest bid would be subject to final ratification by the trustees of the road. The last bidder was B. Colitz, of the Central Iron & Metal Company, Chicago, Ill., at \$90,000. The trustees have refused the offer. The auctioneer advised all prospective bidders that the trustees earnestly desired that the purchaser might be some one who purposed operating the road, and insisted that the bidders announce whether their purpose in offering to buy accorded with that object. All the bidders stated that the road was to be used as junk. The company ceased operating in 1917.

Successor Company Organized.—The articles of incorporation of the Petaluma & Santa Rosa Railway, Petaluma, Cal., formed to take over the Santa Rosa & Petaluma Railroad, in the plan to refinance the line, have been filed with the county clerk as required by law. The capital stock of the new corporation is placed at \$1,250,000. The incorporators and first board of directors are: Rudolph Spreckels, L. B. Mackey, San Francisco; F. A. Brush, Santa Rosa; George P. McNear, Petaluma; Thomas Maclay, Petaluma; Allen I. Kittle, Ross; E. C. Merritt, Santa Rosa. The purposes of the corporation cover the operation of the lines and rolling stock of the former concern; the establishment of a ferry service to Petaluma, a distance by water of 39 miles; the construction of a new line from Sebastopol to Santa Rosa, and a branch from Liberty Station to Two Rock. The plan for the reorganization was reviewed in the *ELECTRIC RAILWAY JOURNAL* for Aug. 31, page 387.

Electric Railway Monthly Earnings

ATLANTIC SHORE RAILROAD, SANFORD, ME.					
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., July, '18	\$20,097	\$13,550	\$6,547	\$470	\$6,077
1m., July, '17	23,326	13,048	10,278	431	9,847
GALVESTON-HOUSTON ELECTRIC COMPANY, GALVESTON, TEX.					
1m., June, '18	\$230,752	*\$147,895	\$82,857	\$39,425	\$43,432
1m., June, '17	164,448	*109,392	55,056	37,568	17,488
12m., June, '18	2,385,304	*1,555,941	829,413	464,291	365,122
12m., June, '17	1,959,871	*1,286,176	673,695	442,230	231,465
LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY, LEWISTON, ME.					
1m., July, '18	\$94,087	*\$67,727	\$26,360	\$19,703	\$6,657
1m., July, '17	99,449	*62,693	36,756	15,570	21,186
12m., July, '18	880,545	*741,748	138,797	206,367	167,570
12m., July, '17	861,823	*637,770	224,053	185,042	39,011

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.					
Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., July, '18	\$248,491	*\$160,935	\$87,556	\$40,372	\$47,184
1m., July, '17	197,671	*131,481	66,190	41,343	24,847
12m., July, '18	2,617,697	*1,675,458	942,239	488,583	453,656
12m., July, '17	2,430,215	*1,535,677	894,538	496,071	398,467
PUGET SOUND TRACTION, LIGHT & POWER COMPANY, SEATTLE, WASH.					
1m., June, '18	\$939,382	*\$566,622	\$372,760	\$265,736	\$107,024
1m., June, '17	755,872	*454,318	301,554	191,438	110,116
12m., June, '18	10,513,263	*6,548,665	3,964,598	2,502,460	1,462,140
12m., June, '17	8,812,115	*5,336,144	3,475,971	2,255,365	1,220,606
TWIN CITY RAPID TRANSIT COMPANY, MINNEAPOLIS, MINN.					
1m., July, '18	\$816,958	\$559,976	\$256,982	\$164,988	\$91,994
1m., July, '17	858,177	567,607	290,570	150,671	139,899
7m., July, '18	5,664,531	4,075,467	1,589,064	1,103,068	485,996
7m., July, '17	6,034,121	3,975,678	2,058,443	1,026,682	1,031,716

* Includes taxes. † Deficit. ‡ Includes non-operating income.

Traffic and Transportation

Rebate Slips in Missouri

Both St. Louis and Kansas City Companies Plan This Action Following Court Decision

Starting at 6 a. m. on Sept. 12 the United Railways, St. Louis, Mo., began to give a negotiable receipt for 1 cent to each passenger who pays 6 cents for a ride. This arrangement will continue in effect until the decision of the Supreme Court of Missouri, which will pass upon the validity of the action of the State Public Service Commission in granting the company an increased fare. The company is required to deposit with the Mercantile Trust Company 1 cent for each 6-cent fare received. Passengers must ask the conductor for the receipt. Advertisements published by the company state that the receipt "will be issued on request." In the event the final ruling of the Supreme Court is unfavorable to the railway, those who hold receipts will be paid back the extra cent. It is probable that the case will be heard by the Supreme Court en banc as early as Oct. 21 and not later than Oct. 28.

The order of Circuit Judge Slate in the fare case would have restored 5-cent fares, but Chief Justice Bond of the State Supreme Court on Sept. 7 authorized the companies to continue charging 6 cents until the Supreme Court passes on the case.

The Kansas City Railways, having given a supersedeas bond in the Supreme Court in the matter of higher fare litigation, is planning to give receipts to passengers for the extra cent they pay. The decision of Judge Slate of the Cole County District Court, on Aug. 31, vitiating the increased fare orders of the Public Service Commission, stimulated many passengers in Kansas City to withhold the extra cent from conductors. Newspaper stories of passengers who upon being refused such receipts refused to pay the penny also assisted the tendency. The admission of a bond by the Supreme Court pending final decision by it on the jurisdiction of the State Commission, restored to the public their normal view of the 6-cent fare.

Skip Stops in Los Angeles

The Los Angeles (Cal.) Railway put the skip stop in operation on West Pico Street line on Aug. 7. Up to the third day of operation not a complaint had been registered. On the other hand two persons called in regarding to the location of stops previous to the installation of the new method of operation. In each case their suggestions were deemed of sufficient merit to warrant shifting of the stop, as the suggestions which were made

were not controlled by personal or selfish reasons. The company took considerable pains to advertise this method of operation thoroughly. A pamphlet was addressed to the employees of the company. Another was distributed to the patrons on the W. Pico Street line. In addition *A-Z-U-R-I-D-E*, the company's fortnightly publication, was distributed through the city to the extent of 75,000 extra copies. Advertisements were also placed in the papers. The company has placed new stop signs throughout the entire line whether or not in the skip-stop section. The skip stop was only used west of Figueroa Street, which is practically half of the line. As this system is introduced on the lines the company will put new stop signs everywhere. No stops are made except at a sign. Over that portion of the lines where skip stops are not supposed to be in operation the company does skip some stops, as the company is cutting out stops at unimportant streets.

Jitney Regulation Sustained

Jitneys in Texas have lost again in the courts in their fight for existence. Judge George Calhoun of the Fifty-third District Court at Austin, in dissolving the temporary injunction granted several weeks ago restraining the city of Dallas from enforcing the city ordinance enacted on Aug. 2 with the avowed purpose of putting the jitneys in Dallas out of business, recognized the right of cities in Texas to exercise their police powers to regulate traffic of this kind, even to the extent of stopping such traffic altogether.

The decision of Judge Calhoun was made after an exhaustive hearing on the merits of the case, in the course of which the jitney drivers offered evidence of their right to operate unhampered on the streets of a city as public carriers, and the city offered evidence showing the detrimental effect of the jitneys on the morals of a community, how they congested traffic on the downtown streets, how they were not amenable to regulation and other undesirable features of their operation.

Immediately after the temporary injunction was dissolved, Mayor J. E. Lawther of Dallas, who was in Austin at the time, notified Chief of Police Ryan by telephone and instructions were issued to the police officers to arrest all jitney drivers found operating in violation of the ordinance of Aug. 2. This ordinance prohibits the operation of jitneys in the downtown or business district of Dallas.

This decision is regarded as of special importance at this time as it upholds jitney ordinances in nearly all the cities of the State.

Increase Sought in Capital

Both Washington Railways Find Cost and Wage Burdens More Than Present Fares Will Stand

The Washington Railway & Electric Company, Washington, D. C., has petitioned the Public Utilities Commission of the District of Columbia to substitute for the sale of six tickets for 25 cents, as at present, a uniform cash fare of 5 cents per passenger per trip with transfer privileges to connecting lines as provided in the present tariffs. Among other things the company cites increasing costs of material and recent advances in wages as factors contributing to the conditions that make the appeal necessary.

