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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8200 copies are printed. Total circulation for 1907 to date 254,550 copies, an average of 8211 copies per week.

The Municipal Ownership Reports

For several weeks past we have been summarizing the reports of the different members of the municipal ownership committee of the National Civic Federation. This week we present the conclusions reached by the majority of the body, with the explanations filed by certain members and the minority report of Walton Clark. In spite of the diversity of views expressed in the longer individual reports, it is gratifying to know that upon many of the topics considered, nineteen of the twenty members of the committee were agreed.

The final report of the committee definitely declares that municipal governments abroad are much more suitably organized for the conduct of business enterprises than those in this country; that the ownership of undertakings of the kind here should, under all circumstances, be limited to those which directly involve the health, safety and transportation of the public or the use of public streets or grounds, and that municipal operation should not be considered unless the exclusion of political influence and personal favoritism from the management can be assured. The second conclusion by no means implies that municipal ownership should be extended to these utilities, as certain members of the committee point out, while the feasibility of the latter essential can easily be left to the sober judgment of any student of American municipal conditions. It is hardly possible to conceive of such a radical innovation where party rule is so firmly established as it is here, especially as the report points out that undoubtedly "municipal ownership would create a large class of employees who may have more or less political influence."

The subject of street railways is, of course, the one in which our readers are most interested, and it would be improper to dismiss the subject without a reference to the valuable statistics upon this subject compiled by W. J. Clark, and of which an abstract was published last week. Under our laws American street railway properties cannot be practically confiscated as has been the case in Great Britain, and we have always maintained that the reason why the stockholders of street railway companies in this country should oppose municipal ownership and operation was because they were experts in railroading and knew the dangers of any such policy, rather than because of their interest in transportation enterprises. For this reason the report referred to is of as much value to anyone who wishes our municipalities to prosper as it is to the street railway companies themselves. The municipal ownership propaganda, up to this time, has been bolstered up largely upon inaccurate ideas of the result which would follow, and upon false premises, and the idea has been fostered very largely on account of its availability for political purposes. With the light which has been thrown upon the subject by the reports of the Federation and by the statistics which will form a part of this report when published, there should be a general recognition that the desirable objects sought can be obtained in a better and cheaper way under private than under municipal ownership.

Operation of Trains on Interurban Lines on Regular Schedules Only

There are interurban systems upon which the same schedule is operated day after day throughout the year.

Special cars and extra cars, if run at all, are sent behind regular trains as a second section of a double header. The trains are seldom delayed and run with the same relation to time as a well-staged play. The trainmen depend upon meeting certain trains at certain hours and places and usually do so.

Some companies believe that this is the best of practice and consequently discourage the operation of special cars at odd times, fast or limited trains, and even make an effort to keep irregularly moving freight or express trains off the line. Their main argument is that the trainmen get so accustomed to the schedule that they go through their work almost mechanically, and thereby the danger of collisions or other accidents is very much reduced.

We must admit that this is true. Trainmen are relieved almost entirely of the necessity of thinking. Dispatching from a central office is practically eliminated and it must be something very much out of the ordinary that will cause two cars to come into collision. Where the earning power of a road is not lessened by operating the trains regularly day after day there is hardly an argument against the practice.

But the movement of people is not regular. On Sundays and on special occasions frequently two or three times the regular number of people want to go over the road. If proper encouragement is given or proper effort is made, often quite a business can be worked up in special theater parties, or special excursions; the receipts can also be increased considerably by handling lodge, church or Sunday-School delegations. But such parties, as a rule, wish to leave at definite times which may not be the exact schedule time; a theater party, for instance, would not want to wait perhaps the greater part of an hour after the show is over before departure. Again, many systems have found that through passengers who would otherwise take steam trains can be induced to patronize the electric line if "limited cars" are run at intervals of two or three hours.

There are, no doubt, instances where the earning powers of a road do not suffer by adhering to a clock-like method of train operation, but the ease with which a road can be operated in this manner and the seemingly lessened chance for accidents may often cause some managements to adhere to the practice at the expense of the earnings of the road.

Voltage of Auxiliary Motors in Power Plants

Considering the increasing use of small motors in power plants for the driving of auxiliary machinery, it is somewhat peculiar that the voltage question remains unsettled in so many instances. It is a common experience in an alternating-current plant to find the exciter-motors running respectively at 110, 550, 220 or 2300, two separate and widely varying potentials being a frequent practice. The conveyor motors may run at 550 volts, the valves may be operated at 110, and 2300 volts may be used on a pump or exciter motor. This variable state of affairs presents certain disadvantages which deserve consideration.

It is undesirable on account of the difficulties of insulation to operate motors of the sizes required to control oil-switch mechanism at voltages of 2300 and upward, and unless the designers are willing to guarantee the motor service for a year or two, it is doubtful if these small machines should be built for over 440 or 550 volts. In direct-current practice in book-binderies, printing establishments and the like, a great deal of trouble has been experienced in operating small motors of ½ hp or ¼ hp down on the ordinary 550-volt commercial service, and in an alternating-current railway plant the insulation requirements in small auxiliary motors are still more severe on account of the peak of the potential wave twice each cycle. The usual potential of 220 volts three-phase is certainly well adapted to the needs of auxiliary motors of small size when first-class guarantees of reliability cannot be secured on the higher potentials, though it has the disadvantage of incurring transformer losses and requiring larger copper allowances in wiring unless a special 220-volt generator is maintained for auxiliary power and lighting service.

Transformer losses are almost inevitable in connection with auxiliary motors if the voltage of the main alternators is 2300, 6600 or 13,200. If rotary converters are constantly in service at the plant the problem may often be very nicely solved by making all the auxiliary motors of the usual 360-volt type or thereabout, so that they can operate on the potential of the alternating sides of the rotaries. In case the main generators are built for 360 volts, with step-up transformers for local distribution and transmission, the auxiliary motor situation becomes much simplified. A more frequent combination, however, is alternators of 13,200 volts, exciter motors of 2300 volts, oil switch and conveyor, valve and pump motors of 220 volts. The larger motors required on the exciters can readily be wound for 2300 volts, and it seems a pity to lose the saving in copper which this potential makes possible in sizes like 25 to 75 kw and upwards. Perhaps the ideal case from the standpoint of the auxiliary motor is 2300 volts at the generators and exciter motors and 220 or 460 volts on all the smaller outfits. It is hard to specify these voltages at random, for all the conditions in the electrical design of the plant must be considered in any proper study of the problem in practice. There is little excuse for the use of more than two or three voltages at the outside at the motors in a combined railway and lighting plant where the generator voltage counts as one, and certainly all motors doing similar work should, in the interests of interchangeability and economy, be supplied at the same potential. The tendency of the modern central station toward supplying current at a single voltage, like 2300, in local distribution, is certain in time to carry favorable weight in the auxiliary motor selection of railway plants.

The Necessity for Practical Brake Shoe Tests

The suggestion of Mr. Sargent in his review of the motor car builders' brake-shoe tests, an abstract of which is presented on another page of this issue, that electric railways in the Middle West and Purdue University co-operate in making service tests of brake-shoes is a timely one and should receive the attention both of railway managements and the university named. Mr. Sargent refers to the value of the previous tests conducted at the Purdue testing laboratory but emphasizes the point that heretofore all tests of this kind have been carried on under conditions which are not present in actual service and that trials under the operating conditions may show quite different results.

Steam road operators were rather slow in realizing the

importance of giving proper attention to the brake-shoe question and operators of electric roads seem to be following in their footsteps. In the days of hand brakes and horse cars, when shoes were changed at six-month periods or even at longer intervals and the entire brake-shoe bill per car was not more than three or four dollars per year there was very little occasion to spend much time in trying to lessen the few dollars which this account involved. But under present conditions when the shoes are sometimes worn out in ten days, and the brake-shoe item is a very prominent one in the car maintenance account, operators would do well to make or authorize a scientific study of the subject.

Our knowledge concerning brake-shoes is, to say the least, very limited, a condition which is evidenced by the fact that there is no uniformity throughout the country as regards brake-shoe practice. One master mechanic prefers a soft shoe without inserts, while another uses a chilled shoe or one with inserts on the same type of wheel. Again, we find the same shoe used on steel tires and on chilled wheels.

The shop tests already made by the Master Car Builders' Association indicate that the softest shoe does not necessarily have the highest coefficient of friction and further research along these lines might prove that the wheel wear per foot-pound of work absorbed is not necessarily a function of the hardness of the shoe. In the light of the information which now exists we can only presume that much of the money spent for brake-shoes by the electric railways throughout the country is simply a penalty for past lack of interest and present paucity of information.

We assume that Purdue University was mentioned in connection with the proposed tests by Mr. Sargent, partly because the M. C. B. tests on brake-shoes were conducted there and partly because it is the custodian of the test car "Louisiana" which was given to the American Street and Interurban Railway Association by the St. Louis electric test commission and was loaned by the association to the university. There are other technical schools of the highest class, however, such as the University of Illinois and the Worcester Polytechnic Institute, which are also provided with test cars and are, perhaps, equally well equipped to conduct studies in technical problems confronting electric railway companies. All of these universities, not to mention Cornell, the Massachusetts Institute of Technology and many others, have in their faculties men competent to devise any special machinery required in fitting up cars for test purposes and for conducting practical researches into railway engineering problems. The field is such a wide one and the questions pressing for solution are so numerous and varied that we do not believe any one of these institutions would object to the assignment to one of an investigation of this kind. There is no lack of material to work upon for all who feel so inclined.

Through Routes in Urban Service

In the establishment of rapid transit trunk lines in large cities the maximum benefit to the largest number of passengers consistent with adequate revenue is the governing consideration. Cities composed of intricate street arrangements cannot be served by such lines in the broadest way without the existence of transfer points to take care of the lateral and through traffic between underground, overhead and surface lines. Boston furnishes an excellent instance of this kind. The tying together of the whole network of subway, tunnel, elevated and surface routes by dozens of transfer points contributes remarkably to the freedom of transportation movement in all parts of the metropolitan district, though at the expense of several changes if a person wishes to make a circuitous journey in the shortest possible time.

The great majority of the traveling public soon learn how to use a system of this kind, and the necessary transfers become accepted as a matter of course. Most of the passengers on a system like the Boston Elevated have no serious objection to making part of a trip on the surface, part on the elevated structure and part in a subway in passing between points not directly connected by fast through cars. Of course, every one recognizes the drawbacks of frequent changes in any kind of transportation service, the operating company, as well as the public, but there is no other way out of the matter if fast schedules are to be maintained through cities of ampler topography.

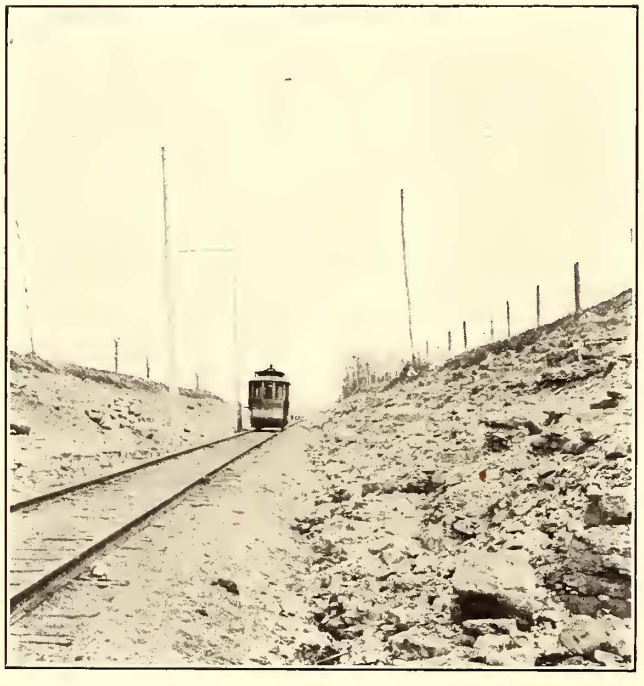
An operating company does wisely, however, in maintaining a considerable number of through routes supplementary to the faster ones in cases like the above. There is a certain percentage of the public which cares less about making fast time between points than it does about making the journey by a single car, less crowded than those of the high-speed lines and slower in schedule speed because of its roundabout route, increased number of stops and accessibility from all local points. Even in cases where such cars traverse the streets above a subway or beneath an elevated structure there is likely to be no lack of patronage because of the adjacent rapid transit facilities. It seems strange to most people that some persons will deliberately avoid riding over fast routes, choosing the slower schedule instead, but the fact remains that a very considerable number of persons desire such accommodations for one reason or another. Some may be in feeble health and find it more convenient to travel by a circuitous surface route in a simple car than to make the necessary changes from one fast line to another via stairs and platforms; others may prefer an open car ride to a trip in a partially closed train, while still others avoid traveling underground as long as surface routes are available. Whatever may be the reason there is no doubt that a demand exists for a more moderate service than the fastest lines give in large cities, and the establishment of through routes on the surface in such cases is a valuable service to the community.

From the operating standpoint such routes are of enormous value in case there arises congestion and blockades on the real rapid transit routes of the city. Surface parallels to elevated or subway routes furnish outlets of great importance at such times. Under normal conditions the circuitous through route connects sections which might otherwise be reached with great loss of time and no little inconvenience and in a general way serves a traffic which is important in the aggregate though scattering in its origin and destination. The assumption that everyone desires to follow the major avenues of traffic, as Mr. Harriman puts it, is unsafe in a large city, and the profitableness of through urban routes with short-distance riding characteristics proves the wisdom of their establishment.

INTERURBAN RAILWAY DEVELOPMENT NEAR MILWAUKEE

Milwaukee promises to be the terminus of one of the largest and most interconnected interurban railway systems in the Middle West. The lines of the system planned for the region around the city might be considered as forming a half wheel, with Milwaukee as the hub. The several lines radiating will form the spokes and an interconnecting line circling the city 20 or 30 miles out will constitute the rim. The system planned owes its inception to John I. Beggs, president and general manager of the Milwaukee Electric Railway & Light Company. President Beggs takes a personal interest in all of the construction work, and it is through his courtesy that the following account is given.

A GRAVEL CUT MADE DURING THE CONSTRUCTION OF THE OCONOMOWOC LINE



ROCK CUT ON THE OCONOMOWOC LINE WEST OF WAUKESHA BEACH

A ROCK FILL MADE WITH MATERIAL FROM ROCK CUT (MILWAUKEE)

The new lines will not only give the nearby farming settlements direct communication with Milwaukee, but they will afford Milwaukee and Chicago people a convenient means of reaching some of the most attractive spots of a most picturesque and romantic region. The territory for 50 miles or more west and southwest of the city particularly is indeed picturesque. The region is of lakes often of several miles area, lying between irregularly-formed hills and fertile farming lands. The portion around Waukesha is most widely known for its mineral water, which is rich in magnesia and has other valuable medicinal properties. During the Columbian Exposition at Chicago this water was piped to the Exposition grounds, about 90 miles distant.

The country, moreover, is rich in Indian lore, and evidences of those inhabitants just previous to settlement by the whites, as well as occupants of a more remote age, are numerous. The lakes and some of the towns still bear the names given them by the Indians, and arrow-heads and other crude implements are frequently found. At several places there exist mounds and earthworks of the earliest inhabitants made in the shape of serpents, lizards, bears and other animals.

During the summer season the accessible portions of this region are filled with city people and people from the Southern States, who usually extend their stay throughout the heated portion of the year, but some of the most desirable regions, from the standpoint of the pleasure-seeker, have heretofore been very difficult to reach. The new interurban system will put these within easy reach of Milwaukee and the steam roads.

The construction of the prospective network of lines is al-

MAP

SHOWING LINES OF

THE MILWAUKEE ELECTRIC RAILWAY & LIGHT CO.

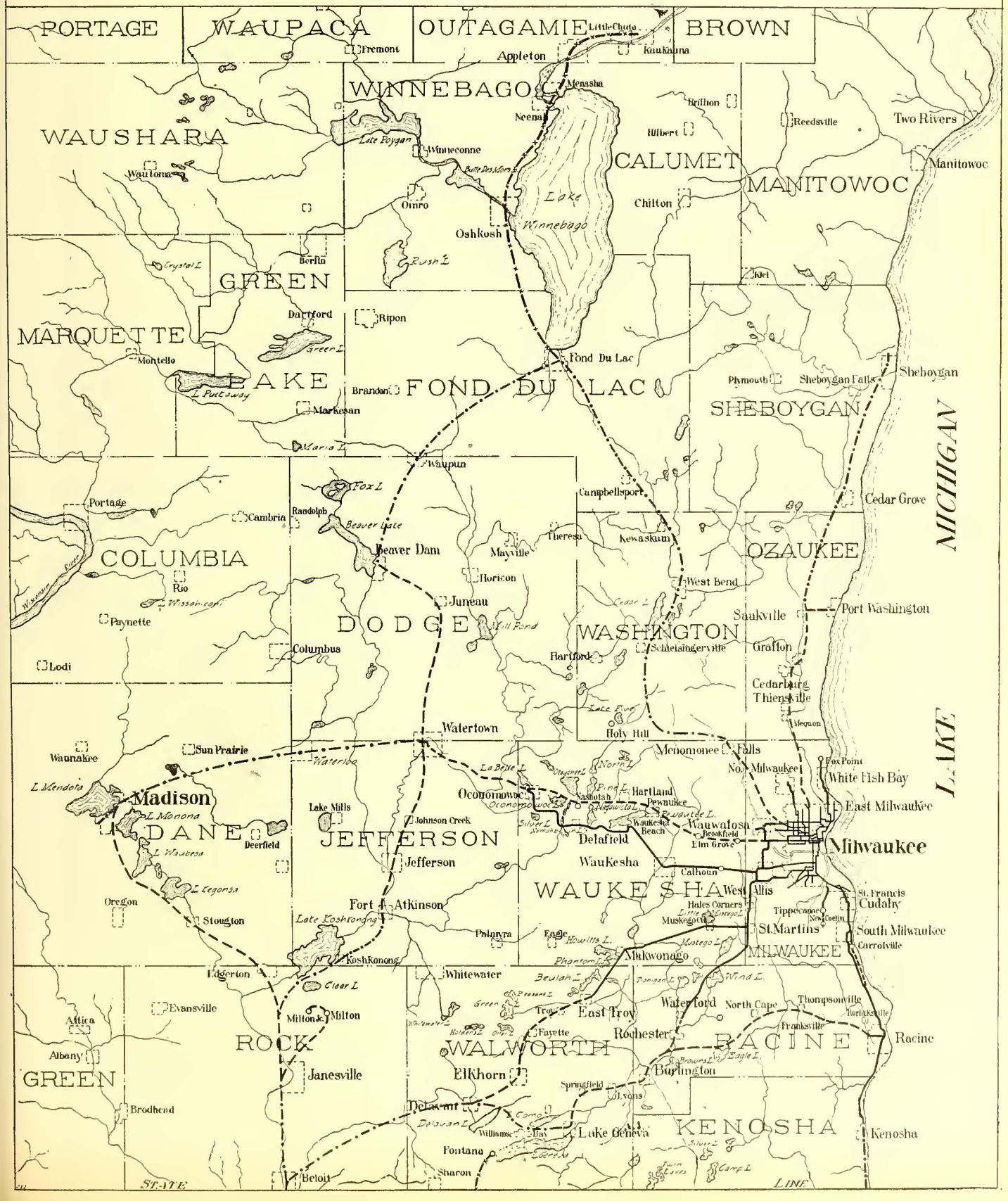
OPERATING ALSO THE

MILWAUKEE LIGHT HEAT & TRACTION CO.

1907

-Scale of Miles-

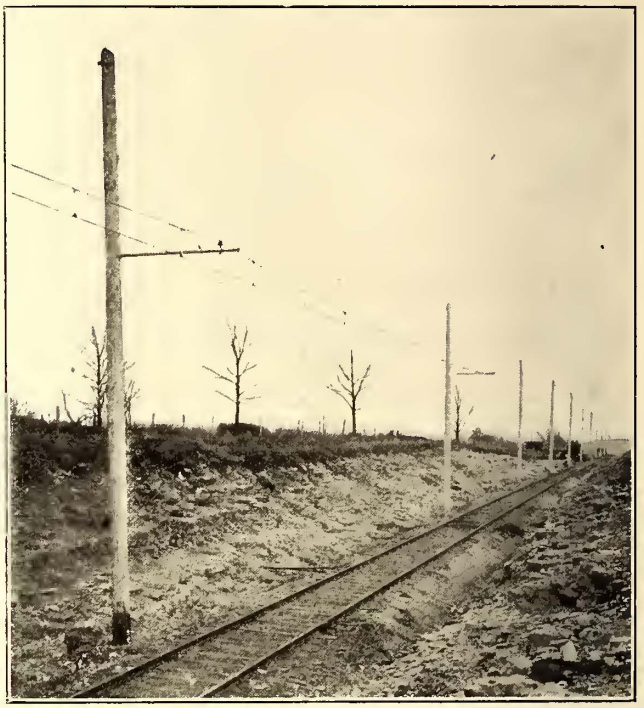
——— Lines Constructed and in Operation.
- - - - - Lines Surveyed and Projected
—•—•— Possible Future Extensions
—x—x— Connecting Electric Lines



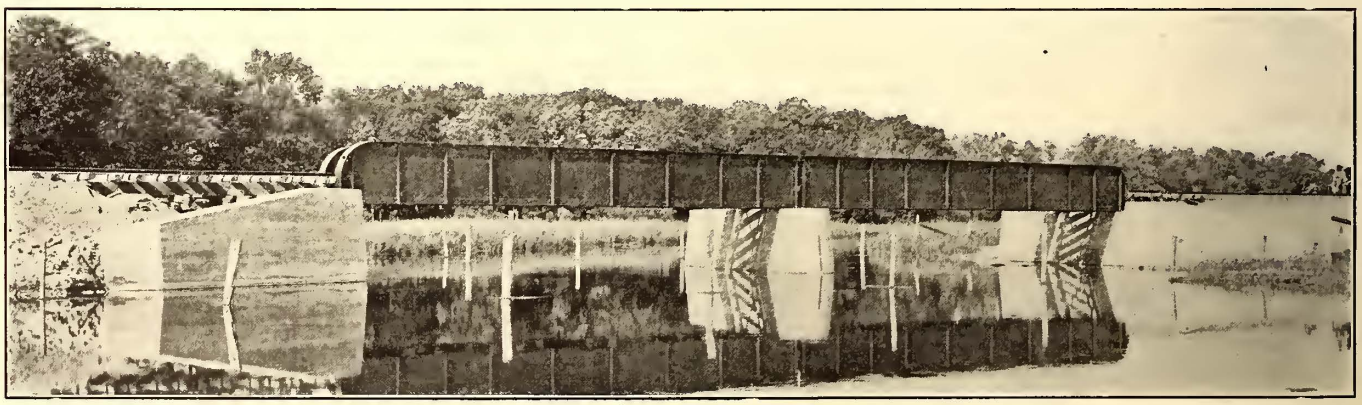
ready well under way. A line directly west out of Milwaukee to Waukesha Beach and a line southwest to Muskego Lake beyond St. Martins have been in operation for several years. The line to Racine, which was purchased a few years ago, has since been extended to Kenosha. During the past year the construction department of the system has been engaged in building three extensions to the already existing lines. The Waukesha Beach line has been extended 13 miles further west to Oconomowoc, and some work has been done on a further extension of 13 miles to Watertown.

CONCRETE CATTLE-WAY ON THE OCONOMOWOC LINE

In all of the new construction every provision is being made for ultimate double tracking. The concrete waterways and abutments are being built for double track, and the tracks are being placed at one side of the center of the right of way. All of the new extensions are built for alternating-current operation. The old portions of the lines will continue to be operated by direct current, largely because of the fact that summer travel to the lake resorts nearest Milwaukee at times demands the use of a great number of extra cars, which, with direct-current operation, can be drawn from the city equipment. The new cars for the lines are being built by the St. Louis Car Company. They will be 53 ft. 5 ins. long over all, of semi-steel construction, and fitted for operation by either direct or alternating current automatically accommodating themselves to the change from one to the other. The air brake equipment is of the National Brake & Electric Company's new a. c.-d. c. type.



CATENARY CONSTRUCTION ON THE OCONOMOWOC LINE



A TWO-SPAN GIRDER BRIDGE ON THE MUKWONAGO LINE

The Muskego Lake line has been extended 16 miles through Mukowonago to East Troy, and this line will be continued through Elkhorn to Delavan. Nearly all of the grading has been completed between St. Martins and Waterford, a distance of 11 miles, for a line which will eventually be continued to Burlington and Lake Geneva.

In addition to the extension work, the double tracking of the west line has been completed to Waukesha Beach.

THE MILWAUKEE-OCONOMOWOC LINE

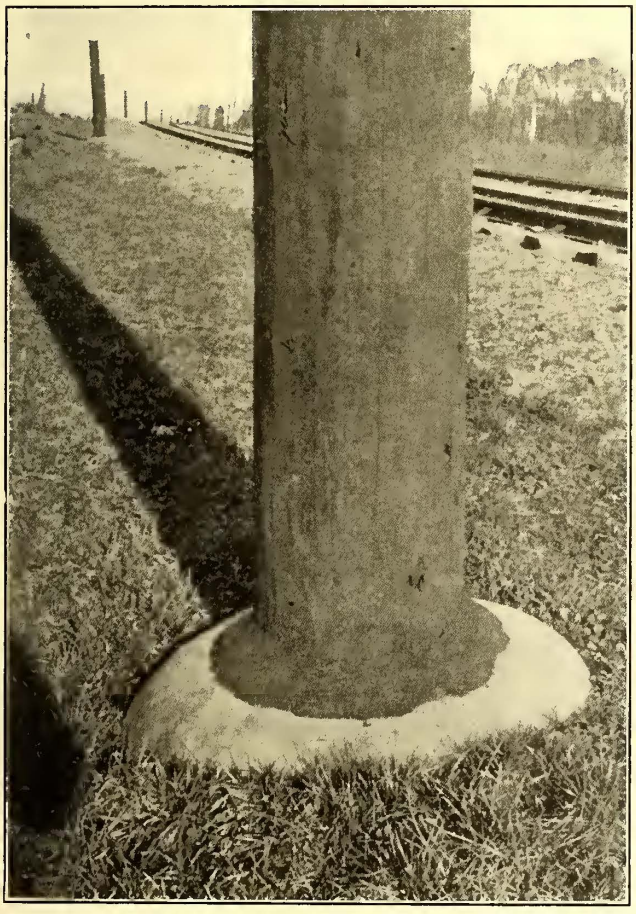
The Oconomowoc extension passes through a most picturesque region. At one elevated point a 7-mile view, the full length of Pewaukee Lake, is obtained, and views of Nagawicka Lake, upper and lower Nemahbin Lakes and

of Silver Lake are equally picturesque. At Delafield, the only town between Waukesha and Oconomowoc, is located St. John's Military Academy, an Episcopal school with about 165 students. There is also being established at this point a State fish hatchery.

The construction on this line is interesting because of the character of the country traversed. For the first 6 miles west of Waukesha Beach the grading averaged 100,000 cu. yds. per mile. There are numerous cuts in gravel from 15 to 40 ft. deep, and just west of Waukesha Beach is a solid rock cut 11 ft. to 12 ft. deep and about 1500 ft. long. It was necessary to blast out all of the excavation of this cut. All of the other cuts were made in coarse gravel, imbedded in which were frequently found masses of boulders weighing a ton or more each, which increased the difficulty of the work.

THE MILWAUKEE-MUKWONAGO LINE

Although the extension from Muskego Lake to Mukwonago passes through a rolling country, the grading averaged



POLE SETTING USED IN BOTH CITY AND INTERURBAN WORK

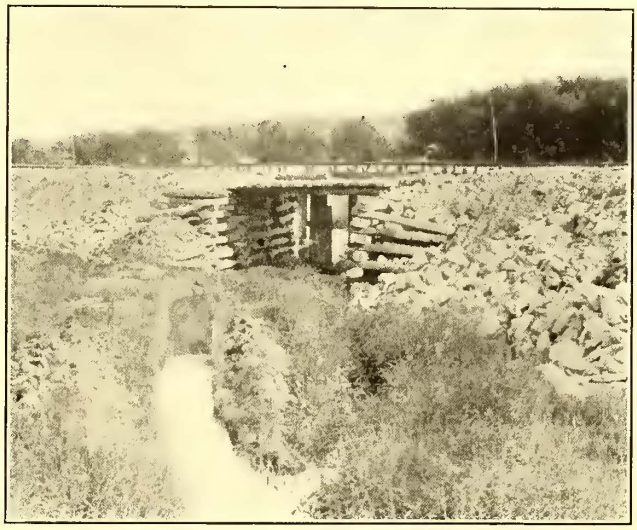
only about 3000 cu. yds. per mile. This is quite in contrast to the work necessary on the Oconomowoc extension, and was occasioned by the fact that the line was built on the grade of the Milwaukee & Beloit Railroad, which was projected and the grade for which was made about fifty years ago. After the bridge timbers had been put in the construction of the road was abandoned. In the intervening time the elements had worn the grade down somewhat and some of it had been partially destroyed by the cultivation of the land; but notwithstanding this, it was put in shape with a small amount of work. Between Mukwonago and Muskego Center the Fox River is crossed by a girder span 160 ft. long, and at another point a double-span structure is employed.

Through-girders were preferred to truss spans because of the less obstruction to the view and the better appearance.

One of the most interesting of Indian formations is found at Pishtaku, on the Mukwonago-East Troy line, 2½ miles west of Big Bend. Several acres of ground are covered by mounds made in the shape of animals.

CONSTRUCTION STANDARDS

For waterways up to 24 ins. tile was used. The tile, however, was always embedded in concrete. All of the larger



A TEMPORARY OPENING FOR WATER-WAY BEFORE BUILDING THE CONCRETE STRUCTURE

waterways are of concrete. Where head room permitted, concrete arches were built, but where room was limited flat-top concrete culverts were employed. The larger openings consist of concrete abutments spanned by steel girders. At several points along the line arch openings for cattle were made, of the type shown in an accompanying reproduction. The roadbed is ballasted with gravel, part of which was obtained from the company's gravel bank east of Waukesha. That for the west end of the line was hauled from a bank along the right of way just west of Delafield.

On all of the new work an 80-lb., 66-ft. rail is employed. Weber rail joints are used, and except on curves the joints are laid opposite. Rails 60 ft. and 62 ft. long have been in service on the interurban lines around Milwaukee for several years without any trouble due to buckling, and long rails are preferred because of the lessened number of joints and bonds required. The rails are anchored at frequent intervals. On tangents the anchors, which are of the Racine type, are placed 200 ft. apart. The joints are bonded with a short soldered bond, manufactured in the shops of the company.

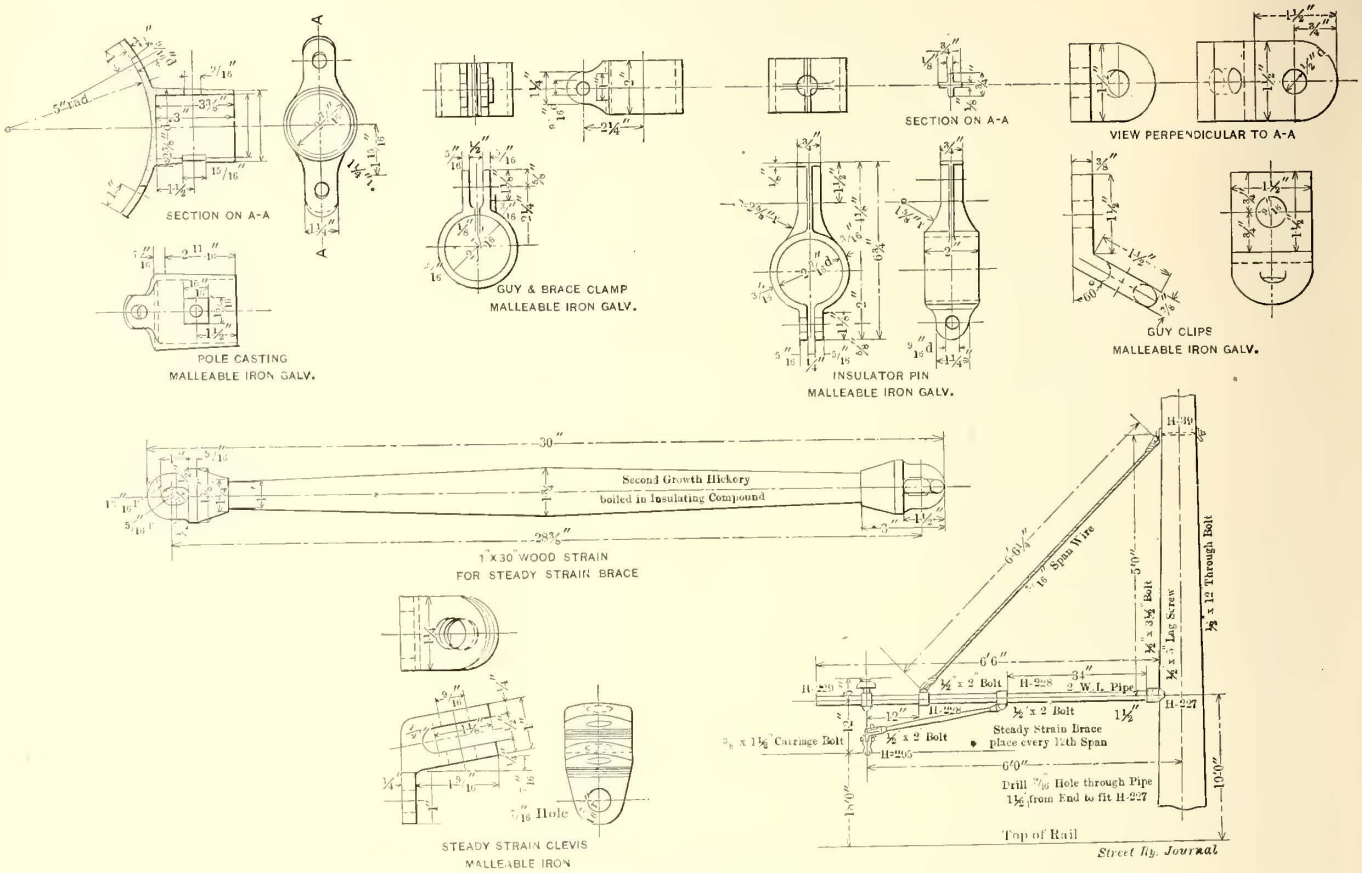
The cedar ties used on straight track are spaced with 16 ins. open space between them, regardless of the width of the tie, which method of spacing is preferred because a uniform amount of bearing surface is obtained, irrespective of the size of the ties. Curves are laid with hewn oak ties, and on sidings sawn oak ties were used.

