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Of this issue of the Street Railway Journal, 8500 copies are printed. Total circulation for 1906 to date, 221,100 copies, an average of 8190 copies per week.

New York State Association Broadens Its Scope

The Saratoga convention of the Street Railway Association of the State of New York marks a new epoch in the history of this progressive and important organization. The association has been in existence for twenty-four years, and it is not too much to say of it that its cumulative record from the date of organization to the present time, in point of usefulness and good work accomplished, places it in the front rank amond kindred associations. Those who from time to time have had the responsibility of directing its affairs have, fortunately, always been keenly alive to the best interests of the members, and have acquitted their trust on a broad-gaged plan. As is necessary when progress is to be made, the policies of the association have been modified to suit new conditions, and this year another change in policy seemed desirable. Within the last two or three years particular emphasis has been laid upon the research and educational features of the association, and a year ago the experiment was started of holding quarterly one-day conferences for the purpose of discussing and reaching conclusions on the many departmental problems and questions that are constantly coming to the front. These conferences have taken the form of informal heart-to-heart experience meetings, and have proved of the utmost value, particularly to the heads of departments and subordinate officials, whose needs for information and help are sometimes neglected where the work of an association is all carried out at annual conventions.

During the last year the New York organization has also accomplished a great deal of important work through special committees. There can be no question that this policy of turning over important topics to competent working committees is an admirable method of making progress. Often when a topic is brought to the attention of a convention in the form of a paper, the lack of time or other conditions prevent satisfactory discussion, and it is difficult to arrive at well-judged conclusions. By putting the topic in the hands of a committee, much preliminary and useless discussion is avoided, the ideas of several minds are concentrated, and the report of the committee is more likely to embody the consensus of opinion on the subject. This report then offers an admirable basis for discussion in open convention, and the chances are some definite conclusion will be reached.

The institution of quarterly meetings has brought the work of the association to the attention of roads in adjoining States and Canada, with the result that outside companies have petitioned for the privilege of participating in, and co-operating with, the New York organization. Realizing the mutual good to be derived from this broader co-operation, the members of the association at the Saratoga meeting amended the constitution and by-laws to provide for an associate membership class, which is intended to include electric railway companies in States and Canadian provinces adjacent to New York, engineering firms, financial institutions, independent engineers, and power generating and transmitting companies.

This occasion was also taken to form an allied membership class to include the manufacturers. The organization has never clearly defined a policy under which the supply men could assume a recognized place in the annual conventions. By the creation of the allied membership class the repre-

sentatives of manufacturing and supply houses will become affiliated with the organization on a definite basis.

In thus enlarging its scope and sphere of endeavor the New York Association enters upon a new era of usefulness and one that should give a record fully in keeping with its past history.

The Relations Between Employer and Employee

We commend to our readers this week a perusal of the paper on the relations between employer and employee presented by Mr. Vreeland at the last meeting of the American Academy of Political and Social Science, in Philadelphia, and reprinted in this issue. In reviewing the industrial and engineering achievements of the last twenty-five years, one is apt to overlook the changes which have been effected in industrial organization, and particularly in the life and environment of the workmen. These changes are just as real as the material improvements which have taken place in the same period, and are a logical result of the enormous aggregations of capital in industrial pursuits and general diffusion of education, with which they have been contemporary. In consequence, we have, on the one hand, what Mr. Vreeland calls the annihilation of the individual in the personnel of great industries. On the other hand, owing to the wider education of the workmen and the more general diffusion of literature, especially of newspapers, we have a tremendous increase in his aspirations, a better knowledge on his part of events outside his own field of activity, and a broadening, though not necessarily an elevation, of his thoughts and ideas. In monarchical countries the preservation of obligatory military service for all citizens has had the effect of delaying the necessity for the same kind of reforms as are required in this country, although militarism has introduced problems, both economic and social, of which we are, fortunately, almost free. But in the United States there is a powerful movement in the direction of considering modern industrial conditions from a broader standpoint than was formerly customary, and of introducing such methods to avoid industrial disagreements as the experience of those most conversant with the conditions can suggest.