SPEEDY ACTION URGED

The petition was dated Sept. 14. It was signed by William F. Ham, president. In his conclusion Mr. Ham urges that the increase now requested be granted as speedily as possible, together with such other relief, if any, as the commission may deem proper.

On Sept. 18 it became known that the Capital Traction Company informally had notified the Public Utilities Commission that it would seek a higher rate of fare in order to meet the increase of more than \$400,000 annually in its payroll, involved in the new pay scale announced last week and other increased costs of operation imposed by war. Formal application, it is expected, will be filed on Sept. 23. Just what form the fare request of this company will take has not yet been made known.

The commission met on Sept. 18, but it did not set a date for the hearing on the petition of the Washington Railway & Electric Company. In view of the appeal of the Capital Traction Company for relief, it is expected that the cases will be heard at the same time, perhaps in a joint proceeding.

LABOR BOARD URGES ACTION

A feature of the case of the Washington Railway & Electric Company is the decided attitude taken by the War Labor Board with respect to the company's appeal. In recommending to the Public Utilities Commission that financial relief be granted to the company, the board has reiterated statements made by it in the Cleveland, Schenectady and other wage cases passed upon by it previously, declaring that alleged "overcapitalization, corrupt methods and exorbitant dividends in the past are not relevant to the question of policy in the present exigency" and that "in justice the public should pay an adequate war compensation for a service which can not be rendered except for war prices."

In the *ELECTRIC RAILWAY JOURNAL* for Aug. 17, page 312, it was stated that the Washington Railway & Electric Company would seek an increase. It was not known at that time, however, just what form the application would take.

Indianapolis Fare Hearings Reviewed

Hearings Have Been Going On Since Aug. 19, but Final Arguments Are Expected This Month

The hearing of the petition of the Indianapolis Traction & Terminal Company, Indianapolis, Ind., for increased rates of fare, which began before the Public Service Commission of Indiana on Aug. 19, has proceeded practically continuously since that date.

CITY ATTORNEY DELAYS CASE

A great deal of delay has been occasioned by the action of the City Attorney of Indianapolis in his cross-examination of the witnesses of the company, who have testified as to the value of the inventory of the street railway property, mention of which was made in the *ELECTRIC RAILWAY JOURNAL* for Aug. 24. The attitude of the City Attorney has been to attempt to discredit the financing of the original properties of the Indianapolis Street Railway and the Citizens Street Railway, which were taken over by lease by the Indianapolis Traction & Terminal Company. The company's valuation of the physical property was given as \$24,018,040, and with intangible values added the total was \$28,634,210; the total issued securities of the Indianapolis Traction & Terminal Company and underlying leased property amounts to \$25,000,000.

H. O. Garman, engineer for the commission, was called on to verify some of the figures used in the company's inventory of the property. He placed a valuation of approximately \$15,000,000 on the company's physical property, including the structural overhead, and including the terminal station and property used in connection with the interurban lines entering the city. He stated, however, that possibly a careful valuation of the property might add 20 per cent to his figures or a total of \$18,000,000. Mr. Garman based his figures on the "barebones" valuation of \$78,700 a mile for the Indianapolis property, and stated that he had taken the valuation per mile in various cities and made certain deductions, giving the comparative "barebones" figures as his estimate for the following cities: Detroit, \$48,860; Kansas City, \$90,639; Milwaukee, \$94,000; Cincinnati, \$88,500; St. Louis, \$65,700.

Mr. Garman stated that in this estimate he had stripped the valuation of all the questionable percentages, like amounts allowed for engineering costs, superintendence, interest and taxes during construction, small omissions, fire and liability insurance, contingencies, franchise and like valuations.

Robert I. Todd, president of the company, was on the stand for several days verifying figures which had been introduced by other officials.

CITY THINKS RENTALS TOO HIGH

The city contended that the rental paid to the stockholders of the Indianapolis Traction & Terminal Company of a 6 per cent dividend, amounting to \$300,000 per annum, should be reduced

before any increase in fare was considered, if the company was found to be in need of securing additional revenues. It was also contended that the interurban companies should be charged a higher rate per passenger for the use of the tracks and interurban terminal of the city company, to provide additional revenue.

On Sept. 3, after much argument as to the details of valuation on the part of the city, Chairman Lewis of the commission took a decided stand in the case, and stated that at this time it was of little concern what the inventory shows, but it was of very great importance to see that the income of the property was not less than its expenses, so that the company could continue to operate without injury to the services, or danger of insolvency. He said that this was no time for receivership. There are about 1400 public utilities in the State under stress. The commission did not propose to see them wrecked. He was frank to say that the company would be saved from insolvency if any danger of that was shown.

CITY REPRESENTATION ON BOARD

On Sept. 5 Commissioner Edwards, who has charge of the case, made a suggestion that public representation be allowed on the board of directors of the company to create confidence in the company on the part of the public, and asked if the company would consider his proposal, that one director should be appointed by the Governor of the State, one by the Mayor of Indianapolis, and one by the Indianapolis Chamber of Commerce and the Board of Trade in conjunction with the other civic organizations of Indianapolis. The company took the matter under consideration and on Sept. 9, unreservedly accepted the proposal of the commission, stating its earnest desire to give the best service possible, and to cooperate in every way for the interest of the public.

An adjournment of the hearing was taken until Sept. 20, when the arguments of the company and the city will be presented, probably closing the hearing.

An Interurban on the Stage

The Arkansas Valley Interurban Railway Company, which operates between the cities of Hutchins, Wichita and Newton, Kan., has completed a motion picture panorama of its entire line. This is to be used principally at the "Wheat Show," an annual event held in Wichita, and scheduled this year for Sept. 30 to Oct. 12. The picture consists of three reels and covers the entire line showing many interesting scenes and the several thriving and prosperous little cities through which the road operates.

The successful filming of the picture, accomplished by M. B. Faidley, well known in Eastern cities and famous for having picturized the Santa Fé Trail, was made under the direction of Fred C. Mayer, traffic manager, of the Arkansas Valley Interurban Railway. Considerable interest has been manifested in the effort to incorporate this line in motion pictures, and a number of Kansas motion picture theaters have already reserved dates for the showing of the film.

This novel scheme of advertising the facilities of a transportation line is being watched with interest by other electric lines, no doubt with a view of some such similar action on their part should the plan fulfill the expectations of its sponsors.

Renews Its Fare Plea

George A. Stanley, president of the New York & North Shore Traction Company, Roslyn, N. Y., has declared that operations will cease one minute after midnight on Sept. 30 unless the city of New York grants the company financial relief or positively signifies intention to do so at an early date. Some time ago the company asked for a 7-cent fare. Mayor Hylan and the other members of the transit committee of the Board of Estimate held a public meeting in Flushing, but no action has been taken by the committee. This matter was referred to previously in the *ELECTRIC RAILWAY JOURNAL* for July 6, page 34.

Six Cents for Houston

The City Council of Houston, Tex., on Sept. 9 adopted a resolution granting the Houston Electric Company a 6-cent fare, an increase of 1 cent. Half fares will be 3 cents, instead of 2½ cents. The new rate becomes effective on Sept. 30 and will remain in operation until the end of the year if there are no further proceedings. At that time the city may order the present rate of 5 cents restored, or it may decide that the company is entitled to a still further increase and declare in favor of a 7-cent rate, which the company has asked for.

All capital expenditures must first be approved by the City Council. Furthermore, the city may demand a detailed statement of the valuation of the property of the Houston Electric Company, which must be furnished either before or after Jan. 1, 1919, the cost to be paid by the company. Until such valuation is made, no dividend is to be declared without giving the city ten days' notice. No dividend can exceed 7 per cent of the present valuation of the property.

The city will have a representative on the board of directors of the company, who will be entitled to inspect the company's books. The railway company is to furnish monthly financial statements of its operations regularly to the city.

Relief for Los Angeles

Case of Pacific Electric Railway, Pending Since May, Decided by Fare Advance in Suburbs

An increase in passenger rates was granted the Pacific Electric Railway, Los Angeles, Cal., by the State Railroad Commission in a decision made on Sept. 4. The opinion was written by Commissioner Harvey D. Loveland.