POLE LINES AND OVERHEAD CONSTRUCTION

The catenary trolley construction for the new work is carried on brackets from a pole line consisting of 35-ft. cedar poles. All of the poles are set 7 ft. in the ground

with about 8 ins. of concrete around the butts. The pole setting was described by Mr. Simmons at the Columbus meeting of the American Street and Interurban Railway Association. Before the concrete has set a wood ring about

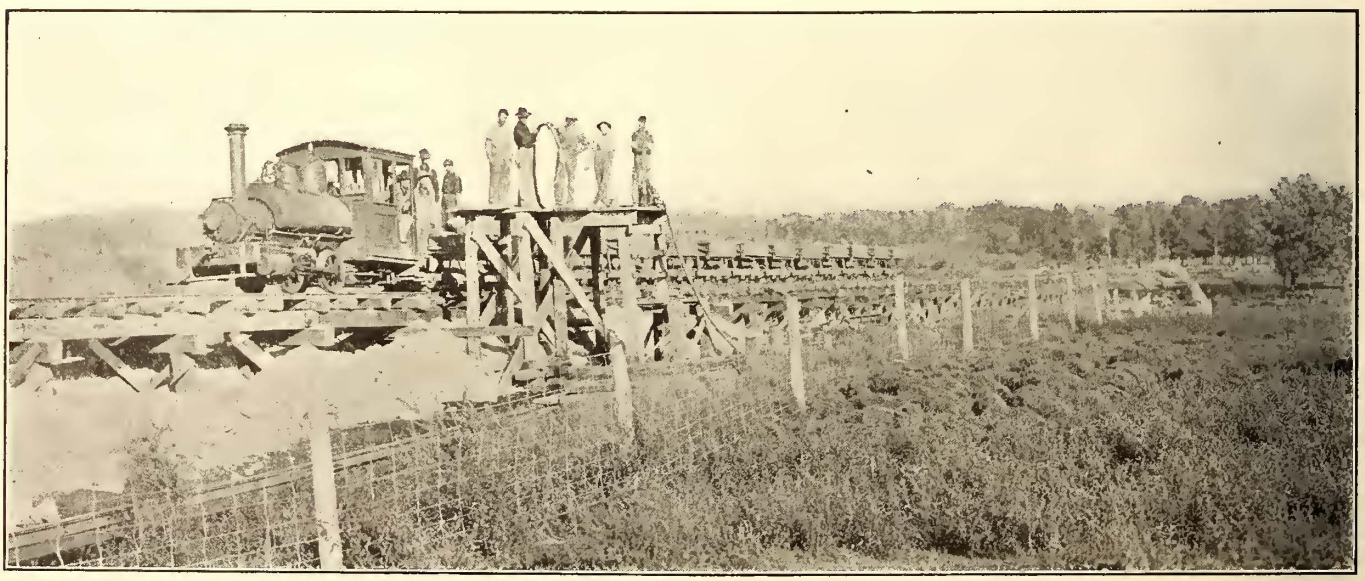
The brackets and all of the fittings and hangers for the catenary construction were designed by the company and manufactured in its shops. The brackets are of 2-in. galvanized wrought-iron pipe. By means of a socket at the



BRACKET ARM AND FITTINGS FOR CATENARY CONSTRUCTION

1½ ins thick and 3 ins. deep is placed around the pole at the top of the concrete. The surface of the concrete is then dressed up smooth and after the concrete has set the

pole end they are secured to the pole by two ½-in. x 5-in. lag screws. The outer end is supported by a 5/16-in. guy wire bolted to the pole a few feet above the bracket. For

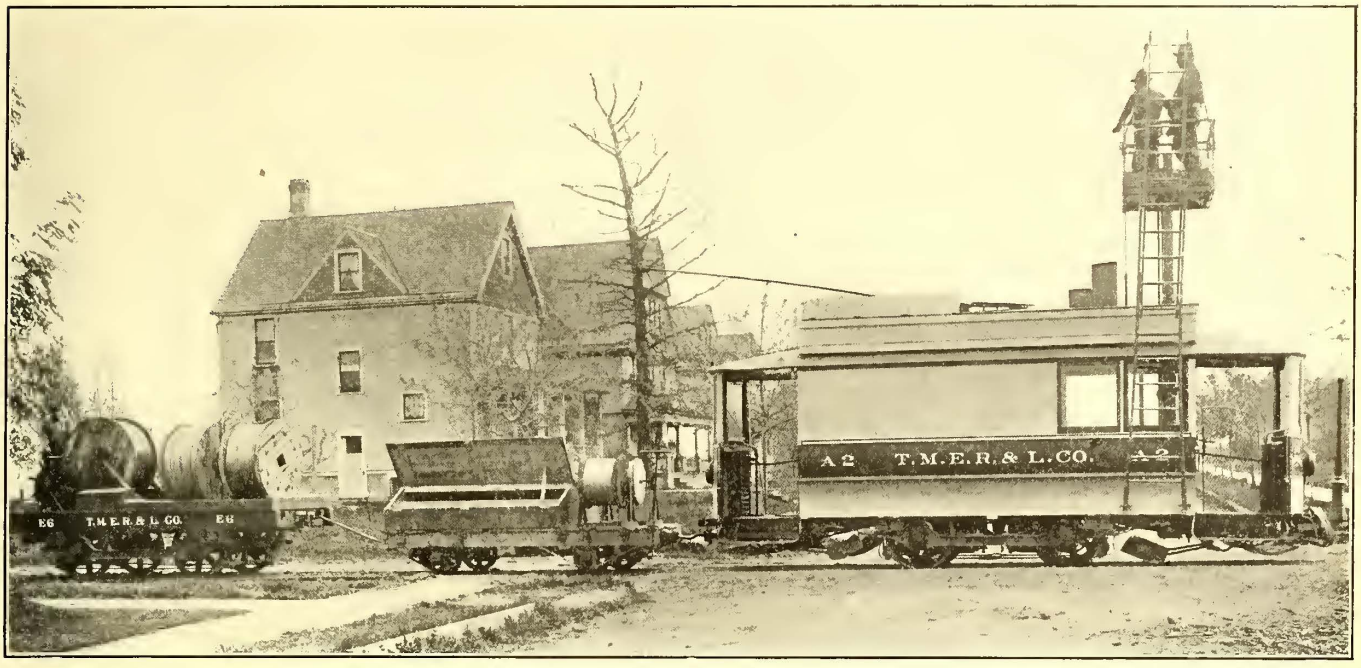


FILLING IN A TEMPORARY TRESTLE FROM ONE OF THE NARROW-GAGE TRAINS

wood ring is removed and the recess occupied by it is filled with a coal tar and asphaltum mixture. This compound adheres to the pole and prevents water from running down into the concrete. The same pole setting is used in the city of Milwaukee. Preservatives for the poles have not yet been adopted.

tangents the pipe brackets are 6 ft. 6 ins. long, but for curves they are of varying length to suit conditions. In some instances the pipes were cut the proper length for curves in the field. On tangents a steady brace is placed every sixth pole. This consists of a long insulator of second-growth hickory boiled in an insulating compound. A

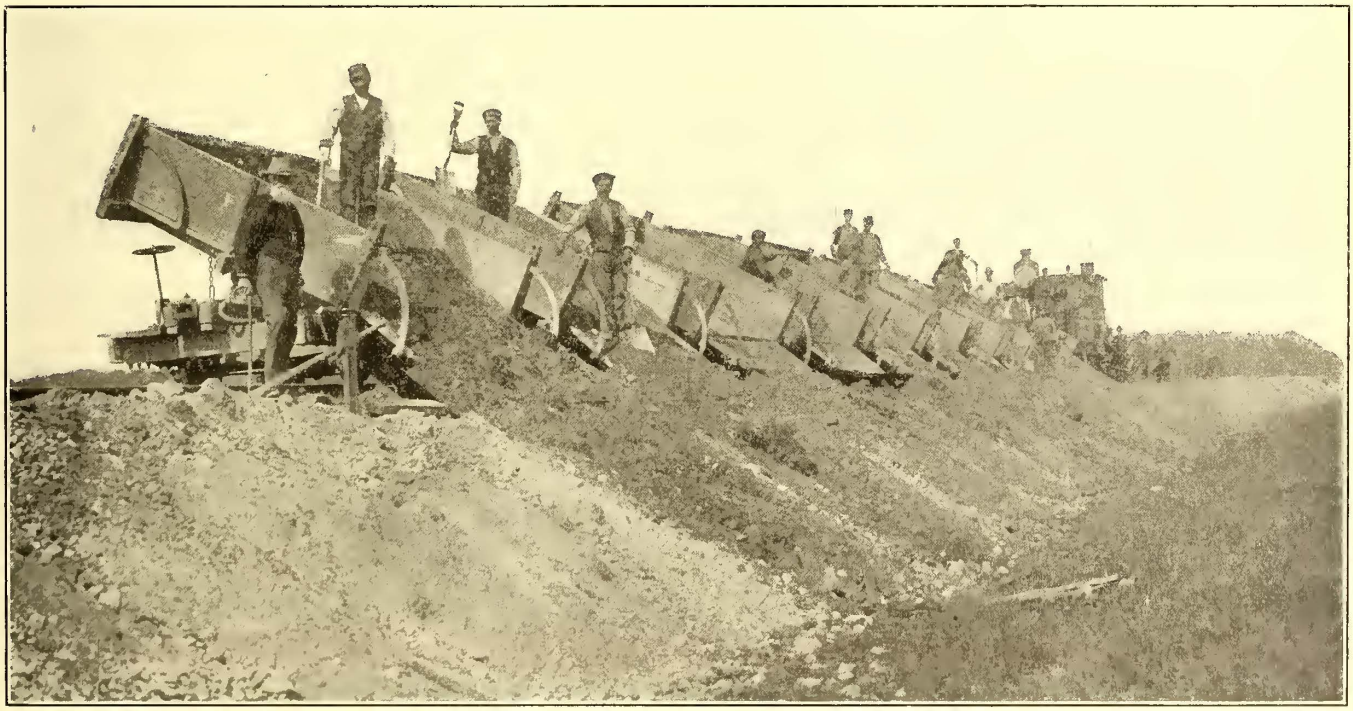
clevice secures it to the bracket. Immediately over the trolley the brace is about 4 ins. above the wire, and, as it has an upward slope towards the pole, non-interference with the trolley is assured. On curves a steady brace is used at each span. In addition, both the messenger supporting the trolley and the trolley are held in position by bridles back-guyed to a messenger. On curves with the poles on the outside this messenger is strung between poles. Where the poles are on the inside, the pipe brackets extend out about 6 ft. beyond the trolley and the messenger, to which the bridles are attached, is supported on insulators near the end of the brackets. The suspending ears and hooks are of peculiar design. The ears, some of which are of brass and some of wrought iron, are made in two parts, which, when forced together with a longitudinal motion, interlock on the wire. They are secured in the locked position by passing a cotter key through them. For getting out the small details of the overhead equipment in quantities and at a reasonable cost, several special jigs, dies and machines were devised and built in the company's shops.



MILWAUKEE METHOD FOR STRINGING TROLLEY WIRE

POWER-DISTRIBUTING SYSTEM

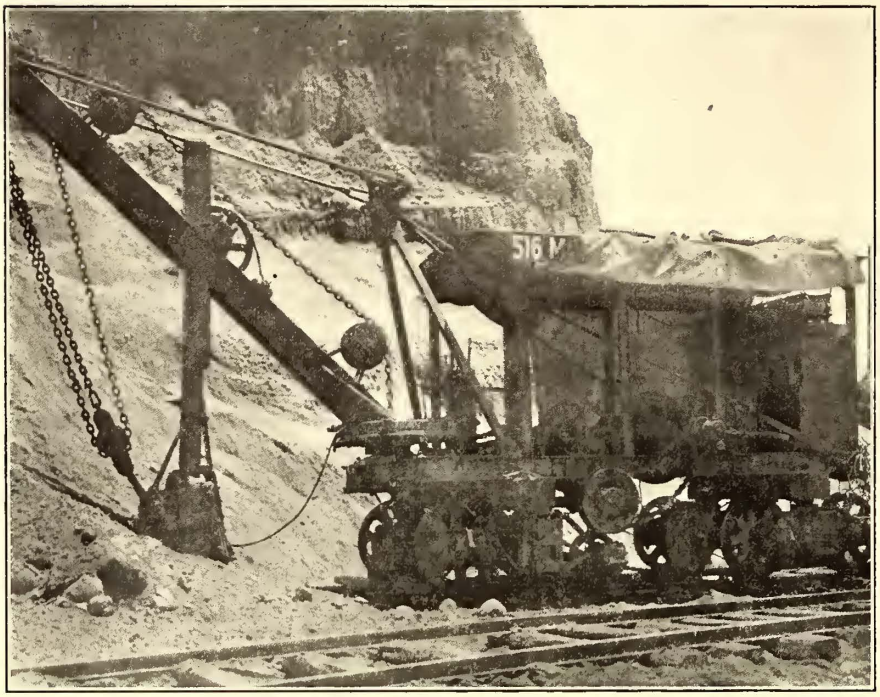
Power for the new extensions is furnished by an alternating current obtained from the Commerce Street plant of the company in Milwaukee. From this station two three-phase cables, each of 100,000 circ. mils, are carried underground to the city limits. Here they are brought up through lightning-arrester houses to a pole line and are carried into a



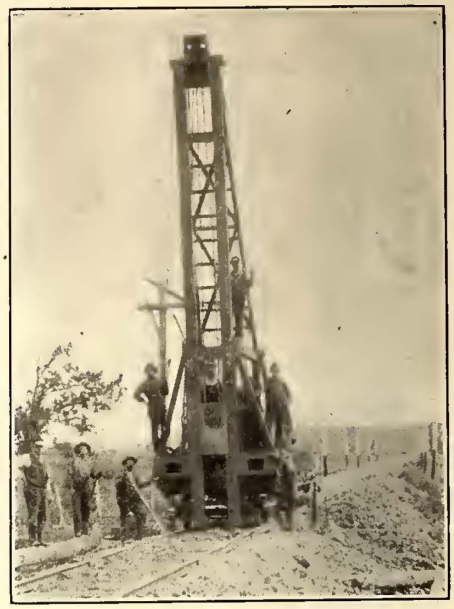
DUMPING A GRAVEL TRAIN, SHOWING HOW THE SIDE DOORS SWING OPEN

rotary converter sub-station at West Allis, which, in addition to this apparatus, contains step-up transformers. The current is stepped-up from 13,200 volts, three-phase, to 33,000 volts and changed to two-phase. From this station one of the two phases is carried over two transmission circuits to a transformer station at Waukesha Beach, 23 miles distant, and two other circuits from the remaining phase go south to a similar sub-station at St. Martins. The 33,000-volt lines, which are of No. 2 copper, are carried on independent pole lines, which follow the right of way, except through towns, where they are carried around the outskirts. The sub-stations are brick buildings, and around them are to be constructed triangular shelters for passengers. Each station contains two 300-kw, single-phase, 33,000 to 3300-volt transformers.

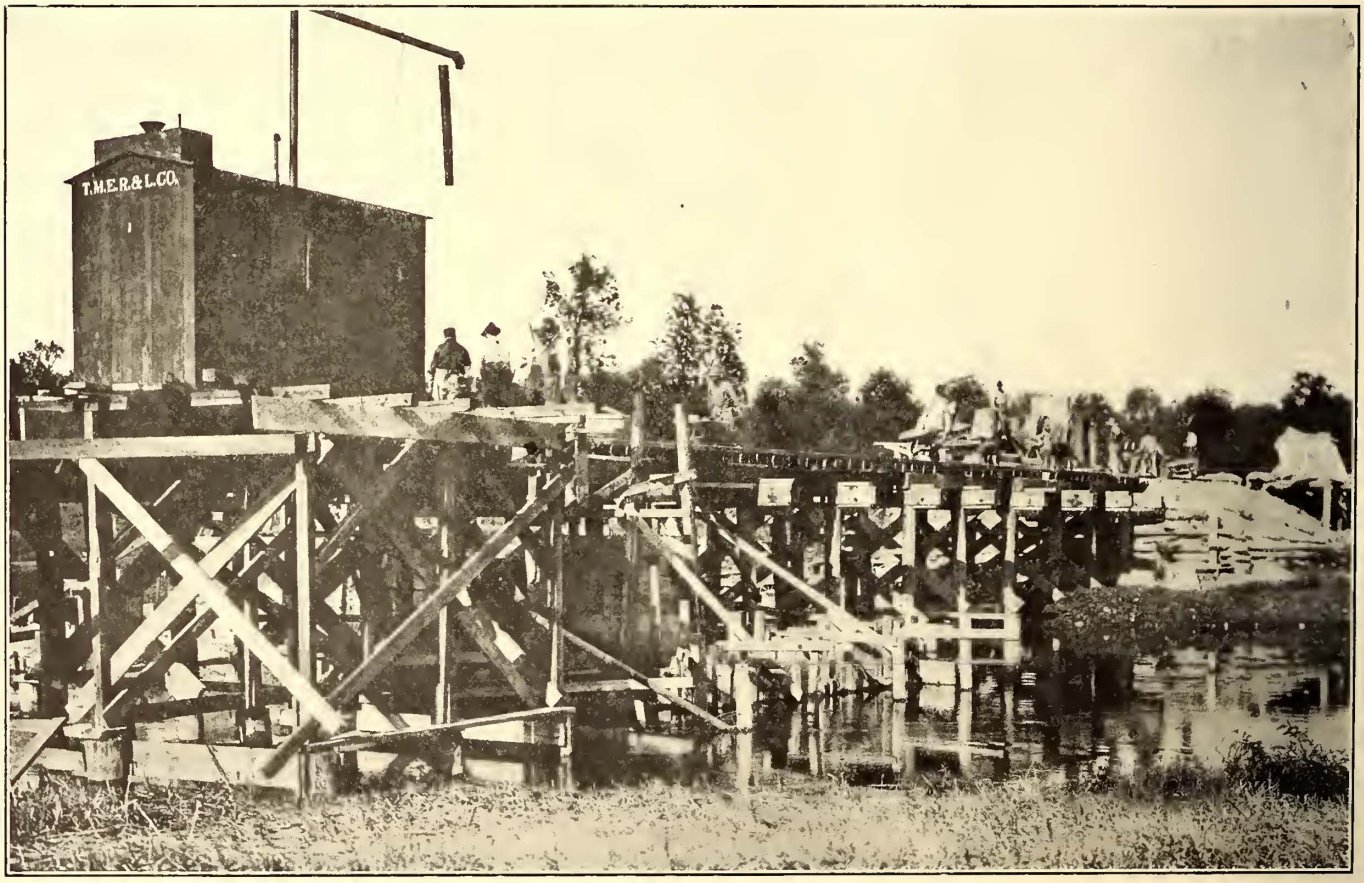
Protective devices for the high-tension lines consist of



ELECTRIC SHOVEL AT WORK IN A GRAVEL BANK

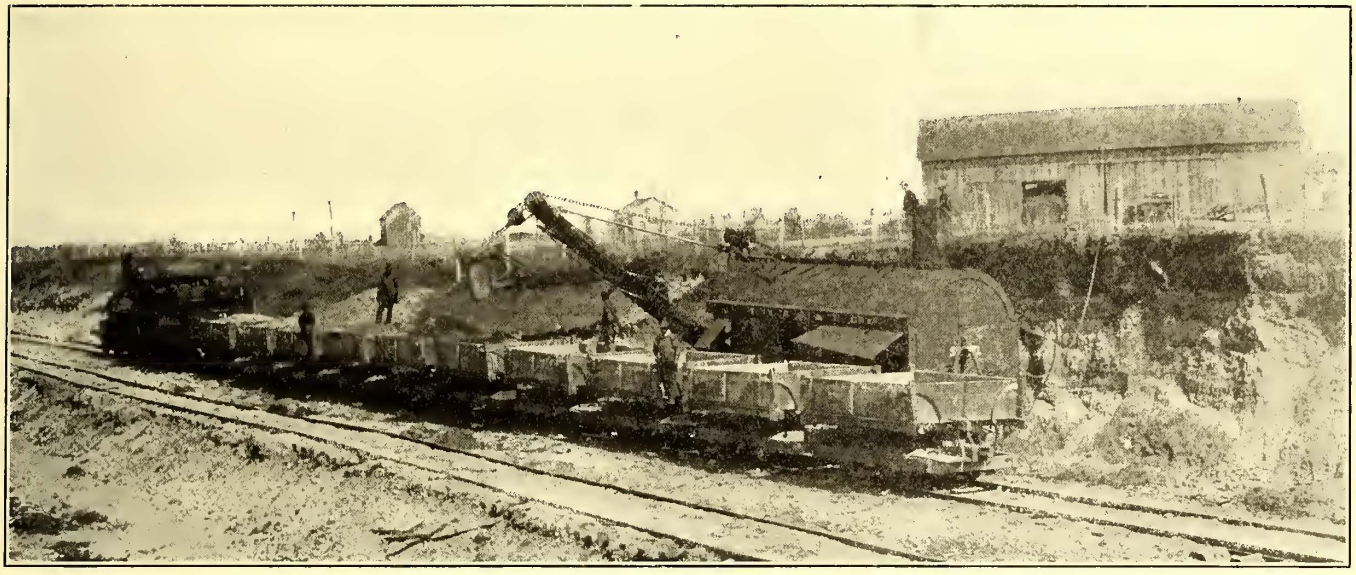


ELECTRIC PILE-DRIVER BUILT IN THE MILWAUKEE COMPANY'S SHOPS AND USED FOR CONSTRUCTION

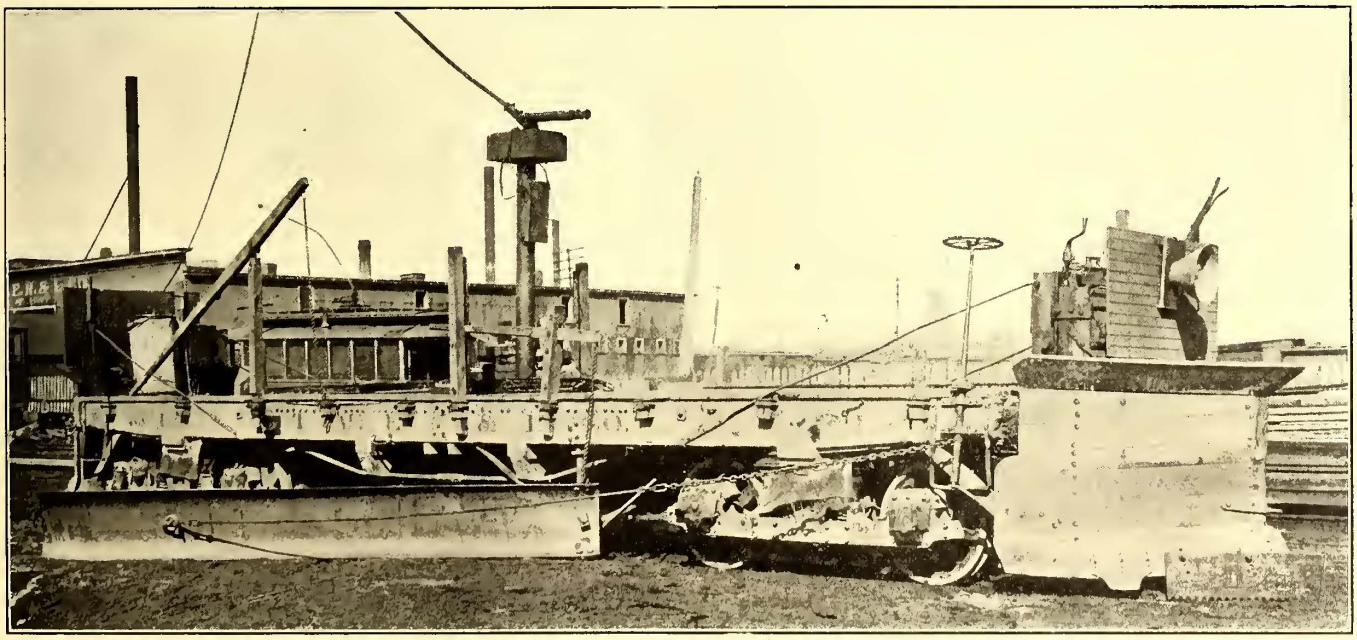


PORTABLE PUMP HOUSE FOR THE STEAM LOCOMOTIVES ON A TEMPORARY TRESTLE

GRADING MACHINE USED IN CONSTRUCTING THE MILWAUKEE INTERURBAN LINES

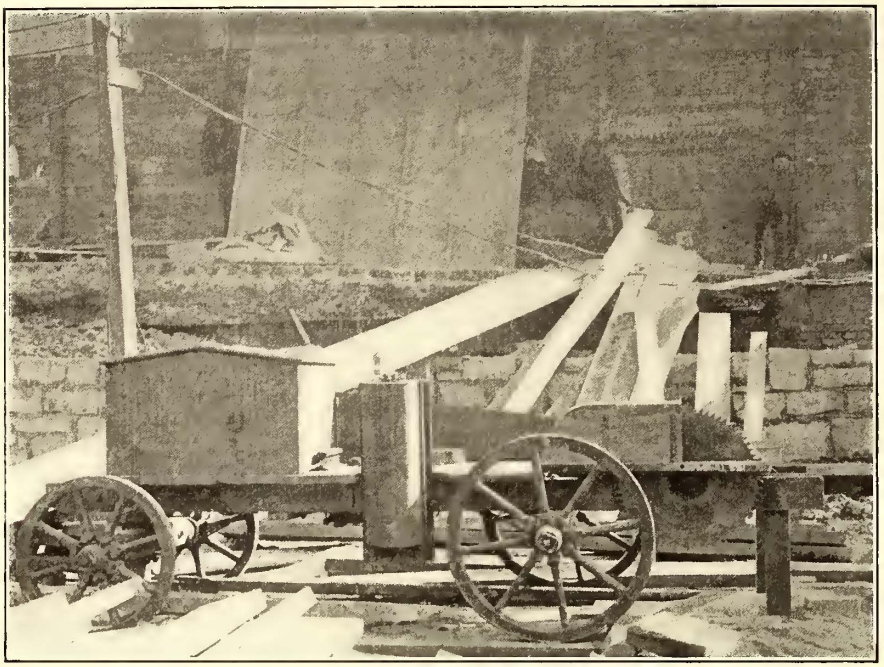


ONE OF THE MILWAUKEE STEAM SHOVELS AT WORK



MILWAUKEE COMBINATION WORK CAR, GRAVEL SPREADER AND SNOW PLOW

automatic oil switches on the 13,200-volt side and on the 33,000-volt side of the line at West Allis operated by inverse time limit relays. At the transformer stations automatic oil switches are placed on both sides of the transformers. These are installed in connection with the instantaneous differential relay by which a short circuit in the transformer opens the switches in both primary and secondary sides. There are also automatic oil switches on the 3300-volt feeders to the catenary trolley operated by direct time limit relays.



PORTABLE MOTOR-DRIVEN CIRCULAR SAW USED FOR SAWING BRIDGE TIMBERS

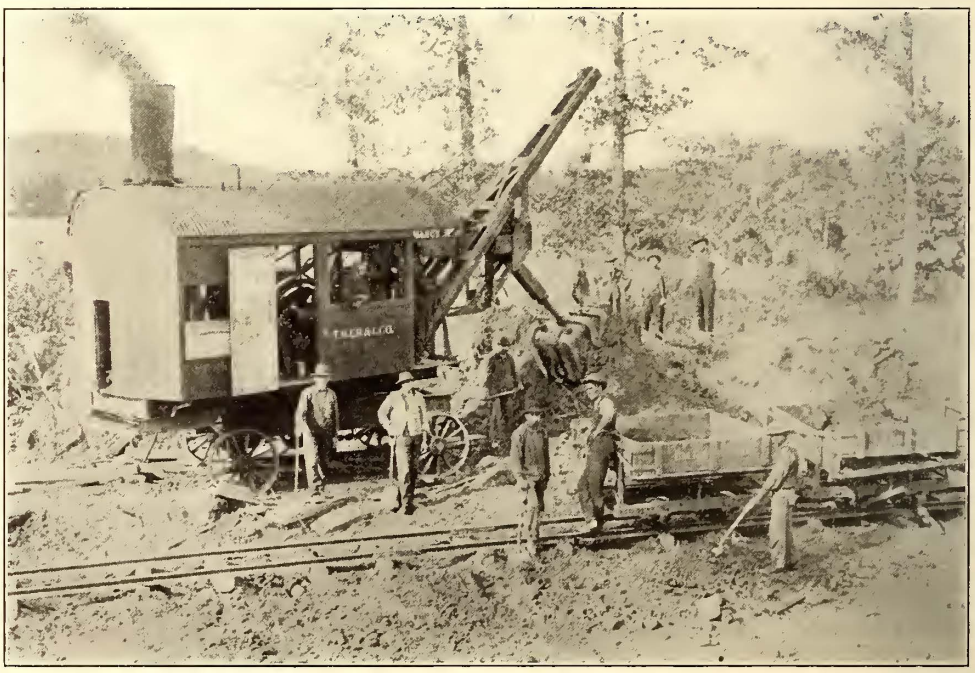
THE CONSTRUCTION DEPARTMENT AND METHODS OF CONSTRUCTION

The lines were built entirely by the construction department of the operating company under the general supervision of Mr. Beggs. The construction department has an organization similar to that of such departments of steam roads, and its equipment is in many respects similar. The equipment includes the following: Four standard gage locomotives; four narrow gage saddle-tank locomotives; one Buffalo Pitts traction engine; one grading machine; two steam shovels; one electric shovel; twenty 10-yd. center-dump cars; one hundred and fifty 5-yd. side-dump cars; ter-dump cars; one hundred and fifty 5-yd. side-dump cars; one hundred 1¼-yd. side-dump cars; one electric derrick car; one electric pile-driver; nine concrete mixing machines, and numerous other devices.

In the construction of new lines stump pullers are employed to clear the way. Where the grading machine cannot be used the preliminary grading is done by using the narrow gage locomotives and cars, a steam shovel being used to fill the cars. The narrow gage track is first carried across places where fills are to be made on temporary trestles. The fills are then made by dumping the cars from the trestles and afterwards all portions of the trestles, with the exception of the mud sills, are removed and the standard gage track is laid.

Where concrete waterways are to be put in the dirt of the fill is held back by temporary retaining walls built up of cross-ties. Delaying building of the concrete structure until the track has been laid has the advantage that all the materials can be hauled to the point required by the construction trains.

After the standard gage track is in place the grade is widened and the road is ballasted by the large locomotives and the center dump and the 5-yd. side-dump cars. These latter cars, although of standard make, have been altered in such a manner as to facilitate the work considerably. The side doors, which originally swung open from the top, have been changed so that the doors are hinged at the bottoms and the tops swing outward. The swing is limited to permit the door to drop no further than the level of the bottom of the car. As changed, the load is dumped far enough to one side to clear the rail. The ballast is frequently leveled off by the use of a work car provided with a plow in front and swinging side plows. This car is also used as a snow plow.



STEAM SHOVEL GRADING FOR A MILWAUKEE INTERURBAN LINE

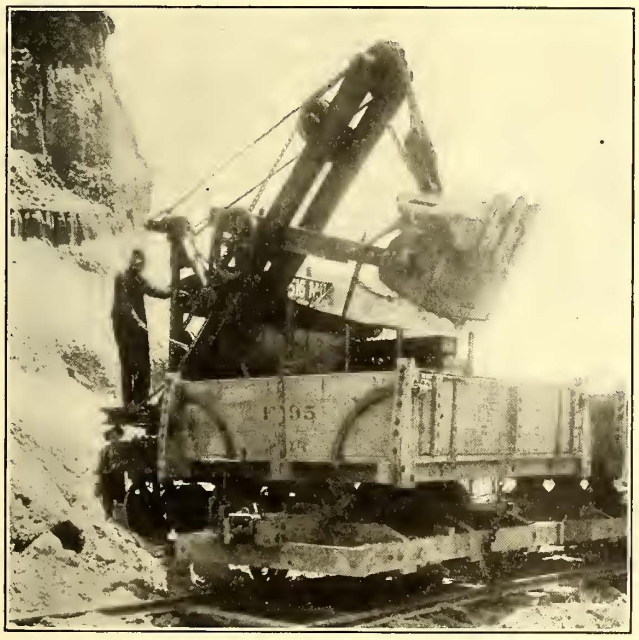
One of the illustrations shows a portable pump house used in supplying the locomotives with water. The centrifugal pump inside is driven by a gasoline engine. As the construction work progresses the house, with all the machinery inside, is put on a car and moved to the most convenient point.

Where it was possible to use the grading machine the

expense of grading per cubic yard was materially lessened. The grading done by the narrow gage locomotives and cars costs approximately 30 to 50 cents per cubic yard. When horses are employed to pull the grading machine the cost is approximately 18 cents per cubic yard, but when it is possible to use the traction engine to pull the grader the cost is reduced to about 9 cents per cubic yard.

An illustration shows how the trolley wire is strung. The train consists of a line car, a tool car and a car carrying the reels of wire. In stringing the wire the reel car is shoved ahead and current to operate the line car is taken from the wire being strung. The wire is first tied up temporarily to the brackets, as shown in several of the construction views. The line car employed is provided with an extra controller, located inside the car near the center. It is provided with operating and reversing shafts, which extend through the roof of the car and are attached to the adjustable platform. The connecting rods between the controller and the handles are arranged to telescope one within the other as the platform is lowered. A ladder attached to the side of the car, which swings outward, permits work on the poles.

Bridge planking and other timbers are sawn in the fields by a portable electric-driven circular saw. The four-wheel truck on which the motor and saw are mounted is put on



ELECTRIC SHOVEL RAISED FROM GRAVEL BANK

a car and hauled to the place where work is in progress. The construction department has two of these outfits.

The grading and much of the other construction work is done by foreign labor, often housed in camps of a more or less permanent character. The department also utilizes ten old-style passenger cars for sleeping quarters and boarding cars for the construction crews.

An idea of the extent of the work done by the construction department during the past year may be obtained from a consideration of the fact that 177 carloads of Portland cement and 790 carloads of miscellaneous materials were used.

Twenty-four employees of the Cincinnati Street Railway Company selected by popular vote have left for the Jamestown Exposition. Each tourist was presented with a ten-dollar bill by the Employees' Association.

PROPOSED RAIL SECTIONS

Interest in the standardization of track construction has led to the suggestion of a number of new sections of rail, two of which are presented in this issue. Fig. 1 shows a section designed by W. A. Underwood, of the Wheeling

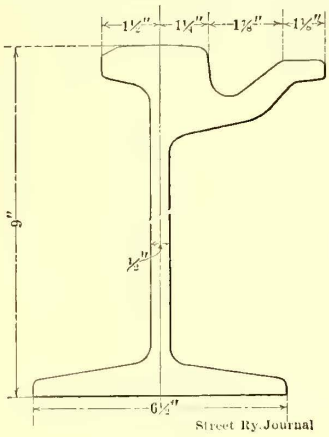


FIG. 1

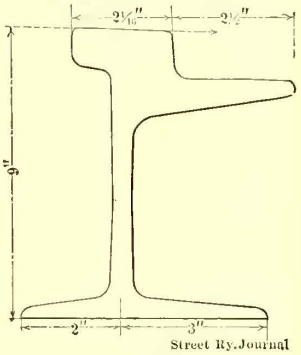


FIG. 2

Traction Company. The object sought in the design of this rail was to bring the weight of the car directly over the supporting web and thus avoid the tendency of the rails to spread. Upon this point Mr. Underwood says: "The section proposed is simply the adaptation of the T-rail section to girder rail requirements. The placing of the head to the right (which is done to some extent in the Lorain section No. 141, and also in the Pennsylvania sections Nos. 241 and 224) is to make the rail center bearing, thereby increasing its stability and riding qualities. The tendency of all side-bearing rails is to cant outward, necessitating the rigid bracing of the rail, and each year as the equipment increases in weight, this fact is brought more forcibly to mind. By moving the point of application of the forces acting on the rail inward, the horizontal component, due to the swinging of the cars, skewing of the trucks, centrifugal action, etc., is considerably overcome. The section proposed should be easier to spike than any 7-in. section and very little harder than most 9 in. If necessary, ⅝ of an inch of the lip could be cut off. As far as I can ascertain, from experienced men consulted, no greater difficulty would be experienced in rolling this section than found in rolling any section which requires a vertical roll. In regard to this question attention might be called to the Pennsylvania Steel Company's section No. 259."

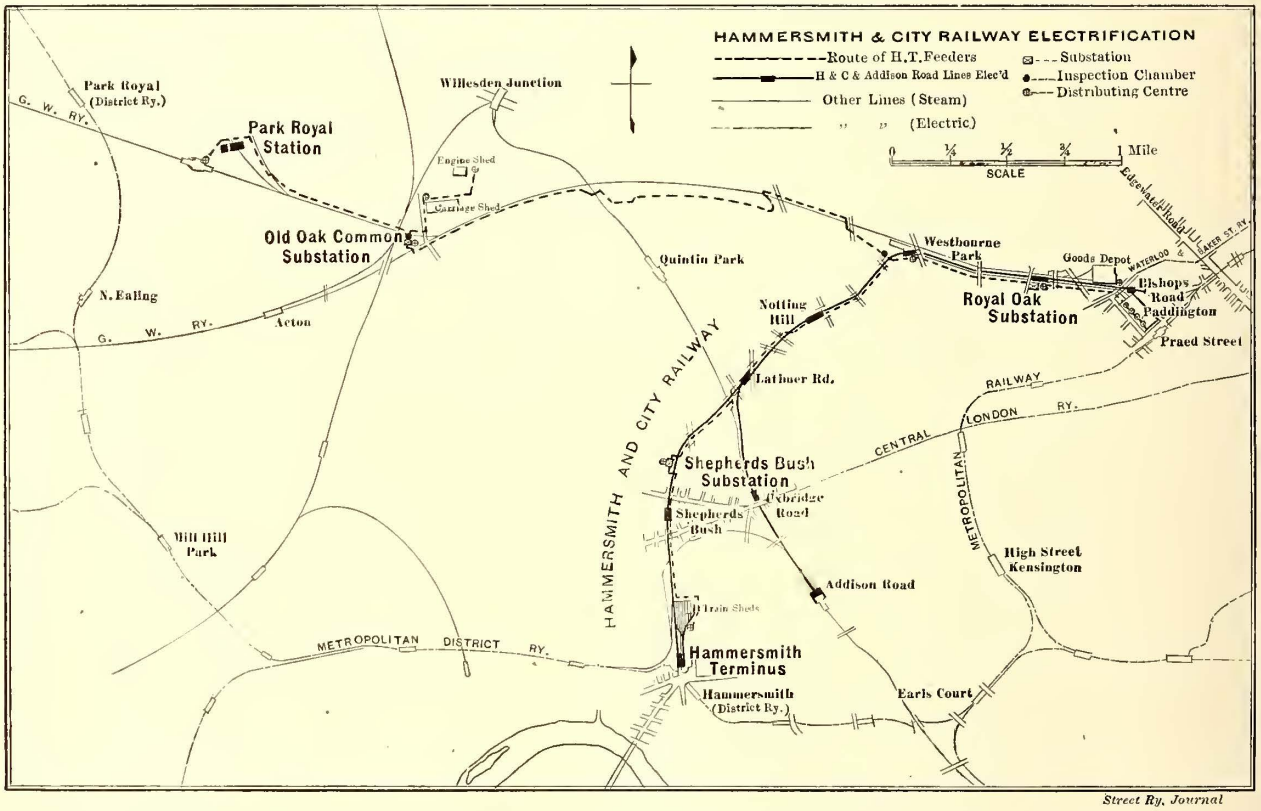
A somewhat similar section, although with a tram-head, has recently been designed by George R. Stewart, president of the Indiana County Railway Company, Indiana, Pa., and is illustrated in Fig. 2. In this rail, however, the bottom flange is extended on the inside of the rail partly to take the strain of the vehicular traffic and partly also to assist in spiking. It is understood that neither of these rails has been rolled, but were designed to fulfil certain operating conditions desired by the designers.

NEW SINGLE-PHASE ROAD IN AUSTRIA

The Austrian Siemens Schuckert Company has recently completed a single-phase line from Vienna to Baden, about 17.4 miles. There are fourteen motor cars, each equipped with four motors, and twelve trail cars. The cars operate over the local tramway tracks at the termini and then use direct current.

THE ELECTRIFICATION OF THE HAMMERSMITH & CITY RAILWAY BRANCH OF THE GREAT WESTERN RAILWAY

The new electric traction system of the Hammersmith & City branch of the Great Western Railway in London has recently been completed. This line is a portion of the intricate system of underground roads used by the steam railroad companies entering London in connection with the District and Metropolitan District railway systems. The electrical equipment was installed partly to meet the requirements of the metropolitan railway act of 1902, which provided that, concurrently with the electrification of part of the Metropolitan Company's inner circle railway, the Hammersmith & City line, owned jointly by the Metropolitan Company and Great Western Company and also the lines of the Great Western Company used in connection with the Hammersmith & City Railway, should be electrified. The extent of the line which has been electrified, and for which power is supplied by the Great Western Company, is shown on the accompanying map.



MAP SHOWING SECTION OF THE GREAT WESTERN RAILWAY EQUIPPED FOR ELECTRIC TRACTION

The system of supply to the trains on these lines had necessarily to be the same as that in use on the trains running over the Metropolitan Company's lines on the inner circle railway between Bishop's Road and Aldgate. The new electric system also provides for the supply of power for arc and incandescent lighting and small motor work throughout the Great Western Company's system in the London district, as well as on the Hammersmith & City Railway. It includes a main generating station, three substations and eleven distributing centers.

Electrical power is generated as three-phase alternating current, with a frequency of 50 cycles and at from 6300 to 6600 volts, and is transmitted at this pressure. In the substations the greater part of the three-phase current is converted by motor generators to 600 volts a. c. for railway use and also for power purposes and arc lighting in the Great Western Company's locomotive sheds, car houses, freight yards and offices and Paddington station. Some current for lighting and power is also distributed at 110 and 220 volts a. c.

POWER STATION AT PARK ROYAL

The present generating station occupies only about one-sixth of the ground available. At the extreme eastern end of the station are the coal pockets, built below ground level so as to be underneath the railway siding which connects with the main line. These pockets are constructed of ferro-concrete and have a total storage capacity of about 400 tons of coal, and have chutes for filling the coal conveyors.

The main building is a steel structure, filled in with brick and roofed with glass and slate, the wooden framework for the latter being lined on the inside with fireproof plaster.

The boiler house, at the east end of the main building, is arranged in three bays and is 115 ft. 6 ins. long x 95 ft. wide and 80 ft. high to the peak of the roof of the center bay. The two side bays are for the accommodation of the boilers, leaving the center bay clear. A set of steel coal bunkers, built between the main stanchions, is provided over the center bay, with a total storage capacity of about 600 tons. Space is provided above the coal bunkers and in a basement underneath the stoking floor for the coal and ash-conveying plant. The feed pumps and accessories and the water-softening and purifying plant are placed in the space between the west wall of the boiler house and the first pair of stanchions. The present chimney is 12 ft. square, internal dimensions, and is 250 ft. high. It is of brick, set in cement mortar up to the level at which the flue enters,

and set in lime mortar above that level. The boiler house is ventilated by louvres.

To the west of the boiler house, and separated from it by a party wall, is the main engine room, which is also arranged in three bays, the two side bays taking the engine sets, and the center bay the condensing plant, which is also above floor level. The switchboards are arranged on galleries extending across the whole width of the engine room at the west end. The engine room floor is paved with red tiles, and the walls are faced with white crystopal tiles. The roof is ventilated by hinged casements in the sides of the lanterns.