The application of the company has been pending since May 28. The increased rates authorized are expected to produce less than 20 per cent increase in the gross revenues of the company, which operates approximately 600 miles of trackage in southern California with its center in Los Angeles. The increase, however, will still leave a gap of approximately \$1,000,000 between the amount of revenue produced and the amount necessary for the expenses estimated during the year ending May 31, 1919.

5½ MILE CENTRAL ZONE

The new rate is based upon a central zone in Los Angeles extending 5½ miles, radius from the Pacific Electric and Hill Street stations. In this zone the rate of fare is 5 cents. All mileage rates are computed from the edge of this zone to the point of destination on mileage basis plus the 5 cent rate. The mileage rate fixed by the commission for one-way fares is 3 cents a mile with half fare for children over five and under twelve years of age; round-trip fares to be at the rate of 2½ cents a mile, with half fares as before stated. Commutation tickets are ordered to be ten-ride individual at 2 cents a mile; thirty-ride family, at 1½ cents a mile; and a forty-six-ride individual school, and a sixty-ride individual at 1 cent a mile up to 10 miles; at 9 mills a mile from 10 to 15 miles, 8 mills a mile from 15 to 20 miles and 7½ mills a mile over 20 miles.

The commission also grants an increase in what is known as the beach zone rates. The beach zone rates are treated largely as excursion and are increased from 35 to 40 cents one-way, and from 50 to 60 cents round-trip. No discrimination has been made in reference to reduced rates to industrial or other zones.

Local fares inside the city of Los Angeles are not to be increased, and the zone computation is only to be used for interurban rides.

The rates authorized may be established at any time within twenty days.

SEVEN-CENT PLEA REJECTED

In dismissing the request of the company that it be permitted to charge zone fares up to 7 cents in the city of Los Angeles, the commission holds that while the government is computing war taxes and all other affairs upon the 1 cent basis, it is not difficult to continue to do so in all other affairs. Hence, the desire of the company to compute its rates wherever the amount exceeded 2½ cents on a basis of 5

cents, and where less than 2½ cents on a basis of nothing, has been denied and the rates will be computed on the 1 cent basis. Where fares come out on an even half cent or over, they are to be rounded up to an even cent, but where below, the fractions are to be discarded.

Meeting the request of City Attorney Stephens at Los Angeles that the rates be based upon the valuation of the property, the opinion states that this valuation is in the process of making by engineers of the commission and the railroad, and is practically 75 per cent finished. It is pointed out that the revenue allowed the company is equal to only 6 per cent upon less than \$32,000,000, while the undisputed value of the property devoted to public service is a value in excess of \$50,000,000. The commission urges that the work on the valuation be carried on to completion for use in further rate considerations.

The decision of the commission was prompted by the financial conditions of the company, the necessity of continuing its service for a large population—the largest population that has been affected by single rate decision in the history of the Railroad Commission—the increased cost of materials due to war conditions, the reduction of traffic due to the growth of automobile transportation and the direct appeal of the federal administration to state commissions to maintain during the war crisis the financial stability of public utilities.

NEW RATE IN EFFECT SEPT. 15

O. A. Smith, general passenger agent for the Pacific Electric Railway, announced on Sept. 5 that the new rate schedule recommended by the State Railroad Commission would go into effect about Sept. 15. Interurban fares will be figured on the basis of 3 cents a mile one-way or 2½ cents per mile for round-trips.

The mileage schedule will not apply between Los Angeles and the beaches, from Santa Monica on the north to Seal Beach on the south, but this fare will be increased from 35 cents one-way and 50 cents round-trip to 40 cents one-way and 60 cents round-trip, respectively.

In constructing one-way, round-trip, ten and thirty-ride commutation fares from Los Angeles, a blanket fare of 5 cents will be applied for the first 5½ miles and mileage rates beyond. Fares will end in denominations of 1 cent instead of 0 or 5, as formerly. The distance from Los Angeles to Covina is 21.78 miles; deducting 5½ miles leaves 16.28 miles at 3 cents per mile, which amounts to 49 cents, and, adding 5 cents for Los Angeles city fare, makes the total one-way fare 54 cents from Los Angeles to Covina.

The sixty-ride commutation fare between Los Angeles and Long Beach or between Los Angeles and San Pedro, which is used to a considerable extent by employees of the shipbuilding plants, will be \$9.20. This is figured at rate of 7½ mills per mile on the distance between Los Angeles and Long Beach, 20.45 miles.

Brief mention of the handing down of the decision was made in the *ELECTRIC RAILWAY JOURNAL* for Sept. 14, page 479.

Transportation News Notes

Six Cents in Racine.—A 6-cent fare for adults and a 3-cent fare for children was granted the Milwaukee Heat, Light & Traction Company, operating in Racine, Wis., by the State Railroad Commission on Sept. 10.

Kankakee Council Willing.—The Council of Kankakee, Ill., has passed an ordinance authorizing the Kankakee Electric Railway to charge a 6-cent fare, provided the change is approved by the Illinois Public Utilities Commission.

Fare Increase in Pascagoula.—The Pascagoula Street Railway & Power Company, Pascagoula, Miss., has raised the rate to Moss Point 6 cents, making the price of the trip from Pascagoula to Moss Point 21 cents instead of the former sum of 15 cents.

Shop Early Plea in New Jersey.—The Public Service Railway, Newark, N. J., has posted the following placards in the cars on the various divisions: "War workers are increasing, thus making it more urgent that women shop early in the day."

Rockford Wants Six Cents.—The Rockford (Ill.) City Traction Company has filed with the Public Utilities Commission of Illinois a request for a rehearing in the matter of 6-cent fares for Rockford. The commission recently fixed fares in the city of Rockford at 5 cents.

Uniform Findings.—The finding of the Utilities Commission of Kansas in the fare and freight rate matter of the Joplin & Pittsburg Railway, Pittsburg, Kan., was the same as that for the Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan., referred to previously in the *ELECTRIC RAILWAY JOURNAL*.

Increase for Evansville Railways.—The Interstate Commerce Commission recently authorized the Evansville (Ind.) Railways, operating the interurban line from Henderson, Ky., and Evansville, Ind., to increase its fares between those two points and intermediate stations, not to exceed 10 per cent.

Chattanooga Hearing Held.—The City Commission of Chattanooga, Tenn., held a hearing on Aug. 20 on the application of the Chattanooga Railway & Light Company, Chattanooga, Tenn., for a 6-cent fare. Both the opposition and those in favor of the change were heard. The matter is still open.

Increase Refused in Binghamton.—The petition of the Binghamton, (N. Y.) Railway for an increase in fares, failed to pass the Common Council on Sept. 9, although the report of the committee in charge of an investigation asked for its acceptance. Twelve Aldermen were present and when a vote was taken ten negatives and two affirmatives were recorded.

Parcel Dispatch Advertised.—The Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., is advertising the service which its North Shore parcel dispatch is prepared to give. Patrons are assured of merchandise being delivered within twenty-four hours and frequently in less time if purchases are made early in the day and promptly delivered to the station.

Winnipeg Will Ask More.—With 60 per cent increase in salaries being demanded by the employees, the Winnipeg (Man.) Electric Railway informed the City Council on Sept. 10 that it is preparing to ask for the right to increase fares. The company's maximum demand will be 7 cents, with unlimited transfers as now, or 6 cents for tickets and 1 cent for transfers, it is understood.

Columbus, Ind., Wants Fare Increase.—The Central Indiana Lighting Company, which operates the railway in Columbus, Ind., has filed a petition with the Public Service Commission of Indiana asking for authority to increase fares from 5 cents to 7 cents. The company announces that in the event of the rejection of the petition by the commission it will take steps to dismantle the lines and discontinue all service.

Accountant Begins Fare Study.—J. R. Lamb, Cincinnati, Ohio, an expert accountant, who has been engaged by the Louisville Board of Trade to examine the books of the Louisville (Ky.) Railway, with a view to determining whether the latter has a valid reason to ask the city administration for permission to raise fares from 5 cents to 6 cents, or even more, has begun his work. A comparative statement of the cost of operation in 1914 is being prepared for him by the company.

Federal Investigator in Cleveland.—C. S. Lake, inspector for the traffic department of the Federal Railroad Administration, was in Cleveland, Ohio, on Sept. 11, looking into the facilities of interurban railways for carrying freight in less than carload lots. His report will determine the action of the government in the proposal to loan the interurban railways funds for the purchase of freight equipment. E. F. Schneider, general manager of the

Cleveland, Columbus & Southwestern Railway, said that freight trains will be operated in the night largely, if Mr. Lake's report is favorable to hauling freight.

Grand Rapids Wants Seven Cents.—Following up its request of June 3, when it asked the City Commission for a 6-cent fare, the Grand Rapids (Mich.) Railway, through Benjamin S. Hanchett, president, has sent in a new request to the commission, this time for a 7-cent fare. Mr. Hanchett informed the commission that the data it asked concerning the financial history of the company had been compiled and would be presented by him to the commission for a hearing whenever the commission desired.

New Keyport Tariff Suspended.—The Board of Public Utility Commissioners of New Jersey, on Sept. 12 ordered the suspension of the proposed increases in the existing fares of the Jersey Central Traction Company, Keyport, N. J., until Dec. 10 next unless the board prior to that date shall determine that the increases are just and reasonable and shall approve them. A hearing on the matter will be held at the State House, Trenton, on Nov. 12. The company filed with the board a schedule of passenger fares to take effect on Sept. 22.

Commission Approves Turnstiles.—The attitude of the Public Service Commission of the First District of New York on the subject of turnstiles has been somewhat misunderstood. Last spring the subject came up in connection with an application of the New York Municipal Railway Corporation (Brooklyn Rapid Transit System) to use turnstiles in some of its stations. The commission's decision in that case was against their use in stations with very heavy traffic. Since then, however, passimeters of the automatic type have been permitted in several of the most busy stations of the New York Municipal Railway.

Jersey Fare Argument Before Court Oct. 5.—After an agreement between George L. Record and Frank Bergen, representing the New Jersey League of Municipalities and the Public Service Railway, Newark, N. J., respectively, it was decided on Sept. 12 to argue the application of the municipalities for a writ of review in the 1-cent transfer case before Justice Swayze in Jersey City on Oct. 5. Justice Swayze has indicated that the writ will be allowed, but he wants to hear argument on the question of whether or not the Public Service Railway is to be allowed to collect the 1-cent for transfers pending the litigation.

Bridge Fare Increase Allowed.—Permission to increase fares over the Eads Bridge from 10 to 11 cents was granted to the East St. Louis (Ill.) Railway on Sept. 5 by the Interstate Commerce Commission. Several weeks ago the East St. Louis & Suburban System, of which the railway line over the bridge is a part, was au-

thorized to raise its fares to 6 cents. This authority came from the Public Utilities Commission, of Illinois, which had no jurisdiction over cars running between Illinois and Missouri over Eads Bridge. The action by the Interstate Commerce Commission extends the 6-cent authority so that this amount may be collected in addition to the regular 5-cent bridge fare.

Omaha Wants Seven Cents.—At a hearing before the State Railway Commission on Sept. 9 on the application of the Omaha & Council Bluffs Street Railway, Omaha, Neb., for leave to collect a fare of 6 cents in lieu of the present fare of 5 cents, John L. Webster, general counsel for the company, filed an amended application asking for permission to charge a fare of 7 cents. The additional 1 cent increase was asked for on account of alleged change in conditions since the filing of the original application, including a further increase in the cost of supplies and material and an increase in wages which the company is paying, the wage increase being paid in accordance with an order of the War Labor Board.

Auto Stages Increasing in California.—Interurban buses are increasing in numbers and popularity about as rapidly as the jitney bus on the city streets is disappearing. There are now more than 2000 interurban buses operating in California. They probably handle about 20,000 passengers daily. These buses are owned by about 750 companies now licensed to operate in the State. In the first six months of 1918 it is estimated that 2,000,000 passengers were carried on interurban buses south of the Tehachapi Pass, and in the northern part of the State it is estimated that an equal number has been handled. Several successful motor freight lines are operating despite the fact that it has not been believed that this business would be found profitable.

Increase in Salamanca.—The Western New York & Pennsylvania Traction Company, Salamanca, N. Y., has been granted permission by the Public Service Commission of the Second District to increase its fares in Salamanca, Bradford and Olean from 5 cents to 7 cents. In granting permission for the change in the company's franchise, the municipal authorities of Salamanca have attached certain restrictions, one of which is that the additional 2 cents cannot be collected from passengers longer than three years after the date of the ordinance, but may be continued one year after the close of the war. The company may also charge a fare of 3½ cents a mile on its interurban lines between these points and Little Valley, Bolivar, Portville and Limestone.

Lincoln Fare Decision Appealed.—The Lincoln (Neb.) Traction Company has filed notice of appeal from the order of the State Railway Commission which allows the company to increase its fares in Lincoln to 5 cents within

the city zone and 6 cents outside that zone. The company asks for a transcript of the evidence taken at the hearing and that it be filed in the Supreme Court as provided by law in appeal cases. No other reason is given in the notice of appeal except that the company is dissatisfied. The order of the commission carried with it several conditions, one of which commands the company not to pay dividends on its common stock; that it proceed to recover \$198,228 paid out since 1912 to the holders of this stock and that it take steps to cancel the \$1,652,000 of common stock. The fare case was before the commission in applications Nos. 3066, 3298 and 3461.

Eight Cents in Scranton and Wilkes-Barre.—Agreement to permit 8-cent fare to be collected on cars in the Wyoming Valley was reached at the session of the Public Service Commission of Wilkes-Barre, Pa., on Sept. 13. Chairman W. D. B. Ainey of the commission ordered the Wilkes-Barre Railway and the Scranton Railway to offer patrons a refund slip that will remain in effect until a final decision, and made it clear that patrons must not be embarrassed nor compelled to ask for the slips. W. E. Boileau, general manager of the Scranton Railway, wanted to know if it would be all right to give three 1-cent slips instead of a one 3-cent rebate ticket when the 8-cent rate becomes effective. He was told by Mr. Ainey that one slip is to be given with each fare. If old rebate tickets are used there must be some mark indicating that it was issued after the fare was raised from 6 cents to 8 cents.

One-Third Its Employees Gone.—Theodore P. Shonts, president of the Interborough Rapid Transit Company, has replied to the Public Service Commission for the First District of New York with respect to its order requiring the company to operate ten-car express trains on a two-minute headway and six-car local trains on a three-minute headway in both morning and evening rush hours on the east side and west side subways. He says that the service is not what the company had hoped it would be when the new subways were put in operation, but that the conditions which prevent the company from giving greatly improved service are beyond its control. The company has plenty of cars and plenty of power, but it lacks men. During the year out of a total of employees numbering about 14,000 the company has lost about 2000 men to the army and navy. In addition about 3000 experienced men have gone into war industries, munition plants, etc. Five hundred women are being employed in the subways and every effort is being made to obtain additional employees. Wages have been raised. Mr. Shonts asks the forbearance of the people during the difficult war times. *The Subway Sun* for Sept. 16, posted in the cars of the company, was given over to presenting these facts to passengers.

Personal Mention

W. F. Ham, President

Former Vice-President and Director of Washington Railway & Electric Company Heads Company

William F. Ham, who has been acting as president of the Washington Railway & Electric Company, Washington, D. C., since the resignation of Clarence P. King, in March, 1918, was elected president of the company on Sept. 12.

Mr. Ham has had more than twenty-five years of electric railway experience, and during this time he has established a high reputation as an administrator and operator. He has also taken a very active part in association work, especially with the Accountants'



Harris & Ewing Photo

W. F. HAM

Association. He was one of the prime movers in the organization of this association and was vice-president in 1899-1900 and president in 1900-1901. His most important service to the association, however, probably has been as a member of its important committee on the standard classification of accounts, on which he has continuously served from the time of the organization of the committee at the first meeting of the association until the present time and as chairman of the committee from 1905 to 1911. It was in recognition of the value of his work on this and other committees of the Accountants' Association that the organization took the unusual action some six years ago of presenting Mr. Ham with a silver salad bowl.