COAL-HANDLING PLANT

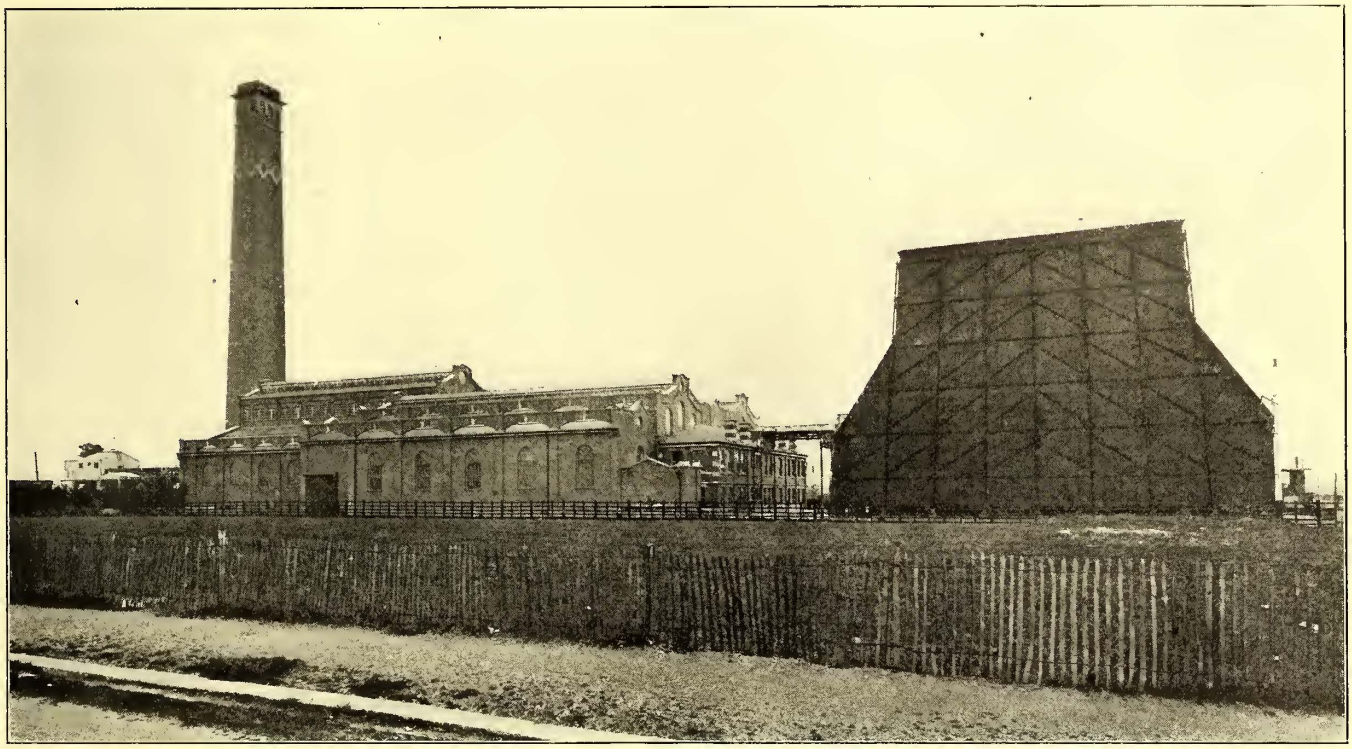
Coal is brought on to the site over a railway siding and dumped into the pockets referred to and thence is fed into the boots of two bucket elevators, which in turn raise the coal to a height of 50 ft. above the boiler house floor level and feed it on to two bucket conveyors for transmission to the boiler house. The two bucket conveyors are carried by means of an overhead gantry as far as the east wall of the boiler house and pass up the inside of this wall and over the steel coal bunkers. On their return the buckets pass into the basement of the boiler house, where ashes are fed into them by means of two traveling fillers. The coal conveyor and elevator plant are arranged in duplicate, and the normal carrying capacity of each set is 50 tons of coal per hour, when also dealing with the ashes. Each bucket conveyor is driven through worm-gear by a 10-hp motor, while the tray conveyor and bucket elevator corresponding to each bucket conveyor are driven through worm-gearing by a single 12-hp motor. These motors, supplied by the Electric Construction Company, of Wolverhampton, are driven by three-phase current at 650 volts, and are of the E. C. C. patent type, the rotor having two windings and the starting up being normally effected by a special starting switch. The same type of motor is used for driving the condenser pumps, the stokers, the drainage sump pumps and two centrifugal pumps, used in connection with the water supply and drainage water.

STEAM-GENERATING PLANT AND ACCESSORIES

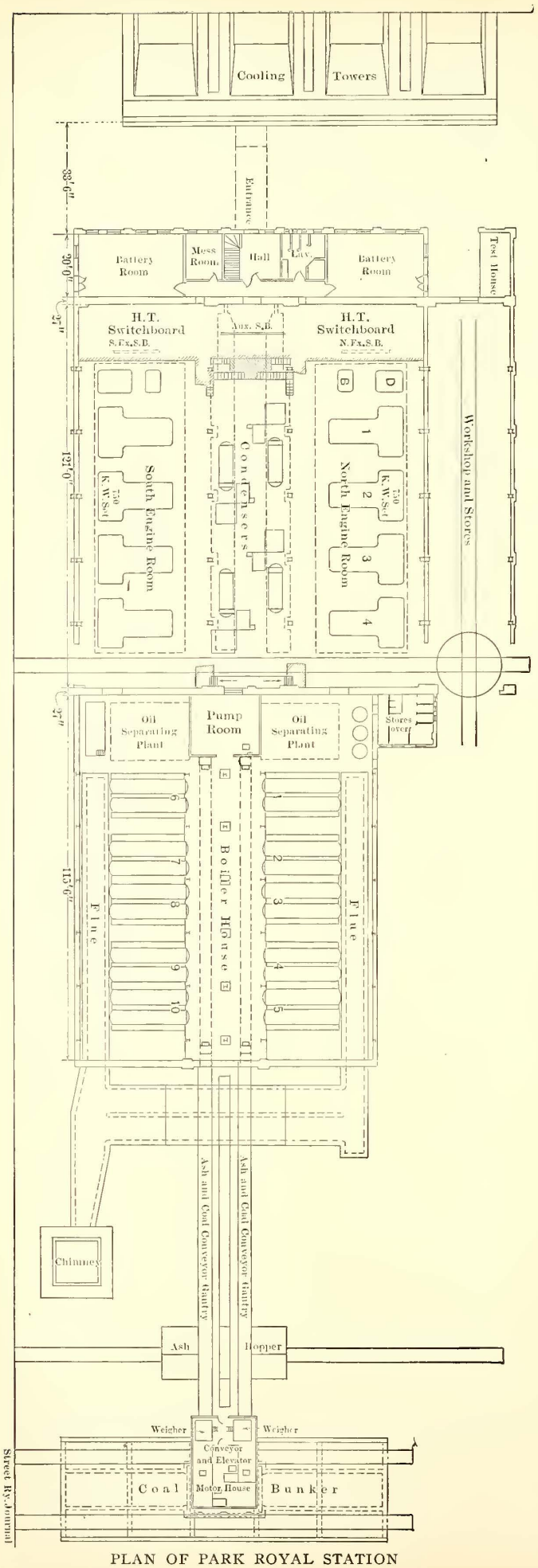
The boiler house contains ten Babcock & Wilcox double-drum water-tube boilers, the five boilers in each side bay being arranged in two batteries of two, and one battery of one boiler. Each boiler has a heating surface of 5764 sq. ft., has a normal evaporative capacity of 19,200 lbs. of water per hour at a pressure of 200 lbs. per square inch, and is equipped with a self-contained super-heater, proportioned so that steam is delivered at a temperature of 550 degs. F. at the boiler-stop valve. The boilers are fitted with mechanical stokers of the B. & W. chain grate type. Each stoker shaft can be driven from either end by a 15-bhp three-phase motor, a clutch being provided at each end for connecting or disconnecting either motor.

In the pump room there are four steam-driven feed pumps of the vertical type, each pump having a capacity of 6000 gals. per hour, delivered against the working pressure of 200 lbs. per square inch. Each feed pump can deliver into either of two 4-inch bus-pipes which are carried round three sides of the pump room. The water carried by each of these two bus-pipes is measured by a Kennedy water meter and passed through a feed heater. To the main bus-pipes are connected two duplicate 4-in. feed pipes which are carried along the front of each block of boilers. Each feed pump is also provided with duplicate suction pipes; one to the hot well tank in the basement, the other to a 5-in. water supply main.

The oil separating and filtering plant for the treatment of the condensed steam from the condensers on its way back to the hot well tank, is also in duplicate. Each plant is capable of separating oil from, and filtering, 8000 gals. of water per hour. Oil-separating batteries operating under 225 volts are used. The batteries discharge into a collecting tank, from which the water is led to a sand filter. The filtered water then passes into the hot well tank below.



GENERAL VIEW OF PARK ROYAL GENERATING STATION, FROM NORTH SIDE



PLAN OF PARK ROYAL STATION

Street Ry. Journal

STEAM DISTRIBUTION, CONDENSING PLANT, COOLING TOWERS, ETC.

The main steam pipes between the boilers and the engine sets are arranged on the duplicate system in the boiler house, and on the ring system in the engine room. Each boiler is connected, through a non-return valve and stop valve, to two 8-in. main steam pipes, carried down the side of the boiler house, over the main flues and connected across the end of the boiler house above the pump room. The 10-in. ring in the engine room is teed off the double line in the boiler house through the necessary valves and is itself divided into sections by valves between the branch pipes to the different engines. It will be seen from the plan that the main engines are arranged in pairs with reference to the pipe work, the separate engines of each pair being supplied with steam through 8-in. branch pipes connected to the separators on the engine bed-plates, a by-pass pipe and valve being provided between the separators on each pair of engines for use in case a section of the main ring has to be shut off.

The exhaust steam from the low-pressure cylinder of each main engine is carried by a 20-in. pipe with a "Y" piece, one branch of which leads through an automatic valve to a vertical atmospheric exhaust pipe passing up through the engine room roof, the other branch leading through a valve to a mechanical oil separator, and thence into a condenser. The mechanical oil separator is of the Reavell type, containing expanded metal baffles, and is provided to extract as much oil as possible from the exhaust steam before it reaches the condenser, leaving the remainder to be dealt with in the oil separating and filtering plant, already described, before the condensed water is returned to the boilers.

The condensing plant is placed above floor level in the center bay of the engine room and is divided into four sections, one for each pair of engines, each section consisting of a surface condenser, combined air and force pump and circulating pump. Each surface condenser is designed to deal with 42,000 lbs. of exhaust steam per hour. The air pumps are driven direct by a two-crank compound steam engine, and are of the Edwards type. The circulating pump is of the centrifugal type, designed to deal with 178,000 gals. of water per hour, and is driven by a three-phase 650-volt motor.

The cooling towers, which are of the natural draught wood type, are arranged in four towers, each of which can be divided into two sections. Each cooling tower is 104 ft. long and 21 ft. wide at the base, the height from the base to the water inlet being 24 ft., and to the top of the tower 74 ft. Each tower is designed to cool 145,000 gals: of water 35 degs. F. from 115 degs. F. under ordinary conditions of temperature.

MAIN GENERATING PLANT

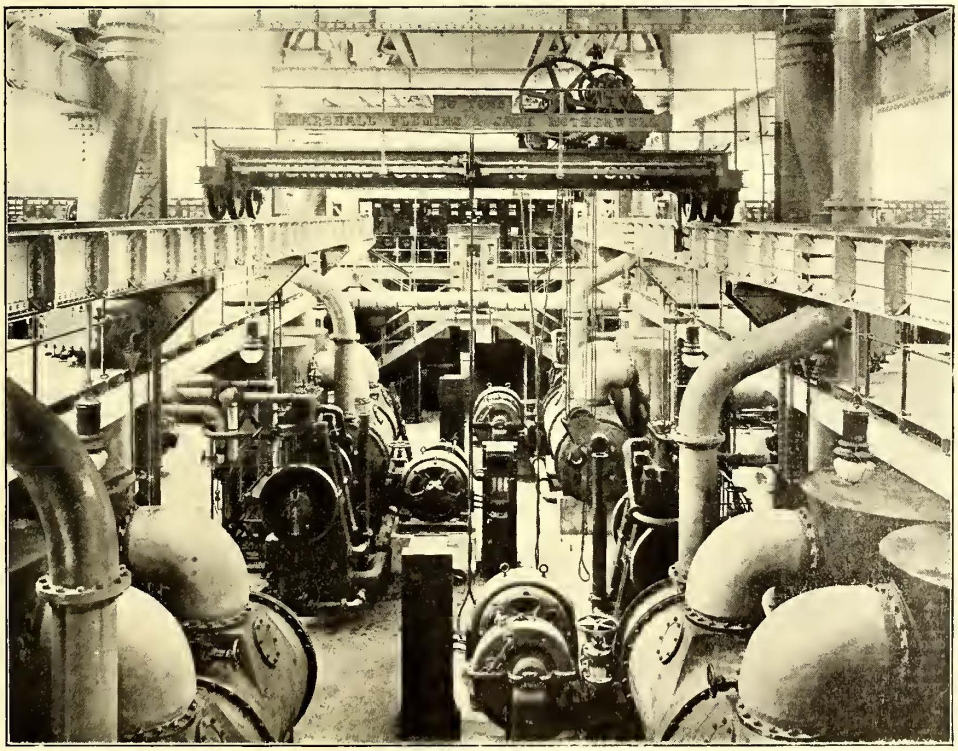
There are eight main generating sets, four in each side bay of the engine room, each set consisting of a Belliss & Morcom engine, driving direct an E. C. C. alternator generating three-phase current at 50 cycles per second and at a voltage of 6300 to 6600 volts, the normal output being 750 kw with an overload capacity of 25 per cent. Each main engine is of the three-crank, triple-expansion, high-speed type, running at 250 r. p. m. The dimensions of the cylinders are 18½ ins., 27 ins. and 40 ins., with an 18-in. stroke. The bearings, cross-head guides, etc., are oiled by forced lubrication, provided by a small pump in the crank chamber, driven off the high-power eccentric strap, and each line of cylinders and valves is lubricated by a separate sight-feed

lubricator. The governor is controlled by an electric motor from the main switchboard gallery for adjusting the speed of the engine during synchronising, and for adjusting the load between the sets running in parallel. An emergency valve, electrically controlled from the switchboard, is also fitted to each engine so that steam may be entirely cut off under emergency.

The main three-phase generators, manufactured by the Electric Construction Company, of Wolverhampton, are of the ordinary rotating field magnet type, the total weight of the magnet wheel and fly-wheel being about 11 tons. The stationary armature is wound in open slots and is star connected, but the center point is not permanently earthed. Screws are provided for sliding the armature sideways for inspection when required.

AUXILIARY PLANT

The auxiliary plant is divided into eight sections of 150-kw capacity, four of which are normally used for supplying d. c. current at about 225 volts for excitation purposes and arc and incandescent lighting and for the overhead Crane motors, and the remaining four sets being normally used for supplying three-phase current at about 650 volts for driving the various three-phase motors throughout the generating station, including those for the stokers, the coal conveyors, the condenser circulating pumps and other pumps. The batteries, which form a stand-by for the excitation supply, are worked in parallel with the generators in the usual way, with motor-driven boosters for charging them from the bus-bars. Each generator with its battery can be worked by itself and used for exciting any or all of the main generators when required.



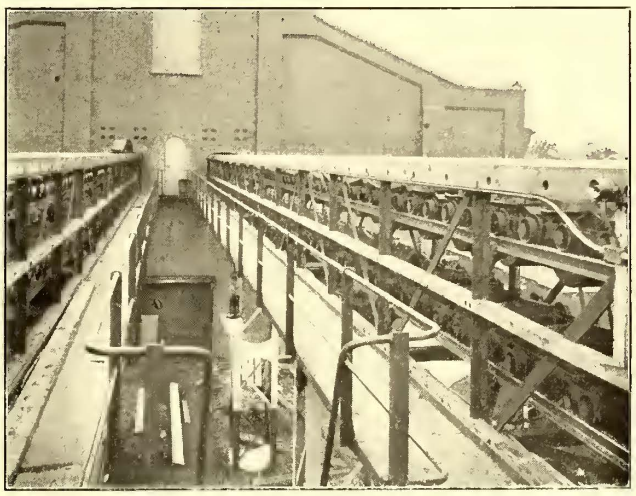
PARK ROYAL—GENERAL VIEW OF CONDENSING PLANT

OVERHEAD CRANES

In each main engine room bay and in the workshop, a 20-ton overhead traveling crane is provided, all three motions of which are worked by series motors supplied with direct current at 220 volts. A 10-ton crane is also provided in the condenser bay, with lifting and lowering motion, driven by a 220-volt d. c. motor.

SWITCH GEAR

The switch gear, all of which was supplied by the British Thomson-Houston Company, of Rugby, includes two main high-tension switchboards, for controlling the 6500-volt three-phase circuits, which are placed one at the west end of each of the main engine room bays, an auxiliary switchboard for controlling the 650-volt three-phase circuits, placed on the same gallery as the main switchboard control panels, and two switchboards for controlling the 220-volt d. c. circuits placed one at the west end of each of the main engine room bays on the floor level immediately under the front of the main switchboard control gallery. The control board is placed on a gallery about 14 ft. above the engine room floor, and slightly in front of the high tension portion of the switchboard. The main switches are worked from the control panels mechanically by rods and cranks. All the instruments are placed on the control panels and are worked from transformers, so that all connections on these control panels are low tension. Immediately in front of the control panels are placed the main generator field regulating resistance columns, the engine governor and emergency valve switches, and also a set of signal columns and indicators by which the switchboard attendant can communicate with the drivers of the engines.



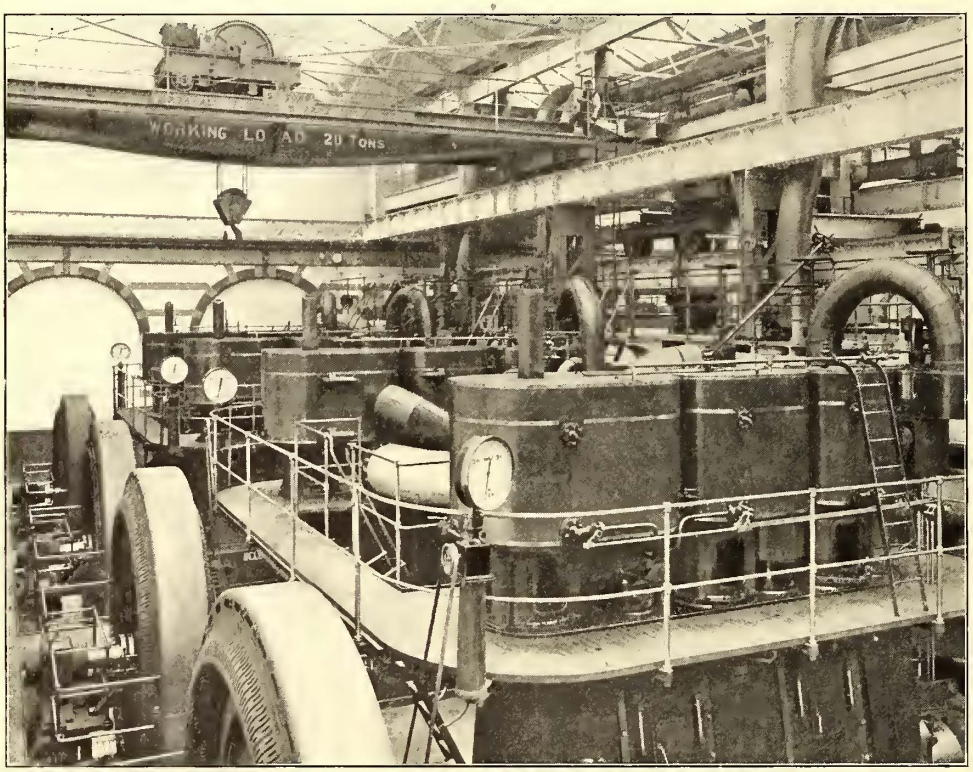
PARK ROYAL—CONVEYOR GANTRY BETWEEN BOILER HOUSE AND DRIVING HOUSE

By means of a system of shafting and cams at the back of each control board, a complete mechanical interlock has been provided in connection with the operating mechanism of the high-tension switches. The interlock is divided into

two halves, corresponding to the division of the synchronising bars into generator and feeder sections. The mechanism of the switch for coupling the two sections of the synchronising bars is arranged so that when the two sections are uncoupled, the two halves of the interlock are also uncoupled, and so that when the two sections are coupled the synchronising bars and interlock act as one unit.

LIGHTING AND POWER CIRCUITS

The general lighting of the main buildings and also of the coal siding and the approach road is carried out by forty "Oriflamme" arc lamps. The lighting installation also includes about 200 incandescent lamps. The feeder cables from the 650-volt a. c. auxiliary switchboard and from the d. c. switchboards are three-core and single cables, respectively, rubber insulated, lead covered and armoured with steel wire. For the branch circuits rubber insulated and braided cable is used, drawn into heavy gage simplex steel conduit. With the exception of the offices, water-tight fittings have been used throughout.



PARK ROYAL—MAIN ENGINES FROM SWITCHBOARD GALLERY FROM NORTH BAY

SUB-STATIONS

The Royal Oak sub-station is equipped with four 400-kw traction motor converter sets, worked in parallel with a battery having a 1-hour discharge rate of 1680 amps. in conjunction with reversible boosters. All the motor converters were specially manufactured for this plant by Bruce Peebles & Company, of Edinburgh. The sub-station also contains two 200-kw motor converters for d. c. lighting and power purposes.

The Shepherd's Bush sub-station is equipped with seven 400-kw traction motor converters worked in parallel with a battery having a 1-hour discharge rate of 840 amps. in conjunction with reversible boosters.

The Old Oak Common sub-station is equipped with one 400-kw and two 200-kw motor converter sets for d. c. lighting and power purposes. All three sub-stations are designed so that they may be developed on the same lines, and Royal Oak being the most representative sub-station is most suitable for a detailed description.

The Royal Oak sub-station is built in three bays and is 109 ft. long x 52 ft. 6 ins. wide and 35 ft. high from floor level to the peaks of the roof in the center bay, with a basement 4 ft. deep. The motor converters and reversible boosters are placed in the center bay, over which a 10-ton handworked traveling crane is provided. One of the side bays contains the high-tension switchboard and the other the low-tension switchboard. At one end of the space reserved for the high-tension switchboard, a transformer room is provided which forms one of the distributing centers and is equipped with static transformers for supplying alternating current at 220 volts for local lighting, including the lighting of the sub-station. The transformer room is equipped with an overhead runway and a set of pulley blocks. Next to the transformer room a workshop is provided which is also equipped with an overhead runway and a set of pulley blocks. Adjoining the same end of the sub-station is the battery room, which forms the basement of a large building used by the Great Western Railway for stationery stores.

Full descriptions of the Peebles-La Cour motor converter have recently been published, and it will be remembered that it consists of a high-tension motor arranged like an induction motor, mechanically coupled to, and also electrically connected with a d. c. generator, connections being made between tappings from the rotor and the d. c. armature. While the machines can be started up on the high-tension side in much the same way as if they were induction motors, they behave when the d. c. machine is fully excited like synchronous machines and are capable of being reversed so as to generate a. c. exactly as in the case of synchronous motor generators. This peculiarity is of special advantage in the present instance for reasons which are explained below. The d. c. generators which are used for traction have compound windings.

The reversible boosters are of the well-known Highfield type, consisting of three machines, the motor, the booster, and its exciter. These booster sets are in duplicate, the continuous capacity of each booster being 130 kw.

The battery consists of 290 cells contained in lead-lined wood boxes, the capacity being 1680 amps. at the 1-hour rate.

The high-tension switchboard is generally similar in construction and design to the Park Royal high-tension switchboards, which have been described above. The incoming high-tension feeders are connected to the center of the board, the traction motor converters being connected to the one end and the lightning converters and the high-tension distributors to the distributing centers at the other end. The

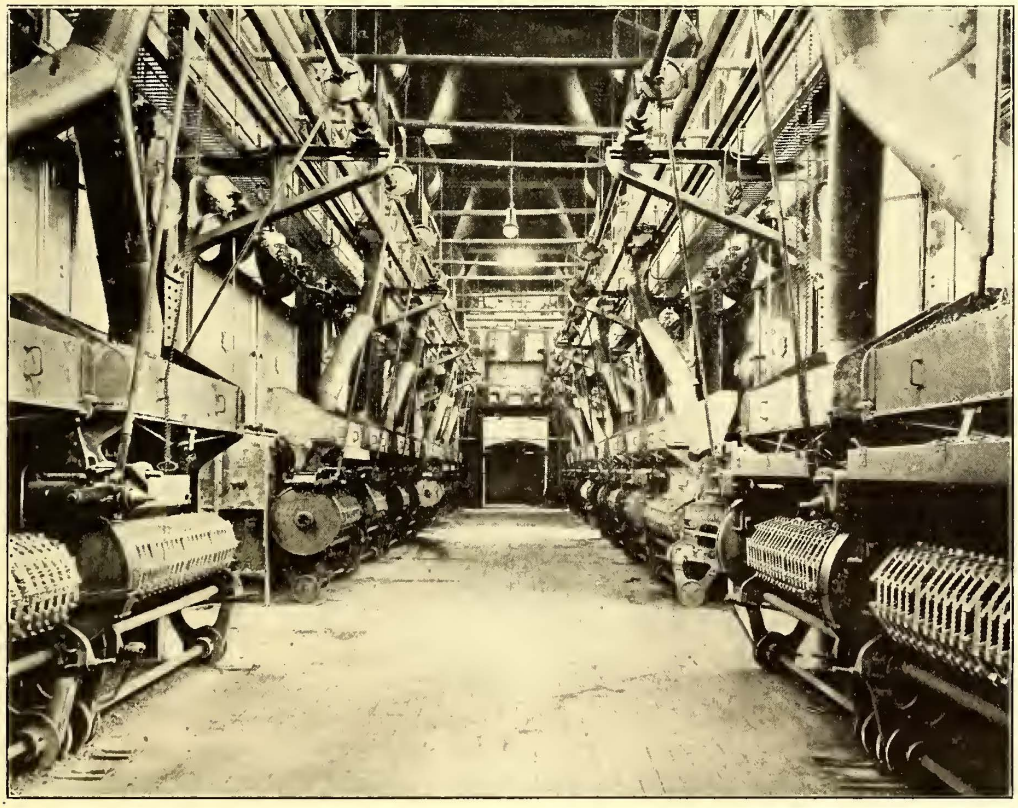
portions of the board which control the incoming feeders and the traction motor converters are provided with duplicate bus-bars, as well as with a set of synchronising bars. The main high-tension feeder switches are provided with time limit overload and instantaneous reverse current relays, and the high-tension distributor switches are provided with overload relays. All the high-tension motor switches are provided with overload relays. Ample room is provided for extensions of the high-tension switchboard as additional motor converters are installed.

The low-tension switchboards, also of the British Thomson-Houston type, placed on the opposite side of the sub-station to the high-tension switchboard are divided into four sections, one for controlling the traction circuits, a second for controlling the lighting circuits, a third for a milking booster and its connections to the battery room, and the fourth for controlling the High-field reversible boosters.

The motor converters are normally started up from the high tension side, the rotors being provided with slip rings and with starting resistances which are placed in the high-tension switchboard basement and which are controlled by handles which can be operated from the floor level near each machine. The 400-kw traction motor converters can also be started up from the d. c. side from the battery, and for this purpose a common d. c. starter is provided, worked from the low-tension switchboard gallery.

A feature of special interest is the method of using the battery, not only to equalize the load on the motor converters and therefore on the main high-tension generators by taking the peaks of the traction load, but also, in cases of emergency, for maintaining both the alternating and direct-current lighting supply. The battery is connected through one of the reversible booster sets to the traction board, being connected between the positive bus-bar and the equalizer bar, with the result that the total current returning from the track to the generators and the battery passes through the generator series windings, which are provided with diverter resistances. In the negative bus-bar a main diverter resistance is provided, through which the total returning from the track passes, and the series winding on the booster is connected across a variable proportion of the main diverter resistance. It is arranged so that when the high-tension supply to the sub-station is interrupted, the battery can run the motor converters reversed, taking current on the d. c. side and delivering high tension alternating current to the high-tension switchboard, from which it is trans-

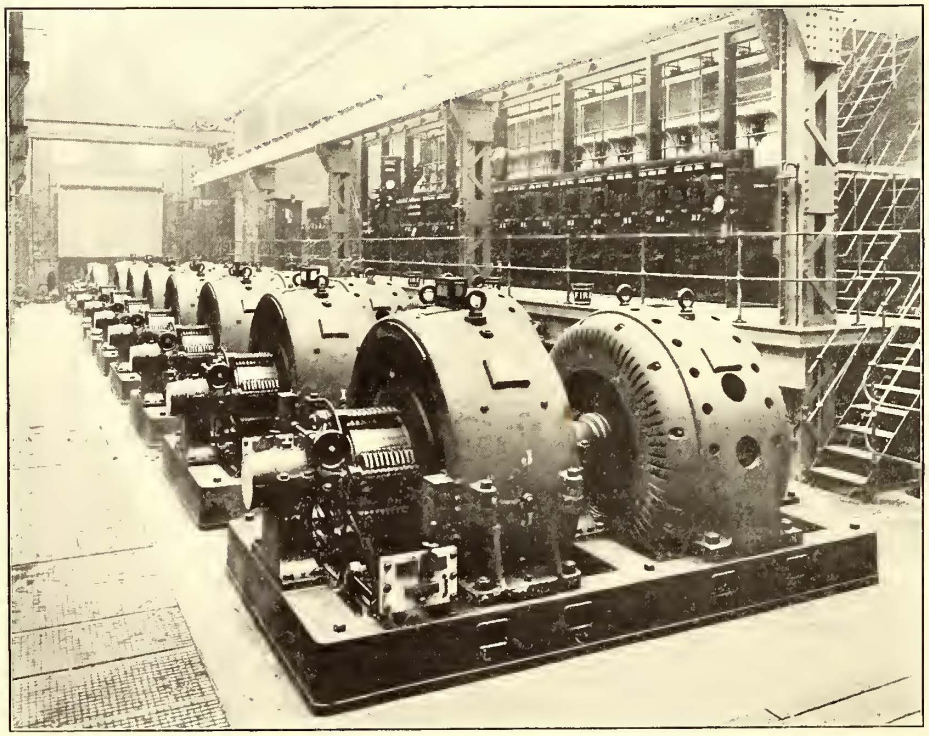
PARK ROYAL—NORTH MAIN CONTROL BOARD



PARK ROYAL—GENERAL VIEW OF BOILER HOUSE FROM STOKING FLOOR

mitted, as before, to the lighting distributing centers. As soon as the motor converters are reversed from the battery, a reverse relay in the positive bus-bar of the traction board operates a change-over switch, which short circuits the series windings of the generators and alters the connections to the series winding on the booster, so as to produce level compounding with variations of the load instead of over compounding. In case the traction load is too great to be maintained by the battery under these conditions, it is arranged that a maximum automatic circuit breaker, connected between the battery and the track feeders shall open should the current from the battery exceed a predetermined amount. A resistance is connected as a shunt across the terminals of this circuit breaker, so proportioned that when the circuit breaker is opened sufficient current can be supplied to the trains to keep the lamps alight until the power for driving the trains can be supplied again.

The negative bus-bar of the traction switchboard is connected to earth through a resistance which allows about 100 amps. to pass when the positive side of the system is earthed, owing to accidental connections to the conductor rails on the track or in any other way. An earth recording voltmeter is provided to give a continuous record of the potential of the negative with reference to earth, and means are also provided for testing the leakage current from the positive and negative conductor rails.



SHEPHERD'S BUSH SUB-STATION—MOTOR CONVERTORS AND HIGH-TENSION SWITCHBOARD

DISTRIBUTING CENTERS

There are eleven distributing centers in which the 6500-volt three-phase current from the sub-stations is stepped down to either 220 or 110-volt three-phase current for the lighting and power circuits. Each center consists of a brick chamber, the usual dimensions being about 20 ft. x 12 ft. x 9 ft. high, and each, as a rule, contains six transformers. The two groups of transformers in each distributing center are, therefore, only connected in parallel on the low tension side.

CABLES

Between the generating station, the sub-stations and the distributing centers about 37 miles of high-tension three-core cable, and about 14 miles of low-tension concentric cable have been laid, in addition to between 3 and 4 miles of single low-tension cable used in the form of jumper cables in connection with the conductor rails. All of the cables were supplied by Siemens Brothers & Company, of Woolwich.

Each high-tension feeder between the generating station and the sub-stations has three cores of .15 sq. in. sectional area, insulated with paper, lead sheathed and armored with galvanized wire. The high-tension distributors are similar cables of .05 and .0125 sq. in. sectional area. The low-tension direct-current and alternating-current cables are concentric paper insulated, lead covered cables, no armoring being provided on these cables as was done on the high-tension feeders in order to meet the requirements of the Board of Trade.

The trunk multi-core and the branch telephone cables are also paper insulated and lead covered.

All the high-tension three-core, low-tension concentric and telephone cables are laid in Howard asphalt troughing, supplied by the Howard Asphalt Troughing Company, of Manchester, a separate trough being used for each cable. These troughs are filled in with bitumen and covered with a layer of asphaltic concrete, ironed over all the troughs, which are placed side by side so as to form a waterproof covering. The trenches in which the troughing is placed are excavated about 2 ft. deep and have a 4-in. layer of concrete laid on the bottom to form a bed for the troughing. Where the cables have to cross under any railway lines, a trench is excavated which is floored with concrete, and brick walls are built up on the side, on the top of which are laid old rails covered with concrete and damp-proof course to form a floor for the sleepers and rails. In this way all weight and pounding from the passing trains is kept off the cables. The culverts so formed are provided with ventilating inlets and outlets and inspection manholes at convenient points. The number of culverts in which the cables pass under the rails is twenty-nine. The route chosen for the feeders has, as far as possible, been at the side of the line, so that any repairs, examination or jointing can be done with greater ease. In certain places, however, more particularly between Westbourne Park, Royal Oak and Shepherd's Bush, it has been necessary to lay the feeders in the 6 ft. way. At points where the cables are laid across railway bridges, the cables have been laid on steel plates fixed to the bridge girders, the ends of the plate being built into the concrete bed of the cable trench at each end of the bridge, but left free for a few feet between the bridge structure and the anchoring point, so as to minimize, as far as possible, the effect of vibration.

All the laying and jointing had to be done without interfering with the traffic, and great care had to be taken to

avoid accidents. It is satisfactory to be able to state that not a single life was lost in carrying out this part of the work.

There is one point of special interest in connection with the way in which the cables were jointed. The usual method of jointing the cables after they are laid was departed from, as it was considered that a much better joint would be made if more space was given to the jointer than is possible after the cables are laid and where there are a number placed side by side. The method adopted in the present instance was to leave the last 20 ft. or 30 ft. of each length of cable unlaid until the end had been jointed to the next length of cable to be laid in the same trough. The ends of the two cables to be jointed were laid on a temporary platform placed over the trench and protected by a jointer's tent, or by a special arrangement of tarpaulins where the clearance was limited, and all jointing was done where there was ample room, and things could be kept clean. Where the cables were laid through the subway underneath the main lines between Wesbourne Park and Royal Oak, the length of cable were so arranged that the joints came opposite the refuges provided in the walls of the subway where the jointing could be done with safety.

TRACK WORK

As has been explained above, the system adopted for supplying current to the train-collecting shoes is the same as that already in use on the Metropolitan and District Railways.

ATTACHING BONDS WITH HYDRAULIC PRESS

There are two insulated conductor rails, the positive being 3 ins. above rail level and 16 ins. outside the running rail, and the negative conductor being 1½ ins. above rail level and in the center of the track. The two conductor rails are of an inverted channel section, resting at intervals not exceeding 10 ft. on iron-capped porcelain insulators. The insulator is fixed to the tie by small clamps and coach screws. This design leaves the conductor rail and insulator free to move up and down relatively to each other when trains are passing, owing to the spring in the tie and in the roadbed.

The rails, which are 44 ft. 6 ins. long, weigh 102.8 lbs. per yard and have a cross-sectional area of 10 sq. ins. They

VIEW OF CONDUCTOR RAILS AT JUNCTION AT CAR SHEDS AT HAMMERSMITH

are made of special quality of steel having a conductivity equal to 15 per cent of that of copper. The conductor rails are fished by a joint plate bolted on the underside and are bonded by four laminated copper strip bonds which are practically protected by the sides of the conductor rails and the joint plate. At intervals of about 130 ft. the conductor rails are anchored by means of special insulators having a groove in the iron cap in which a bolt engages which passes through the flanges of the conductor rail, the anchor insulator being secured to the tie by semi-circular clips. The bond terminals were expanded into the conductor rails by means of hydraulic presses which were of two types. One type consisted of a combined press and pump, shown in the accompanying view, which was used when the trains were not running and which could be readily moved by means of runners along the surface of the rail and have the centers of the rams quickly adjusted to the bond terminals. The other type consisted of a specially designed press worked by a separate pump and so arranged that it could be used on the positive conductor rail without removing it when trains passed.

Steel inclines 13 ft. long (1 in 50) made from a bent section of the ordinary conductor rail are normally used at facing ends and steel inclines 4 ft. 6 ins. long (1 in 9) at trailing ends. At sidings and points where the collecting shoes may pass over the rails in either direction at a medium speed, steel inclines 8 ft. long (1 in 25) are fitted to each end of all rails. At cross-overs where the speed is less, cast-iron inclines (1 in 8) are fitted.