Mr. Ham's corporation career has been one of continuous promotion. His first connection with electric railway work was from 1892 to 1895 in the New York office of the Lorain Steel Company. In this way he became associated with Tom L. Johnson and Albert N. Johnson and in 1895 he accepted the office of secretary of the Nassau Electric Railroad, Brooklyn,

N. Y., one of the Johnson properties. He continued in this position until the Nassau Electric Railroad was acquired by the Brooklyn Rapid Transit Company early in 1899. He was then appointed auditor of the Brooklyn Rapid Transit Company and served until December, 1899, when he accepted the position of comptroller of the Washington Railway & Electric Company. The following year he was also elected treasurer of the company. In December, 1911, after eleven years' work with the Washington property, he was elected first vice-president and a director of the company to succeed George H. Harries, who became connected with H. M. Bylesby & Company, public utility operators, Chicago.

Since he has been in Washington Mr. Ham has confined his business activities strictly to the Washington Railway & Electric Company, except for being a director of the Federal National Bank. During his connection with the company the gross earnings have increased from \$2,000,000 a year to more than \$6,500,000 a year.

Mr. Taylor on Tour

Director of Transportation on Inspection Trip to Pacific Coast—Appointments Announced

A Merritt Taylor, director of passenger transportation and housing for the United States Shipping Board, Emergency Fleet Corporation, has left Philadelphia for the Pacific Coast on an official tour of investigation. He will inspect all transportation lines that touch the shipyards and will decide many important problems of line extension and housing. Mr. Taylor's tour will occupy about three weeks and will thoroughly cover the Pacific Coast yards south from Seattle.

Mr. Taylor has announced the appointment of Garrett T. Seely, former assistant director of transportation, as assistant director of passenger transportation and housing.

J. Willison Smith, former assistant director of housing, has been appointed assistant director of passenger transportation and housing also.

The change in the official designation of Mr. Taylor's two assistants was made to give authority to Messrs. Seely and Smith to direct the affairs of the passenger transportation and housing division during the absence of Mr. Taylor.

As noted elsewhere in this issue, Mr. Taylor is reported from Seattle to have assisted toward the proposed settlement of the transportation problem there which provides for the city taking over the local railway lines.

William B. McKinley, president of the Illinois Traction Company, Peoria, Ill., and a member of Congress from the nineteenth Illinois district, expects to visit the western battlefield this fall, as a member of a party of Congressmen.

J. F. Canfield has been appointed auditor of the Ottumwa Railway & Light Company, Ottumwa, Iowa, to succeed Crad Brazel, who is now auditor of the construction department of the Northern States Power Company, Minneapolis, Minn.

J. J. Chisholm, superintendent of the Market Street power house of the New Orleans Railway & Light Company, New Orleans, La., has severed his connection with the company and accepted a position with the Woodward Iron Company, Woodward, Ala.

Elmer G. Fay has been appointed assistant treasurer of the Trinidad Electric, Transmission, Railway & Gas Company, Trinidad, Col., to succeed Hubert J. Wightman, resigned, who has gone into business for himself in Trinidad as a public accountant.

H. W. Smith has been appointed claim agent of the Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railway, South Bend & Northern Indiana Railway, and the Southern Michigan Railway, South Bend, Ind., to succeed E. R. Dow.

J. C. MacPherson, superintendent of the electrical lines of the Southern Pacific Company's transbay system, with headquarters at Oakland, Cal., who has held that position since the installation of the system several years ago, has resigned. Mr. MacPherson has received a commission as captain in the Engineers' Corps, U. S. A., and expects to leave for France immediately.

George M. Mattis has been elected vice-president of the Chicago, Ottawa & Peoria Railway, with headquarters at Champaign, Ill. Mr. Mattis has also been elected treasurer of the company to succeed Edward Woodman. The company is included in the Illinois Traction System. Mr. Woodman continues as a director of the Illinois Traction Company and as vice-president and director of the Western Railways.

Joseph H. Towle, after seven years service, has resigned as master mechanic for the American Railway Company's Dayton and Springfield (Ohio) properties, to join the Railway Improvement Company as assistant electrical engineer as of Oct. 1. Mr. Towle's father is George C. Towle, general manager Peoples Railway, Dayton and the Springfield Railway. His headquarters will be at the New York office.

Edward J. Cooney, executive assistant of the Rhode Island Company, Providence, R. I., in charge of publicity and editor of that company's weekly publication, *The Trollier*, has resigned from the company. Mr. Cooney has had many years' experience in editorial, general publicity and advertising

work. Before becoming connected with the Rhode Island Company he was assistant sales manager of the Screw Machine Products Company.

Charles A. Smyth, who for a number of years has been general manager of the Arkansas Valley Interurban Railway, Wichita, Kan., has just returned from France where he has been in the service of the American Red Cross Society, and will again assume active management of the railway. Mr. Smyth spent about seven months in Europe and his description of the conditions "over there" are reassuring, instructive and immensely entertaining.

T. H. Williams, who succeeded J. C. MacPherson as superintendent of electrical lines of the Southern Pacific covering Oakland, Alameda and Berkeley, has been promoted to the position of assistant general manager of the Southern Pacific lines south of Ashland, Ore. The announcement was recently made by W. R. Scott, federal manager of the Southern Pacific-Western Pacific lines. T. F. Rowlands, who has been superintendent of the Western division of the Southern Pacific electric lines at Oakland pier, has had his jurisdiction extended to cover the district which has been under Mr. Williams' supervision.

Hubert J. Wightman, who for more than five years has been assistant treasurer of the Trinidad Electric, Transmission, Railway & Gas Company, Trinidad, Col., has resigned his position, and in the near future will establish himself in Trinidad as a public accountant. After serving as a bookkeeper and clerk for several years, he became associated with Niles & Niles as an accountant, and served with them for more than a decade, severing connection with them after having had charge of their Boston office for more than a year. He resigned from their employ to become connected with the company in Colorado.

R. D. Long, for the last twelve years connected with the electrical engineering department of the Winnipeg (Man.) Electric Railway, has resigned from that position. For the first six years of this time Mr. Long was assistant chief engineer and for the last six years he has been chief electrical engineer. As such he has had full charge of all installations and operations of the company's electrical system, including the hydrogenerating plant and high-tension transmission systems and receiving and distributing stations at Winnipeg, as well as the underground and overhead low-tension distribution for electric light, power and railway service.

James Theron Rood has been appointed professor of railway electrical engineering at the University of Illinois. Professor Rood takes charge of the department formerly administered by Prof. A. M. Buck, now with John A. Beeler. Professor Rood was graduated from the Worcester Polytechnic Institute in 1898 with the degree of bachelor

of science and received the degree of doctor of philosophy from Clark University in 1906. He was instructor in physics and mathematics at Ursinus College from 1906 to 1907, instructor in physics and electrical engineering at the University of Alabama from 1907 to 1909, and since 1909 has been professor of electrical engineering at Lafayette College.

Obituary

Douglas Robinson, capitalist and real estate dealer, died on Sept. 12 from heart disease at Amsterdam, N. Y. He was in his sixty-fourth year. Mr. Robinson was widely known in New York State, and for a number of years was one of the leading figures in New York City realty transactions. He was co-receiver with Adrian H. Joline of the Metropolitan Street Railway, New York, N. Y., the predecessor of the New York Railways.

Willard Harding Burroughs, secretary and treasurer of the Memphis (Tenn.) Street Railway, is dead. He succumbed to acute uremic poisoning after only a few hours' illness. Mr. Burroughs was born forty-five years ago in Shelby County, Missouri. He was educated to become a lawyer, and in 1895 was licensed to practice law in Missouri. In 1903 he entered the accounting department of the United Railways, St. Louis. In March, 1905, he went to Memphis as secretary and treasurer of the Memphis Street Railway. Mr. Burroughs is survived by his widow and one daughter.

William Kent, eminent consulting mechanical engineer of New York City, died at his summer home at Gananoque, Ont., on Sept. 18, at the age of sixty-eight years. Dr. Kent was possibly most widely known through his "Mechanical Engineer's Pocket Book," written in 1895 and now in its ninth edition. He was for five years dean of the L. C. Smith College of Applied Science of Syracuse University, and for four years editor of *Industrial Engineering*. Before going to Syracuse he was associated editorially first with the *American Manufacturing and Iron World*, later for a considerable period with *Engineering News*. He was a prolific writer, lecturer and inventor, and maintained throughout his life an active interest in the national societies related to his engineering and educational work. An extended article by him, comparing the designs of the three principal electric railway power stations which had recently been erected in New York appeared in the issue of this paper for Oct. 5, 1901. Dr. Kent was admired and respected for his courageous advocacy of the principles he believed to be right, and he accomplished much in the three fields of engineering, education, and technical literature.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS

FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES • MARKET QUOTATIONS • BUSINESS ANNOUNCEMENTS

Recent Priority Regulations

War Industries Board Acts on Brass Conservation—Classification of Important Industries Under Sept. 9 Order

Following a conference of the brass manufacturers with B. M. Baruch, chairman of the War Industries Board, and other members and officials of the board, and representatives of the Navy and the Emergency Fleet Corporation, and a later conference of the board with the war service committee of the surface-type condenser industry, it was decided in order to conserve brass to regulate distribution of those condensers which are essential to ships.

There are about forty-five manufacturers affected by the decision of the War Industries Board. They are being notified to take no further orders and enter into no new contracts for sale or to sell or deliver to any purchaser, government or civilian, except on a permit issued by the War Industries Board. To get such a permit the proposed purchaser must show his need to the satisfaction of the board.

The manufacturers will be permitted to fill, where possible, existing orders with non-ferrous condenser tubes on contracts for shipment prior to Jan. 1, 1919. On contracts after Jan. 1, 1919, the manufacturers are urged to put steel tubes on condensers for land uses and are directed to send immediately estimates for steel required.

The Navy and the Emergency Fleet Corporation are exempt from these orders and regulations of the War Industries Board as to condensers for ship usage, but not as to condensers for land stations.

Some months ago the government took over control of and distribution of the turbine-engine industry because of the shortage in the supply and their essential need in the Navy and Emergency Fleet war program. The non-ferrous condenser is an essential integral part of the turbine, and shortage in its production caused the Navy and Emergency Fleet Corporation officials to appeal for government regulation of production and distribution.

CLASSIFICATION OF RAILWAY INDUSTRIES

An abstract of the priority order classifying all industries into four groups, issued Sept. 9, was published on page 471 of this paper for last week. For the convenience of readers the actual classification of some of the principal electric railway manufacturing industries is reprinted here. (The term principally as used in the following means 75 per cent or more):

Brass and copper—Plants engaged in rolling and drawing copper, brass and other copper alloys in the form of sheets, rods, wire and tubes—2.

Cranes—Plants engaged principally in manufacturing locomotive or traveling cranes—2.

Electrical Equipment—Plants engaged principally in manufacturing same—3.

Public Utilities—Street railways, electric lighting and power companies, gas plants not otherwise classified, telephone and telegraph companies, water supply companies, and like general utilities, also plants engaged principally in manufacturing equipment for railways or other public utilities—2.

Steel Rail Mills—Rolling rails fifty or more pounds per yard—2.

Stoker Manufacturers Organize

A national organization known as the Stoker Manufacturers Association has been voluntarily formed by automatic mechanical stoker manufacturers primarily to so improve the engineering and business sides of the stoker industry as to render it more efficient and better equipped to utilize coal more economically and to serve better the government during the war. The movement is in no sense a business combination.

Under war conditions capacity and economy are the big factors in stoker operation. Improvements are to be expected as a result of technical discussion and interchange of ideas at annual conventions to be held by the association. The organization will also insist upon uniformity of guarantees which will relate only to the stoker and not as hitherto include the performance of the boiler and draft-producing apparatus. The War Industries Board was quick to accept the offer of assistance made by the association, asking only that each manufacturer make an individual monthly private report of conditions of the trade direct to the government in order that each might secure proper priorities to facilitate deliveries to essential industries.

The executive committee of the association includes: President, P. A. Poppenhusen, Green Engineering Company, Chicago; vice-president, S. L. Nicholson, Westinghouse Electric & Manufacturing Company, East Pittsburgh; secretary-treasurer, F. H. Daniels, Sanford Riley Stoker Company, Ltd., Worcester; W. F. Sauter, American Engineering Company, Philadelphia; W. H. Rea, Detroit Stoker Company, Detroit.

Coal Production Situation

Labor Day Causes Loss In Output, Although Compared With Last Year the Results Are Very Favorable

Production of bituminous coal during the week of Sept. 7 while limited by the loss of time on Labor Day exceeded production during the week of July 6 when production was also limited by a holiday by 1,000,000 net tons, according to the weekly report of the Geological Survey. The output during the current week (including lignite and coal made into coke), is estimated at 11,249,000 net tons, a decrease compared with the week preceding of 1,455,000 net tons or 11.5 per cent, and an increase over the corresponding week of last year by 1,257,000 net tons or 11.2 per cent. The average production per working day during the week of September 7 (five and $\frac{1}{2}$ days), is estimated at 2,110,000 net tons as against 2,117,000 net tons during the week of August 31 and as against 1,874,000 net tons during the same week of 1917. The loss of time during the current week places production for the coal year to date approximately 17,000,000 tons behind the summer requirements outlined by the U. S. Fuel Administration and makes necessary an average daily production during the balance of the coal year of 2,041,000 net tons to make up this deficit. This, it will be noted, is 3.2 per cent in excess of the average daily production for the coal year to date.

Production of anthracite during the week ended Sept. 7 is estimated at 1,617,597 net tons, 28 per cent less than the production during the week preceding, due mainly to loss of time on Labor Day, and 3 per cent less than the corresponding week of last year. The daily average during the week of Sept. 7 is estimated at 323,516 net tons as against 338,111 net tons during the coal year to date and as against 330,081 net tons, the daily average during the corresponding period of 1917. The total production for the coal year to date is estimated at 45,645,597 net tons, an increase over the same period of last year of 2.4 per cent.

The Roller-Smith Company, 233 Broadway, New York, N. Y., has appointed W. G. Merowit as its Buffalo agent, with offices at 716 Ellicott Square. Mr. Merowit will handle the Roller-Smith Company's lines of instruments, meters and circuit breakers in the western part of the State of New York.

Little Demand for Pole Erection Tools

Ash to Manufacture Handles Is Now More Difficult to Obtain Than Steel

To determine the market condition of pole erection equipment in so far as demand is concerned is simply to answer the question, "How much new construction work is there going on?" This equipment is seldom purchased except for new construction, and when the construction is completed the equipment is adequate for several years for maintenance purposes. The present financial status of public utilities in general, plus the urgent requests of the government, prohibit any new construction that is not absolutely essential to industry and public welfare.

This answer to the foregoing question bears out the report of manufacturers that there is little demand for such articles as pikes, cant hooks, shovels, spoons, picks, digging bars and "jimmies." Because of the small demand and poor prospects for any immediate need very little stock is being carried. A small quantity of shovels and spoons is kept on hand, but few of the other tools. Although steel is a scarce commodity, it is reported that for the manufacture of pole erection equipment wood for handles is obtainable in still smaller quantities. Steel can be manufactured, but wood has to be grown. A few years ago certain manufacturers of these tools specified and would accept only second-growth

ash with straight grain. Later they were requested to and did accept other than second growth, and still later ash with the grain at a slight angle to the axis of the handle had to be accepted. This was followed by the use of maple as well as ash, and at the present time little but maple can be obtained.

All tools are up in price, and those used in the erection of poles are no exception, as they have come in for an advance of from 50 to 75 per cent. Only last week prices advanced 10 to 15 per cent on this line. Delivery of orders in any considerable quantity may be somewhat delayed.

No curtailment of types has as yet been reported. In other construction and digging lines, however, there has been a marked reduction in the number of types produced.

Commission Rules Against Commercial Bribery

The Federal Trade Commission has ordered a chemical company in Chicago to discontinue the practice admitted to have been employed by some of its salesmen of giving gratuities such as liquor, cigars, meals, entertainment, souvenirs, etc., to employees of its customers and prospective customers with a view to influencing the purchase of supplies. The company, which manufactures industrial chemicals, admitted further to have spent money for the entertainment of its customers. The company accepted the issuance of the commission's order without presenting testimony in support of the practice.