At switches and crossings the different lengths of conductor rail are connected together by rubber insulated, lead sheathed and armored cables buried direct in the ground, each end of the cable being sealed in a specially designed porcelain terminal cap from which a solid copper rod projects. To this projection two flexible copper bonds are

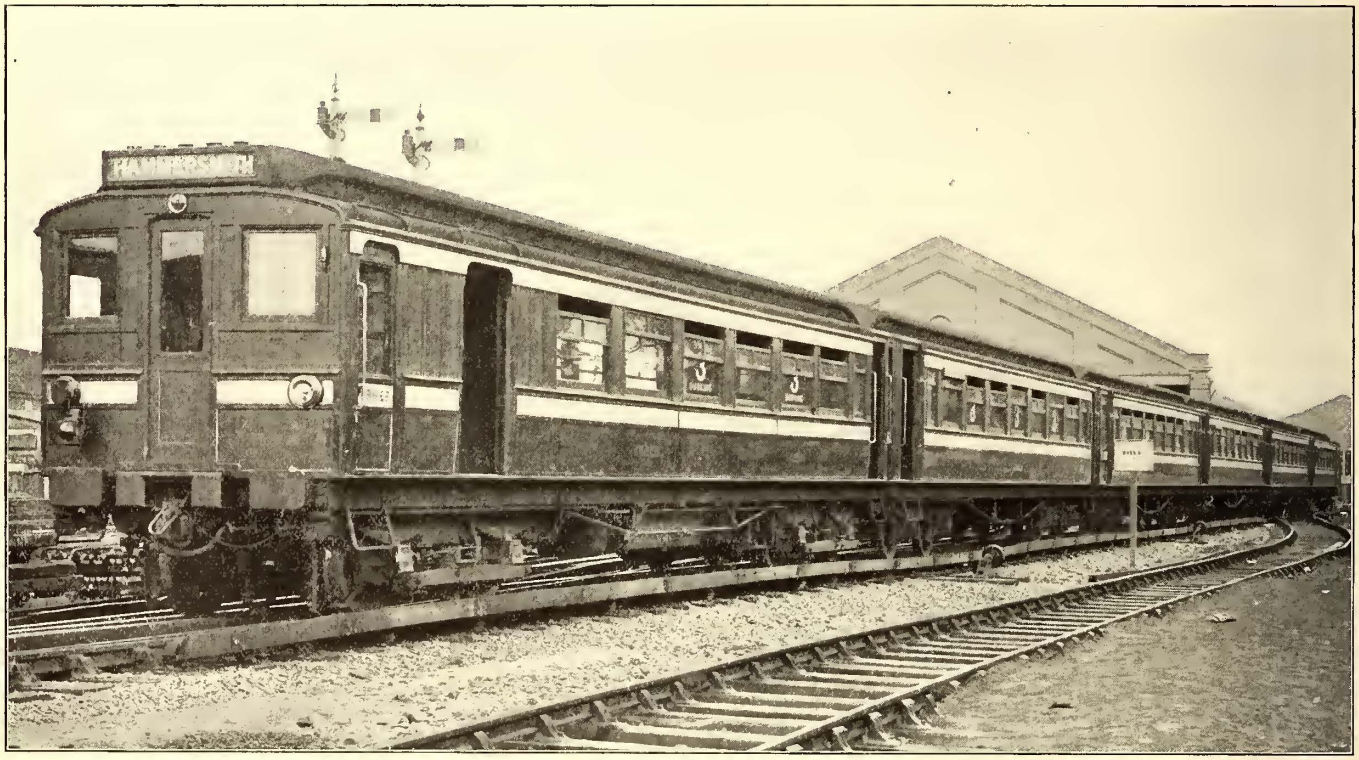
clamped, the other ends of the bonds being expanded into the conductor rail. Any jumper cable can in this way be at once disconnected by the removal of two bolts in the clamp.

Both positive and negative conductor rails are insulated from earth throughout their whole length, but at each sub-station the negative is connected to earth through a resistance. On the occurrence of an earth on the positive, the potential of the negative conductor rail may drop to about 600 volts below earth when a current of about 100 amps. passes through the earthing resistance.

The conductor rails on the "up" line can be connected electrically on one end of the line to the other, and those on the "down" line can be similarly connected from one end to the other. Cross-bond pillars are placed at various points of the line, usually near a station, for the purpose of connecting the conductor rails of the "up" line with those of the "down" line. Each cross-bond pillar contains a double-pole switch worked by rodding from a lever placed in the nearest signal cabin, the signalman being in telephonic communication with one of the sub-stations. The switch, when closed, connects the two positive conductor rails together and the two negative conductor rails together, so that the "up" and "down" lines are worked in parallel.

The section insulators for the conductor rails on the "up" and "down" lines are placed opposite each other in all cases. The section insulator is placed beyond the cross-over between the "up" and "down" lines at a railway station, so as to leave rather more than a train's length between the end of the cross-over and the ends of the section insulator. This allows trains to be shunted from one line to the other without taking the train on to a dead section insulator or on to the faulty section of the line. The section insulator consists of a 315-ft. length of conductor rail (in the positive and in the negative) which is separated from the conductor rails on the same line at each end by a 3-in. gap, which is filled in with a hardwood block. Under normal working conditions both ends of the section insulator on the negative and one end on the positive are connected to the conductor rails by heavy copper straps which bridge the hardwood insulating block and which are easily removable. A section pillar is placed opposite the insulating wood blocks at the other end of the section insulator in the positive conductor rail, and contains two single-pole switches, one switch for the "up" line, and the other for the "down" line. Each switch is so connected to the conductor rails that, when closed, it bridges the insulating wood block at the end of the section insulator in the positive conductor rail.

The cross-bond and section pillars are of cast iron with locked doors. The switches in the section pillars are worked by hand. Interlocking tablets are provided in the signal cabin in the case of a cross-bond pillar, and in the pillar in the case of a section pillar, so arranged that when a key is withdrawn the switch is left locked in the open position and cannot be again closed until the key is inserted. When the switches are in the closed position the keys cannot be withdrawn.



TYPICAL TRAIN OF SIX CARS

ELECTRIC TRAINS

For the service between Hammersmith, Kensington (Addison Road), Aldgate and Whitechapel, twenty electric trains have been provided by the Great Western and Metropolitan Railways. The cars are of the closed vestibule type, with doors only at the ends and sides of the vestibules, the car frame being stiffened by a partition half way along its length. Each train is composed of six cars, approximately 52 ft. long x 8 ft. 9 ins. extreme width. Only the front and rear cars of a train are motor cars. Each motor car is equipped with two motors. The train has a total seating capacity of 320 passengers, with additional room for about 160 passengers standing, making a total passenger load of 30 tons, while the train itself, unloaded, weighs about 174 British tons with electrical equipment complete. The side frames and roof of the cars are of wood, built on steel underframe, while the seats and other interior fittings are

made as nearly fireproof as possible, the floors being of Paris patent plastic cement.

The electrical equipment is of the Sprague-Thomson-Houston multiple-control type, supplied by the British Thomson-Houston Company, of Rugby, and similar to the Sprague General Electric in this country. Positive and negative train cables have been fitted throughout the train, as well as the 10-core multiple-control cable to avoid interrupting the supply of current to the motors and to the lights in the train where gaps occur in the conductor rails. A switchboard is fitted in the driver's compartment on each motor car between the driver's compartment and the luggage compartment, and all the terminals and cables at the back of the board are readily accessible by opening a door in the luggage compartment. The motors are of the G. E. 76 type. The eight motors are capable of accelerating a fully loaded train at the rate of 1.6 ft. per second, with a track voltage of 600, the momentary maximum current per motor not exceeding 320 amps., while the average maximum is about 280. The motors are capable of attaining a train speed of 40 ft. per second within 40 seconds of the start, and the energy consumed on the trip from Hammersmith to Aldgate and back does not exceed 75 watt-hours per ton-mile. Westinghouse air brakes are fitted throughout the train, as well as hand brakes in the motor cars.

By means of a change-over switch each car can be lighted separately by flexible cables from the trolley wires in the shed without making the shoes or other main circuits alive.

TELEPHONE SYSTEM

A very complete system of telephonic communication has, of course, had to be provided throughout the system of electrical supply. At the generating station and at each of the three sub-stations an exchange switchboard is installed, and each of the distributing centers, railway stations, signal cabins and section switch pillars can communicate direct with one or other of the four exchange switchboards, and can thence be plugged through to any of the remaining switchboards. In addition to the exchange switchboards, three telephone instruments are installed at the generating station and at each of the three sub-stations for direct communication between the main high-tension switchboards.

CONSTRUCTION

The buildings for the generating station, sub-stations, distributing centers and inspection chambers have been provided under the supervision of the Great Western Railway Company's engineers who were also responsible for the trench work in connection with the system of cables. The whole of the rest of the work in connection with the generating station, sub-station, distributing centers and cable work was carried out to specifications prepared by Messrs. Kennedy & Jenkin, acting as consulting engineers to the Great Western Railway Company, and under their supervision.

The rolling stock was constructed by the locomotive department of the Great Western Railway, and the carriage and wagon department of the Metropolitan Railway Company, according to specifications of Messrs. Kennedy & Jenkin, and of Thomas Parker, acting as consulting engineer to the Metropolitan Railway Company.

Messrs. Chamberlain & Hookham, Elliott Brothers, Everett, Edgcumbe & Company, Ltd., Evershed & Vignoles, Ferranti Ltd., Nalder Brothers & Thompson, Ltd., and the British Thomson-Houston Company, Ltd., all supplied instruments in connection with one or other of the various switchboard contracts.

REPLY OF MR. SPRAGUE

At the meeting of the American Institute of Electrical Engineers on May 21, when the paper on "Electric Trunk Line Operation" was read by F. J. Sprague, the author promised to contribute later to the proceedings his reply to the various points presented by different speakers. This reply has just been submitted.

Mr. Sprague takes up the comparison of the performance of a d. c. and a 25-cycle a. c. motor, shown in Fig. 1 on page 908 of the issue mentioned. He states that the d. c. motor selected for the comparison was the GE-69 B and the a. c. motor was the GEA-603. He justifies the selection of these two motors for the comparison as they are not only of similar weight, but are of almost exactly the same dimensions. Both are of the largest practical size which should be put on a truck with a 33-in. wheel running in the open on a standard railroad. As explained in the text, gear and transformer weights were eliminated. A similar d. c. motor when equipped with commutating poles weighs about 400 lbs. more, but in view of its extraordinary freedom from sparking, it can with perfect impunity be steadily operated at an increase of potential which would much more than offset the increased weight.

So far as 15-cycle motors are concerned, he believes that the weight of the transformer will generally offset the saving of weight in motor capacity on 25-cycles. In the comparison used by him of the weights of 15- and 25-cycle quadruple motor equipments, the former were given by the Westinghouse, and the latter by General Electric Company. In some weights recently secured by him of 15- and 25-cycle equipments made by the former concern there is an excess of total weight of a quadruple equipment of nominal 75 hp greater than that given in the paper.

In comparing the New York Central and New Haven locomotives he believes that twenty-three of the former could do the work of thirty-five of the latter. Assuming a duty of 200 miles per day, the difference in weight, 1081 tons, would correspond with an excess of 216,200 daily locomotive ton-miles on the New Haven system. The additional cost necessary to secure the same motor capacity would be about $400,000, which at $15 per kilowatt would pay for a synchronous converter addition of 26,667 kw. The cost of the New Haven overhead construction, according to Mr. Wilgus' figures, was over $50,000 per mile, much less than that of the 1200-volt third-rail system. The 1200-volt third-rail system, unhampered by special conditions, would have worked out cheaper than the present a. c. installation, be safer, and have fewer experimental features.

Mr. Sprague disagrees with Mr. Storer that ability to sustain torque while standing still is not a desideratum and calls attention to pusher service where the second locomotive is frequently called upon, when the leading locomotive pulls up on signal to hold the train with full head to steam against slackened draw-bars, and to prevent it being pulled in two when the leader starts again.

To meet the requirements of the Stone & Webster organization in Boston, a modern eight-story fireproof building has been purchased. This building is centrally located in the business section of the city at 147 Milk Street, and on the corner of Milk and Batterymarch Streets, diagonally opposite the Exchange Club. Title to this building has been taken in the name of the Stone & Webster Engineering Corporation.

REVIEW OF THE MASTER CAR BUILDERS BRAKE-SHOE TESTS

At the June meeting of the Master Car Builders' Association F. W. Sargent, chief engineer of the American Brake Shoe & Foundry Company, presented a very interesting review of the brake-shoe tests made by the association during the past twelve years at the Purdue University testing plant.

Mr. Sargent's report was prepared at the request of the committee on brake-shoes and formed a portion of the brake-shoe committee's report.

As an introduction to the discussion of the tests, Mr. Sargent gave some very interesting facts regarding brake-shoes and some reasons for expecting the results obtained in the tests. This introduction and other portions of the report which are of special interest to the electric railway master mechanic are presented in the following abstract:

The value of a brake-shoe depends upon the manner in which it performs the work required, and in the study of the subject there are three points which must be considered in the selection of a brake-shoe. These are:

First, the frictional effect or retarding power of the shoe when pressed against the wheel;

Second, the durability and wearing qualities of the brake-shoe and its ability to stand up to the work required; and

Third, the effect of the brake-shoe upon the wheel against which it is pressed.

The brake-shoes in general use on railroads in this country can be classed under the following heads: (1) Plain cast-iron shoes; (2) cast-iron shoes with inserts in the wearing face; (3) cast-steel shoes; (4) composite shoes.

Under the first head is the product of local foundries throughout the country turning out iron castings, the shoes ranging from soft, tough machinery mixture to the hard, brittle and often mottled iron from an all-scrap mixture of shop refuse.

As a general rule, very soft cast iron is not desired in the brake-shoe on account of its supposedly short life, but it is very important that the casting be strong enough to stand up in service. There is, however, a great lack of uniformity in cast-iron brake-shoes, and often in the same shoe, as indicated by both friction and service records.

Shoes under the second head include those which are cast from a hard iron mixture against chill blocks in the mold, which form hard areas at intervals along the wearing face and at the ends of the brake-shoe; also those shoes which have a soft iron body cast about inserts of harder and tougher metal disposed along the wearing face. These cover usually shoes that are made under patents, and more care is exercised in the selection of cast-iron mixtures from the fact that such shoes are structurally much weaker than an integral casting of unchilled iron.

Under the third head are cast-steel shoes used exclusively on locomotive driving-wheels, and are particularly valuable where thin shoes are necessary, which cannot be made to give satisfactory service with cast-iron body, the toughness and strength of the mild steel rendering this metal very useful for this shoe.

The fourth head covers types of brake-shoes which do not rely upon cast iron or mild steel for frictional qualities and durability. They are made up usually with an iron or steel shell enclosing non-metallic insertion.

BRAKE-SHOE FRICTION

Brake-shoe friction is the resistance to breakage, crushing or distortion, or all three of these, of interlocking projections or particles on or between the face of the brake-shoe and the tread of the wheel, when the brake-shoe is forced against the surface of a moving wheel. The amount of friction is dependent upon the load pressing the shoe against the wheel and the speed of rubbing contact.

The retarding effect of the brake-shoe is expressed in terms of the mean coefficient of friction, which is the average effect of the brake-shoe to retard the wheel, divided by the pressure with which the shoe is forced against the wheel. In the M. C. B. reports the results of the frictional tests are given in terms of the mean coefficient of friction expressed in per cent of the braking load. An examination of the reports of the M. C. B. test committee shows some interesting features in regard to the friction of brake-shoes that are worth considering.

The record of test on chilled wheels shows each brake-shoe in the order of its hardness, the softer shoes being at the top of the scale and the extremely hard shoes at the bottom. The face of the chilled wheel is inflexible and hard, its projections rigid, and, while rounded, offer a fixed and determined resistance to the passage of the brake-shoe, the particles of which are ground between the two surfaces, with the friction dependent upon the intimacy of contact.

On the steel-tired wheel the brake-shoes arrange themselves in a different order, the friction being influenced apparently by the action of the metal in the brake-shoe upon the steel tire. The element of ductility in the steel tire permits its projections to bend over and flatten under the shoe, diminishing the interlocking of particles, making a sliding rather than a grinding action between the two surfaces.

In the case of insert shoes which offer sharp projections or cutting edges to dig into the tire, the friction is increased in proportion to the cutting effect, whereas in shoes of a ductile metal, such as soft steel, wrought or malleable iron, the projections on the shoe face tend to flatten out, the shoe to polish, and a sliding action results against the steel tire, reducing the friction. With such shoes, however, when the temperature rises to a point at which the metal begins to flow, it frequently happens that lumps form on the face of the shoe, which become highly heated and burn, causing hard spots which cut into the tire. When this happens, the friction is largely increased.

With shoes of heavily chilled areas where there is very little grinding, the sliding action over the steel tire is emphasized and friction is reduced. Such shoes occupy practically the same stand on the steel-tired wheel under similar conditions of load and speed as on the chilled wheel; whereas shoes with hard cutting inserts take a higher position on the steel tire than on the chilled wheel, and shoes of very soft or moderately hard cast iron are usually found to take a lower position on the steel-tired wheel than on the chilled wheel, the load and speed being the same.

It is this change in position which occurs with the various shoes when applied on the chilled or steel-tired wheel that may have considerable influence in determining the proper selection of a brake-shoe for each class of service. As an example, take the shoe with wrought-iron inserts, No. H-96, which meets the M. C. B. specification on the chilled wheel, but fails to meet the same specification on steel-tired wheels. Also the shoe with the hard white iron insert, No. 51-'01, which meets the specification on the steel-tired wheel while failing the same specification on the chilled wheel. Charts Nos. 1 and 2 show this change of position in the friction lines of the different shoes under similar conditions of braking load and speed of wheel on both the chilled wheel and steel tire.

Chart No. 3 shows some friction curves of brake-shoes on steel tire at a speed of 65 miles an hour, in which it will be noticed that the softer shoes fall quite rapidly with increased loads as compared with the more durable shoes, but the curves of all the shoes with increase of load tend to flatten and converge.

This peculiarity has been observed in the Berlin-Zossen tests made in Germany in 1902 in connection with cast-iron shoes on steel tires, where it was found that the coefficient of friction was very nearly constant at speeds between 45 and 60 miles an hour, but as the speed decreased below 45 miles an hour the brake-shoe friction rapidly increased, as shown by the following table:

68 miles an hour, average coefficient of friction.....0.06
62 miles an hour, average coefficient of friction.....0.055
47 miles an hour, average coefficient of friction.....0.062
31 miles an hour, average coefficient of friction.....0.075
15 miles an hour, average coefficient of friction.....0.108
5 miles an hour, average coefficient of friction.....0.149

The convergence of the curves of the different shoes toward a common meeting at some higher speed or load indicates the effect of heat upon the structure of the shoe face. Under conditions of low rate of heating each particular material holds up in proportion to the strength of the particles forming the wearing face. The hard chilled or tough ductile surfaces polish over and slide, where the open or granular structure or the composite material in the filled shoes make more intimate contact with the wheel face and hold better.

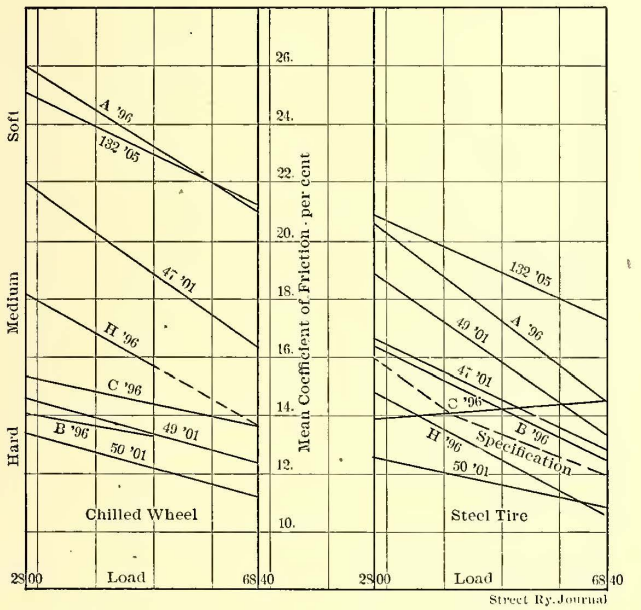


CHART NO. 1.—SHOWING LOCATION OF VARIOUS SHOES ON CHILLED AND STEEL-TIRED WHEELS—SIMILAR CONDITIONS OF LOAD AND SPEED

Laboratory Number	Description of Shoe
A-96	Soft cast iron.
B-96	Hard cast iron.
C-96	Soft cast steel.
H-96	Soft cast iron, wrought-iron inserts.
47-1901	Medium hard cast iron.
49-1901	Cast-iron body, white-iron inserts.
50-1901	Hard cast-iron body, chilled ends, sofe cast-iron inserts.
132-1905	Hard cast iron, expanded steel inserts.

As the intensity of heat generation increases by the continued application of the shoe or by the extra pressure or work done in a given time, the whole structure of the face of the shoe undergoes a change. Unchilled cast iron crumbles, composite filling decomposes by the destruction of the bond, and these shoes lose their grip on the wheel. The chilled areas are softened and toughened, give closer contact and more friction as the chill is driven out, while the shoes of wrought and ductile material soften and stick to the wheel, holding up in friction by a more intimate contact.

From this it would appear that a brake-shoe combining in its wearing face the grinding qualities of cast iron and the tough, ductile flowing properties of mild steel, would produce average results in which the extremes of both metals were neutralized and utilized to best advantage. Such a shoe appears to be indicated in the performance of No. 132, Chart No. 3 (submitted by the C. R. R. of N. J. in 1903), at least so far as frictional effect on the steel-tired wheel is concerned, having a high-retarding effect at low speeds and holding up well under extreme conditions of speed and pressure, due to the composite structure of unchilled cast iron and mild steel.

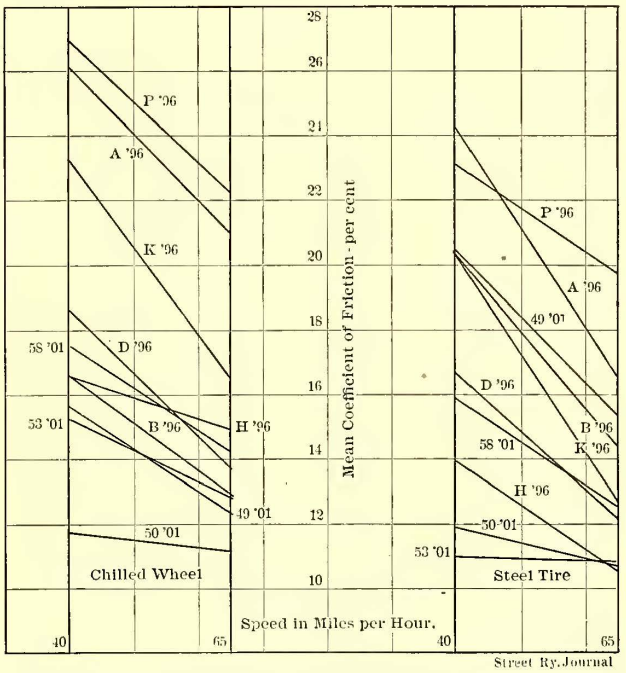


CHART NO. 2.—SHOWING POSITION ON CAST-IRON AND STEEL-TIRED WHEELS UNDER SIMILAR CONDITIONS OF LOAD AND SPEED

Laboratory Number	Description of Shoe
A-96	Soft cast iron.
B-96	Hard cast iron.
D-96	Hard cast steel.
H-96	Cast-iron body, wrought-iron inserts.
K-96	Cast-iron body, wood plugs.
P-96	Cast-iron shell, composition filling.
49-1901	Cast iron, white-iron inserts.
53-1901	Cast-iron body, chilled ends, pockets with asphalt composition filling.
58-1901	Cast iron, expanded steel insert.

Chart No. 4 illustrates graphically the record of test on twelve varieties of plain cast-iron shoes, as follows:

PLAIN CAST-IRON SHOES.

A — 1896, Very soft cast iron, from P. R. R., Altoona.
B — 1896, Hard cast iron, wheel mixture, Ramapo Iron Works.
47 — 1901, Medium cast iron, unchilled, Lappin Brake Shoe Co.
79, 80, 81 — 1903, Cast iron shoes, Michigan Central Ry.
129 — 1905, Special hard cast iron, Southern Pacific Ry.
175 — 1906, Soft cast iron, Wheeling & Lake Erie R. R.
178 — 1906, Medium cast iron, Wheeling & Lake Erie R. R.
205 — 1906, Medium cast iron, Lake Shore & Mich. So. Ry.

These samples represent a variety of product ranging from extremely soft cast iron to very dense, close-grained, unchilled cast iron, and may be taken as representative of the extremes to which the metal may run in what are known as plain cast-iron shoes. The shoes shown in the lower

limits, Nos. 79, 80, 81 and 129, are undoubtedly very hard shoes from an all-scrap mixture, or made up with an admixture of steel in the charge, which accounts for their low position in the scale. They are, however, representative of much of the metal in the plain cast-iron shoes of the present day, made up of low-grade raw material. It will be noticed that the specification on both steel-tired and chilled wheels is such as to preclude acceptance of this material. The specification will also throw out shoes of a mottled structure, which are but a very slight degree removed as regards friction records from those noted at the bottom of the scale.

The M. C. B. report of service tests made in 1895 gives some interesting figures concerning the relative wear of different shoes, where each shoe was tested against shoes A-96 of soft cast iron, and the figures are, therefore, directly comparable, and are shown in the following table:

M. C. B. Report of Road Test, 1895.

	Cast-iron wheel. Durability of our shoe as compared with A-96 shoe.	Steel-tired wheel. Durability of our shoe as compared with A-96 shoe.
A-96 — Soft cast iron.....	1	1
B-96 — Hard cast iron.....	1.16	0.94
J-96 — Hard iron, 50 per cent of face chilled	1.82	3.70
H-96 — Cast iron, 40 per cent of face wrought iron inserts.....	3.23	3.33
I-96 — Forty per cent of wearing face hard steel inserts.....	3.23	4.79
C-96 — Soft steel.....	5.90	2.40
D-96 — Hard steel.....	10.00	3.23
L-96 — Pressed steel.....	9.09	3.45
M-96 — Wrought iron.....	9.09	3.45
Malleable iron, average of E. F. and G.....	1.37	1.50

The foregoing records were obtained by wearing out completely in service a number of shoes and comparing their durability with the soft cast-iron shoe "A" in each test. We find, on inspection of this table, that the hard cast-iron shoe B-96, although showing an average of at least 50 per cent less friction than the shoe A-96, has practically the same rate of wear on both the cast-iron and steel-tired wheels. This point is of especial interest in view of the general impression that hardness in the cast-iron shoe means greater durability with proportionate loss of friction, although it has been stated that it is possible to greatly increase the durability of the plain cast-iron brake-shoe without materially reducing the frictional effect. This may be so, but this record does not show it.

It may appear in future tests, and, in fact, does appear in the case of the cast-iron shoes of the 1901 report (see Table No. 2), that a comparatively soft cast-iron shoe can be made which will show high friction as well as comparatively low rate of wear. Take, for instance, shoe No. 47-1901, which was intended to be heavily chilled and consequently was cast against chill blocks, but failed to show any more than a light skin chill, and this chill was not in contact with the wheel in any of the tests on record. The metal in this shoe was very dense, yet soft and tough, and could be drilled readily.

It may appear that the close-grained metal of the all-scrap mixture, which is hard and brittle, will wear more rapidly against both the cast-iron and steel-tired wheel than a softer metal with greater toughness and resilience, and that the more rapid fall in friction of these softer shoes and tougher and harder holding brake-shoes with increase in the rate of heat generation, is not the result of greater wear, but of the smoothing over and reduced rate of grinding because of greater ductility and tougher metal. This fact has been indicated in the case of steel rails, and in the case of cylinder bushings, eccentric straps and other cast-iron parts which at times have been subjected to unlubricated rubbing.

The extra hard brake-shoes with heavy chills are from three to four times more durable than ordinary plain cast iron, depending upon the amount of hardness present, and usually under similar conditions of work, so far as noted, give practically similar results on both chilled wheel and steel tire. Shoe J-96 of 1895 test, shows up well in durability on the steel-tired wheel, and I cannot account for the low record on the chilled wheel, unless it is that some parts of this shoe were lost by breakage in service.

There are three shoes in the 1901 record, namely, Shoe No. 50, Shoe No. 55, and Shoe No. 53, which rely entirely upon the hardness of the chilled portion for durability. These show practically similar results on steel-tired and chilled wheels, with the exception of the last one, No. 53, the friction and wear of which is largely reduced by the lubricating effect of the asphalt bond of the filling.

Brake-shoes with hard and tough inserts generally show in service tests from three to five times greater durability than plain cast-iron shoes, and this is indicated in the records of two shoes, H and I of the 1895 test, and shoes Nos. 49, 51, 57 and 58 of the 1901 report.

The crucible insert shoe, I-96, shows higher durability on the steel-tire than on the chilled wheel, which agrees with the general record in service on locomotives, which averages from four to five times the durability of a plain cast-iron shoe.

Shoes with white iron inserts, No. 49 and No. 51, show considerably higher durability on the chilled wheel than on the steel tire. This may be accounted for by the increase in heat at the face of the shoe, produced by the cutting effect of the insert on the tire.

The record of shoes with wrought metal inserts, No. H-96, and the shoes with soft steel in the shape of expanded metal, Nos. 57 and 58-1901, show practically a close agreement in wear on both chilled wheels and steel tire.

The record of shoes of steel or wrought iron shows very high durability on the chilled wheel, where they apparently glaze over and become very hard on the wearing face; while on the steel-tired wheel the durability is very much reduced by the tearing off of metal from the face of the shoe, which clings to the tire. The record of these shoes agrees with the service recorded, which runs from four to five times the durability of the plain cast-iron shoe.

Malleable iron shoes seem to approximate, so far as the records go, plain cast iron when warmed up, and wear about the same on both wheels.

Ordinarily, service records show for the various shoes the following averages as compared with plain cast iron; but, as before indicated, the trade name of the brake-shoe signifies nothing more than the type of the shoe, and records of wear of such shoes are valuable for comparison only when the exact structure of the shoe tested is known:

Heavily chilled shoes, three to four times as durable as plain cast iron.

White iron insert shoes, three to four times as durable as plain cast iron.

Chilled shoes with soft inserts, three to four times as durable as plain cast iron.

Hard iron, expanded metal inserts, two to four times as durable as plain cast iron.

Wrought iron or steel insert shoes, three to four times as durable as plain cast iron.

Cast-steel shoes, four to five times as durable as plain cast iron.

Cast-iron shoes with crucible inserts, chilled ends, four to five times as durable as plain cast iron.

Certain shoes met the M. C. B. requirements on one wheel while failing specification on the other. For example, the shoes which are practically plain cast-iron shoes, Nos. 47, 52 and 56, together with the shoes with expanded metal, Nos. 57 and 58, which have no large areas of insert, are suitable for service on either wheel, whereas the hard insert shoes, Nos. 49 and 51, are satisfactory only on the steel-tired wheel. Here they can be used to advantage, especially if the inserts are so located as to contact with the tire beyond the limits of rail wear, and by the cutting action of the inserts tend to maintain the original outline of the wheel tread.

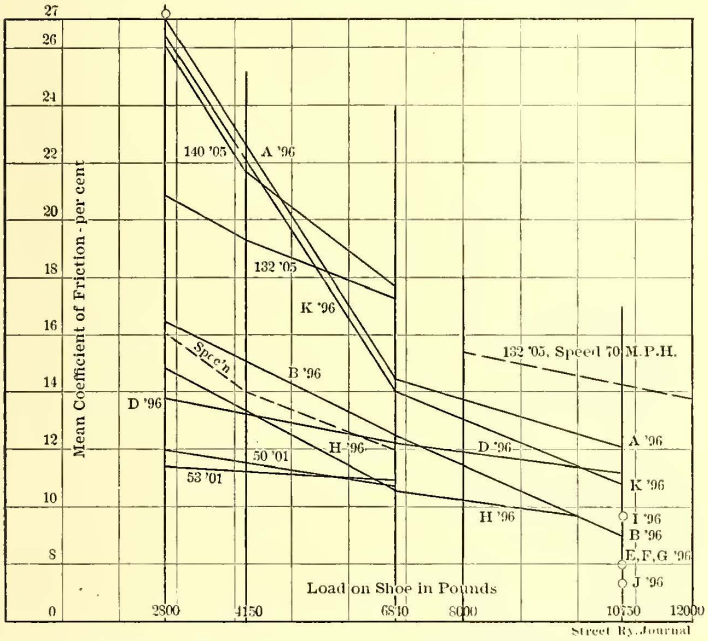


CHART NO. 3.—RECORD OF TESTS ON STEEL-TIRED WHEEL, SPEED 65 MILES PER HOUR; LOAD, 2808 TO 12,000 LBS.

Laboratory Number	Description of Shoe
A-96	Soft cast iron.
B-96	Hard cast iron.
D-96	Hard cast steel.
E. F. G.-96	Malleable iron.
H-96	Cast iron, wrought-iron inserts.
I-96	Cast-iron body, crucible-steel inserts.
J-96	Hard iron, 50 per cent of face chilled.
K-96	Hard cast iron, wood inserts.
50-1901	Hard cast iron, chilled ends, soft cast-iron inserts.
132-1905	Hard cast iron, expanded steel insert.
140-1905	Malleable iron shell, composition filled.

While the standard M. C. B. Christie brake-shoe is undoubtedly the most efficient design ever devised for the brake-shoe on account of distribution of metal and ease of application, it is a particularly weak design for the cast-iron shoe. Where the structure is further weakened by inserts or by chilling strains, the M. C. B. Christie unflanged shoe is actually unsafe to use on heavy and high-speed equipment. New shoes have failed with the application of the high-speed brake, and partly worn shoes are sure to go. Broken shoes are a source of danger, and worn brake heads are very expensive, as also the scrapping of shoes which are less than half worn out in order to avoid failure in service. This defect of structural weakness has long been noticed in the cast-iron shoes, and various means have been devised to overcome the trouble by the insertion of strips of wrought and tough metal along the back of the shoe, the body metal being cast about the strips.

The most satisfactory and universally adopted reinforcement is known as the steel back, which is formed of a plate 3/16 in. thick mild steel, freely perforated for anchorage of the body metal. The Christie lug is reinforced by means of a strip of similar metal surrounding the key way core, the ends being tucked under the steel back, which is raised slightly at the center of the shoe. The steel back and wrought lug are placed in the mold and the body cast about them. The body metal, which may crack, cannot get away from the steel back, and cracks cannot disable the steel back shoe, as the back cannot be broken.

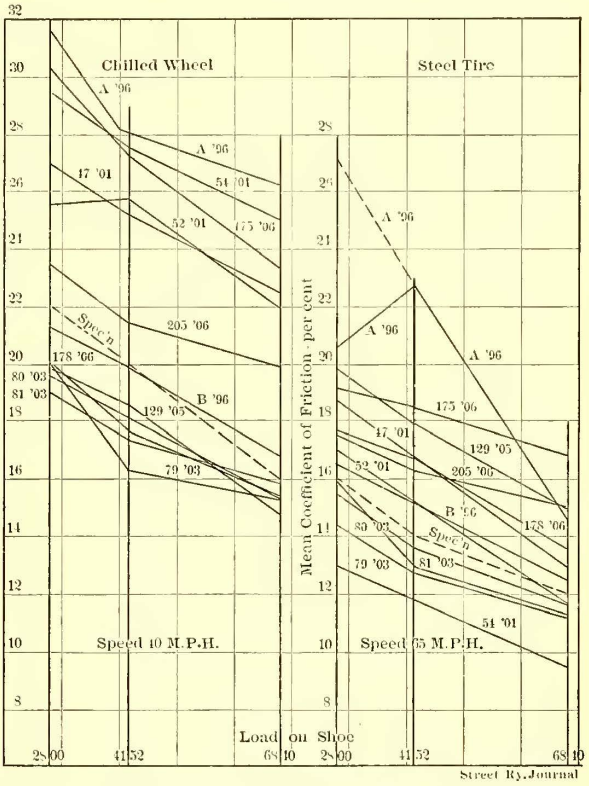


CHART NO. 4.—PLAIN CAST-IRON BRAKE-SHOES, UNCHILLED

Laboratory Number	Description of Shoe
A-96	Soft cast iron.
B-96	Hard cast iron.
47-1901	Medium hard cast iron.
52-1901	Soft cast iron, soft cast-iron insert.
54-1901	Soft cast iron, soft cast-iron insert.
79-1903	Hard cast-iron brake-shoe.
80 & 81-1903	Hard cast-iron brake-shoe.
129-1005	Hard cast iron.
175-1906	Cast-iron brake-shoe.
178-1906	Hard cast-iron shoe.
178-1906	Hard cast-iron shoe.
205-1906	Medium cast-iron shoe.

It is this reinforcement which has made possible the continued use of the M. C. B. standard brake-shoe, and has increased the average life of this shoe at least 50 per cent, in many cases doubling the service obtained from the same weight of metal by continuing the shoe in service until worn down to the steel back. Some idea of the advantage of the steel back in increasing the durability of the plain cast-iron brake-shoe is shown in the following record, which is but one of a number of reports of similar nature by railroads which have adopted the steel back as a standard.

WEAR OF THE WHEEL TREAD BY THE BRAKE-SHOE

Practically no evil effect is noticeable on the cast-iron wheel by any of the brake shoes noted, except with those of cast steel or wrought iron, which at times may score the chilled wheel when there is a piling up or bunching of the metal on the face of the shoe, forming a high spot where the pressure is concentrated and the face of the shoe is

highly heated and burned. Another trouble with shoes of ductile metal is the glazing over and hardening of the shoe face against the chilled wheel, which apparently forces a greater amount of heat into the wheel than would be the case with a cast-iron brake shoe. This point needs further investigation.

Cast-iron shoes with a continuous longitudinal insert of wrought iron or steel have been known to groove cast-iron wheels, especially if there is a low chill in the wheel, by the continuous drag and the hardening effect of the wrought metal; but in the case of the shoe where the wrought inserts are limited in area and entirely surrounded by cast iron which apparently coats the face of the insert, the injury to the chilled wheel is not apparent, nor is there any marked reduction in the friction of the shoe over that of the ordinary cast iron.

All brake shoes wear the wheel to some extent, whether cast iron or steel tired, so far as my observation goes, except in the type of shoes mentioned, there is no appreciable wear of the chilled wheel by cast-iron shoes with chilled areas or with hard inserts, or with soft inserts, which are not continuous along the face of the shoe.

On the steel tire, however, conditions are different, and care must be taken in the selection of brake shoes to avoid scoring the wheel, particularly outside the limits of rail wear. There appears to be hardening of the face of the steel-tired wheel by the rolling action on the rail which prevents to some extent wear by the brake shoe, or at any rate, the scoring by the brake shoe is rolled out and not in evidence over that portion of the wheel tread; but irregularities in the texture of the shoe face may be shown by scoring on the outer tread or flange of the steel tire where it does not come in contact with the rail.

The unflanged shoe is undesirable on steel-tired wheels especially because of its change of position across the face of the wheel, increasing the wear of the tire over the limits of rail wear and against the flange.

Shoes with wrought inserts are undesirable for use on steel-tired wheels on account of the cutting effect of the wrought insert and its tendency to pick up tire metal and score the wheel tread.

Shoes with hard inserts or chilled areas are in extensive use on small diameter steel-tired wheels, and best results are obtained by the use of such shoes bearing all across the tread of the wheel and flange.

The puestion of extra braking effect secured by the flanged shoe over the unflanged shoe is one which should be investigated by the Brake Shoe Committee, as well as the question of wear of wheels by such shoes and the greater mileage obtained from the tire by the use of the flanged shoe. It has been demonstrated by service tests and is the experience of quite a number of railroads, that the use of the flanged shoe on steel-tired wheels means reduced cost in wheel maintenance as regards tire turning and more service obtained from the steel tires, as well as reduced cost in brake-shoe maintenance.

The tendency of the unflanged brake shoe to pull to one-side and wear off the wheel is a source of expense to the railroad. Such shoes concentrate a wearing action against the flange at one end of the brake beam, while the shoe on the other end is being pulled off the wheel and must be scrapped very early in its life. The braking pressures is increased at one side of the truck and reduced on the other, resulting in increased tendency to sharp flanged wheels as well as loss in brake-shoe metal. All this is avoided by the use of a flanged shoe, and where the cast-iron body is supported by a steel back the flanged shoe can not fail to show a considerable saving over an unreinforced unflanged shoe for the same type of wearing face.