Revised Wiring Device Schedule

Reduction of 68 Per Cent in Types Recommended by Manufacturers' Committee

Manufacturers of wiring devices, acting through the wiring device committee of the general war service committee of the Electrical Manufacturing Industry, have prepared a revised schedule of essential devices to be retained in their listings. Each manufacturer has been asked to check carefully his line of devices as cataloged and report to the chairman his elimination. The extent of the elimination is shown in the following:

	Number Devices Now Listed	Number Retained	Per Cent. Reduction
Sockets and Receptacles..	100	20	80
Cut-outs and fuses.....	500	125	75
Miscellaneous	25	20	20
	625	165	68

The War Industries Board will not permit development for commercial purposes during the period of the war, and especially no manufacturer will be permitted to duplicate the essential devices of some other manufacturer as scheduled herein, provided he is not now making them.

Similar work having as its motive the elimination of many types in accordance with the wishes of the War Industries Board is under way in about twenty-five group committees of the electrical industry.

NEW YORK METAL MARKET PRICES

	Sept. 11	Sept. 18
Copper, ingots, cents per lb.....	26	26
Copper wire base, cents per lb.....	29.25	29.25
Lead, cents per lb.....	8.05	8.05
Nickel, cents per lb.....	40	40
Spelter, cents per lb.....	9.75	9.85
Tin, Chinese*, cents per lb.....		
Aluminum, 98 to 99 per cent., cents per lb.....	†33.10	†33.10

* No Straits offering. † Government price in 50-ton lots or more, f. o. b. plant.

OLD METAL PRICES—NEW YORK

	Sept. 11	Sept. 18
Heavy copper, cents per lb.....	23.50 to 24.50	23.50 to 24.50
Light copper, cents per lb.....	21.00 to 21.50	21.00 to 21.50
Red brass, cents per lb.....	23.00 to 24.00	23.00 to 24.00
Yellow brass, cents per lb.....	16.00 to 16.50	15.50 to 16.00
Lead, heavy, cents per lb.....	7.50 to 7.75	7.50 to 7.75
Zinc, cents per lb.....	7.50 to 7.75	7.50 to 7.75
Steel car axles, Chicago, per net ton.....	\$41.52	\$41.52
Old carwheels, Chicago, per gross ton.....	\$29.00	\$29.00
Steel rails (scrap), Chicago, per gross ton.....	\$34.00	\$34.00
Steel rails (relaying), Chicago, gross ton.....	\$60.00	\$60.00
Machine shop turnings, Chicago, net ton.....	\$16.25	\$16.25

ELECTRIC RAILWAY MATERIAL PRICES

	Sept. 11	Sept. 18
Rubber-covered wire base, New York, cents per lb.....	30 to 37	30 to 37
Weatherproof wire (100 lb. lots), cents per lb., New York.....	32.40 to 36.75	32.40 to 36.75
Weatherproof wire (100 lb. lots), cents per lb., Chicago.....	35.00 to 37.72	35.00 to 37.72
T rails (A. S. C. E. standard), per gross ton.....	\$70.00 to \$80.00	\$70.00 to \$80.00
T rails (A. S. C. E. standard), 100 to 500 ton lots, per gross ton.....	\$67.50	\$67.50
T rails (A. S. C. E. standard), 500 ton lots, per gross ton.....	\$62.50	\$62.50
T rail, high (Shanghai), cents per lb.....	4½	4½
Rails, girder (grooved), cents per lb.....	4½	4½
Wire nails, Pittsburgh, cents per lb.....	3½	3½
Railroad spikes, drive, Pittsburgh base, cents per lb.....	4½	4½
Railroad spikes, screw, Pittsburgh base, cents per lb.....	8	8
Tie plates (flat type), cents per lb.....	*3½	*3½
Tie plates (brace type), cents per lb.....	*3½	*3½
Tie rods, Pittsburgh base, cents per lb.....	7	7
Fish plates, cents per lb.....	*3½	*3½
Angle plates, cents per lb.....	*3½	*3½
Angle bars, cents per lb.....	*3½	*3½
Rail bolts and nuts, Pittsburgh base, cents per lb.....	4.90	4.90
Steel bars, Pittsburgh, cents per lb.....	5	5
Sheet iron, black (24 gage), Pittsburgh, cents per lb.....	4.90	4.90
Sheet iron, galvanized (24 gage), Pittsburgh, cents per lb.....	5.80	5.80
Galvanized barbed wire, Pittsburgh, cents per lb.....	4.35	4.35

	Sept. 11	Sept. 18
Galvanized wire, ordinary, Pittsburgh, cents per lb.....	3.95	3.95
Car window glass (single strength), first three brackets, A quality, New York, discount †.....	77%	77%
Car window glass (single strength), first three brackets, B quality, New York, discount.....	77%	77%
Car window glass (double strength, all sizes AA quality), New York discount....	79%	79%
Waste, wool (according to grade), cents per lb.....	16 to 40	16 to 25
Waste cotton (100 lb. bale), cents per lb....	12 to 13	11 to 16
Asphalt, hot (150 tons minimum), per ton delivered.....	\$38.50	\$38.50
Asphalt, cold (150 tons minimum, pkgs. weighed in, F. O. B. plant, Maurer, N. J.), per ton.....	\$42.50	\$42.50
Asphalt filler, per ton.....	\$45.00	\$45.00
Cement (carload lots), New York, per bbl.....	\$3.20	\$3.20
Cement (carload lots), Chicago, per bbl....	\$3.34	\$3.34
Cement (carload lots), Seattle, per bbl....	\$3.68	\$3.68
Linseed oil (raw, 5 bbl. lots), New York, per gal.....	\$1.90	\$1.90
Linseed oil (boiled, 5 bbl. lots), New York, per gal.....	\$1.92	\$1.92
White lead (100 lb. keg), New York, cents per lb.....	14	14
Turpentine (bbl. lots), New York, cents per gal.....	66½	66½

* Government price. † These prices are f. o. b. works, with boxing charges extra.

Recent Incorporations

Petaluma & Santa Rosa Railway, Petaluma, Cal.—Articles of incorporation have been filed with the County Clerk by the Petaluma & Santa Rosa Railway, which has been formed to take over the Santa Rosa & Petaluma Railroad in the plan to refinance the line. The company purposes to operate the present lines and rolling stock of that company, to establish a ferry service to Petaluma, a distance by water of 39 miles, and to construct a new line from Sebastopol to Santa Rosa and a branch line from Liberty Station to Two Rock. Capital stock, \$1,250,000. Incorporators and first board of directors: Rudolph Spreckels and L. B. Mackey, San Francisco; George P. McNear and Thomas MacLay, Petaluma; F. A. Brush and E. C. Merritt, Santa Rosa, and Allen I. Kittle, Ross.

Franchises

Alameda, Cal.—The San Francisco-Oakland Terminal Railways has asked the Railroad Commission of California for authority to build a double-track street railroad across the tracks of the Southern Pacific Company just east of Webster Street and north of the Alameda Marsh Line, Alameda, Alameda County. This crossing is in connection with the San Francisco-Oakland Terminal Railways' line under construction from Webster Street across the Alameda Marsh to the Liberty Shipbuilding Yards now being built by the United States Shipping Board Emergency Fleet Corporation.

Gloucester, N. J.—The Public Service Railway has received a fifty-year franchise from the City Council of Gloucester for the construction of an extension from Broadway to Warren Street. The new line will run to the new shipyard village at Yorkship and the work will be begun soon.

Portland, Ore.—The Kenton Traction Company has received a franchise from the City Council to operate its cars over the Derby Street approach to the Interstate Bridge.

Track and Roadway

Muscle Shoals Traction Company, Florence, Ala.—The Muscle Shoals Traction Company has received a guarantee of the total amount of subscriptions required from Limestone County, together with a guarantee of the right-of-way, which will be donated for the company's main line extending from Huntsville to Florence. The Florence Chamber of Commerce has guaranteed right-of-way in Lauderdale County and terminal facilities in Florence. The survey has been completed from Huntsville to a point 7 miles from Florence. Thurston Allen, Florence, secretary. [Aug. 3, '18].