From the records of test which have already been presented by the reports of the Brake Shoe Committee, there is sufficient information at hand to enable those interested to form a very close estimate of the fitness of almost any type of brake shoe that may be presented for the service required. By examining the structure of the body metal and noting the extent and character of the insert, one can locate its place very closely in the friction scale and decide as to its probable life and durability, and effect upon the

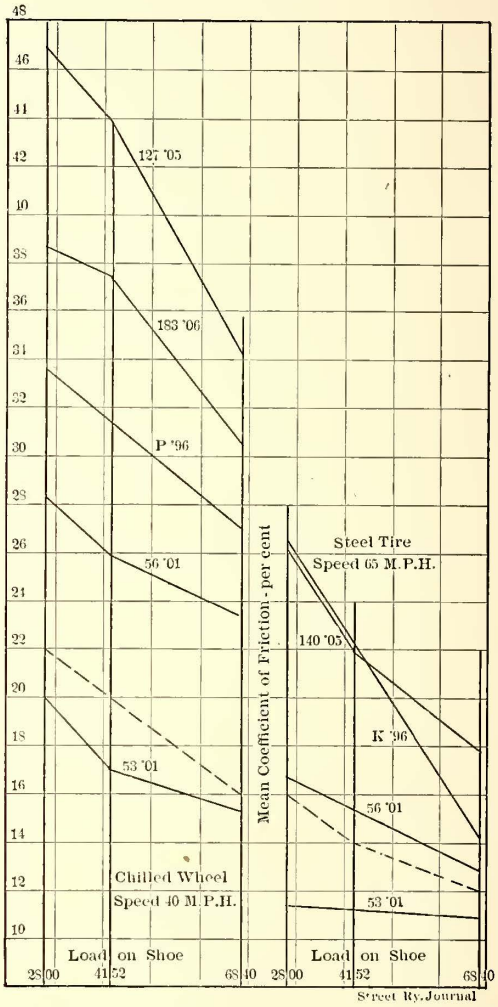


CHART NO. 5.—RECORD OF TEST OF COMPOSITE BRAKE-SHOES

Laboratory Number	Description of Shoe
K-96	Hard cast-iron body, wooden plugs.
P-96	Cast-iron shell, composition filling.
53-1901	Hard cast-iron body, chilled ends, pockets filled with asphalt composition.
56-1901	Cast-iron body, cork inserts.
127-1905	Pressed-steel shell, composition filling.
140-1905	Malleable-iron shell, composition filling.
183-1906	Pressed steel shell, composition filling.

wheel tread. By this it is not to be understood that the M. C. B. tests are complete or should be discontinued, for there is plenty of work to be done in connection with the M. C. B. testing machine in the line of investigation which will undoubtedly better the brake shoe and improve the braking of railway trains, as well as reduce expense in brake shoe maintenance.

The brake shoe tests should be continued to determine the maximum load on shoe and speed of wheel possible, say for instance, 12,000 to 15,000 pounds load on the M. C. B. unflanged shoe at a speed of eighty miles an hour, in

WEAR OF BRAKE SHOES ON CAST IRON WHEELS.

Speed constant at 20 miles per hour; pressure of shoe on wheel, 2808 pounds; Revolutions of wheel during application, 190; equivalent distance run during application, 1,641.5 feet.

No. of Shoe.	TRADE NAME OF SHOE.	Description of Shoe.	Area of Shoe Face in Square Inches.	PERCENTAGE OF SHOE FACE.			Comparative Durability Million Feet—Pounds of Work Done per 1 Pound of Wear.	Shoe Tested Made By	Shoe Tested Furnished By	Number of Shoe.	Mean Coefficient of Friction.
				Insert.	Chill.	Unchilled Cast Iron.					
175	Plain Cast Iron	Unchilled cast iron; no inserts; soft iron	45	0	0	100	80.8	Griffin Wheel Co.	W. & L. B. R.R.	175	30.3
205	Plain Cast Iron	Unchilled cast iron; no inserts; soft iron	47	0	0	100	92.0	American Brake Shoe & Foundry Co.	L. S. & M. S.	205	23.5
179	Pittsburg Malleable	Malleable iron shell; composition filling	44	Mal. I. 36	Comp. 64	0	114.3	Pittsburg Brake Shoe Co.	W. & L. B. R.R.	179	36.8
161	Streeter	Cast iron body; white iron inserts	51	32	0	68	146.6	American Brake Shoe & Foundry Co.	H. V. R.R. Co.	161	21.8
186	Congdon	Cast iron body; wrought steel inserts	47	13	0	87	162.5	American Brake Shoe & Foundry Co.	D. M. & N. Ry.	186	24.1
209	"U"	Cast iron body; tapered ends chilled	54	0	13	87	172.0	American Brake Shoe & Foundry Co.	L. S. & M. S.	209	24.7
183	Pittsburg Steel	Pressed steel shell; composition filling	45	Steel 22	Comp. 78	0	173.8	Pittsburg Brake Shoe Co.	D. M. & N. Ry.	183	38.7
178	Plain Cast Iron	Unchilled hard cast iron	48	0	0	100	227.7	American Brake Shoe & Foundry Co.	W. & L. B. R.R.	178	20.0
172	Hard Insert—Seaton	Cast iron body; wrought steel inserts	45	12	0	88	258.2	J. Seaton Foundry, Topeka, Kan.	A. T. & S. F.	172	22.8
215	Congdon	Cast iron body; wrought steel inserts	47	16	0	84	270.9	American Brake Shoe & Foundry Co.	D. S. S. & A.	215	20.9
163	"U" Dia. "S"	Cast iron; ends chilled; soft steel inserts	53	30	13	57	350.1	American Brake Shoe & Foundry Co.	A. T. & S. F.	163	21.7
200	Streeter	Cast iron body; white iron inserts	45	37	0	63	367.0	American Brake Shoe & Foundry Co.	L. S. & M. S.	200	22.7
158	Streeter	Cast iron body; white iron inserts	51	32	0	68	407.2	American Brake Shoe & Foundry Co.	H. V. Ry. Co.	158	22.5
220	Congdon	Cast iron body; wrought steel inserts	48	25	0	75	504.7	American Brake Shoe & Foundry Co.	C. & A. Ry. Co.	220	26.5
194	Congdon	Cast iron body; wrought steel inserts	47	40	0	60	554.6	American Brake Shoe & Foundry Co.	L. S. & M. S.	194	26.5

order to bring out which type and what material is best suited for these severe conditions of heat generation.

We have very little knowledge of brake-shoe effect under conditions of low speed and load. From the trend of friction curves it would appear that many of the shoes which give satisfactory service at speeds of forty to sixty-five miles per hour and with loads of 2808 to 6840 pounds, can not be used in the emergency application at lower speeds than say thirty-miles per hour without grave danger of sliding wheels. The coefficient of friction at the rail varies from 20 to 30 per cent. We know very little about this factor, but with a brake shoe working under a braking load of 90 per cent and showing a mean coefficient of friction of 25 to 30 per cent at forty miles an hour, we have the possibility of sliding the wheel at a lower speed. Many of the shoes in test show a much higher coefficient of friction than 30 per cent at forty miles an hour, and we should know where their record goes down to say five miles per hour; or in other words, the friction curves for the various shoes noted and on hand for test should be extended to show their record at speeds from five to eighty miles an hour and with loads from 2000 to 15,000 pounds, covering at least the typical shoes of accepted practice at the present time.

It does not appear that a high coefficient of friction is necessary or desirable under low conditions of speed and load, but it is of vital importance, where the speed is high and the loads heavy, that the shoes show all the friction possible; and while we should not neglect the question of the best brake shoe for conditions of low heat generation, we must first of all consider the extreme conditions. This question is considerably simplified by the fact that there appears to be an equalizing of the frictional effect of the hard and soft shoes under conditions of high speeds and loads, or at least a tendency toward that, which should be confirmed by further tests, and the question reduces not so much to the friction as to the structure of the shoe to stand the racket, so to speak, at the upper limit of service. The methods of reinforcement, notably with the steel back, provides for this to a large extent, as may be indicated by the good service rendered by steel-back plain cast-iron shoes in high-speed brake train service throughout the country.

The M. C. B. record of shoe tests, while most important and valuable, will remain incomplete until checked up by service tests. The brake-shoe testing machine records results under ideal conditions—a steady wheel moving true with a constant uniform braking load and perfect contact between shoe and wheel, with clear, dry surface in contact under practically uniform climatic conditions.

In actual service we have the reverse, namely: an unsteady wheel pounding along over uneven track, more or less elasticity in brake beams and brake connections, and fluctuation in braking pressure, coupled with the varying contact between wheel and shoe with extremes of climatic conditions from cold to hot and wet to dry.

The test wheel is uniform in its bearing against the shoe, and always moving in the same direction, the projections tend to bend away from the shoe and the surface of the wheel to polish up and smooth over and afford a better contact than in the case of the wheel in service conditions. With the ordinary car wheel the unflanged brake shoe covers that part of the wheel not in contact with the rail, as well as that part of the wheel which is in contact with the rail; so that there are two distinct surfaces under the shoe. The side motion of the brake shoe is continually varying the amount of contact between the shoe and these two surfaces, while

the inequalities of track condition and the pounding of the wheel can not but fail to break the grip of the shoe on the wheel, all of which means that the actual coefficient of friction from the service tests is much less than that indicated in the shop test.

To make the records complete, therefore, some connection should be made between shop and service tests, and to my mind this can be done without very much trouble and expense. The management of some of the electric roads in the West, in the vicinity of Purdue University would, I believe, be much interested in conducting a service test of brake shoes with a heavy electric car in interurban service, using unflanged M. C. B. Christie type of brake shoes on 33-in. wheels, and I believe a series of tests could be arranged using brake shoes previously tested on the M. C. B. machine, and after service stops has been made, returned to the machine for further test. It would not be necessary to test all the various types of brake shoes, but say three different kinds of shoes illustrating those in general use on locomotives, steel-tired coach wheels and chilled wheels.

The exact relation between shop and service tests with the shoe could readily be determined, and would undoubtedly be of great value. The work could be done without serious interference or expense in connection with some of the electric lines in the Middle West, and would prove of great value to those operating electric railroads, who would undoubtedly heartily co-operate with the M. C. B. committee in providing apparatus and track for conducting such test. It seems to me that this is one of the most important questions that can be brought before the brake-shoe committee, and, once started, I am confident that the subject would not be dropped until the question of flanged and unflanged shoes would be settled, as well as the most suitable and efficient material for the purpose.

In conclusion, I beg to state that I feel safe in saying that those interested in the manufacture of brake-shoes will cooperate to the fullest extent in supplying whatever brake-shoes are necessary for service and shop tests and assist in every way in the effort to obtain more light on the subject.

The questions to be decided concerning brake-shoes in the future may be noted as follows:

First—Extending the records of test to cover speeds of from 5 miles to 80 miles per hour under loads from 2000 lbs. to 15,000 lbs.

Second—The comparative durability or wear of brake-shoes under similar conditions of service.

Third—The comparative effect of various brake-shoes upon the wheel tread, both as regards wear of wheels under the shoe and heat effect produced by the shoe upon the wheel.

Fourth—The comparative merits of the unflanged and flanged brake-shoe to note the advantage, if any, and better braking effect obtained with the flanged shoe, which would seem to be indicated in service, as well as better effect on the wheel.

With these questions settled, the brake-shoe story will be complete until some new metal stronger, tougher, but still retaining the grinding and non-cutting qualities of unchilled cast iron, has been obtained.

As an appendix to his report Mr. Sargeant submitted the table shown on the preceding page.

Two hundred and two interurban trains are dispatched from Columbus every day in the week, besides a number of specials and extras. Eight interurban lines enter the city, two are building and two others are in prospect.

NATIONAL CIVIC FEDERATION—REPORT OF COMMITTEE ON INVESTIGATION OF PUBLIC OWNERSHIP

The final report of the conclusions of the committee on investigation of the National Civic Federation Commission on Public Ownership and Operation was made public July 29. This committee, of which Melville E. Ingalls, chairman board of directors Big Four Railroad, is chairman, made a thorough investigation of municipal and private workings of gas, electric light, water and street railway plants, both in the United States and England. It is worthy of note that of the committeemen, all but one, Walton Clark, of Philadelphia, who presents a separate paper giving his views, sign the report. Charles L. Edgar, of Boston, and W. J. Clark, of New York, present a statement of minor exceptions. The conclusions reached give in detail the opinions of the committee on all the various questions connected with the public ownership problem, and present a number of practical and important recommendations on the subject.

The members of the committee who sign the report are:

Melville E. Ingalls, chairman.

Dr. Albert Shaw, editor of the "Review of Reviews," vice chairman.

Edward A. Moffett, secretary.

Edward W. Bemis, superintendent of waterworks, Cleveland, Ohio.

William J. Clark, general manager of the foreign department of the General Electric Company.

Prof. John R. Commons, of Wisconsin University.

Charles L. Edgar, president of the Edison Electric & Illuminating Company, of Boston.

Walter L. Fisher, president of the Municipal Voters' League, of Chicago.

Prof. Frank J. Goodnow, of Columbia University.

Prof. John H. Gray, of Northwestern University, Illinois.

Timothy Healy, president of the International Brotherhood of Stationary Firemen.

Daniel J. Keefe, president of the International Longshoremen's Association.

Milo R. Maltbie, member of the new Public Service Commission for the Greater New York.

H. B. F. Macfarland, president of the Board of Commissioners of the District of Columbia.

Frank J. McNulty, president of the International Brotherhood of Electrical Workers, Springfield, Ill.

Prof. Frank Parsons, president of the National Public Ownership Leage, Boston.

J. W. Sullivan, editor "Clothing Trades Bulletin," New York.

Talcott Williams, editorial writer of the "Press," Philadelphia.

Albert E. Winchester, superintendent of the South Norwalk, Conn., electric works.

THE COMMITTEE REPORT

The report made public by Mr. Moffett, the secretary, says:

"It is difficult to give positive answers of universal application to the questions arising as to the success or failure of municipal ownership as compared with private ownership. The local conditions affecting particular plants are in many cases so peculiar as to make a satisfactory comparison impossible, and it is very difficult to estimate the allowance that should be made for these local conditions. For instance, in making deductions from the financial con-

ditions of Wheeling, as affected by its gas plant, as compared with those of Atlanta and Norfolk with their private plants, allowance must be made for the presence of natural gas in Wheeling. Again, in comparing the public waterworks of Syracuse with the private waterworks of Indianapolis from the point of view of the success or failure of municipal operation, geographical conditions must be taken into consideration. The situation at Syracuse is extremely favorable to the establishment of an efficient plant with comparatively little effort on the part of its management. At Indianapolis the conditions are unfavorable. In Syracuse the water flows to the city by gravity; in Indianapolis it must be pumped. So we might go through the various cities here and abroad that have been visited and show that the results were affected favorably or unfavorably by special conditions applicable to each city.

"Further, the difficulty of reaching satisfactory results by the comparative method is not confined to special or local conditions. It is true, as well, of much broader questions. Thus any attempt to compare municipal with private electric light plants in the United States would be fruitless if allowance were not made for the fact that in most cases such municipal plants are confined to street lighting and may not do commercial business. Allowance must be made also for the fact that many municipal plants have had a struggle to exist in the face of unsympathetic public opinion. Again, in England consideration must be given to the fact that the municipal electric light and street railway plants have permanent rights, while the rights of the private companies operating these particular utilities are limited as to the length of their existence, many street railway franchises expiring twenty-one years after they were granted.

"Finally, not only must it be borne in mind that the social and political conditions which characterize the two countries find expression in their private and public systems, but we must consider the difference in the nature of the two peoples which causes them to adopt different ideas and views as to the expediency of certain things. In other words, a measure of success in the municipal management of public utilities in England should not be regarded as necessarily indicating that the municipal management of the same utilities in this country would be followed by a like measure of success. Conditions are quite different in the two countries.

"There are some general principles which we wish to present as practically the unanimous sentiment of our committee.

"First, we wish to emphasize the fact that the public utilities studied are so constituted that it is impossible for them to be regulated by competition. Therefore, they must be controlled and regulated by the government; or they must be left to do as they please; or they must be operated by the public. There is no other course. None of us is in favor of leaving them to their own will, and the question is whether it is better to regulate or to operate.

"There are no particular reasons why the financial results from private or public operation should be different if the conditions are the same. In each case it is a question of the proper man in charge of the business and of local conditions.

"We are of the opinion that a public utility which concerns the health of the citizens should not be left to individuals, where the temptation of profit might produce disastrous results, and therefore it is our judgment that undertakings in which the sanitary motive largely enters should be operated by the public.

"We have come to the conclusion that municipal ownership of public utilities should not be extended to revenue-producing industries which do not involve the public health, the public safety, public transportation, or the permanent occupation of public streets or grounds, and that municipal operation should not be undertaken solely for profit.

"We are also of the opinion that all future grants to private companies for the construction and operation of public utilities should be terminable after a certain fixed period, and that meanwhile cities should have the right to purchase the property for operation, lease or sale, paying its fair value.

"To carry out these recommendations effectively and to protect the rights of the people, we recommend that the various States should give to their municipalities the authority, upon popular vote under reasonable regulations, to build and operate public utilities, or to build and lease the same, or to take over works already constructed. In no other way can the people be put upon a fair trading basis and obtain from the individual companies such rights as they ought to have. We believe that this provision will tend to make it to the enlightened self-interest of the public utility companies to furnish adequate service upon fair terms, and to this extent will tend to render it unnecessary for the public to take over the existing utilities or to acquire new ones..

"Furthermore, we recommend that provision be made for a competent public authority, with power to require for all public utilities a uniform system of records and accounts, giving all financial data and all information concerning the quality of service and the cost thereof, which data shall be published and distributed to the public like other official reports; and also that no stock or bonds for public utilities shall be issued without the approval of some competent public authority.

"We also recommend the consideration of the sliding scale, which has proved successful in some cases in England with reference to gas and has been adopted in Boston. By this plan the authorized capitalization is settled by official investigation, and a standard rate of dividend is fixed, which may be increased only when the price of gas has been reduced. The subway contracts and their operation in Boston and New York are also entitled to full consideration.

"In case the management of public utilities is left with private companies, the public should retain in all cases an interest in the growth and profits of the future, either by a share of the profits or a reduction of the charges, the latter being preferable as it inures to the benefit of those who use the utilities, while a share of the profits benefits the taxpayers.

"Our investigations teach us that no municipal operation is likely to be highly successful that does not provide for:

"First—An executive manager with full responsibility, holding his position during good behavior.

"Second—Exclusion of political influence and personal favoritism from the management of the undertaking.

"Third—Separation of the finances of the undertaking from those of the rest of the city.

"Fourth—Exemption from the debt limit of the necessary bond issues for revenue-producing utilities, which shall be a first charge upon the property and revenues of such undertaking.

"We wish to bring to your consideration the danger here in the United States of turning over these public utilities to the present government of some of our cities. Some, we know, are well governed and the situation, on the whole,

seems to be improving, but they are not up to the government of British cities. We found in England and Scotland a high type of municipal government, which is the result of many years of struggle and improvement. Business men seem to take a pride in serving as city Councillors or Aldermen, and the government of such cities as Glasgow, Manchester, Birmingham and others includes many of the best citizens of the city. These conditions are distinctly favorable to municipal operation.

"In the United States, as is well known, there are many cities not in such a favorable condition. It is charged that the political activity of public service corporations has in many instances been responsible for the unwillingness or inability of American cities to secure a higher type of public service. This charge we believe to be true. However, there seems to be an idea with many people that the mere taking by the city of all its public utilities for municipal operation will at once result in ideal municipal government through the very necessity of putting honest and competent citizens in charge. While an increase in the number and importance of municipal functions may have a tendency to induce men of a higher type to become public officials, wo do not believe that this of itself will accomplish municipal reform. We are unable to recommend municipal ownership as a political panacea.

"In many cases in the United States the people have heedlessly given away their rights and reserved no sufficient power of control or regulation, and we believe that corruption of public servants has sprung, in large measure, from this condition of things. With the regulations that we have advised, with the publication of accounts and records and systematic control, the danger of the corruption of public officials is very much reduced."

The committee sums up its more important conclusions as follows:

"Public utilities, whether in public or private hands, are best conducted under a system of legalized and regulated monopoly.

"Public utilities in which the sanitary motive largely enters should be operated by the public.

"The success of municipal operation of public utilities depends upon the existence in the city of a high capacity for municipal government.

"Franchise grants to private corporations should be terminable after a fixed period and meanwhile subject to purchase at a fair value.

"Municipalities should have the power to enter the field of municipal ownership upon popular vote under reasonable regulation.

"Private companies operating public utilities should be subject to public regulation and examination under a system of uniform records and accounts and of full publicity."

On the general broad subject of municipalization, the committee reports that the general expediency of either private or public ownership is a question that must be determined by each municipality in the light of local conditions. "What may be possible in one locality may not be in another. In some cities the companies may so serve the public as to create no dissatisfaction, and nothing might be gained by experimenting with municipal ownership. Again, the government of one city may be good and capable of taking charge of these public utilities, while in another it may be the reverse. In either case the people must remember that it requires a large class of able men as city officials to look after these matters. They must also remember that municipal ownership will create a large class of employees who may have more or less political influence."

EXCEPTIONS

Messrs. Charles L. Edgar and William J. Clark present the following exceptions to the committee's report:

"We the undersigned dissent from the report of the investigating committee as follows:

"First—The report says:

" 'There are no particular reasons why the financial results from private or public operation should be different if the conditions are the same. In each case it is a question of the proper man in charge of the business and of local conditions.'

"We dissent from the implication in this paragraph that the conditions are or are likely to be the same.

"Second—The report says:

" 'We are of the opinion that a public utility which concerns the health of the citizens should not be left to individuals, where the temptation of profit might produce disastrous results, and therefore it is our judgment that undertakings in which the sanitary motive largely enters should be operated by the public.'

"We dissent from this conclusion as having been proved by our investigation. In our opinion, privately operated water systems were, especially as regards their consideration for the public health, as properly and successfully managed as the publicly operated water systems.

"Third—The report says:

" 'We have come to the conclusions that municipal ownership of public utilities should not be extended to revenue-producing industries which do not involve the public health, the public safety, public transportation, or the permanent occupation of public streets or grounds, and that municipal operation should not be solely for profit.'

"This sentence is so drawn that to a casual reader it implies that the opposite is advisable. From this we strongly dissent.

"Fourth—The report says:

" 'To carry out these recommendations effectively and to protect the rights of the people, we recommend that the various States should give to their municipalities the authority, upon popular vote under reasonable regulations, etc.'

"The words 'under reasonable regulations' were put into the report at the suggestion of Charles L. Edgar, and were intended by him to mean such regulations as would compel deliberate consideration not only by the people, but by their representatives, and would consequently prevent the superficial attractiveness of the scheme from overriding the 'sober second thought' of the people. We strongly dissent from any definition of 'regulations' which does not cover these points.

"Fifth—The second and fifth conclusions in the latter part of the report, being merely repetitions of previous statements, are, of course, subject to the same dissents."

MR. CLARK'S PAPER

Walton Clark, third vice-president of the United Gas Improvement Company, in a separate paper, sets forth his agreement with the other members of the committee that "companies entrusted with franchises and charters for the operation of so-called public service industries should be subject to regulation." He dissents, however, from the statement of the committee regarding waterworks, saying:

"Recognizing the almost supreme importance of an adequate and cheap supply of pure water, I dissent from one of

the recommendations of my associates, in effect that waterworks should be operated by public bodies. I dissent for the reason that my study of the report of the waterworks expert employed by your committee, and my personal investigations, lead me to the conclusion that the water companies have made the more intelligent efforts toward adequacy and purity of supply, and that, all conditions considered, the result of their efforts has been and is a better and cheaper water supply and service than that maintained by the municipal waterworks department."

Mr. Clark also dissents from the statement, speaking of politics in Glasgow, Manchester and Birmingham, that these conditions are distinctly favorable to municipal operation, if by this is meant a municipal ownership that may be favorably compared with private ownership, in the character of its results and in benefit to the city and citizens served. "My knowledge of the question," says Mr. Clark, "is had from personal investigation, and from a study of the reports of the experts employed by this Commission, and of the writings of members of the Commission. It leads me to the conclusion that the city and citizens of Glasgow, Manchester and Birmingham, as well as of the other municipalities investigated, are not so well served by their public service trading departments as the cities and citizens of London, Newcastle, Sheffield, Dublin and Norwich are by companies operating similar trading industries, and that there is no element of blessing in the municipalization in the former cities to compensate for the indifferent character of the service rendered."

On the general subject of municipal ownership, Mr. Clark says the investigation in which he has taken part has convinced him that municipal ownership has not proved equal to private ownership, in benefits to the consumer, citizen or city. He does not agree that the way should be left open for any municipality to undertake any trading operation, without special authorization by the legislature of the State wherein it is located. "I cannot believe," Mr. Clark declares, "that the prescribed remedy for any ill should be a worse ill, and I cannot recommend that a municipality suffering, or believing that it suffers, under public administration of a public utility, should be given the right to engage in the operation of such utility for itself, without such a course of procedure as will make sure that the sober second thought of the people shall have ample opportunity for development and expression, before the community is committed to municipal ownership with the accompanying dangers and difficulties, of which you are warned in the majority report.

"Because I believe that the general credit of municipalities should be conserved for the benefit of public and necessary improvements, from which, in the nature of things, private enterprise is excluded; and because I believe that a municipality should not, in any event, engage in any trading enterprise that will not pay its own way, and have the confidence of the citizens as financially sound, I think that municipalities should be prohibited by statute from making investments in trading operations, except with money borrowed on mortgage, or otherwise, the loan being secured by a lien on the plant in which it is invested, and on the right to operate the same, and on this only."

Mr. Clark dissents from the opinion that a city should have the right to purchase at its option the property of public service corporations for operation, lease or sale. He bases his opposition on the belief that it is practically impossible to secure private funds for investment in an enterprise subject to purchase by a municipality, at any date to be selected by the municipality, and because he believes that the impossibility of so securing private investment may, and often will, work a social harm to a community.

"I believe in State regulation and protection of public service companies," Mr. Clark continues. "I do not understand that your committee was charged with the duty of recommending to you a form of regulation. I know that your committee made no special study on this subject. Therefore I am not prepared to propose any detailed plan of regulation.

"Finally, regretting to be in any degree in conflict of opinion with my associates, I may still satisfy my sense of duty to my fellow-citizens and my sense of obligation to you for the honor of a share in this important work, by recording the conviction I am under at the close of this investigation.

"I am convinced that the condition of the British people, individually or collectively, has not been improved by the municipalization of the industries we have investigated.

"I believe that political and social conditions in the United States are less favorable to the success of municipal ownership than are the same conditions in Great Britain.

"I find this conclusion strengthened by our investigation into municipalized industries in the United States.

"I am convinced that, under American conditions, the system of private ownership of public utilities is best for the citizens and the consumers.

"I recommend State regulation and protection of public service companies, provided by statute, and as far as possible automatic in its application and operation."

THE HEALTH OF EMPLOYEES IN THE NEW YORK SUBWAY

Two years ago George A. Soper, Ph. D., was engaged by the New York Rapid Transit Commission to conduct an investigation into the sanitary conditions of the New York subway, with particular reference to the effect of the air upon the health of the employees. This investigation was made in 1905 and has resulted in two reports, one of which was published in abstract on page 906 of the STREET RAILWAY JOURNAL for May 25, 1907. In this report the author stated that the general air of the subway, although disagreeable, is not actually harmful, except possibly for the presence of iron dust, and that this latter point was then under special consideration.

The second report covering the effect of iron dust and the general health of the subway employees is summarized by Dr. Soper in the last issue of the "Technology Quarterly," and was based upon an investigation conducted in 1905-06. Physical examinations were made of a sufficient number of subway employees to determine the condition of the average man. Especial care was taken to look for early signs of diseases of the lungs, which exist to an excessive extent among persons engaged in dusty occupations. The condition of the air and the work of the men were also compared with the conditions which exist in such vocations as stone cutting, knife grinding, metal polishing and similar occupations in which a high mortality occurs.

An examination of the air in the subway showed the presence of a great deal of iron dust, as well as fragments of many kinds resulting from the wear and tear of the subway and the clothing of the passengers. The proportion of iron in the dust was large, however, and it was estimated that 25 tons of iron and steel were ground off the wheels,

brake-shoes and rails every month in the 21 miles of the subway. All of this does not float in the air, some of the pieces are so large that they fall immediately to the track and much becomes greasy and adhered to different surfaces with which it happened to come in contact. The amount of dust which would be breathed was not enough, however, to be injurious solely on account of its bulk and was considerably less than that in an iron foundry or an iron mill, the figures being, respectively, 72 to 100 hg., 14 mg. and 2.25 mg. per cubic meter. Little of this reaches the lungs which are protected in various ways against the entrance of dust particles from the air. Autopsies upon five employees were made.

The principal conclusions reached by the author concerning the various subjects dealt with in this investigation follow:

CONCLUSIONS

1. The air of the subway, as judged by analyses and by careful studies of the health of the men, was not injurious.

2. The most objectionable feature of the air was the dust, which consisted chiefly of angular particles of iron. It was possible, also, that injurious bacteria might sometimes be associated with these metallic particles. Lack of strict enforcement of the city ordinance against spitting, and the want of skillful care in cleaning the subway, made this danger greater than it need be.

3. The odor and heat of the subway, although very disagreeable, were not actually injurious to health. The strong draughts and changes of temperature which occurred at the stations were the most objectionable atmospheric conditions, so far as health was concerned.

4. The employees submitted by the company for physical examination were a particularly robust lot of men. From their excellent physique it appeared that they had been carefully selected, a fact which was explained when it was found that a large majority of the men had previously been engaged in railroading, where capacity to do hard manual labor was required. It was fair to assume that the employees examined represented a fair average of all those who came in close contact with the passengers, so far as resistance to disease was concerned.

5. There had been very little sickness among the employees during their period of subway employment, judging by the accounts which the men gave. No information with respect to this matter was obtainable from the operating company. Many of the men claimed to have gained weight since they had been working in the subway— a fact due, apparently, less to any peculiarly healthful property of the air than to the easier work repuired.

6. Most of the men spoke of drowsiness. This was perhaps to be explained by the comparative darkness of the subway, the nonotony of the work, and fatigue to the eyes. The drowsiness was never sufficient to keep the men from performing their duties properly.

7. A large number of employees complained of yellow stains which came upon their underclothing, as they supposed, from their sweat. This caused considerable inconvenience. The stains probably resulted from iron particles upon the body which were acted upon by the sweat. Investigation excluded the probability that the sweat itself was discolored.

8. Careful physical examinations showed that an excessive amount of dry pleurisy, without pain or other physical discomfort, existed among the men. Pleurisy occurred to the extent of 53 per cent among the employees and to the extent of 14½ per cent among persons not engaged in subway work. The cause of the dry pleurisy was not at first apparent, but upon investigation it appeared to have been in no way due to the subway. Nine per cent of the men had medical histories which accounted for their condition, and 28 per cent had worked for many years under conditions known to be favorable to the occurrence of this disease. The pleurisy had no visible effect upon the health of the men and was not likely to be injurious to them in the future.

9. Congestion and inflammation of the upper air passages were prevalent. Rhinitis and pharyngitis in acute or chronic form occurred in about 70 per cent of the men examined. Laryngitis was less common, occurring in about 55 per cent. These figures are somewhat above the normal considering the degree of severity represented. No case of bronchitis was discovered. The prevalence of the minor respiratory affections noted was due, apparently, more to the previous employments of the men than to their present surroundings, althougr the excessive use of the voice required of the conductors seemed likely to aggravate these affections.

10. Analyses of the sputum, urine and sweat of the men showed that iron dust was given off only in the sputum. This sputum was derived mostly from the mouth and throat, where most of the iron particles drawn in with the inspired air were caught.

11. The findings at autopsy threw no light upon the possibly evil effects of the dust. The men whose bodies were examined had worked too short a time in the subway for information of value in this direction to be obtainable. Iron was found in the lungs of all, but to an extent which had produced no evil consequences.

RECOMMENDATIONS

Certain specific recommendations seemed to be required, under the circumstances:

1. Care should be taken that persons employed in the subway are free from respiratory disease or a tendency toward it. This rule should be extended to all grades and positions and made to apply, also, to the women who operate the news stands.

2. Thorough physical examinations, especially of the respiratory apparatus and heart, should be made of all employees when they are first engaged and at yearly intervals subsequently.

3. While the dust was not proved to have produced harmful results, sanitary considerations require that it should be prevented, as far as practicable,, from getting into the air. To this end (a) sand and a sawdust should not purposely be scattered on the stairways and platforms, as at present; (b) sweeping and cleaning should be done in a more strictly sanitary manner, preferably in accordance with the recommendations of the advisory board of the Department of Health; and (c) investigations should be made to determine whether it is feasible to reduce or collect much of the iron dust.

4. The city ordinance against spitting should be enforced to the letter. Although some progress has already been made in preventing it, spitting is still practiced occasionally on the platforms and on the roadbed. Not only passengers, but employees are offenders in this direction.

The Sandusky-Fremont branch of the Lake Shore Electric is now in operation. It makes possible through Cleveland-Toledo cars via Sandusky without doubling on the route.

ESTIMATED COST OF ELECTRIFYING THE BERLIN RING AND STADTBAHN

Dr. W. Reichel, professor at the Berlin Technical High School and also well known as a railway engineer, recently completed an elaborate study demonstrating the desirability of electrifying a number of Berlin steam suburban lines, the Stadtbahn, a connecting line extending through the city, and the Ringbahn, a connecting belt line around the city. Included in Dr. Reichel's essay are the following figures covering the estimated first cost, wages, maintenance and depreciation. It is assumed that 152 kms. (94.25 miles) are to be electrified. Two 30,000-kw. stations are provided, but one of these is considered principally as a reserve. The estimate based upon the use of alternating-current motors.

INSTALLATION COST

Two 30,000-kw. power stations, each containing six 5,000-kw. turbo-generators at $87.50 per kw....	$7,250,000
Fourteen sub-stations, 100,000 K. V. A. capacity at $7.50 per K. V. A.....	750,000
City track (12.4 miles) with tubular poles.....	
Remaining track (111.6 miles) with lattice poles.....	900,000
Transmission wires (10,000 to 20,000-volts) 12.4 miles	125,000
Bare feeders (40,000-volts) 12.4 miles.....	200,000
120 trains consisting of four new motor cars and rebuilt trailers.....	12,600,000
Miscellaneous.....	50,000
Total	$20,000,000

Considering the cost of the proposed electrification, Dr. Reichel does not think the estimated cost too high to be impracticable from an economical standpoint, citing, as an instance, the Leipzig railway terminal, which cost over $30,000,000. He states that this estimate includes the cost of considerable additions to the rolling stock which would have to be made whether electrification took place or not.

OPERATING COST

The author states that it is impossible to forecast the operating expenses exactly, but an approximation is attempted by assuming that 39,000,000 kms (24,180 train miles) would be operated. Last summer the actual train km were 26,000 (16,120 train miles).

EMPLOYEES

600 motormen and trainmen (including pension allowance)	$450,000
Car cleaners.....	100,000
Switchmen and signalmen (including general maintenance	600,000
Truckmen and miscellaneous.....	100,000
General management.....	125,000
Total	$1,375,000

COST OF POWER

170,000,000-kw-hours, coal, oil, wages and maintenance	$1,000,000
Maintenance and lubrication of trains.....	875,000
Maintenance of transmission system, including transformers	42,500
Track maintenance throughout.....	332,500
Total	$2,250,000

DEPRECIATION

Power house electrical machinery and cars, 4 per cent of $20,000,000.....	$800,000
Track, 4 per cent of $7,500,000.....	312,500
Buildings, ½ of 1 per cent of $27,500,000.....	137,500
Total	$1,250,000

GRAND TOTAL

Employees	$1,375,000
Power, material, etc.....	2,250,000
Depreciation	1,250,000
Total	$4,875,000

In figuring the cost of operation, the power plants are valued at $35,000,000.

To find whether the electrified line would pay, the total annual cost of $4,875,000 for 39,000 train-kms must be compared with the income from 300,000,000 passengers. If the average fare from each passenger is 2¼ cents, the annual income would be $6,750,000. This is equivalent to $1,875,00 on $35,000,000 + $20,000,000, or $55,000,000, which gives 3½ per cent. If the usual reduced rate tickets were sold, however, the income per passenger would drop to 1¾ cents and the total income would be reduced to $5,250,000. The interest rate would then be so low (.7 per cent) as to make the electrification impracticable. Dr. Reichel, therefore recommends that no reduced rates should be given, following the practice of the Berlin elevated railway; the system would then pay.

THE FIRE PROBLEM OF CAR HOUSES

BY P. J. McKEON

Many of the fires in street railway car houses which have been so prevalent lately are the inevitable result of a too frequent neglect of the fire danger. Conditions in many car houses are left to take care of themselves, or the responsibility for the fire safety of the buildings is put on a man who is already preoccupied with his usual duties, and, moreover, can hardly be expected to be familiar with the special necessities of fire prevention. For instance, an examination of a car house which was destroyed by fire during the last twelve months reveals a brick division wall between two bays, but with the openings not protected. If this wall had been made a fire stop, at least half of the building could have been saved. In another case the nearest hydrant to the fire was some 500 ft. away. In an existing car house with which the writer is acquainted the only way for the firemen to get upstairs is by a single iron ladder hidden away in the building so that only those who are acquainted with the premises know where it is located.

The problem of car house protection is especially troublesome because the use of electricity involves a source of fire that is difficult to regulate and which calls for a high degree of care and attention in construction and inspection. Moreover, the necessity for repair work, such as painting and carpentery, and the cleaning operations, introduce many fire causes, while the presence of numerous employees means another source of danger.

Operating necessities call for large open structures, and this feature, joined with the inflammable quality of the cars, seriously complicates the putting out of a fire. The average car house exceeds 100 ft. x 100 ft., or 10,000 sq. ft., and a fire in this area quickly gets beyond the control of the firemen unless they arrive promptly after it has started. The smoke fills the building rapidly, and it is difficult for the firemen to get close enough to it to direct their hose streams. The fire is thus enabled to get a start and in a few minutes will spread throughout the building and the firemen are forced to fight it from the street, which means that it is only a question of minutes before the whole structure will collapse. The large area as a handicap to firemen is supplemented by the construction of the cars. They are simply huge wooden crates with considerable hollow space made

by the seats and the compartments. The openness of the cars creates a natural draft which helps the action of the fire, while the amount of varnished woodwork in a car hastens the spread of the flames. A car not only burns quickly and fiercely, but it is difficult to extinguish. Hose streams, except at a short distance, are broken by the framework and lose their effectiveness. To put out a fire, the whole car has to be pulled apart and the fire extinguished piecemeal.

In the improvement of car houses from the fire standpoint, the cutting down of the area of the building is a prime essential. This is advocated by the insurance interests as an underwriting measure, but it is also a necessity as an assistance to the firemen. The proposal is sometimes opposed by managers on the ground of operating necessities, but a study of car house design will invariably show ways of increasing fire safety without interfering with the running of the cars. Automatic sprinklers are now coming into extended use and will soon come to be considered as indispensable for car houses as they are in mills and department stores. Their use, however, often tends to a neglect of other precautionary measures which should not be overlooked. These latter include the proper construction of the building with a view to stopping the spread of fire, care and maintenance with a view to removing the preventable causes of fire, and an efficient system of fire inspection. A fire in a car house means a loss that cannot even partially be covered by insurance, and this makes it all the more necessary for street railway companies to follow the principle of self-protection against fire.

MEETING OF STANDARDIZATION COMMITTEE

A meeting of the committee on standards of the American Street and Interurban Railway Engineering Association was held at the Hollenden Hotel, Cleveland, on July 26 and 27. The meeting was called by the chairman, W. H. Evans, of the International Traction Company, of Buffalo, who announced the subjects assigned to the committee to be considered at this meeting were as follows::

1. "Standard Axles, Journals, Journal Bearings and Journal Boxes."
2. "Standard Brake-Shoes, Brake-Shoe Heads and Keys."
3. "Standard Sections of Treads and Flanges of Wheel."

The meeting was also attended by the sub-committee on standard rails of the way committee of the Engineering Association, on account of the close relation of rails and special work with the most desirable flange and tread of wheel to adopt. The members of the standardization committee in attendance were Messrs. W. H. Evans, of Buffalo; R. C. Taylor, of Anderson, Ind.; J. M. Larned, of Pittsburg; H. W. Blake, of New York, and C. B. Fairchild, Jr., of Cleveland. Messrs. Wallerstedt, Benedict and Fleming found it impossible to be present. The way committee was represented by Fred G. Simmons, of Milwaukee; Charles A. Clark, of Buffalo; Julian Griggs, of the Scioto Valley Traction Company, of Columbus, and E. O. Ackerman, of the Columbus Railway & Light Company, Columbus. H. H. Adams, president of the American Street and Interurban Railway Engineering Association and B. V. Swenson, secretary of the American Street and Interurban Railway Association, were also in attendance.

Upon invitation a number of representatives of the principal manufacturers of trucks, journal boxes, brake-shoes, motors, wheels, etc., were present. Among those who took part in the discussion were the following:

Representing the brake-shoe industry, F. W. Sargent, chief engineer, and J. S. Thompson, engineer of the Chicago office of the American Brake Shoe & Foundry Company; A. G. Olberding, president of the Columbia Brake Shoe & Foundry Company.

Representing the cast wheel manufacturers, P. H. Griffin, general manager of the New York Car Wheel Works, and J. B. Rhoades, president of the National Car Wheel Company.

Representing the steel wheel manufacturers, N. B. Triste, of the Schoen Steel Wheel Company, and E. Sidney Lewis, of the Standard Steel Works.

Representing the electrical manufacturers, E. D. Priest, of the General Electric Company, and N. W. Storer, of the Westinghouse Electric & Manufacturing Company.

Representing the journal box manufacturers, A. H. Weston, of the T. H. Symington Company.

Representing the truck builders, Walter S. Adams, of the J. G. Brill Company.

Representing the manufacturers of rails and special work, Victor Angerer, of Wm. Wharton, Jr., & Company; William C. Cuntz, of the Pennsylvania Steel Company, and E. B. Entwistle, of the Lorain Steel Company.

On Friday morning the subject of axles was continued. On Friday afternoon, journals, journal boxes, brake-shoes, heads and keys were taken up. On Saturday morning the subject of wheels was considered, and on Saturday afternoon the whole subject was reviewed.

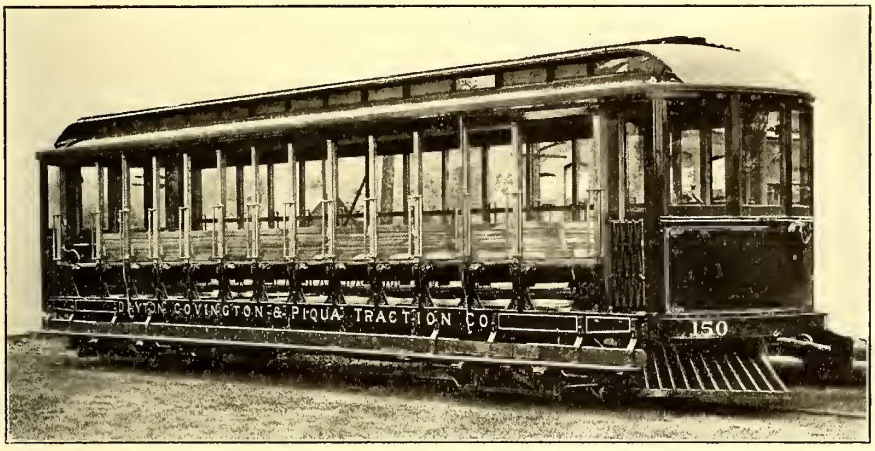
The work of selecting standards was very materially advanced by the discussion, but it was decided not to take final action on the recommendations of the committee until after another joint meeting to be held by the committee and the representatives of the manufacturers on Sept. 13 and 14 in New York. A detailed account of the decisions reached at the Cleveland meeting will be published in an early issue of this paper.

Through the courtesy of a number of supply men in Cleveland, those who attended the meeting were entertained Friday evening at White's restaurant, near Elyria, at a dinner. The guests were conveyed by a special car on the Cleveland & Southwestern Railway, furnished through C. N. Wilcoxen, general superintendent of the company.

The last link of the trolley system joining New York to Lewiston and Bath, Maine, was forged on Sunday, July 20, when, as previously stated in the Street Railway Journal, the Atlantic Shore Line Railway was opened between York Beach and Kennebunk. Two years ago the Atlantic Shore line, which had built a road from Sanford, Kennebunk, Cape Porpoise and Biddeford, purchased the Portsmouth, Dover & York Electric Railway, and all became known as the Atlantic Shore Line, with two divisions. Plans were made at once to connect the two divisions and at the same time supply the missing link in the trolley system. To do this it was necessary to build a road 15½ miles long. The work was started a year ago. A physical connection has been made with the Boston & Maine Railroad at Wells depot, so that freight cars can be shifted to the electric road. The line from York Beach to the junction of the old line at Kennebunk is just 16½ miles long. The company has three electric locomotives which are used for hauling freight and express. The power for this new link of road is obtained from a waterpower at Old Falls, in Kennebunk, of 2000 hp, and a lesser one at Stanford. There is also a steam plant of 500 hp at Kennebunk, besides the steam plant of the old western division at Kittery Point.

NEW CARS FOR THE DAYTON, COVINGTON & PIQUA RAILWAY

The Wason Manufacturing Company has recently delivered to the Dayton, Covington & Piqua Railway a number of open-vestibuled cars, one of which is shown in the illustration. The short platforms indicate that none but the motorman and conductor will stand on these places. Attention is called to the style of grab handle used, which, in addition to keeping down the over all dimensions of the car, affords a safer and more convenient hold than the single type of grab handle. It is not always that both vestibules and bulkheads are furnished in cars of this class, but when they are, as in the present case, the passengers are protected the more in inclement weather. The steam car roof was adopted because it is considered to afford better protection than the usual monitor deck. Mahogany forms the interior finish; ceilings are of maple. The trucks are the builder's 21-A type with 4-ft. wheel base; the motors are of 50-hp capacity each. The chief dimensions follow: Length over end posts, 35 ft. 2 ins.; over vestibules, 41 ft. 6 ins.; width over sills, including sheathing, 7 ft. 1 in.; size of side sills, 5½ ins. x 8¼ ins.; end sills, 3¾ ins. x 8½ ins.; sill plates, 8 ins. x ¾ in.



CAR FOR DAYTON, COVINGTON & PIQUA COMPANY

The line over which the cars described will run is one of the network of interurban roads converging at Dayton. Covington is in the neighborhood of 25 miles from Dayton, and midway between these points is the company's power station at West Milton; from Covington to Piqua is another 8 miles. At West Milton is also located an amusement park, owned by the traction company, to which property many additions have been added this year. At Piqua, electric railway connections can be made with various points north, including Toledo via Lima and Findlay.

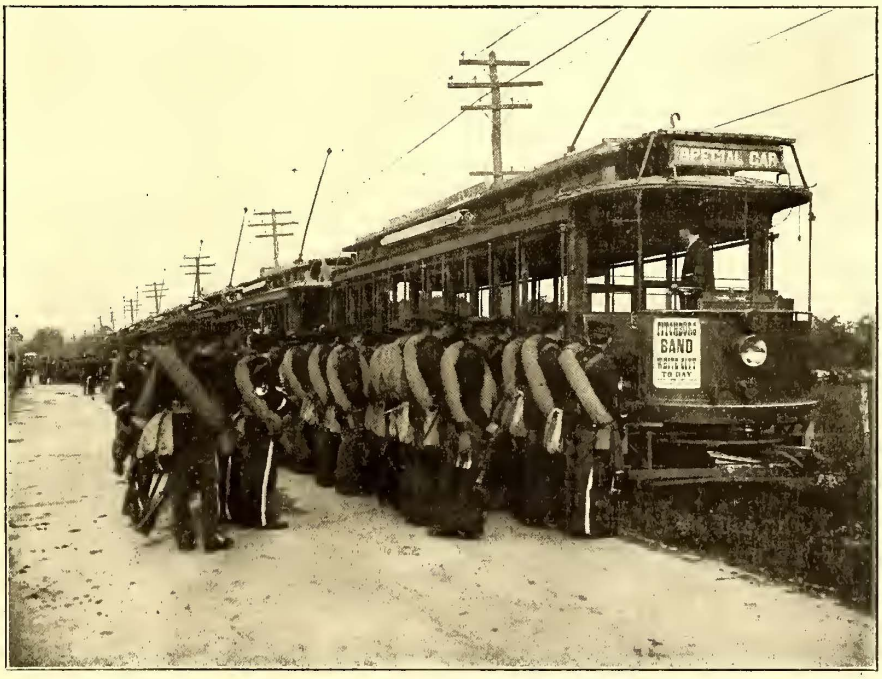
It is reported that the City Council has agreed to the combining of all lines owned by the Canadian Railway, Light & Power Company in Rio de Janeiro.

A TOURIST BUREAU IN BOSTON

A general tourist information bureau has been established in the Old Colony Bookstore Building, corner of Washington and School Streets, Boston, under the management of Thomas P. Patrick and Robert H. Derrah, both of whom are well known in railway circles. Mr. Derrah began his railway carreer with the West End Railway Company sixteen years ago in the office of Henry M. Whitney, where he remained for ten years. He was also passenger agent of the Boston & North and Old Colony Street Railways. His street railway guide has been a standard publication for many years. Mr. Patrick was connected with the Southern Pacific and other steam railroads as traveling passenger agent for fifteen years. This office will furnish information regarding trolley, steam, steamship lines, summer hotels, seashore and country resorts, etc.

HANDLING TROOPS ON THE BOSTON & WORCESTER RAILWAY

The handling of troops on the Boston & Worcester Street Railway plays quite an important part in the company's business. Last season 110 carloads of soldiers were dispatched over the lines, consisting of three entire regiments, and the majority of other regiments in camp at the time. The cars used for this service were built by the J. G. Brill Company and contain the builder's "Narragansett" double-step feature which tends greatly to facilitate the handling of just such crowds as mentioned. Seven new cars of this type have just been put on the lines and are generally similar to those illustrated, although they have the added comfort of spring-cane cushions. The cars are mounted on the 27-FE1 truck and measure over the bulkheads 37 ft. 5¼ ins., and 44 ft. 3¼ ins. over the vestibule sheathing.



HANDLING TROOPS ON THE BOSTON & WORCESTER RAILWAY

A PLAN FOR NOTIFYING PASSENGERS WHERE THERE ARE VACANT SEATS

The Cleveland Electric Railway Company has announced through its organ, "The Trolley," that the question will be taken up by the company of facilitating the loading of open cars by means of a series of signals indicating to passengers the location of empty seats. The delay caused by passengers scanning a car for seats has always been a source of annoyance in the operation of open cars, and the result of the Cleveland experiment will be watched with interest.

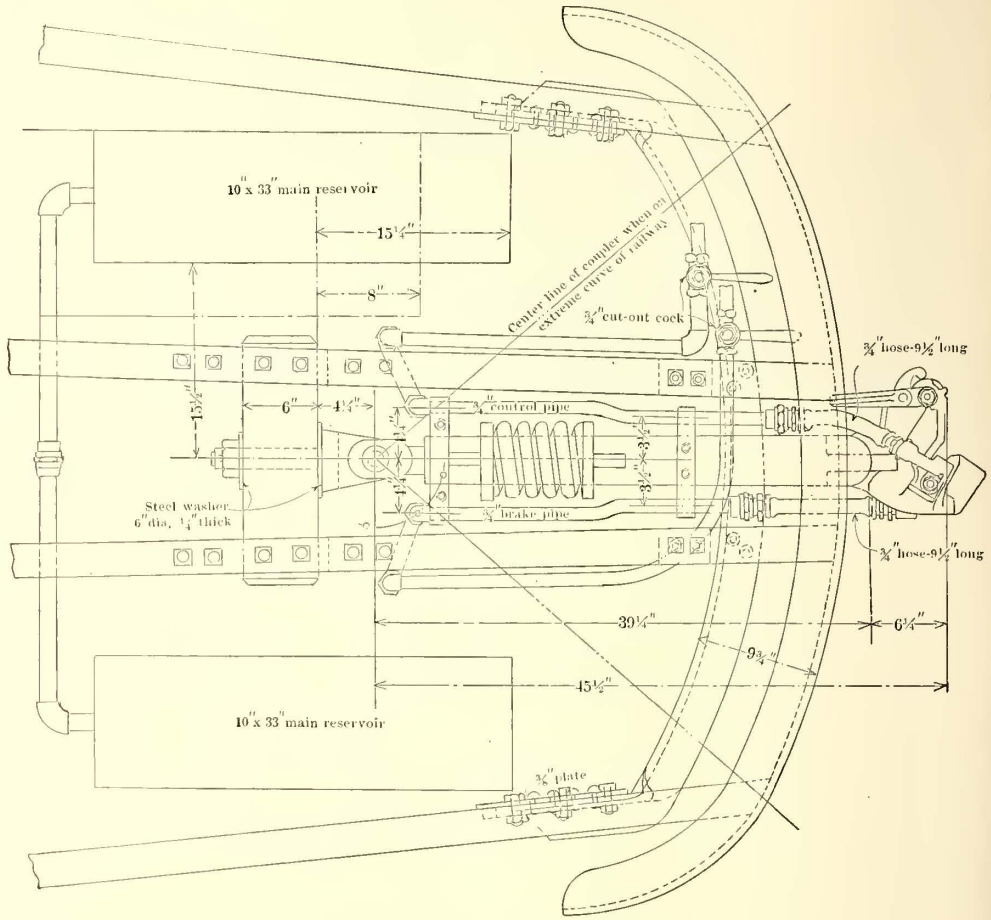
The decision to consider a plan of this kind is the result of a competition recently conducted by the company in which a prize of $25 was offered for the best practical suggestion for service betterment. The suggestion that won the prize follows:

"During the summer months, when open cars are run, much time is lost while prospective passengers look for seats. Frequently passengers walk on the street almost the full length of the car and then finally crowd into a row already fully occupied, while there are seats in neighboring rows. To overcome this, have each row of seats plainly numbered, where the numbers can be read from the street. Make it the duty of the conductor, as the car approaches a transfer point, to note in which rows there are vacant seats, and then let him notify passengers by numbers where the vacant seats are located. This will save time and will prevent much unnecessary standing, especially by women, who cannot climb along the running board after the car is in motion."

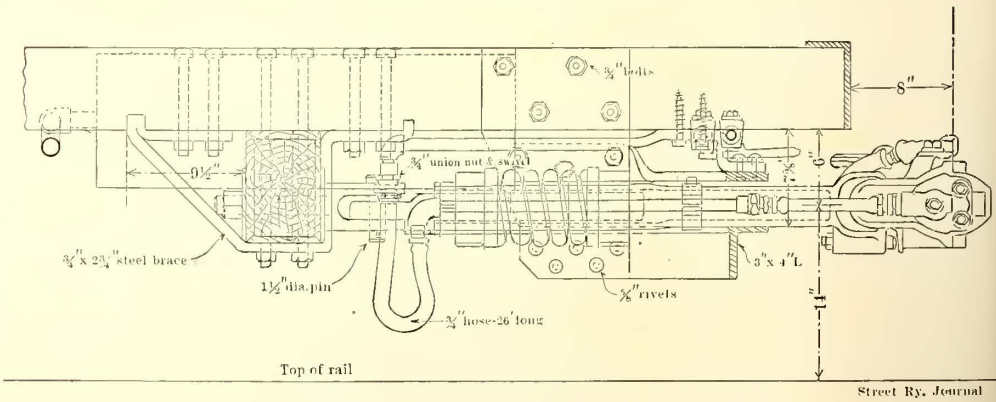
It is announced that the Manhattan Transit Company, of New York, will begin in September the operation of a line of gasoline autobuses from the Cortlandt Street Ferry across the Brooklyn Bridge to the Flatbush Avenue station of the Long Island Railroad. The company will also run a line on Fifth Avenue, from 125th Street to Fourteenth Street, and thence across town on both East and West Fourteenth Street, and from Fourteenth Street down Broadway to the City Hall and across the Brooklyn Bridge to the Brooklyn Borough Hall. The company is to start with twenty 'buses.

AUTOMATIC CAR AND AIR COUPLER

An account was published in the Street Railway Journal for June 29 of the combination car and air coupler recently designed for electric traction service by the Westinghouse Air Brake Company, and exhibited at the Lake Champlain convention of the Street Railway Association of the State of New York. It is possible in this issue to present side elevation and plans of the coupler, indicating its construction.



PLAN OF CAR AND AIR COUPLER

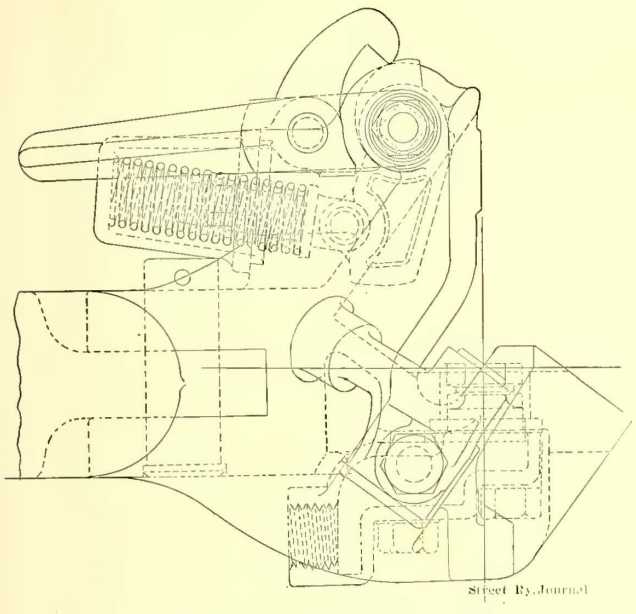


SIDE ELEVATION OF CAR AND AIR COUPLER

As stated previously, the coupler is suitable for the short radius curves and sharp changes in grade encountered in electric traction work. It is of cast steel and as shown is hollow to provide for one of the air couplings, the other being on the top of the draw-head. The heads are coupled by two cams, each of which engages with the surface of the opposite coupler so that a double positive locking is secured.

The heads of the draw-bars are so pointed that even if they are out of alignment 6 ins. or 7 ins. on a horizontal plane or 1½ ins. in a vertical plane, they will come together and automatically lock into each other. The air connections are provided with the usual rubber gaskets which are not subject to sliding wear, but to direct compression. The other features of the coupler and the places in which it is in use, including Boston and New York City, were published in the previous issue referred to.

The coupler possesses all the advantages of an automatic



DETAIL PLAN VIEW OF COUPLER

coupler, such as a saving in time and the elimination of danger to employees. Other special advantages claimed for it are that the car and air connections are made and unmade simultaneously, that cars varying in height can be coupled or uncoupled on straight or curved track, and when coupled all slack is eliminated; that the air connections are always accessible, and that if the lock on one coupler should become disarranged the other will prevent the cars from becoming uncoupled except in the usual manner.

ILLINOIS TRACTION COMPANY BEGINS INTERURBAN SLEEPING CAR SERVICE

The Illinois Traction Company has put in service two interurban sleeping cars between Bloomington, Ill., and St. Louis via Decatur and Springfield. The cars were built in the shops of the company in Bloomington. They are of attractive design and are well equipped in every particular. The floor of the car is double and is packed with mineral wool to deaden the sound. The windows are of double plate, and the wiring is carried in conduits. The interior of the car is very interesting. All old ideas and methods in the arrangements of berths have been obliterated. Each double berth is a stateroom in itself. There are two chairs in each section, and the combination of the two make up the lower berth. The upper berth is secured by lowering the frame from the upper part of the car. There is a space of 12 ins. between the curtain and the edge of the couch. The curtains are of wood covered on the inside with flowered cretonne, and on the outside with cloth. They roll up by means of spring rollers and are completely hidden from view during the day. There is a four-lamp series of incandescent bulbs for each berth. There are twenty berths, ten on each side, and in addition there are four comfortable chairs in the smoking room. The sleepers are now making alternate trips between Bloomington and St. Louis, one leaving each city every night.

QUARTERLY MEETING OF NEW YORK STATE ASSOCIATION

The next or fifth quarterly meeting of the Street Railway Association of the State of New York will be held at Kingston, N. Y., Sept. 21, 1907. The subjects selected for discussion are: "Interurban Rules," "Express Rates and Service," "Collection and Registration of Interurban Fares." These are particularly live subjects just at the present time, and it is thought there will be a large attendance.

PROGRESS ON THE NEW BOSTON POWER HOUSES

The Stone & Webster Engineering Corporation, of Boston, reports that work is progressing rapidly on the Boston Elevated Railway Company's power stations at Charlestown, Lincoln Wharf and Cambridge. The Charlestown power station is an extension of the present station with room for two 2700-kw vertical engine driven units, and eight 600-hp boilers. Only half of this equipment is being put in at present however. The building walls are up and the roof is on, and the chimney, 12 ft. in diameter by 200 ft. high, is practically completed. Four Babcock & Wilcox boilers have been erected and are nearly ready for brickwork and piping connections. The erection of the piping is already under way. All machinery foundations are in place, and the main driving shaft of the engine and the armature spider for the generator have arrived and will be placed within a few days. Work upon the engine, which is being built by McIntosh, Seymour & Company, of Auburn, N. Y., is being pushed forward as fast as possible. It is planned to have this station in complete operation about Nov. 1.

The extension to the Lincoln Station will contain 5400 kw in apparatus made up of two units of 2700 kw each. The engines are of the vertical Corliss type, made by the William Tod Company, of Youngstown, Ohio. The base plates and shaft for the first engine have arrived and are now being erected. The spider for the first generator is also on the ground, and the work of building up the armature will proceed as soon as the shaft is placed in its bearings. It is expected that the second engine will come forward in August. There will be eight 600-hp Babcock & Wilcox boilers in this new portion of the station. The chimney, 13 ft. in diameter by 250 ft. high, is completed and awaits the flue connections.

Owing to delays in securing permits to build from the Cambridge city authorities, work on the Harvard Square power station was not started until seven weeks after the other two jobs, and the station is, therefore, not so far advanced. The foundations are in, the structural steel erected, and the masons are at work on the brick superstructure, which will be pushed forward as rapidly as possible, and the building got ready for machinery about Aug. 15.

In addition to the above work, the Stone & Webster Engineering Corporation has in hand a wharf and a 5000-ton elevated coal pocket with tracks, conveyors, etc., for the Boston Elevated Railway Company. Plans are nearly completed for this work, and construction will be started as soon as the material can be obtained.

LEGAL DEPARTMENT*

SAFETY AND HEALTH APPLIANCES

The case of Beaumont Traction Company vs. State in the Court of Civil Appeals of Texas (103 S. W. 238), is a recent illustration of a class of decisions holding that it is within the police power of a State to enact that a street railway company shall provide its cars with appliances that are reasonably necessary for preserving the health of employees operating them. This case passed upon a statute requiring the equipment of cars with vestibules during the winter months for the protection of motormen from the weather, and it was held that the law was constitutional. The court cites and relies upon State vs. Whitaker (160 Mo. 59), in which it was held that a statute directing companies owning or operating electric street railways to provide their cars with screens for the protection of motormen during certain cold months, and applying to every part of the State alike, is not unconstitutional as class legislation, simply because it applies only to electric cars, and not to cable cars. In the course of its opinion in the Whitaker case the Supreme Court of Missouri observed:

Learned counsel urge, however, that courts "are not required to shut their eyes to matters of common knowledge or things in common use." Conceding this, is it not generally known that on a cable car the gripman stands back near the center of the car, in a box which protects the lower half of his body, and is protected by the roof of the car in rainy or snowy weather, and that this grip car is constantly used by passengers in getting on and off the train, whereas the motorman on an electric car stands in front, with his attention necessarily given to the means of controlling the motive power and the brake, and is much more exposed to the cold and inclement weather of our winters than the gripman on the cable car, and are we to assume the Legislature did not consider this difference, or their finding that there was such a distinction was contrary to the fact beyond a reasonable doubt? We think not. It cannot be questioned that in the exercise of its police power the Legislature may enact laws to protect the health and safety of our citizens by all reasonable regulations and when a given subject is within that power, the extent to which it is to be exercised is within the discretion of the Legislature. It is not insisted that it is not a wise and most humane provision for the protection of those whose avocation requires them to stand in front of a rapidly moving car on a bitter cold day, often with the mercury below zero, but merely that it does not apply to all who may suffer in similar callings.

We think the Legislature had the right to make the classification it did, and we have no power to hold it contravened the Constitution in so doing.

These decisions are similar to those in which special regulations of hours of labor for laborers in mines are held valid under the police power. Classifications and distinctions which are merely arbitrary are properly condemned as denying the equal protection of the laws. But when a legislative measure aiming at the conservation of the safety and health of a class of workmen may be seen to have some special and apparently substantial relation to the physical conditions under which their work is performed, the statute will usually be upheld as constitutional.

The Supreme Court of the United States has held that legislation restricting hours of labor by employees of bakeries is not within the police power, because the conditions under which they work are not extraordinary. Whether a given statute will be treated as valid or invalid, must, of course, depend upon the circumstances of the case. In many localities motormen of street cars are subjected at times to greater extremes of cold than bakers are to extremes of heat. It is believed that "vestibule" and "screen" legislation for the protection of employees of trolley cars will generally be held within the police power.

* Conducted by Wilbur Larremore, of the New York Bar, 32 Nassau Street, New York, to whom all correspondence concerning this department should be addressed.

LIABILITY FOR NEGLIGENCE.

KENTUCKY.—Carriers—Injury to Passenger—Setting Down Passenger — Contributory Negligence — Evidence — Sufficiency.

1. A passenger on a street car at night informed the conductor that he desired to alight at a certain street, but he was carried by, and the conductor then refused to back the car or to permit the passenger to remain on the car until it returned to the desired street, but instructed plaintiff to walk to a certain light, which he pointed out, and then turn in a certain direction, stating that such course would take the passenger to his destination, and the passenger, while following such directions, walked upon a trestle and fell through it, whereby he was injured, not having known, owing to the darkness, that he was on a trestle when he fell, held, that the carrier was liable, as it was its duty to see that the passenger got safely to the desired street.

2. The evidence was sufficient to sustain a finding that the passenger was not guilty of contributory negligence.—(Kentucky & I. Bridge & Ry. Co. vs, 100 S. W. Rep., 328.)

MASSACHUSETTS.—Street Railways—Injury to Persons Crossing Track—Contributory Negligence.

A verdict was properly directed for a street railway company, where plaintiff sued for injuries received by being struck by a car while crossing the track to board a car going in the opposite direction, where he could have seen the approaching car had he looked.—(Fitzgerald vs. Boston Elevated Ry. Co., 80 N. E. Rep., 224.)

MASSACHUSETTS.—Carriers—Injuries to Passenger—Contributory Negligence.

1. A street car passenger was knocked from the running board of a car by the sudden starting of the car after it had slowed down. He was accustomed to ride on cars and knew that the car would not stop until it reached a particular point. After the car had slowed down he reached for a package, and as he clasped it there was a plunge forward of the car. There was no defect in the car or tracks, and there was no evidence of incompetency of the servants. Held insufficient as a matter of law to show negligence on the part of the company.

2. A street car passenger was, without negligence on the part of the company, knocked from the running board where he was standing, and a fellow passenger in a collision with him was knocked off and injured. Held, that the fellow passenger could not recover from the company for the injuries received.—(Sanderson vs. Boston Elevated Ry. Co., Atchison, vs. Same, 80 N. E. Rep., 516.)

MASSACHUSETTS.—Courts—Federal Courts—Authority of Decisions of State Courts—Street Railways—Injury to Person at Highway Crossing—Contributory Negligence—Question for Jury.

1. Upon the question of the care required of a traveler on a highway on approaching a street railway crossing, the local decisions are persuasive in a Federal Court.

2. A buggy in which plaintiff was driving was struck by a street car on defendant's line upon a highway crossing. When plaintiff passed a building 33 ft. from the track, he could see along the track in the direction from which the car came but 60 ft., because of an intervening building; while at a distance of 20 ft. from the track he could see 1200 ft. At some point after passing the building not precisely shown, he looked up the track and did not see nor hear any car approaching. There was evidence tending to show, and which justified a finding, that the car was being run at excessive speed. Held that, under the law of Massachusetts as established by decision, the question of plaintiff's contributory negligence was one for the jury.—(Milford & U. St. Ry. Co. vs. Cline, 150 Fed. Rep., 325.)

MASSACHUSETTS.—Street Railways—Injuries to Lineman — Warning — Contributory Negligence — Evidence — Opinion Evidence—Facts or Conclusions—Notice—Custom—Surroundings—Appeal—Exceptions—Necessity.

1. Plaintiff, a telegraph lineman, incumbered by a hand line attached to a coil of wire, was directed to climb a crooked telegraph pole, located between the double tracks of defendant street railway. Before he started to ascend he saw defendant's car, which afterwards struck him, approaching at a distance of 150 ft., and appearing to be going at about 10 m. p. h. Plaintiff did not notice that the pole slanted toward the track on which the car was running, but relied on his foreman to notify the car to stop or notify him of any impending peril while he was on the pole. This the foreman did not do, and, as plaintiff

climbed to the center of the curve of the pole, the roof of the car struck his hips and threw him to the ground. Held, that plaintiff was entitled to rely on his foreman to protect him from danger, though the foreman was not in any manner connected with defendant, and that plaintiff was, therefore, not guilty of contributory negligence as a matter of law.

2. Where plaintiff, a telegraph lineman, was struck and thrown from a curved telegraph pole by a passing street car as he was ascending the pole, his answer, when asked why he went up the side of the pole that he did, that it "was the safe side to go," should be construed to mean that he so understood it at the time, and was therefore admissible as a reason for his act.

3. In an action for injuries to a telegraph lineman by being struck by a street car while he was climbing a telegraph pole, evidence as to a custom of giving notice of danger to linemen by men on the ground was admissible, as bearing on the issue of plaintiff's due care, though the action was not against plaintiff's employer.

4. In an action for injuries to a telegraph lineman by being struck and thrown from a pole by defendant's street car, evidence that flags were stationed to notify people, and particularly cars, that there was dangerous construction going on, was admissible to show the surrounding conditions.

5. An objection to the court's charge cannot be reviewed on exceptions, where no exception was taken thereto. —(Ahearn vs. Boston Elevated Ry. Co.,80 N. E. Rep., 217.)

MASSACHUSETTS.—Carriers—Street Car Passengers—Duty of Conductor.

Though a street car conductor's duty towards an alighting passenger is not discharged by merely waiting a reasonable time before starting the car, and he must exercise reasonable care to see that the passenger is off the car before starting it, he is not bound to see that the passenger has alighted, being required only to exercise the highest degree of care consistent with the proper transaction of the company's business.—(Millmore vs. Boston Elevated Ry. Co., 80 N. E. Rep., 445.)

MASSACHUSETTS.—Municipal Corporations—Street Alterations—Closing to Travel—Barriers—Contributory Negligence.

Where a city and a street car company, while paving a street at a crossing, placed suitable barriers to warn the public that the street was closed to travel, they were not liable to plaintiff, who passed such barriers on a bicycle and was injured by falling over an obstruction onto the street car tracks.—(MacFarlane vs. Boston Elevated Ry. Co., Same vs. City of Cambridge, 80 N. E. Rep., 447.)

MASSACHUSETTS.—Carriers—Street Railroads—Injuries to Passengers—Negligence.

Plaintiff, a street car passenger, was required to transfer from one car to another, because of repairs being made by another street railway company in the street. As plaintiff stepped down from the car, the ground under her sunk in somewhat and she was thrown to the ground. Plaintiff testified that when she started to alight it appeared to her that everything was all right, and there was nothing with reference to the character of the street to show that the conductor should have known that the ground was defective. Held, that such facts were insufficient to show negligence on the part of the carrier.—(Rose vs. Boston & N. St. Ry. Co., 80 N. E. Rep., 580.)

MICHIGAN.—Street Railroads—Injuries to Travelers—Contributory Negligence—Failure to Look—Question for Jury.

1. One who steps or drives on a railroad immediately in front of an approaching street car and is struck, when, had he looked before so attempting to cross, he must have seen the proximity of the car and appreciated the necessary consequences of his act, is chargeable with negligence as a matter of law.

2. Where, at the time plaintiff turned to cross a street car track, the car by which he was struck was more than 200 ft. away, and at the time of the collision was running at an unusual, if not an unlawful, rate of speed, whether plaintiff was negligent in failing to look a second time as he was about to drive on the track was for the jury; plaintiff not being required to refrain from crossing because the car was in sight.—(Wider vs. Detroit United Ry., 111 N. W. Rep., 100.)

MISSOURI.—Damages—Mental Anguish—Fright—Carriers—Injuries to Trespassers—Children—Appeal—Instructions—Prejudice—Willful Injury—Bill of Exceptions—Motion for New Trial—Contents—Trial—Argument of Counsel—Curing Error.

1. In an action for mere negligence there can be no recovery for mental anguish and fright, where there is no bodily hurt.

2. Plaintiff, a girl of six years of age, was put aboard defendant's street car for transportation to another town, with a memorandum as to where she was going, pinned to her dress. The conductor, on ascertaining that she had no fare, ejected her on the outskirts of the town and left her by the side of the track. The conductor informed the conductor of the car going in the opposite direction that he had better take up the plaintiff and take her back to the street where she boarded the car. The day was bleak and wintry and when the conductor of the latter car found plaintiff she was very cold and frightened. Plaintiff was thereafter taken to her parents by a stranger. Held, that the conductor's act in ejecting plaintiff was willful and inhuman, and justified a recovery for fright and mental suffering, though plaintiff suffered no bodily hurt.

3. In an action against a street car company for the ejection of a child on a bleak winter day for failure to pay fare, an instruction making the defendant's liability to depend on whether it was guilty of "gross and reckless carelessness" was favorable, and not prejudicial, to defendant.

4. Where, in an action against a street car company for ejection of a child for failure to pay fare, the jury were required to find that the act was willful and malicious, and that it was an act of inhumanity, in order to entitle plaintiff to recover, and were also charged that, if the act was wanton and malicious, it would "justify" exemplary damages, the fact that the jury did not find exemplary damages did not establish that it did not find, in support of a verdict for plaintiff, that the conductor's act was malicious and inhuman.

5. Objections to argument of counsel, made in a motion for a new trial and supported by affidavits, without being incorporated in a bill of exception, cannot be reviewed on appeal.

6. In an action for injuries, a statement by plaintiff's counsel that certain testimony might be said to be manufactured of the same stuff as dreams are made of, and characterizing it as a baseless fabric of a dream, was not objectionable.

7. In an action for ejection of a child from a street car, plaintiff's counsel in argument referred to the child as having been thrown off the car, and to the conductor's treatment of her as inhuman and oppressive. On objection the court stated that there was no evidence that the child was "thrown off," whereupon counsel stated that he withdrew the statement, and did not wish to charge the conductor with having used personal violence in putting her off. Held, that any error in the statement made was cured.—(Harless vs. Southwest Missouri Electric Ry. Co., 99 S. W. Rep., 793.)

MISSOURI.—Trial—Question for Jury—Street Railroads—Injuries to Pedestrian—Instructions—Conformity to Evidence—Personal Injuries—Actions—Evidence—Sufficiency.

1. In an action against a street railroad for the death of one run over by a car, if the facts bearing on the question of contributory negligence admit of different constructions and inferences, the question must be left to the jury.

2. In an action for the death of one run over by a street car, the presumption is that decedent was in the exercise of due care and looked and saw the car.

3. In an action for the death of one run over by a street car, the motorman testified that decedent did not "seem to notice anything," and the conductor testified that he did not see her look, and the court instructed that if decedent, as she started across the tracks, saw the car, and it was at such a distance as not to imperil her, if not running in excess of the speed prescribed by ordinance, and she did not know it was running at a speed in excess of that prescribed by ordinance, and in the exercise of ordinary care in looking and listening would not have so known, and the car was in fact exceeding the speed mentioned, decedent had a right to cross the tracks, relying on the car being properly run, and that, using ordinary care in doing so, she was not negligent. Held, that in view of the presumption that decedent was using ordinary care, and notwithstanding the testimony of the motorman and conductor, the instruction was not objectionable as based on facts not in evidence and resting on conjecture.

4. In an action for the death of one run over by a street car, evidence held sufficient to sustain a finding that decedent could have crossed the track in safety if defendant's car had been run at the rate prescribed by ordinance.

5. In an action for the death of one run over by a street car, it was proper to refuse an instruction that the motorman was under no obligation to slacken the speed of his car or stop the

same because decedent was approaching the track, but that he had a right to proceed on the assumption that decedent would remain off the track in a place of safety, as the instruction ignored the fact that it was the motorman's duty to slacken the speed or stop the car upon seeing decedent in a place of danger, even though she might have been guilty of contributory negligence at the time.—(Powers vs. St. Louis Transit Co., 100 S. W. Rep., 655.)

MISSOURI.—Master and Servant—Injury to Servant—Contributory Negligence—Proximate Cause—Care Required of Employee—Evidence.

1. Where, in an action for the death of a motorman operating a car in a collision between his car and another car, the evidence showed that the deceased motorman could have seen the track for more than 700 ft. from a designated point, and that the accident occurred about 150 ft. therefrom, the presumption of due care on his part is overcome, and his contributory negligence established.

2. In an action against a street railroad for the death of a motorman in a collision with another car, based on the negligence of the railroad in commanding the motorman to make the run within a specified time, it appeared that the car was on time when the collision occurred, and was at that time running at the ordinary rate of from 5 to 6 miles an hour. Held, that the negligence, if any, on the part of the railroad in fixing the schedule for the running of the car, was not the cause of the accident.

3. A motorman operating a car on a single track is not relieved from the duty of exercising care in avoiding danger from a collision with another car operated on the same track and running in the opposite direction, irrespective of the question of the order the railroad gave to the motorman with respect to the running time of his car.

4. In an action against a street railroad for the death of a motorman in a collision with another car operated on the same track and running in the opposite direction, evidence examined, and held not to show negligence on the part of the railroad arising from its failure to give the motorman warning of the other car, or in failing to provide a rule by which the motorman would know of the presence of the other car.