Washington-Virginia Railway, Washington, D. C.—It is reported that an extension is being built by the Washington-Virginia Railway to Camp A. A. Humphrey and will probably be ready for operation about Oct. 15.

McComb & Magnolia Railway & Light Company, McComb, Miss.—A report from the McComb & Magnolia Railway & Light Company, which is building a line to connect McComb, Magnolia and Summit, states that the construction of its line has been suspended for the period of the war. Guy M. Walker, New York, N. Y., president. [June 1, '18.]

Public Service Corporation, Newark, N. J.—Up to the present time the Public Service Corporation has received a total appropriation of \$2,317,105 from the Government for extensions in the Public Service Railway Company system and electric transmission lines, as follows: new traction lines to Newark Bay, with eighteen additional cars, \$821,739; extensions to traction lines at Camden and Gloucester City, including thirty-three cars, electrical extensions, etc., \$1,240,780; electric construction and development work for the New York Shipbuilding Corporation at the recently established Yorkship Village, Gloucester City, \$215,000, and new electric feeders and other work at Kearny—near Newark, \$39,586.

Items under "Recent Incorporations," "Franchises," "Track and Roadway" and "Power Houses, Shops and Buildings" are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

Tidewater Power Company, Wilmington, N. C.—Plans are being made by the Tidewater Power Company to double-track its line to the shipyards, the Government to loan \$400,000 for this and other work.

Stuebenville, East Liverpool & Beaver Valley Traction Company, East Liverpool, Ohio.—Plans are being considered for the construction of a new bridge over Little Yellow Creek, at a point a few feet up the creek from the present structure. The bridge will be 41 ft. wide, 36 ft. to be used by the traction company and vehicle traffic and 5 ft. to be railed off as a sidewalk.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—The city of Seattle, according to Mayor Hanson and Superintendent of Public Utilities Murphine, will seek a definite agreement with the Puget Sound Traction, Light & Power Company for the use of the new Fifteenth Avenue bridge into Ballard, before the company will be permitted to operate its cars over the structure. The question has become a live issue since the recent demand from the War Department for the immediate removal of the old bridge across the Salmon Bay Waterway at Fourteenth Avenue, Northwest, now used by the company. The Fourteenth Avenue bridge was built by the company on a permit from the War Department with the understanding that it should be removed when it became an obstruction, or when a permanent high bridge was built. The latter condition was realized when the city built the Fifteenth Avenue bridge. Unless the traction company comes to an agreement with the city, the removal of the old bridge will shut the company out of the thickly-populated Ballard district, except by a longer route over the Fremont bridge. The municipal cars now serve the Ballard district over the Fifteenth Avenue bridge, and according to Superintendent of Public Utilities Murphine could handle all the Ballard traffic.

Power Houses, Shops and Buildings

East St. Louis & Suburban Railway, East St. Louis, Ill.—A portion of the building containing the transformers at the Winstanley station of the East St. Louis & Suburban Railway Company was recently damaged by fire, caused by the explosion of an oil switch. Damage to the building is estimated at about \$2,500, and the loss of the transformers is estimated at \$20,000. New equipment will be purchased at once.

Boston & Worcester Street Railway, Boston, Mass.—The new general freight offices and freight depot of the Boston & Worcester Street Railway on Shrewsbury Street, Worcester, which have been under construction for the past few months, are now completed and the offices of the company have been moved to the new quarters.

Toledo Railways & Light Company, Toledo, Ohio.—A 12,500-kw. turbine at the Water Street plant of the Toledo Railways & Light Company was recently damaged by a short circuit. The loss is estimated at about \$10,000.

Pennsylvania Railroad, Philadelphia, Pa.—Preparations are being made by the Pennsylvania Railroad for the construction of new shops, including engine house, machine-shop, car shop, etc., at Marietta.

Charleston Consolidated Railway & Light Company, Charleston, S. C.—About \$750,000 will be expended by the Charleston Consolidated Railway & Light Company for additional construction and machinery for its Charlotte Street electric plant to provide ample power and lighting for Government plants and private factories manufacturing war products. Of this amount \$350,000 will be financed by the War Industries Board. The new machinery to be installed will include a 5,000-kw. turbo-generator, three 500-hp. boilers, condenser, switchboard, condenser intake, coal and ash handling equipment, etc. Specifications for the new construction include a brick chimney 250 ft. high by 12 ft. diameter at the top, and a 7,900-ft. transmission system. Contracts have been awarded for the machinery.

Columbia Gas & Electric Company, Huntington, W. Va.—The Government has awarded a contract to the Columbia Gas & Electric Company for furnishing electric energy to the new Federal nitrate plant to be located at Broadwell, near Cincinnati, Ohio. The contract provides for an increase in capacity of the company's electric plant including a new 30,000-kw. turbo-generator, condensers, boilers and auxiliary equipment. It is understood that the Government has advanced the company \$2,000,000 for the work.

Rolling Stock

Lewiston, Augusta & Waterville Street Railway, Lewiston, Me., is expecting delivery of a number of new passenger cars early in November.

Municipal Bridge Commission, St. Louis, Mo., has purchased two one-man cars for use on the Free Bridge. Delivery is expected early in November.

Columbus Railway, Power & Light Company, Columbus, Ohio, has received nine new cars which will be put into service soon. They are combination summer and winter cars.

City of Tacoma, Wash., has arranged through the Director of Transportation and Housing of the United States Shipping Board for a loan of \$237,000 to double-track the Tide Flats line and purchase ten additional cars.

City of Seattle, Wash., has arranged through A. Merritt Taylor, Director of Transportation and Housing of the United States Shipping Board, to borrow \$392,000 for municipal railway improvements, among which will be included thirty-one cars. The title to the cars is to remain with the shipping board until the loan is repaid.

Auburn & Syracuse Electric Railway, Auburn, N. Y., is reported to have purchased a 350-ton electric locomotive, Westinghouse type, the first of its kind to be used by the company, to provide for increased service from the works of the Semet-Solvay Company, Split Rock plant, near Solvay. The locomotive will be used on the freight line of the company extending to Marcellus.

New Advertising Literature

Bonham Traffic Recorder Company, Hamilton, Ohio: Eight-page folder descriptive of the Bonham fare recorder.

Economy Electric Devices Company, Chicago, Ill.: Card entitled "Skip Stops Save Coal—Economy Meters Show the Saving."

Universal Safety Tread Company, Boston, Mass.: Circular on "Ladder Tread," designed primarily for ships, but suitable for electric cars, stations, etc.

Trade Notes

A. F. Nelson, Harrisburg, Pa., has purchased the rapid ready change carrier business from the estate of Charles F. Etter.

Boston (Mass.) Elevated Railway has closed a contract with the Bernitz Method Company, Boston, Mass., for the use of this company's method of furnace wall protection in connection with all of its underfeed stoker installations.

Economy Electric Devices Company, Chicago, Ill., announces that an order has been received from the Capital Traction Company, Washington, D. C., for ten Economy electric railway meters suitable for the measurement of energy consumption on the cars of the Capitol City. The company has also recently sold the Chicago & West Towns Railway Economy railway meters for use in power-saving work on all of the cars of this property, which serves a dense suburban territory west of Chicago.

Bolden Manufacturing Company, Chicago, Ill., in order to overcome delays of I.C.I. freight deliveries from Chicago to Eastern customers and to meet the government's restrictions on I. C. I. shipments, has opened a warehouse and distributing station at Metuchen, N. J. This warehouse is in charge of S. C. Schenck, Eastern manager of the company, and a small emergency stock of all insulations and sizes of magnet wire will be carried for immediate or urgent shipment. Shipments from this stock will be billed f.o.b. Metuchen at an advance of 3 cents a pound over the Chicago price. It is also the intention of the company, so far as possible, to pack shipments from Chicago for Eastern customers in its cars from Chicago to Metuchen, to be reshipped from there. The freight will be prepaid through to destination and an additional charge made on the invoice equivalent to the I.C.I. rate from Chicago to destination. However, if shipments are desired direct from Chicago, they will be made on request. All orders to the company from Eastern customers for magnet wire should be mailed to the Belden Manufacturing Company, Metuchen, N. J.