5. An action against a street railroad for the death of a motorman in a collision with another car operated on the same track and running in the opposite direction, occurring shortly after the latter car had left the end of the line, based on the company's negligence in commanding the motorman to make his run within a specified time, and in failing to give him warning of the other car or to provide any rule by which he would know of the presence of the other car, cannot be sustained on the ground that the railroad negligently spaced the two cars that collided, for a uniform spacing of street cars is impracticable.—(McGahan vs. St. Louis Transit Co., 100 S. W. Rep., 601.)

NEW YORK.—Damages—Personal Injuries—Measure of Damages—Loss of Earnings.

The amount earned by one while working for a bookmaker in placing bets on horse races, in violation of Pen. Code, Sec. 351, immediately prior to an accident resulting in his personal injury incapacitating him from continuing in such work, cannot be considered in fixing the amount of his damages.—(Murray vs. Interurban St. Ry. Co., 102 N. Y. Sup., 1026.)

NEW YORK.—Carriers—Injury—to Passenger—Actions—Evidence—Weight and Sufficiency—Damages—Pleading—Issues—Proof and Variance—Loss of Earnings or Services—Trial—Misconduct of Counsel—Interruptions—Matters Not Sustained by Evidence.

1. In an action against a street car company for injuries received by being thrown from the car step, evidence examined, and held insufficient to sustain the finding that the servants of defendant were negligent.

2. Where a husband, in an action for injuries to his wife, alleged that her services, which he lost, consisted of keeping house for him, it was error to allow him to prove that she assisted him in his duties as janitor.

3. In an action by a husband for loss of services of his wife, the loss of wages by his daughters, who remained at home to perform the duties of his wife, was not proper proof of the reasonable value of the services of the wife.

4. In an action by the husband for loss of services of his wife, due to injuries, the wife was asked on cross-examination concerning the complaint in an action she brought against the defendant for the same injuries, and the husband's attorney stated, after the objection of the defendant's counsel, that the action had been dismissed owing to an error in the complaint, such conduct was improper, and calculated to prejudice the defendand in its right to cross-examine the witness without her being assisted by her counsel in explaining a verified declaration inconsistent with her testimony.

5. In an action against a street car company for personal injuries, it was error for the plaintiff's attorney to state, without any evidence to justify it, that defendants "had millions of capital," and "thousands of employees," and had failed to produce a passenger who saw the accident, and to dwell unduly on the fact that the conductor on the car did not give his right name on entering the employ of the company, referring to him as the man who committed a crime on entering that corporation.—(Keenan vs. Metropolitan St. Ry. Co., 103 N. Y. Sup., 61.)

TEXAS. — Witnesses — Cross-Examination — Scope — Evidence—Admissibility of Explanatory Facts—Street Railroads—Care Required—Sufficiency.

1. In an action for injuries to one run over by a street car, it appeared that there was an ordinance forbidding a greater rate of speed than 10 miles an hour, and the motorman testified that at the time of the accident he was running about 7 or 8 miles an hour, and on cross-examination he was asked whether the cars would run 10 miles an hour. Held that such cross-examination was proper.

2. Where, in an action for injuries to one run over by defendant's street car, the motorman testified that at the time of the accident he was running about three-fourths of the maximum speed of the car, it was proper to permit one who had tested the speed of defendant's cars to testify for plaintiff as to their maximum speed.

3. A street car company has no right to the exclusive use of that part of the street where the tracks are laid, and the company is bound to observe ordinary care to avoid injuring persons on and along its tracks.

4. In an action for injuries to one run over by a street car, evidence considered, and held sufficient to sustain a finding that plaintiff was not guilty of contributory negligence, and that her injuries were caused by the negligence of defendant.—(San Antonio Traction Company vs. Haines, 100 S. W. Rep., 788.)

TEXAS—Street Railroads—Injuries to Persons on Track—Negligence—Trial—Instructions—Inconsistent Instructions—Error Cured by Other Instructions—Evidence—Opinion Evidence—Matters Directly in Issue—Right of Way for Tracks—Exclusive Use—Instructions.

1. The failure of a motorman, upon discovering the perilous position of a person upon the track, to use all reasonable means within his power to avoid running him down, does not render the street railway company liable for injuries resulting from the collision, unless the use of such means would have avoided the collision.

2. In an action for injuries sustained in being run down by a street car, the court instructed that, if the motorman after the discovery of the perilous position of plaintiff did not use every means within his power, consistent with the safety of the car, to avoid a collision, then the street railway company was liable. There was evidence tending to show that the motorman did not discover plaintiff's peril in time to have avoided the collision, even had he used the means in his power to do so. Held, that the instruction was erroneous; and the error was not cured by the further instruction that the failure of the motorman, upon discovering the plaintiff's perilous position upon the track, to use all means within his power, consistent with the safety of his car, to avoid running him down, did not render the company liable, unless the use of such means would have prevented the collision.

3. In an action for injuries received in a collision with a street car, testimony "that the motorman tried to stop the car" is objectionable, as being merely the opinion or conclusion of the witness.

4. A street railway company has no right to the exclusive use of any part of the street upon which its track is laid, and all persons have equal right to use the same for travel over and across the street; and in the operation of its cars the company must use that care which a man of ordinary prudence would exercise under like circumstances.

5. Where, in an action for injuries received in a collision with a street railway car, there was an issue of contributory negligence, an instruction that a street railway company has no

right to the exclusive use of any part of the street upon which its track is laid, and that all persons have equal right to the use of the same for travel over and across the street, and that the street car company is bound to use ordinary care with respect to the particular circumstances, was proper.—(San Antonio Traction Company vs. Kumpf et al., 90 S. W. Rep., 863.)

TEXAS.—Evidence—Res Gestæ—Statements Before Accident—Opinion Evidence—Contribution—Joint Wrongdoers—Appeal—Record—Failure to Present Error—Ruling as to Evidence—Opinion Evidence—Management of Train—Trial—Objections to Evidence—Instructions—Applicability to Issues.

1. The remarks of a street car conductor made in the presence of passengers while the car was within a few feet of the railway crossing where the accident occurred and within a few seconds of the time when it occurred that "I will go to the front and see that every thing is all right so we will get across the railroad," and "I must go through to the front of the car and look out for headlights and engines," are admissible as a part of the res gestæ, in an action brought for injuries received in a collision between the street car and a railway train.

2. In an action for injuries received in a collision between a street car and a railway train, the railway conductor was asked: "When a street car is approaching a crossing, when will it appear that it is going to stop? When would it become apparent that there was danger of a collision when the street car was coming on M Street, like this?" Held, that the question was objectionable, as calling for an opinion of the witness.

3. In an action for injuries received in a collision, a witness for the railway company, who had made a test at the scene of the collision for the purpose of testifying, was asked whether or not it would be possible for a man standing 30 ft. from that crossing, as he stood, listening for the train, not to hear it as it approached the crossing. Held, that the question was objectionable, as calling for an opinion of the witness.

4. Where the negligence of a traction company, and that of a railway company both appear to have been the proximate and concurrent causes for collision, neither is entitled to contribution, as against the other in the event of either being held liable to a person injured.

5. Alleged error in the admission of testimony will not be considered where the record does not disclose what objection was made thereto.

6. In an action for injuries received in a collision, it is competent for an experienced railroad man to testify as to whether or not a street car can be stopped in a much shorter space than a steam locomotive or a number of cars.

7. In an action for injuries received in a collision between a street car and a railway train, a witness was asked to state whether or not, in his experience as a railroad man, when a railroad train is approaching a crossing, and a street car is approaching the same crossing, so that it would appear that one or the other must stop, he ever knew the train to stop to let the street car pass. The question was objected to on the ground that the witness had shown that he did not see the car until it had passed, and therefore he could not answer the question. Held, that the objection was inapplicable and properly overruled.

8. In an action for injuries received in a collision between a street car and a railway train against both the traction company and the railway company, there being no issues between the two defendants, and neither of them seeking a judgment against the other, an instruction on behalf of the traction company that, as between themselves that company owed the railway company the duty to exercise such care to avoid the collision as a person of ordinary prudence would exercise with reference to a similar matter, was properly refused.—(Northern Texas Traction Company et al. vs. Caldwell, 99 S. W. Rep., 869.)

WASHINGTON.—Street Railroads—Injuries to Persons on Track—Care Required—Instructions—Appeal and Error—Review—Failure to Present Question Below—Instructions.

1. Where a motorman sees a man ahead of him near the track or approaching it, and there is nothing to indicate any inability on his part to care for himself, the motorman has a right to assume that the other will act as a prudent man would and it is not incumbent on the motorman to stop the car until he sees that the other is in a position of apparent danger.

2. In an action against a street railroad for injuries to one struck by a car, it was not error for the court to fail to embody the "last chance" doctrine in the instructions on contributory negligence.

3. Ballinger's Ann, Codes & St. sec. 4993, provides that the court shall charge the jury on the law of the case. Held, that, where a party failed to request any further or more specific instructions than those given by the court, he could not be heard to complain on appeal that the charge did not cover a certain phase of the case.—(Duteau vs. Seattle Electric Company, 88 Pac. Rep., 755.)

CHARTERS, FRANCHISES AND ORDINANCES.

ILLINOIS—Municipal Corporations—Debt Limit—Constitutional Provisions—Effect—Special Taxes—Nature of Property—Public Property—Granting of Use of Streets—Power to Grant Franchises.

1. Hurd's Rev. St. 1905, p. 438, c. 24, known as the "Mueller Law," giving every city in the State the power to own and operate street railways, provides, in order to obtain funds with which to acquire and equip them, that the city may issue street railway certificates not constituting the obligation of the city, but payable solely out of the revenues from the street railway property for the acquisition of which they were issued, and, to secure their payment, may convey by way of mortgage or trust deed all street railway property. An ordinance of the city of Chicago of Jan. 18, 1906, supplemented by an ordinance of May 28, 1906, makes provision for the issue of $75,000,000 in street railway certificates secured by a trust deed, providing that in case of default in the payment of the certificates "there shall be a sale of all the property * * * mortgaged," and the purchaser at such foreclosure sale shall have the right to construct and operate the street railways thereby mortgaged for twenty years after the sale. Held, that the trust deed giving the right to the purchaser at a foreclosure sale to maintain and operate street railways constitutes a security on valuable property of the city not derived from the issue and sale of the secured certificates, and hence the certificates, when issued and sold, and the trust deed given to secure them, constitutes an increase of the city's debt within the meaning of Const. 1870, Art. 9, Sec. 12, providing that no municipal corporation shall become indebted in the aggregate exceeding 5 per cent of the assessed value of its taxable property.

2. Street railway certificates secured by a trust deed giving the right to take the street railway property and operate a street railway in the city streets, if the city defaulted in the payment of the certificates, would be chargeable upon the property of the city and not upon that of individuals, and hence the principle involved in special assessments, the warrants for which do not constitute indebtedness of the city within the meaning of the constitutional inhibition, does not apply.

3. The mortgaging by a city of the right to use its streets for street railway purposes, to secure the payment of such street street railway certificates, is not a grant of their use as a gratuity, so as to bring the act within the rule that a court of equity will not interfere with the city in making grant of the use of its streets as a gratuity.—(Lobdell et al. vs. City of Chicago et al., 81 N. E. Rep., 354.)

INDIANA.—Eminent Domain—Compensation—Persons Entitled.

Act 1901, Sec. 5, authorizes the street railway companies to exercise the right of eminent domain, and provides that the company shall deposit with a designated officer a description of the rights and interests to be appropriated, and that such lands, rights, and interests shall belong to the company, to use for the purpose specified by making or tendering payment. The section further provides that, if the parties cannot agree upon the compensation, notice shall be served by delivering a copy of the instrument of appropriation, or, if the owner be a nonresident of the county, that he may be served by publication, and that upon the filing of the act of appropriation and delivery of such copy or publication three appraisers shall be appointed on the application of either party, who shall return their assessment of damages. Held, that the filing of the instrument of appropriation with the designated officer was a seizure and appropriation of the land therein described and constituted the final act of taking, upon which title passed, and all damages resulting from the taking thereupon vested in the then owner of the land as a personal claim.—(Ft. Wayne & Southwestern Traction Company vs. Ft. Wayne & Western Railway Company et al., 80 N. E. Rep., 837.)

INDIANA.—Muncipal Corporations—Control of Streets—Moving Buildings.

Act March 6, 1905, Sec. 267, provides that every city and town, except when otherwise provided by law, shall have ex-

clusive power over its streets, and by Sec. 269 they are given exclusive power by ordinance to control their streets. Sec. 270 provides that whenever there is a grant of power in an act, and no method is provided for the exercise of the power or authority, the method may be prescribed by ordinance. Acts 1891, p. 68, c. 55, Sec. 5472, authorizes the use of electricity as a motive power for street cars where the consent of the city had been had, but provides that nothing in the act shall take away from Common Councils of incorporated cities the exclusive powers exercised over their streets and highways. Held, that a city ordinance regulating the matter of moving buildings on streets occupied by street railways requiring a person desiring to move a building which would necessitate the raising or removing of the railway's wires to first obtain a license from the city, and to give a 24-hour notice to the company, and declaring that upon a compliance with these requirements it should be the duty of the company so to raise or remove its wires as to allow the building to pass, was a valid exercise of the police power, relieving the party desiring to move a house from any liability to the street car company.—(Indiana Railway Company vs. Calvert et al. (No. 20,819), 80 N. E. Rep., 961.)

LOUISIANA.—Street Railroads—Repair of Roadbed.

1. The appellant is held to repair its roadbed, as it is not safe and in good repair.

2. It is under obligation to maintain its roadbed.

Whatever may be the responsibility of other contractors, if there be, primarily appellant is responsible, and must make needful repairs, when demanded, because of the bad and dangerous condition of the track.—(City of Shreveport vs. Nelson. Same vs. Southern Paving & Construction Company et al., 43 S. Rep., 389.)

MAINE.—Municipal Corporations—Use of Streets—Leaving Horse Unhitched—Contributory Negligence—Street Railroads—Operation—Injury to Animal on Track—Contributory Negligence—Negligence of Company—Sufficiency of Evidence.

1. It is not negligence per se to leave a horse attached to a carriage in the street unhitched.

2. But, when one leaves a horse attached to a carriage, unhitched, unimpeded by any weight, and unattended by any person near enough to control him by the voice or to reach him before he can escape, in a city street in which there is an electric car line, at a time when the conditions are such that cars may reasonably be expected to run with snow scrapers, calculated to frighten horses both by sound and sight, he is guilty of such negligence as will prevent his recovery in an action against the railway company, if the horse, frightened by the noise or action of the scrapers, runs in front of a car and is injured by it. And this is true, although the horse had never been afraid of the electric cars, and had never run away, though left unhitched.

3. The evidence in the case is held to be insufficient to warrant a finding by the jury that the defendant was guilty of negligence.—(Moulton vs. Lewiston, B. & B. Street Railway, 66 Atl. Rep., 388.)

MARYLAND.—Street Railroads—Duty to Pave Streets—Bridges—Subrogation—Benefit of Original Obligation.

1. A railroad company entering a city and crossing a street at grade, an ordinance was passed providing that the grade of the street be raised so as to enable the railroad company to construct its railroad tracks under the street, and the change of grade, made in pursuance of the ordinance, was accomplished by the construction of a bridge. By a previous ordinance of the city a street railway company was granted the right to lay double tracks upon this street on the condition that the owners thereof should keep the portion of the street covered by its tracks and two feet on either side thereof in repair. With respect to a second street of the city, another street railway company was by ordinance authorized to construct double tracks upon the same, on the same condition as to repair as that imposed in the first grant of authority. A bridge connecting portions of that street and forming the only means of passage from one portion to another had at that time been constructed by the city. Neither the charters of these two street railway companies nor the ordinances of the city made any reference to bridges as distinguished from streets, and under the respective grants of authority to use such streets the two street railway companies laid their tracks upon these two bridges. Held, that the two bridges were parts, respectively, of the two streets, within the meaning of the word "streets" as used in the ordinances imposing on the owners of the street railways, as a condition of their right to use the streets, the duty to repair the same.

2. Where street railway companies were under obligation to the city to keep in repair the portion of two bridges occupied by their tracks and two feet on either side, and thereafter a railroad company became liable to the city to maintain and make all needed repairs on both bridges by virtue of ordinances granting certain privileges, the obligation of the street railway companies was not thereby discharged, and the railroad company, having made all such needed repairs, was entitled to recover from the street railway company succeeding to the rights and obligations of the original companies that portion of the cost of repairing the bridges for which the street railway company would have been liable had the bridges been repaired by the city.—(Northern Central Railway Company vs. United Railways & Electric Company, 66, Atl. Rep., 444.)

MINNESOTA.—Eminent Domain—Delegation of Power—Railroads—Carriers—Who Are—Corporations—Incorporation Classes—Eminent Domain—Delegation of Power—Private Corporations—Statutory Provisions—Necessity of Municipal Franchise.

1. Petitioner's articles of incorporation authorized it to purchase, lease, build, own, and operate suburban street railways extending from the limits of the cities of St. Paul and Minneapolis to and into outlying cities, towns, and villages within the State of Minnesota—one line beginning at the easterly limits of St. Paul, and running thence in a northeasterly direction through the village of North St. Paul, by White Bear Lake, to the city of Stillwater; another line beginning at the southerly limits of St. Paul, and extending thence in a general southeasterly direction to South St. Paul; another line beginning at Camden Place, in Minneapolis, and running thence in a northwesterly direction to the city of Anoka; another line extending from the Western limits of Minneapolis at a certain point, and running thence in a westerly direction through the village of Hopkins to Lake Minnetonka—the routes for such lines to be designated as shall be determined upon by the company. Among its other stated powers is the right to own and operate by electric or steam power such steamboats, launches, or other boats as may be determined upon by the company upon the lakes of Minnesota, and power to purchase and own stock or stocks of suburban or other street railway companies, and to purchase or lease railways within the State, and to lease, construct, and operate electric or other power stations for the purpose of furnishing electric light or power.

Held, as determined by the main purport of its articles, such corporation is a work of internal improvement and a common carrier, and, its articles having been executed in compliance with title 1, c. 34, Gen. St. 1894, was entitled to exercise the right of eminent domain conferred by Sec. 2592 thereof, even though the incorporators declared in the articles that they proposed to incorporators under the provisions of title 2.

Such corporation is none the less a common carrier, as defined by Sec. 379, Gen. St. 1894, though its articles do not in terms prescribe that one of its powers is to carry freight.

In determining under what title the corporation was organized, the fact that the organizers denominated the proposed improvement a "street railway" is not controlling, since it conclusively appears from the articles that it was not the purpose of the company to construct and operate street, but interurban, railways from place to place.

2. The right to exercise the power of eminent domain, conferred upon a corporation organized under title 1, c. 34, Gen. St. 1894, was not abrogated, but recognized, continued, confirmed, and re-enacted, by the provisions of the revised laws.

3. Sec. 2915, Rev. laws 1905, authorizing a railroad company to cross the tracks of another such company at points of intersection, and to acquire such easement by condemnation, confers such right on all railroad corporations organized under the former statutes, as well as those organized under the revised laws.

4. The crossing of streets and alleys incidental to constructing a railroad from place to place does not constitute the occupancy of such streets or alleys for the purpose of operating a railway thereon, within the provisions of Sec. 2841, Rev. laws 1905; and a railroad company has the right to acquire by condemnation, under Sec. 2916, Rev. laws 1905, a right of way over the streets and alleys of cities and villages, and over private property within such limits, without securing a franchise from the municipal authorities.—(In re Minneapolis & St. P. Suburban Ry Co. Minneapolis & St. P. Suburban Ry. Co. vs. Manitou Forest Syndicate et al., 112 N. W. Rep., 13.)

LONDON LETTER

(From Our Regular Correspondent.)

For some months W. Arrol & Company's workmen have been doing the preliminary work for the widening of Blackfriars bridge made necessary because the London County Council Tramways will eventually cross this thoroughfare. The occasion of the sinking of the first caisson was taken advantage of for a ceremony carried out in the presence of the city bridge house estates committee and others. As already stated, the bridge when completed will be 30 ft. wider, the distance between the parapets being 105 ft. and the roadway 73 ft. A foot path of 16 ft. will be on either side. The tramway lines will be laid on the extended or western side of the bridge. Such work as the London County Council Tramways have at present in hand is progressing rapidly, and the new system on Holloway Road at Highbury Station to the Archway Tavern is nearly completed, Holloway Road having been in an impassable condition for some months. The work also from the Angel, King's Cross is now well advanced, and a start has been made with the extension of the London County Council Tramways from Tooting Broadway which, when completed, will connect the London County Council system with the system of the London United Tramways Company which goes via Wimbledon, Malden and Surbiton to Hampton Court. The Council has also given notice to the Hackney Borough Council that it will proceed with the electrification of the tramways in Mare Street, Hackney, to Ball's Pond Road. It has become evident to the Council that the facilities for repair work are insufficient, and in a recent Highways Committee Report the Council expresses a desire to have authorized an expenditure of about £104,000 for the establishment of a repair depot. It is not proposed, however, to spend all that money at once, and the first section, which would be capable of dealing with a thousand cars, can be built at an established cost of about £51,400, with about £16,000 for the necessary tools.

A question of morals has come up in the London County Council in connection with the tramways, the highways committee having previously refused to accept for display on its cars any advertisements relating to whisky or other alcoholic beverages. A series of advertisements has now been offered by a firm of whisky distillers representing an income to the Council of £500 per year, and it is interesting to note that the highways committee has recommended the acceptance of these advertisements. It would appear that advertisements of this nature have been accepted on the boardings round the Council's surplus lands, and the Council now thinks that if careful discretion be exercised, such advertising need not be excluded from the cars, although the Council states that it has not lost sight of the importance of exercising a close supervision over the character of the advertisements to be accepted.

The interesting statement has just been made that the London County Council intends to try a surface contact system on the line from Aldgate to Bow Bridge, for the electrification of which it already has powers. Difficulties are connected with this, owing to the fact that the Whitechapel & Bow Railway is underneath the roadway and the roof of the tunnel is so close to the surface of the road that the cost of the usual conduit system as employed in London would be prohibitive. Examination has therefore been made of a number of the surface contact systems, and tentative arrangements have been made with the owners of the G. B. system, which has been in operation in the city of Lincoln for more than a year, by which a royalty would be paid to the owners in the event of the system being used on this section. The city of Lincoln has recently taken over the G. B. system, so that the Council's engineers are satisfied that should they adopt the G. B. system it would prove satisfactory on this route. The Aldgate to Bow Bridge line is about 3 miles long, making 6 miles of single track, and the estimate of the total cost of electrifying this route on the surface contact system is £66,000, whereas if the conduit system were adopted the expenditure would be £92,000. It was originally intended to adopt the overhead system on this route but the Stepney Borough Council absolutely rejected such a proposition.

While on the subject of the London County Council's tramways, it may not be amiss to make mention of the complete change of front of the ordinary cab driver, who is now meeting more severe competition all around. We have frequently referred in this column to the motor omnibus and also to the putting on the streets of London of a large number of motor cabs, most of which are now equipped with the taximeter. These taximeter cabs have sprung into immediate popularity, and now are rarely idle. The taximeter motor cab's charge is 8d. per mile, while the ordinary horse cab still holds to the 1s. for the first mile and 6d. for each extra mile. There are hundreds more taximeter motor cabs on order for the streets of London, so that it would appear as if the horse cab would be in dire straits before long. Notwithstanding repeated refusals on the part of the horse cab drivers and the cab owners to have anything to do with taximeters or to reduce their fares, it would appear that they are extremely anxious that the taximeter should be extended to the horse cab vehicle as well, and have applied to the Home Secretary to be put on the same basis as the taximeter motor cabs. No definite statement has yet been made by Mr. Gladstone except in so far that the whole question of the use of taximeters is under the consideration of the Home Office, and it is extremely probable that before long London transportation, so far as public vehicles for hire are concerned, will be regulated rigidly by a definite scale of prices registered by taximeters. This will undoubtedly be a step in the right direction, as public sentiment for a long time has been in favor of some better method of regulating prices than an animated argument with a cab driver.

The London County Council electricity supply bill, to which we have frequently referred in this column, and which was a bill for the purpose of affording rights to the London County Council to supply not only the county of London but a large surrounding district with cheap electric power, has now been definitely thrown out of Parliament. It will be remembered that it was referred to a hybrid committee of the House of Commons which heard a large amount of evidence for the Council at numerous sittings, but without even waiting to hear the opponents' case it found the preamble not proved and the bill was consequently thrown out. The London County Council, at a subsequent meeting, reported deep regret at the bill having been thrown out, thereby, according to its opinion, depriving London of an opportunity of cheap electricity for some time to come. This, of course, means nothing, but it seems quite certain that it will be some considerable time before any bill dealing with the supply of electricity in London will have any chance in the present Parliament. The hybrid committee gave no reason for its action, but it is generally supposed that the committee did not like the idea of the Council delegating the committee's powers to a company and letting in private enterprise. In the circumstances, it is almost unnecessary to give any of the interesting evidence which was produced before the committee, but a few statements made by J. H. Rider, chief electrical engineer to the London County Council, may be interesting. Briefly, the scheme was to have a large station at Barking, where there was carriage for coal and an abundant supply of water. The area to be covered was 451 square miles, of which 117 were within the county of London and 334 outside. Estimates had been prepared showing an expenditure necessary of £4,500,000, and power was to be transmitted by trunk cables to thirteen central stations within the county and eight plants outside, and there were to be three kinds of supply for which varying prices were to be charged. It is also interesting to recall that in 1905 the chief bill introduced at that time was the Merz bill, commonly known as the Administrative County Scheme, but it never reached its third reading owing to blocking measures before the close of the session. In 1906, the London County Council bill and two private schemes were promoted. The London County Council bill was the only one allowed to go to committee and was thereafter rejected by Parliament. In the present session the bill which has just been thrown out was introduced and afterwards modified, so as to put the risk on private enterprise though to keep the control in the hands of the Council. The total expense incurred more than £150,000, has therefore been wasted, and so far as electricity is concerned London is where it was.

A rather interesting decision was recently given in Carlisle in favor of a solicitor who took the view that an electric car should stop for a passenger at any point desired, and without any regard to the fixed stations which have become general since the adoption of electricity as a motive power. This gentleman, on a car refusing to stop for him, summoned the driver, and strange to say has succeeded in getting a legal decision in his favor, so that hereafter any one in Carlisle can compel any of the electric cars to stop at any point. It is not likely, however, that this will affect other towns, as under the Tram-

ways Act of 1870, power is given to municipalities to make regulations as to the stopping of their tramway cars at specified places.

Another interesting decision which has recently been given by the House of Lords is in relation to the powers of a railway company to use motor omnibuses as accessories. The case is that of the Mersey Railway Company, which, by means of tunnels, connects the city of Liverpool with Birkenhead and its suburbs. This railway has always had a precarious existence, although it has been generally improved and its financial prospects greatly enhanced since it was electrified some years ago. In order to get still more traffic the company inaugurated a system of motor omnibuses in Birkenhead from outlying points to its various stations. The corporation of Birkenhead, however, having a system of electric tramways, opposed this motor omnibus traffic, and last year got an injunction against the railway company prohibiting it from running omnibuses on the ground that it was outside the company's statutory powers. This injunction was removed by a court of appeal some time later, but the original injunction has now been restored by the judgment of the House of Lords. No efforts were being made by the Mersey railway to compete with the system of tramways. It is also true that a number of railway companies throughout England are operating motor omnibuses, so that the decision does not appear to be altogether an impartial one.

While not desiring to enter into figures in this column regarding the business of the British Electric Traction Company, which operates a very large proportion of the tramways in England not owned by municipalities, it is interesting to notice from the remarks of Sir Charles Rivers Wilson, who presided at the general meeting, how strong a position this company takes in the question of fares, in that it maintains that tramway fares in this country are now on far too low a basis. The company's various undertakings carried during the past year over 300,000,000 passengers, while the receipts were only a penny and a fifth a passenger. Sir Charles contends that the policy of carrying passengers about 2½ miles for a penny is wrong, and that the company is suffering from an ever increasing agitation for a reduction of fares. The company's fares are not so low as those charged by the municipalities of some of the big cities, but regarding the character of the service he contended that the fares were too low and foreshadowed a general advancement in the charges before long.

It is interesting to note that since the opening of the new Hampstead tube described last month, the omnibus service from Hampstead to Oxford Street has been discontinued. This is not the first of the omnibus routes that has been changed since the new state of affairs in London, but this particular route is interesting as it forms direct connection with the past, being one of the routes taken by the old passenger mail coaches from London to the far north.

The name of the Twopenny Tube, which has been familiar to Londoners now for several years, will no longer be actually correct. As foreshadowed last month in this column, the various companies operating in London have been considering increasing their fares, and the Central London Railway Company has now inaugurated a new method of charging. The old twopenny fare will only serve passengers hereafter for about two-thirds of the journey, say, from the Bank to Lancaster Gate, and passengers desiring to go further than that will now have to pay 3d. instead of 2d. This increase of fare will, of course, necessitate a complete change in the system of collection, as hitherto a uniform ticket has been supplied which was immediately dropped by the passengers into boxes when passing through the gates at the start of their journey. Hereafter passengers will have to reserve their tickets, which will be given up at their destination. For some time the traffic of the Central London Railway has been falling off, and this is an effort to increase revenue. The result will be watched with interest. The change seems to be one more proof that the American system of a uniform fare does not suit London.

Like every other city operating electric tramways, Cardiff has not escaped the difficulty of corrugated rails, and some time ago purchased a machine for grinding the rails so as to remove the corrugation if possible. The machine was not an entire success, and Mr. Ellis, the tramway manager, has constructed a machine which, from reports received, gives promise of being effective. The difficulty with most machines for grinding rails has been with the carborundum wheel. Mr. Ellis' cutting surface is carborundum, but he has adopted the plane principle. He says that he can place his apparatus on the market at a cost averaging £30 per car, with the additional advantage of needing no extra service, as the driver of the car can work it without inconvenience and the work of levelling the rails can go on whenever desirable.

Sheffield has recently had delivered to it fifteen new cars which have been constructed by the United Electric Car Company, Ltd., of Preston, and which are somewhat new in city work, Sheffield, it is supposed, being the first of the large cities to adopt this type. The cars are all equipped with vestibule ends, so that both motormen and conductors have complete protection from the weather. It has long been a subject of dispute as to whether or not a glass front increases the chance of an accident in stormy weather, but in Sunderland, Bolton and other places where vestibule cars have been given a trial it has not been proved that the liability to a collision is increased.

The extension of the system of the London United Tramways Company from Wimbledon to Tooting and from Wimbledon to Summerstown, has now been completed and is open to traffic. The Tooting terminus of this system is only a few hundred yards distant from the Tooting terminus of the London County Council Tramways, and an arrangement has been made between the company and the Council by which there will be an interchange of traffic over the two systems, and the actual work of making the physical connection is now being undertaken. The whole ramification, therefore, of the London United Tramways Company's system, which extends to New Malden, Kingston, Surbiton, Long Ditton, Hampton Court, Acton, Ealing, Southall, Hanwell, Shepherd's Bush and Hammersmith, will be joined with the London County Council's system at Tooting and will undoubtedly add to the popularity of both lines.

The Halifax Corporation tramways committee has decided to allow its Parliamentary powers to make tramway extensions to Elland, Stainland, Kipponden, Rishworth, Cragg Vale and Wainstalls to lapse. These extensions and other works would, if carried out, have involved a capital expenditure of about £190,000. The decision of the committee will cause disappointment in the districts concerned, the inhabitants of which have from time to time urged the extension to be made.

At a special meeting of the Morecambe Town Council to consider the question of the purchase of the horse tramways, at present owned by the Morecambe Tramway Company, the finance and general purposes committee recommended that the system be electrified, and Parliamentary powers obtained. Mr. Gardner, manager of the Chester Corporation tramways, estimates the cost of purchase and reconstruction for electrification at £46,093. After allowing for the fluctuations between summer and winter traffic at Morecambe, he estimates an annual income of £10,390, and a balance of £3,689 for reserve and renewals. It would be necessary to spend a sum of £10,000 in additional plant at the electricity works. The report of the committee was approved.

A. C. F.

THE LONG ISLAND RAILROAD AND ELECTRIFICATION

The Long Island Railroad has been granted the right to build an important cut-off near Long Island City, which means the elimination of all grade crossings on the way from Jamaica to Woodside, and the installation of electric power. The reconstruction and electrification of the line from Jamaica to Woodside, it is said, will require at least another year to complete, but it is expected that late in 1908, or at the latest early in 1909, electric trains will be sent into the Pennsylvania terminal. The lines which are next on the company's program to be equipped with electrical power are those to Whitestone Landing and Port Washington. The double tracking of the Port Washington branch is proceeding as rapidly as the necessity of condemning right of way in a good many places will allow. This double track will extend as far as Great Neck, between which point and Flushing the work is now under way. Double tracking is also under way on the Oyster Bay branch between Roslyn and Glen Head, but the company has not yet announced when this line will be electrified. On the main line the electric power is already used as far as Belmont Park, and when the Glendale cut-off has been completed the electric installation will be carried on to Garden City and down around the loop through Hempstead Gardens to Valley Stream. From the latter point back to Jamaica the line is already electrically equipped, so there will be a loop of electrical railroad from Jamaica through Belmont Park, Garden City and Valley Stream back to Jamaica again.

AFFAIRS IN CHICAGO

The first hearing in the Union Traction reorganization case was heard before the arbitrators, Judge P. S. Grosscup and Prof. John G. Gray, on Friday, July 26, at Chicago. Representatives of the bondholding interests in the north and west systems argued against diminishing the present bond par values or the revenue therefrom. Judge Grosscup's court room was crowded when the hearing opened. There were present representatives not only of the companies interested—the Chicago Union Traction Company, the North Chicago Street Railroad Company, the West Chicago Street Railroad Company, the North Chicago City Railway Company, the Chicago West Division Railway Company and the Chicago Passenger Railway Company—but also various bondholders and stockholders in the several companies.

Ninety-two lawyers had been officially notified of the hearing and about half that number were present. At the beginning of the discussion Judge Grosscup announced that the primary purpose of the meeting was to hear objections against the proposed plan of reorganization.

"At the same time," said Judge Grosscup, "I will hear anything that interested parties may have to say against the receivers of the Chicago Union Traction Company turning over the property of the corporation to the proposed Chicago Railways Company. Prof. Gray and myself have conferred in regard to the method of procedure in listening to the different objections and we have decided to listen to the objections to the reorganization plan first and then hear replies from those who are in favor of the plan. After that we will listen to the closing statements from those representing both sides. We will not confine the speakers to the regular rules of judicial procedure, our purpose being to allow the widest possible latitude to those desirous of being heard."

Judge Grosscup called for a list of the interests present. Practically every creditor of the Union Traction interests responded.

Attorney Henry Crawford interposed an objection to the hearing as soon as the list had been completed. He questioned the right of the arbitrators to act. Judge Grosscup decided against Mr. Crawford by saying that the arbitrators did not act as having the power to compel their actions, but as agents of the City of Chicago.

The burden of each and all the attorneys arguing was that neither the par value nor the interest of the existing bonds should be depreciated in reorganization.

THE CLEVELAND SITUATION

To serve as a basis for the settlement of the street railway question in Cleveland the committee on political action has submitted the following to the Cuyahoga County League of Republican Clubs for consideration:

First.—All the street railways of Cleveland and its immediate suburbs should be dealt with as one general system, and transfers should be given from company to company and line to line, so that a ride for a single fare can be had from one part of the city or suburbs to any other part. No new franchise or franchise extension should be granted to any company without this provision.

Second.—A committee of three men for each of the existing companies, each committee consisting of one person appointed by the incoming Mayor, the second by the company, and the third member by the first two, should appraise the property of each company and report its actual present value to the Council.

Third.—The Council should grant to each of these companies a twenty-year franchise over all its existing lines on the following terms:

Fourth.—Universal transfers, as above explained, the company to be allowed a cumulative dividend of 6 per cent per annum on the actual appraised value of the property, one-half of all additional profits to go to the city to be used toward the reduction of fares. Particular provisions to be made for future extensions, subways and rapid transit facilities. The additional capital required for these purposes to receive an annual dividend of 6 per cent based on the actual cost of construction. This actual cost to be ascertained by a commission consisting of an engineer selected by the city, an engineer appointed by the company, and a third appointed by these two or by the Circuit Court, in the event of disagreement; the city to have the right to appeal to the courts from the finding of the commission.

Fifth.—The books of each company are to be kept according to a system prescribed by the city, and to be open at all times for inspection by the City Auditor, a committee of the Council or the city's accountants. Reports to be made to the city monthly and annually.

Sixth.—The rate of fare to be seven tickets for a quarter at the beginning, with reduction to three tickets for 10 cents, eight tickets for a quarter, etc., as soon as is justified by the amount of the city's share of the profits.

Seventh.—Six per cent of the gross receipts each year to be set aside for maintenance and repairs, and 8 per cent of the gross receipts set aside for renewal, construction and depreciation; any unexpended portion of these funds to pass to the general treasury of the city at the expiration of the franchise; any additional sums devoted to this purpose to be paid out of the profits of the company.

Eighth.—The city to have the right to purchase the property at the end of twenty years at its actual value at that time, to be determined as above indicated.

Ninth.—Each company to be required to clean, sprinkle and pave its right of way.

Tenth.—The city to reserve all police powers, including the right to require the operation of additional cars and the right to make all needful regulations necessary for providing adequate service and accommodations for the public.

Eleventh.—All franchises and extension of franchises to expire at the same time.

The report is given to the club as a basis only, and it is expressly stated that the committee feels that it will act as a stimulus to the settlement of the trouble, though many of the original provisions may be changed before it is found entirely satisfactory.

Ordinances were introduced at the last meeting of the City Council giving the Low Fare Railway Company three separate and distinct grants on the Central Avenue-Quincy Street route. One of these provides for portion on Central Avenue between East Fourteenth Street and East Fifty-Fifth Street, and a second completes this from East Fifty-Fifth Street to East Eighty-Fifth Street, the end of the line. The third gives the company the right to use East Fifty-Fifth Street from Central Avenue to Quincy Street, and Quincy Street to the end of the line.

The generating machinery of the new companies was out of repair all last week and no cars were operated. Just when the company will be able to put the plant in operation is a question. Service was promised every day in the week, but it did not materialize. It is said that franchises may be in jeopardy, because the company has failed to give service for so long a time. As a result of this mishap, the bid price of the Forest City on the stock exchange dropped from 97 to 70⅜, although the price asked held up to 99. During the past week the price of Cleveland Electric has advanced from 45¼ to 53, with an active demand for it. Quite a large number of shares changed hands during the week at 49, but after that the offerings were small, owners feeling that it is better to hold to it for a time at least.

BELIEVES 2-CENT LAW APPLIES TO INDIANA TRACTIONS

Contrary to the legal opinion of Attorney-General James Bingham, the Indiana Railroad Commission has held that the 2-cent fare law, passed by the last General Assembly, applies to interurbans as well as to steam roads, and a suit will be instituted soon against some traction company to determine whether or not the law applies to interurbans and thus settle a matter that involves, in a way, the constitutionality of the 2-cent fare law itself. In a formal opinion given the Commission several months ago the Attorney-General held that the law applied only to the steam roads, and that there was no similarity between the steam and the electric roads substantial enough to warrant the application of the 2-cent fare law of the railroad to the operation of interurbans.

Immediately, prominent lawyers in the city raised the question as to the constitutionality of the 2-cent fare law if it did not apply to interurbans. They pointed out that the tendency of the higher courts of the State had been recently to class the steam and the electric railroads together, and that every new opinion involving this point made the analogy and similarity between these two transportation agencies close and closer. The Commission itself is said to feel that the Attorney-General is wrong, and that the law applies to the electric roads exactly as to the steam roads. The members think that that was the intention of the Legislature, and that the law makes the application very plain to all railroads.

AMERICAN TRACTION'S REPORT

The annual report of the American Light & Traction Company for the twelve months ended June 30 shows net earnings of $2,312,965, an increase of $483,589 and a final surplus after allowing for larger dividend payments and also funds set aside for construction reserve of $422,256, a decrease of $103,274. The total surplus now stands at over $2,600,000.

The income account, with comparisons, is as follows:

	1907	Increase
Net earnings	$2,312,965	$483,589
Preferred stock dividend	854,172	139,275
Common stock dividend	354,937	105,386
Total dividends	$1,209,109	$244,661
Surplus	$1,103,859	238,928
Reconstruction reserve	681,600	342,200
Final surplus	$422,256	*$103,274
Previous surplus	2,235,147	525,530
Total surplus	$2,657,403	$122,256

The condensed general balance sheet, as of June 30 last, compares with the figures as of Dec. 31, 1906, as follows:

Assets—	1907	Increase
Investment account	$26,671,756	*$67,913
Treasury stock	1	.....
Earnings receivable sub. companies	2,827,246	441,913
Bills receivable sub. companies	1,626,812	51,275
Certificates indebtedness sub. cps.	1,705,169	*3,015
Accounts receivable	53,941	*9,618
Managers' stock contracts	225,000	*2,500
Interest and dividend received from temp. investment	5,822	5822
Temporary investment	211,332	185,176
Cash	425,774	*68,681
Total	$33,752,853	$532,394
Liabilities—		
Preferred stock	$14,236,200	.....
Common stock	15,000,000	.....
Bills payable	500,000	.....
Depreciation on managers' stock contracts	10,202	3,141
Miscellaneous expenses anticipated	13,094	4,592
Dividends accrued	314,954	16,903
Reconstruction reserve	1,021,000	340,500
Undivided earnings	2,657,403	167,258
Total	$33,752,853	$532,394

* Decrease.

The directors have declared the regular quarterly dividend of 1½ per cent on its preferred stock and a quarterly dividend of 1½ per cent on its common stock, payable Aug. 1. This is an increase of one-quarter of 1 per cent over the previous disbursement on the common stock, which was made on May 1 last.

THE TRANSIT INQUIRY IN NEW YORK

After a conference with William M. Ivins, who is to conduct the investigation of the Public Service Commission into the merger of local transit corporations, William R. Willcox, chairman of the Commission, announced Monday, July 29, that the first hearing would be held in the Aldermanic Chamber at the City Hall on Thursday afternoon at 2 o'clock. Chairman Willcox said that, in all probability, the traffic facilities of the various corporations involved, as these affect the traveling public, would be the subject of a thorough investigation at the outset, and that other matters in relation to the merger would be taken up in the order of their importance.

At the meeting of the Commission Mr. Bassett reported on behalf of the committee appointed to consider forms of reports on wrecks and accidents, such as the railroad companies within its jurisdiction are required to make to the Commission under the new law. The order, which was adopted and will go into effect on Aug. 5, directs the corporations to report every accident resulting in death or serious injury to any person, any collision resulting in serious damage to cars, any derailment of a passenger train, whether in the subway or on the elevated or suburban lines. The railroad companies concerned also are directed to report any serious interference with or stoppage of traffic.

The reports must be made by telephone immediately after any such accident between the hours of 8 in the morning and 11 at night. Any accident occurring after 11 o'clock must be reported at 8 o'clock the next morning. All telephone reports must be followed within three days by written statements to the Commission. This written statement must contain the following information:

(a) The name of the corporation owning the road.
(b) The name of the corporation leasing or operating the road.
(c) The date and hour of the accident.
(d) The precise location of the accident.
(e) The number and description of the car involved in the accident.
(f) The names and places of residence of employees in any way connected with the occurrence.
(g) The names and addresses of passengers or other persons killed or injured.
(h) The names and residences of employees killed or injured, and the extent of the injury.
(i) The circumstances attending and the supposed causes of the accident, with the names and residences of all witnesses who saw the accident or can give any facts in references to the same.

It is announced that Abel E. Blackmar, counsel to the Commission, had appointed as assistant counsel at a salary of $3,500 Albert E. Walker, of 32 Liberty Street, and that the appointment had been confirmed. Mr. Walker, who is a native of Massachusetts and an Amherst graduate, has been practicing law in this city since 1899, and has made a special study of transportation and franchise matters.

It was announced on Tuesday that Theodore P. Shonts, president of the Interborough Rapid Transit Company, will be the first witness before the Public Service Commission when its investigation of the Interborough-Metropolitan merger and the Brooklyn Rapid Transit Company is begun the latter part of the week. President Vreeland and Oren Root, Jr., manager of the New York City Railway, and Vice-President E. P. Bryan and Manager Hedley of the Interborough are among the officials asked to attend. A thorough investigation is under way of the Engineering Department of the old Rapid Transit Commission, which came to it as a legacy from that body when it went out of existence. Chief Engineer George S. Rice, who has occupied that place since William Barclay Parsons quit to become consulting engineer for the Interborough, had about 300 engineers under his jurisdiction in the Rapid Transit Commission's regime. When that body went out of existence many of these men were transferred, mostly at their own request, to other departments. As a result a reorganization of the engineering staff has become necessary. Chairman Wilcox said the investigation was purely preliminary to effecting this reorganization.

EARNINGS OF THE ST. LOUIS COMPANY FOR SIX MONTHS

The report of the United Railways for the first half of this year indicates a large increase in traffic and gross earnings with increased expenses. As a result, while the gross earnings show an increase for the period, the net earnings exhibit a decrease. The report for June shows a large increase in gross earnings, but with a decrease in net earnings, owing to increased expenses. The reason for the greater expenses this year, affecting the net earnings and net income, is in the application of big appropriations to betterment and reconstruction work. The gross earnings for the first six months were $337,981 larger than in the corresponding period of 1906, while the expenses increased $405,256, and the net earnings decreased $67,275. The charges decreased $4,453, and the net income on June 30 this year was $62,822 less than on the same date in 1906. The gross earnings of June showed an increase of $62,116, the expenses an increase of $44,121, the net earnings a decrease of $844, and the net income a decrease of $18,839. Nevertheless, the company had, at the end of the first half year net earnings of $1,761,576, and the net income of $375,266. The June transactions closed with net earnings for the month of $362,836, and a net income of $131,984. The following tables show the increases or decreases for the first six months of this year as compared with the cor-

responding period of 1906, and the increases or decreases for June this year as compared with the same month of 1906. Gross earnings include "other income," and expenses include taxes and depreciation:

SIX MONTHS		
Gross earnings	$5,287,612	*$337,931
Expenses	3,526,036	*405,256
Net earnings	$1,761,576	†$67,275
Charges	1,386,310	†4,453
Net income	$375,266	†$62,822
JUNE REPORT		
Gross earnings	$961,189	*$62,116
Expenses	598,353	*44,121
Net earnings	$362,836	†$17,995
Charges	230,852	†844
Net income	$131,934	†$18,839

* Increase. † Decrease.

The management finished its new car shops, for building and repair work, several months ago, but has been able to use them only for minor work. General Manager McCulloch had hoped to turn out two or three new cars every week in the past three months, but operations were delayed because of difficulty in getting machinery and material. Contracts which required delivery on Jan. 1 are now being fulfilled. Capt. McCulloch expects to run the shops at their full capacity in a week or two. Several rainy days in July had the effect of keeping down the holiday earnings, but it is expected that the summer record will show an average of $100,000 receipts for every Saturday, Sunday and holiday.

THE CONSOLIDATED COMPANY'S ORDER FOR EQUIPMENT

In the last issue of the STREET RAILWAY JOURNAL was briefly noted an order for equipment placed by the Consolidated Company, which embraces all the electric railway lines in Connecticut and Rhode Island under the control of the New York, New Haven & Hartford Railroad. According to official sources this order includes invoices of more than $600,000, embracing 103 closed cars at $5,000 each, making a total of $515,000; fourteen snow-ploughs, which cost $35,000, and motors, trucks, wheels, heaters and brakes in odd lots, which will bring the total to about $75,000 additional. Following is a list of the cars ordered and their specifications, with the line upon which they will be used: New Haven line, sixteen double-truck, 30-ft. closed cars; Hartford line, twenty-four double-truck, 30-ft. closed cars; Bridgeport line, ten double-truck, 30-ft. closed cars; South Norwalk line, three double-truck, 30-ft. closed cars; Derby line, ten double-truck, 30-ft. closed cars; New Britain line, two double-truck, 30-ft. closed cars; Milldale line, two double-truck, 30-ft. closed cars; Waterbury line, eleven 30-ft. closed cars; Stafford Springs line, four 30-ft. closed cars; New York & Stamford line, twelve 30-ft. closed cars; Norwich line, one 33-ft. closed car; Middletown line, eight 33-ft. closed cars; Rhode Island lines, 30-ft. closed cars. Connecticut system total, 103 closed cars.

From the Wason Car Manufacturing Company the officers of the New Haven concern have ordered fourteen snow-ploughs, as follows: Derby line, three; Waterbury line, two; Hartford line, three; Bridgeport line, Milldale line, Stafford Springs, New York & Stamford, Middletown and Norwich lines, one each.

Considerable special equipment has also been ordered, the following makers having been selected to furnish the goods: Bodies from Wason Company; brakes from Allis-Chalmers Company; heaters from Consolidated Electric Company; motors for most all lines, Westinghouse Company; motors for New Haven, Hartford, Stafford Springs, New York & Stamford and Rhode Island lines, from General Electric Company; fare registers from New Haven C. R. Company; trolleys from Sterling Meaker Company; trucks from Standard Motor Truck Company; wheels from Schoen Rolled Steel Company.

THE PLANS FOR THE GALVESTON-HOUSTON INTERURBAN LINE

Stone & Webster, of Boston, have announced the plans for the proposed interurban electric railway between Galveston and Houston, about which there have been many rumors recently. They say their idea is not only to increase the rapid transit facilities between the cities of Galveston and Houston but to assist in the local development of the systems in each city. A company called "Galveston-Houston Electric Railway Company" has been organized to construct and operate the road. In order to make the three properties—the two terminal companies and the interurban—as homogeneous as such an interwoven system naturally should be, another company has been formed—namely, Galveston-Houston Electric Company—which will acquire all of the capital stock of the interurban company, and which will have an authorized capitalization of preferred and common stock equal in amount to the aggregate of the preferred and common stocks authorized by the two terminal companies. It has been made optional to the stockholders of both the Houston Electric Company and the Galveston Electric Company to exchange their holdings, share for share, for stock of the Galveston-Houston Electric Company. The preferred stock of both the Galveston Electric Company and Houston Electric Company is non-cumulative, while the preferred stock of the Galveston-Houston Electric Company is cumulative. No preferred or common stock will be issued by the latter company in excess of the amount of Houston Electric Company and Galveston Electric Company stock surrendered for exchange. Surveys have been made and considerable preliminary work has been done toward the construction of the interurban. The territory between the cities is practically level, with a stretch of open water which will have to be bridged, just north of Galveston. The line will run on a private right of way, and actual construction will be begun as soon as various further preliminaries have been attended to.

EARNINGS OF IOWA INTERURBANS FOR THE YEAR 1906

The interurban railways of Iowa have filed their annual reports for the year ending Dec. 31, 1906, with the executive council of the State for taxation purposes. The following is a short synopsis of these several reports:

The Boone Suburban Railway Company reports 4.70 miles of main line track; total gross earnings, $6,990.33; gross earnings per mile, $1,487.30; total operating expenses, $3,690.30; operating expenses per mile, $785.17; total net earninggs, $3,300.03; net earnings per mile, $702.13.

The Cedar Rapids & Iowa City Railway & Light Company reports 27.63 miles of main line track, same as in 1905; total gross earnings, $100,997.73; gross earnings per mile, $3,655.36; total operating expenses, $64,217.18; operating expenses per mile, $2,324.18; total net earnings, $36,780.55; net earnings per mile, $1,331.18.

The Cedar Rapids & Marion Railway Company reports 15.65 miles of main line track or 1.44 greater than in 1905; total gross earnings, $160,050.30; gross earnings per mile, $10,226.85; total operating expenses, $103,364.07; operating expenses per mile, $6,604.73; total net earnings, $56,686.23; net earnings per mile, $3,622.12.

The Interurban Railway Company of Des Moines reports 64.58 miles of main track, or 35.7 more miles than in 1905; total gross earnings, $198,579.22; gross earnings per mile, $3,074.93; total operating expenses, $104,388.94; operating expenses per mile, $1,616.43; total net earnings, $94,190.28; net earnings per mile, $1,458.50.

The Iowa & Illinois Railway Company reports 33.072 miles of track; total gross earnings, $112,156.04; gross earnings per mile, $3,391.27; total operating expenses, $85,558.28; operating expenses per mile, $2,587.03; total net earnings, $26,597.76; net earnings per mile, $804.24.

Mason City & Clear Lake Traction Company reports 14.62 miles of main line track, same as in 1906; total gross earnings, $48,535.90; gross earnings per mile, $3,319.83; total operating expenses, $47,962.10; operating expenses per mile, $3,280.58; total net earnings, $573.80; net earnings per mile, $39.25.

The Oskaloosa & Buxton Electric Railway Company (first

report) reports 2.3 miles of main line track; total gross earnings, $1,030; gross earnings per mile, $447.92; total operating expenses, $506.88; operating expenses per mile, $220.38; total net earnings, $523.12; net earnings per mile $227.44.

Tama & Toledo Electric Railway reports 2.75 miles of main line track, the same as in 1905; total gross earnings, $12,558.43; gross earnings per mile, $4,565.70; total operating expenses, $8,176.37; operating expenses per mile $2,973.23; total net earnings, $4,382.06; net earnings per mile, $1,593.47.

The Waterloo, Cedar Falls & Northern Railway Company reports 54.73 miles of main line track, the same as in 1905; gross earnings, $170,043.88; gross earnings per mile, $3,106.96; total operating expenses, $89,657.31; operating expenses per mile, $1,638.18; total net earnings, $80,386.57; net earnings per mile, $1,468.78.

The total mileage for all nine companies is 220.032; total gross earnings, $810,941.83; average gross earnings per mile, $3,697.45; total operating expenses, $507,521.43; average operating expenses per mile, $2,447.77; total net earnings, $303,420.40; averag enet earnings per mile, $1,249.68. The total actual valuation of all property of all nine companies is $4,001,473, and the total taxes of all companies paid in 1906 was $18,549.74, so the earnings of the nine companies were in the neighborhood of 7.1 per cent on the total reported valuation. The total mileage for all companies in 1906 is 39,554 greater than for the year 1905. The total gross earnings of all companies are $146,431.48 greater, the total operating expenses are $87,536.27 greater and the total net earnings are $58,895.21 greater than for the year 1905. In 1905 the companies earned more than 7.5 per cent on a reported actual valuation of $3,056,821.

ILLINOIS TRACTION SYSTEM'S PLANS FOR THROUGH LINES

The plans for connecting Chicago and St. Louis by electric railway as proposed by William B. McKinley, president of the Illinois Traction System, have been outlined by him. The road already has been pushed north to Seneca, which is thirty miles from Joliet and Yorkville, from one of which places an entrance into Chicago will be made. The road is to have its own terminal in St. Louis and will build a $2,500,000 bridge from Venice, Ill., across the Mississippi River into St. Louis. In return for the city franchise the bridge gives accommodations for foot and team traffic. The cars now run to East St. Louis, and through express and fast freight service enable St. Louis wholesale houses to reach all of the rich territory of central and southern Illinois. Orders which the Illinois storekeepers send to St. Louis in the afternoon are filled and received in Springfield, Decatur, Bloomington, Champaign and Danville, near the Indiana line, before noon of the next day. In addition to the short stretch on Chicago's outskirts work must be finished on fifty-five miles to connect Eureka and Ottawa and pass through Streator. The Chicago-St. Louis trains will go over this route, passing several miles east of Peoria over a time saving cutoff. The line will be 283 miles long. The fare will be 1½ cents per mile. Another stretch of work of interest is the few miles to connect the Indiana interurban lines with those of Illinois at Danville. When this is finished a continuous trip will be possible from St. Louis through Illinois, Indiana, Ohio and Michigan to Port Huron. When the Chicago connection is completed the system will operate 700 miles of interurban lines. It now has 415 miles, besides 125 additional miles of city lines at Danville, Urbana and Champaign, Decatur, Bloomington, Peoria, Jacksonville and the Tri-Cities.

NEXT CONVENTION OF NATIONAL ASSOCIATION OF RAILROAD COMMISSIONERS

The next convention of the National Association of Railroad Commissioners will be held in Washington, D. C., on Oct. 8, 1907. As a result of the resignation of Hon. John S. McMillin, president of the association, who was a member of the Railroad Commission of the State of Washington, it was deemed advisable, for various reasons, to change the meeting place of holding the next convention to Washington, D. C., Oct. 8, 1907, instead of Seattle, Wash., July 29, 1907. Hon. C. C. McChord, chairman of the Railroad Commission of Kentucky, will preside at the next convention.

TO LOOK INTO NEW YORK RIVER TUNNELS

A number of resolutions were adopted by the Public Service Commission at its open meeting on Wednesday, July 31. Commissioner McCarroll introduced a resolution in anticipation of the opening of the Brooklyn subway, which Chief Engineer Rice said would occur about Nov. 1. The resolution was as follows:

"Resolved, That the chairman designate a Commissioner to consider the matter of providing adequate facilities for the handling of passengers at Borough Hall, Brooklyn, by the time operation of the Brooklyn subway begins."

Commissioner McCarroll also offered the following resolution:

"Resolved, That a Commissioner be designated by the chairman to co-operate with the counsel in preparing a form for annual report under paragraph 46 of the Public Service Commission Law."

Commissioner Bassett was designated in pursuance of this resolution.

In connection with a general investigation of the engineering department of the Commission, which is being conducted quietly by the Commissioners themselves, in order to determine the general efficiency of that department as left over by the old Rapid Transit Board, Commissioner Bassett offered the following resolution:

"Resolved, That Engineer Rice be requested to report to what extent he has heretofore inspected the tunnels and subways of the Hudson & Manhattan Railroad Company and the New York & Jersey Railroad Company (the so-called McAdoo tunnel lines), what portions the city of New York has the privilege to purchase, and what means, if any, are adopted to ascertain the actual cost thereof."

Commissioner Maltbie was designated to investigate the condition of the so-called Steinway tunnel in pursuance of the following resolution which he introduced:

"Resolved, That a Commissioner be named by the chairman to investigate and report upon the status of the subway and tunnel constructed by the New York & Long Island Railroad Company (commonly known as the Steinway tunnel), and to ascertain what rights and franchises are held by this company."

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 41 Park Row, New York.]

UNITED STATES PATENTS ISSUED JULY 16, 1907

859,950. System for Automatic Signaling; Isidor Kitsee, Philadelphia, Pa. App. filed Feb. 11, 1907. Relates more particularly to a railway signal to enable crews of trains or cars traveling either in the same or opposite directions to readily determine the location of each other with respect to the danger zone.

860,010. Guard Rail Clamp; William C. Boswell, Chattanooga, Tenn. App. filed Oct. 8, 1906. A guard rail clamp having guard rail and track rail clamping blocks and means formed in one of the blocks to receive and hold the head of a fastened bolt.

860,114. Trolley Harp; Charles A. Atkinson, Richmond, Ind. App. filed Oct. 20, 1906. The harp is made in the form of a separate section and is so pivoted as to have a vertical oscillatory movement at the upper end of the pole.

860,143. Pleasure Railway; Rocco Mega, New York, N. Y. App. filed April 19, 1907. A pleasure railway comprising an inclined roadway, a circular vehicle body rolling on the roadway, and a plurality of gravity carries suspended within the vehicle body at points intermediate between its axis and the periphery whereby they swing clear of the roadway.

860,206. Alarm and Signal Mechanism; Ellsworth E. Flora and Robert J. Zorge, Chicago, Ill. App. filed Oct. 11, 1906. Provides means for positioning a torpedo in the path of a train when a switch is left in improper relation.

860,229. Trolley Stand; James H. McPherson, Haverhill, Mass. App. filed Jan. 31, 1907. Provides a trolley stand in which the upward pressure caused by the lifting spring upon the trolley wheel is decreased as the pole is lowered, and means for

adjusting the leverage through which the spring acts so that it may be caused to exert its maximum effect in pressing the trolley wheel upward while in a predetermined position, and to exert its minimum effect in pressing it upward in another position.

860,243. Slack Adjuster; Augustus Parker-Smith, New York, N. Y. App. filed Nov. 30, 1906. Relates to means for taking up the slack in the braking mechanisms occasioned by the wear of the brake shoes, in systems where kick springs are used to hold the brake shoes clear of the wheels when brakes are released.

860,249. Slack Adjuster; William H. Sauvage, New York, N. Y. App. filed Nov. 21, 1906. See above patent.

860,279. Brake Shoe; Frederick K. Caswell, Los Angeles, Cal. App. filed June 14, 1906. Comprises a shell embodying a back member, side and end members folded to form walls, indentations or creases extending inwardly from the side members and a body or filling embraced by the shell.

860,320. Brake Rigging; Augustus Parker-Smith, New York, N. Y. App. filed Jan. 4, 1907. The "dead" lever is fulcrumed on the car body instead of on the truck.

860,431. Car Fender; Gustaf M. Anderson, Hyde Park, Mass. App. filed Sept. 25, 1906. Means for maintaining the fender at a constant elevation from the track.

860,438. Device for Removing Ice From Rails; James W. Blacksten, Newark, Ohio. App. filed Jan. 28, 1907. A device for removing ice from rails comprising a yielding carrier frame in which is journaled an ice-crushing wheel having a diagonally-toothed tread, said teeth having sharp angular edges and arranged at an inclination of approximately 45 deg. to the sides of the wheel.

860,526. Trolley Wire Hanger; Walter G. Clark, New York, N. Y. App. filed June 20, 1906. Relates to trolley-wire hangers of the class known as doubt catenary suspension. Construction in which the side bars and spreaded bars of the hanger are easily adjustable so that it can be quickly made to fit varying conditions.

860,558. Railway Track Construction; Henry B. Nichols and George B. Taylor, Philadelphia, Pa. App. filed March 2, 1906. The ties are short blocks and the invention consists in the means for anchoring the ties to a concrete road bed.

860,561. Art of Railway Signaling; Wesley T. Oviatt, Stratford and Edward F. Latimer and William Grunow, Jr., Bridgeport, Conn. App. filed Aug. 2, 1906. A system for erecting the movement of railway cars or trains over a railway either in the same or opposite directions, whereby cars or trains may enter a definite section of the roadway from either end thereof and in and desired number, the first car to enter such section effecting the operation of signals at both ends of the section giving definite indication, and the succeeding cars giving additional indications to show the number thereof.

PERSONAL MENTION

MR. SAMUEL McCLINTOCK HAMILL, prominent in the General Electric Company and president of the Schenectady Trust Company, is dead.

MR. F. W. BROWN, formerly with the Pere Marquette and the Michigan Central Railways, has been appointed general passenger agent of the Michigan United Railways Company.

MR. L. E. HOLDERMAN has been appointed superintendent of the Terre Haute, Indianapolis & Eastern Traction Company. Mr. Holderman formerly was superintendent of the electrical department of the Eastern Wisconsin Railway & Light Company, of Fond du Lac.

MR. SIMON B. STORER, whose resignation from the Niagara Falls, Lockport & Ontario Power Company was mentioned in a recent issue, announces the opening of an office as consulting electrical engineer at 732 University Block, Syracuse, N. Y. Mr. Storer will specialize in power transmission, power contracts, commercial investigations and reports.

APPOINTMENTS announced by the Brooklyn Rapid Transit Company include that of Mr. Albert Maxwell as chief clerk to the general superintendent in place of Mr. T. J. Cunningham, who will retain connection with the company, and Mr. I. B. Clarke as supervisor of motormen for both the surface and elevated lines of the system. Mr. Clarke has hitherto had charge of the training and work of the elevated motormen only.

MR. O. A. HALE, a prominent merchant and capitalist of San Jose, Cal., died at the Hahnemann Hospital, in San Francisco, on July 20, from an attack of appendicitis. Mr. Hale was president of the San Jose-Los Gatos Interurban Railway Company and the Peninsula Railroad Company, of San Jose. He was not only deeply interested in electric railway development in the vicinity of his city, but was an influential factor in the progress of several California industries.

MR. WILLIAM SEIBERT, district superintendent in charge of the eastern division surface lines of the Brooklyn Rapid Transit Company, of Brooklyn, N. Y., has been appointed general superintendent of the surface lines of the company, reporting to Mr. W. S. Mendon, superintendent, who succeeds Mr. Dow S. Smith, resigned. Mr. Seibert has been connected with the Brooklyn Rapid Transit Company and its constituents since 1885, when he was appointed as a conductor on the Nostrand Avenue line. Recognition of his worth came first in his promotion to the place of starter at Prospect Park. Then he became night depot master. His next step was promotion to the position of day depot master at Flatbush. Following this came the important appointment to the position of division superintendent at Bergen Street. Later he was transferred to the still more important post of superintendent of Ridgewood and East New York. With the organization about two years ago of the lines of the company into two divisions, the Eastern and the Southern, representing respectively the lines in East Brooklyn and those in South Brooklyn, Mr. Seibert was selected for the position of superintendent of the Eastern division.

MR. J. S. HAMLIN, who has for the past eighteen months been sales agent of the car equipment division of the Ohio Brass Company, of Mansfield, Ohio, died very suddenly at his home in Mansfield, Friday, July 26. Mr. Hamlin started his railway career with the Chicago street railways in the days of horse car. Later he became master mechanic of the South Side Elevated Railway, Chicago, and from there went to the Indiana Union Traction Company as superintendent of motive power. Subsequently he entered the service of the Christensen Engineering Company, of Milwaukee, and while with this company installed air-brake systems in London and Paris. Later he became Chicago agent of the St. Louis Car Company. As previously stated, it was about eighteen months ago that he accepted the position of sales agent with car equipment division of the Ohio Brass Company. During his connection with this company Mr. Hamlin built up this line of business to a marked degree, having been active in the development of the Tomlinson coupler and other new specialties. Mr. Hamlin was only 42 years of age. He leaves a widow, son and daughter. The remains were interred at Sandwich, Ill., the birthplace of Mr. Hamlin.

MR. J. M. YOUNT, assistant master mechanic of the Pittsburg Railways Company, has been appointed assistant to Mr. W. D. Wright, master mechanic of the Rhode Island Companies, of Providence, R. I., controlling the electric railway lines operating in Providence, Pawtucket, Central Falls and adjoining towns. Mr. Yount began his street railway career in Indianapolis in 1896, with the Citizens' Street Railway Company, whose service he entered after graduating with the degree of electrical engineer from Purdue University. He remained with the Citizens' Company about two and a half years, and then entered the employ of the Metropolitan Street Railway Company, of New York, with which he was connected for about a year. He next entered the employ of the Jersey City, Hoboken & Paterson Street Railway Company as assistant to Mr. H. H. Adams, the master mechanic, under whom he served for more than a year. Subsequently he was appointed master mechanic of the North Jersey Street Railway Company, controlled by the same interests. When the consolidation of the street railway companies of New Jersey was effected in 1902, under the title of the Public Service Corporation of New Jersey, Mr. Yount was made superintendent of rolling stock of the company in charge of the North Jersey division. Later he became connected with Mr. J. H. Fogarty, of New York, whom he represented as sales agent. In April, 1906, he was appointed to the position from which he has just resigned.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. *Including taxes. †Deficit. ‡Including Rapid Railway system, Sandwich, Windsor & Amherstburg Railway, and Detroit, Monroe & Toledo Short Line Railway.

Company.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Available for Dividends.
AKRON, O. Northern Ohio Tr. & Light Co.	1 m., June, '07	182,242	100,807	81,434	43,550	37,885
	1 " " '06	159,733	92,152	67,581	40,018	27,563
	6 " " '07	849,257	513,405	335,852	252,735	83.117
	6 " " '06	751,941	480,088	271,853	239,753	32,100
CHAMPAIGN, ILL. Illinois Traction Co.	1 m., June, '07	307,119	*176,109	131,010	.....	.....
	1 " " '06	239,988	*135,397	104,591	.....	.....
	6 " " '07	1,706,317	*974,882	731,435	.....	.....
	6 " " '06	1,362,870	*776,443	586,427	.....	.....
CHARLESTON, S. C. Charleston Consolidated Ry., Gas & Elec. Co.	1 m., June, '07	62,785	37,190	25,594	13,516	12,078
	1 " " '06	55,612	32,144	23,468	13,017	10,452
	4 " " '07	235,644	147,048	88,595	54,067	34,529
	4 " " '06	210,487	128,144	82,343	51,917	30,426
CHICAGO, ILL. Aurora Elgin & Chicago Ry. Co.	1 m., May, '07	116,415	61,872	54,543	26,414	28,129
	1 " " '06	102,533	55,730	46,803	24,939	21,864
	11 " " '07	1,196,047	651,826	544,221	291,311	252,910
	11 " " '06	1,062,666	585,350	477,317	269,079	208,238
Chicago & Milwaukee Elec. R.R. Co.	1 m., June, '07	96,991	33,826	63,165	.....	.....
	1 " " '06	84,555	27,255	57,300	.....	.....
	6 " " '07	434,508	194,355	240,154	.....	.....
	6 " " '06	331,873	143,793	188,080	.....	.....
CLEVELAND, O. Cleveland, Painesville & Eastern R.R. Co.	1 m., June, '07	27,387	*14,972	12,414	7,213	5,202
	1 " " '06	27,257	*14,247	13,011	7,108	5,903
	6 " " '07	123,186	*68,477	54,710	43,276	11,434
	6 " " '06	113,888	*66,102	47,786	41,205	6,581
Cleveland, Southwestern & Columbus Ry. Co. (Incl. Ohio Central)	1 m., June, '07	67,965	40,265	27,701	.....	.....
	1 " " '06	59,058	31,777	27,281	.....	.....
	6 " " '07	338,687	205,182	133,505	.....	.....
	6 " " '06	289,277	173,160	116,117	.....	.....
COLUMBUS, GA. Columbus Elec. Co.	1 m., May, '07	30,063	*18,809	11,255	10,080	1,175
	1 " " '06	24,825	*13,251	11,574	8,762	2,812
	12 " " '07	329,349	*182,842	146,507	111,170	35,337
DALLAS, TEX. Dallas Elec. Corp'n.	1 m., May, '07	89,532	*66,523	23,009	18,148	4,861
	1 " " '06	83,369	*55,010	28,359	15,660	12,699
	12 " " '07	1,058,952	*769,674	289,278	195,032	94,245
	12 " " '06	996,462	*615,004	381,458	183,445	198,013
DETROIT, MICH Detroit, Jackson & Chicago Ry.	1 m., June, '07	35,674	*27,014	8,660	15,012	†6,352
	5 " " '07	164,626	*131,597	33,029	75,062	†42,033
‡Detroit United Ry. Co.	1 m., June, '07	603,601	*344,428	259,173	116,968	142,205
	1 " " '06	554,937	*323,457	231,480	105,296	126,184
	6 " " '07	3,122,701	*1,946,142	1,176,559	679,003	497,556
	6 " " '06	2,777,877	*1,678,069	1,099,808	604,743	495,065
DULUTH, MINN. Duluth St. Ry. Co.	1 m., May, '07	69,316	35,018	34,298	17,641	16,657
	1 " " '06	63,884	33,020	30,864	17,513	13,352
	5 " " '07	313,305	166,340	146,965	88,007	58,958
	5 " " '06	289,238	162,210	127,029	87,519	39,509
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1 m., May, '07	178,988	95,535	83,453	.....	.....
	1 " " '06	159,183	79,022	80,161	.....	.....
	5 " " '07	814,750	449,198	365,552	.....	.....
	5 " " '06	733,138	375,868	357,270	.....	.....
EL PASO TEX. El Paso Cos.	1 m., May, '07	40,537	*31,299	9,238	5,004	4,234
	1 " " '06	31,666	*21,625	10,042	3,793	6,248
	12 " " '07	435,659	*329,461	106,198	51,851	54,347
	12 " " '06	322,533	*218,216	104,317	45,096	59,221
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1 m., May, '07	101,012	60,566	40,446	.....	.....
	1 " " '06	87,328	55,847	31,481	.....	.....
	5 " " '07	461,971	284,757	177,213	.....	.....
	5 " " '06	398,959	250,527	148,432	.....	.....
FT. WORTH, TEX. Northern Texas Tr. Co.	1 m., May, '07	84,608	*51,567	33,041	10,401	22,640
	1 " " '06	71,485	*42,695	28,790	9,942	18,848
	12 " " '07	947,549	*599,240	348,308	121,338	226,971
	12 " " '06	720,553	*440,259	280,294	119,660	160,634
GALVESTON, TEX. Galveston Elec. Co.	1 m., May, '07	31,468	*19,548	11,920	4,167	7,753
	1 " " '06	37,721	*16,519	11,201	4,167	7,035
	12 " " '07	341,624	*202,959	138,665	50,000	88,665
	12 " " '06	279,642	*177,421	102,221	50,000	52,221
HOUGHTON, MICH. Houghton County St. Ry. Co.	1 m., May, '07	20,775	*11,116	9,659	3,974	5,685
	1 " " '06	18,212	*11,500	6,713	3,966	2,747
	12 " " '07	241,034	*150,810	90,224	47,140	43,084
	12 " " '06	205,679	*144,334	61,345	45,642	15,703
HOUSTON, TEX. Houston Electric Co.	1 m., May, '07	54,137	*38,181	15,955	8,417	7,538
	1 " " '06	49,176	*29,624	19,553	7,692	11,861
	12 " " '07	626,604	*404,201	222,403	95,185	127,217
	12 " " '06	551,997	*341,837	210,161	101,331	108,829
KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1 m., May, '07	498,497	277,468	221,029	151,980	69,049
	1 " " '06	461,181	252,796	208,385	141,016	67,369
	12 " " '07	5,724,780	2,909,136	2,815,644	1,765,870	1049774
	12 " " '06	5,162,869	2,596,500	2,566,369	1,644,524	921,845
LEXINGTON, KY. Lexington & Interurban Rys. Co.	1 m., May, '07	46,649	30,816	15,833	.....	.....
	1 " " '06	46,640	31,009	15,630	.....	.....
	5 " " '07	204,221	138,565	65,656	.....	.....
	5 " " '06	184,134	133,337	50,796	.....	.....
MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1 m., June, '07	332,192	155,797	176,395	100,529	75,866
	1 " " '06	300,793	146,401	154,392	76,993	77,399
	6 " " '07	1,861,926	936,302	925,624	568,694	356,930
	6 " " '06	1,671,660	840,212	831,448	514,405	317,043
Milwaukee Lt. Ht. & Tr. Co.	1 m., June, '07	77,830	30,364	47,466	56,695	†9,229
	1 " " '06	65,750	24,461	41,289	28,007	13,282
	6 " " '07	344,534	158,710	185,824	209,921	†24,097
	6 " " '06	293,240	123,046	170,194	145,961	24,233
MINNEAPOLIS, MINN. Twin City R. T. Co.	1 m., May, '07	496,711	235,986	260,725	115,142	145,583
	1 " " '06	448,104	209,263	238,841	110,592	128,249
	5 " " '07	2,317,873	1,148,373	1,169,501	576,175	593,326
	5 " " '06	2,070,018	998,838	1,071,180	549,425	521,755
MONTREAL, CAN. Montreal St. Ry. Co.	1 m., June, '07	325,252	175,031	150,221	55,786	94,436
	1 " " '06	287,595	152,835	134,760	52,034	82,727
	9 " " '07	2,494,888	1,585,598	909,290	389,614	519,675
	9 " " '06	2,193,785	1,367,193	826,592	319,008	507,584
NEW ORLEANS, LA. New Orleans Ry. & Lt. Co.	1 m., May, '07	470,901	261,047	209,854	154,806	55,048
	1 " " '06	495,661	271,935	223,727	167,562	56,165
	5 " " '07	2,452,811	1,279,149	1,173,662	761,481	412,180
	5 " " '06	2,573,502	1,292,495	1,281,007	834,264	446,743
NORFOLK, VA. Norfolk & Portsmouth Tr. Co.	1 m., May, '07	216,919	140,084	76,835	.....	.....
	1 " " '06	142,086	95,777	46,309	.....	.....
	5 " " '07	845,932	551,247	294,686	.....	.....
	5 " " '06	637,464	417,276	220,188	.....	.....
PEEKSKILL, N. Y. Peekskill Lt. & R. R. Co	1 m., June, '07	16,513	7,990	8,523	.....	.....
	1 " " '06	15,219	7,065	8,154	.....	.....
	6 " " '07	75,824	43,714	32,110	.....	.....
	6 " " '06	65,976	35,984	29,992	.....	.....
PHILADELPHIA, PA. American Rys. Co.	1 m., June, '07	264,986	.....	.....	.....	.....
	1 " " '06	247,230	.....	.....	.....	.....
	12 " " '07	2,855,335	.....	.....	.....	.....
	12 " " '06	2,610,449	.....	.....	.....	.....
PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1 m., May, '07	9,772	*6,862	2,910	1,814	1,096
	1 " " '06	8,793	*6,175	2,618	1,833	785
	12 " " '07	114,868	*73,054	41,814	21,673	20,141
	12 " " '06	103,461	*72,029	31,432	21,457	9,974
ST. LOUIS, MO. United Railways Co. of St. Louis	1 m., June, '07	961,189	*598,353	362,836	230,852	131,984
	1 " " '06	899,073	*554,232	344,841	231,696	113,145
	6 " " '07	5,287,612	*3,526,036	1,761,576	1,386,310	375,266
	6 " " '06	4,949,631	*3,120,780	1,828,851	1,390,763	438,088
SAVANNAH, GA. Savannah Electric Co.	1 m., May, '07	48,332	*34,643	13,688	11,973	1,715
	1 " " '06	53,174	*30,694	22,480	11,020	11,460
	12 " " '07	597,231	*381,750	215,481	138,350	77,131
	12 " " '06	609,734	*369,463	240,271	129,634	110,637
TACOMA, WASH. Puget Sound El. Ry. Co.	1 m., May, '07	148,273	*89,440	58,833	30,680	28,153
	1 " " '06	112,155	*73,937	38,218	24,450	13,768
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., May, '07	173,990	*106,632	67,358	47,397	19,961
	1 " " '06	167,847	*93,855	73,992	42,243	31,749
	5 " " '07	834,881	*490,132	344,749	229,111	115,638
	5 " " '06	784,391	*420,494	363,897	211,451	152,446