We cannot attempt at this time to review all of the points in the paper presented by Mr. Vreeland, but we ought not to fail to refer to one element creating a lack of sympathy between capitalists or executive directors and their men to which he calls particular attention. This is to the lack of judgment, coupled with domineering conduct, on the part of subordinate officials who, clothed with a little brief authority, often nullify the broader plans and purposes of their executive chiefs. It may truly be said that one of the most essential qualifications of the manager of a large industry at present is the ability to select and control the conduct of those whom he selects as his assistants, and the greatest successes in modern industrial organization have been made by those who have had this ability in a most marked degree. We admit that narrowness and lack of perspective on the part of the employee are quite as often, if not more frequently, a cause of industrial disagreements; but the aim of all, of course, should be to reduce all excuses or causes of complaint. In this connection we should bear in mind that open dissatisfaction is rarely spontaneous. Instead, it is usually the result of an accretion of a number of small troubles, such as petty rules which have done no real good, minor causes for complaint which are insignificant in themselves, and regulations which are intended for the betterment of the service, but whose object is not thoroughly understood. On the other hand, and combined with these, are unwillingness to undergo slight inconveniences for the benefit of the general good, trade unionism, the feeling of discontent fostered by many present agitators, and the desire, now too prevalent, to see those who have more money than one's self suffer financial loss. It is the effort of the modern social reformer to point out these remediable differences and to direct attention to ways in which every participant in industrial enterprises will be impressed with the fact that the prosperity of each is interrelated with that of all.

Testing Switchboard Instruments

The testing of switchboard instruments is a matter which ought not to be overlooked in a railway plant, even though the necessity for it is less urgent than in central station work. Opinions vary considerably as to the frequency with which calibrations must be made, but there is no doubt that it is unwise to let more than a year pass without checking up the instruments most directly concerned in measurements of station output. Recording wattmeters are the most important instruments in the plant, from the standpoint of operating economy, and some companies test these three or four times a year. In the 1906 Question Box of the National Electric Light Association, the Toledo Railways & Light Company advises testing recording wattmeters of the direct-current type at least once in three months, with inspection and drop of potential test across the armature once a month; induction recording wattmeters once in three months, and indicating ammeters, indicating wattmeters and other instruments used for approximate readings, once in six months.

Ammeters on feeder panels are relatively unimportant instruments, and even generator ammeters are seldom used in economic measurements. Once a year would seem to be often enough in many cases to test them, but voltmeters and totalizing ammeters ought to be kept a good deal closer to the line, for the reasons that machine potentials ought to be in close accord for paralleling, and load curves of the entire station output should be prepared upon as accurate readings as possible if they are to be of any real value. In the case of a road which buys current by instrument readings from some other organization, it is wise to check up the equipment five or six times a year. Instruments need not be removed from the switchboard for testing, as a rule, unless gross inaccuracies are found. It is seldom difficult to test ammeters, voltmeters and indicating wattmeters under service conditions, and, thanks to the flexibility with which electrical connections can be made, recording wattmeters can be compared in many plants with a standard, without disturbing the switchboard arrangements. It is a good plan to keep a few standard instruments on hand for such testing work, and these can often be employed to advantage in track and feeder determination as well as in power plant tests.

In testing large capacity recording wattmeters on direct current railway switchboards, one or two storage cells can be used to advantage for supplying current to the series coils. A steady load should be used to secure the best results. In the absence of a battery, a water rheostat can usually be

pressed into service. The potential coil usually has to be supplied from the bus-bars, with regular readings of voltage. In case an extra meter is available, a very satisfactory method is to standardize this instrument on a steady current, after which it can be inserted in circuit with the regular meter to be calibrated, and its registration compared directly with the regular railway load. A wattmeter operating on a heavily fluctuating load will record the true output within commercial limits of accuracy, for the reason that, disregarding friction, which is small, the loss from failure to respond instantly to an increase of load will be made up by a similar gain when the load is falling. There is, of course, greater incentive toward the maintenance of instrument accuracy in central station work than in railway service, for the latter does not depend upon the sale of energy for its profits. At the same time the operating efficiency of a power plant cannot be determined accurately unless the instruments are periodically checked with some reliable standard.

Rapid Transit for London

We publish this week an abstract of Vol. IV. of the Report of the Royal Commission which, in 1903, examined our American rapid transit conditions for the benefit of London. Their investigation was of very wide scope, dealing with the financial, legal and engineering phases of the question, and the Report considers all these as well as the more remote effect of rapid transit on urban populations. To begin with, it seems to have been thoroughly fixed in the minds of the commission that to carry out successfully a rapid transit scheme on broad and comprehensive lines some civic body should be endowed with substantially plenary authority in the matter. There can be no effective division of powers in dealing with matters of so large public interest, and the successful working of the New York and Massachusetts Commissions seem to have made a profound impression upon our friends from abroad. The English legal mechanism for such operations is cumbersome, and has too much lost motion to operate with the necessary promptness and precision. Another thing cordially endorsed was the co-operation between municipalities and private corporations, as shown in subway construction. It is a question whether this plan will prove so mutually satisfactory in the future, to both the public and private interests concerned, as the Commission seems to assume, but the result is certainly to get things done on a scale that would be otherwise difficult. At least, municipal direction ensures rapid transit upon a coherent plan that could be followed only with great difficulty were it entrusted to competing companies.

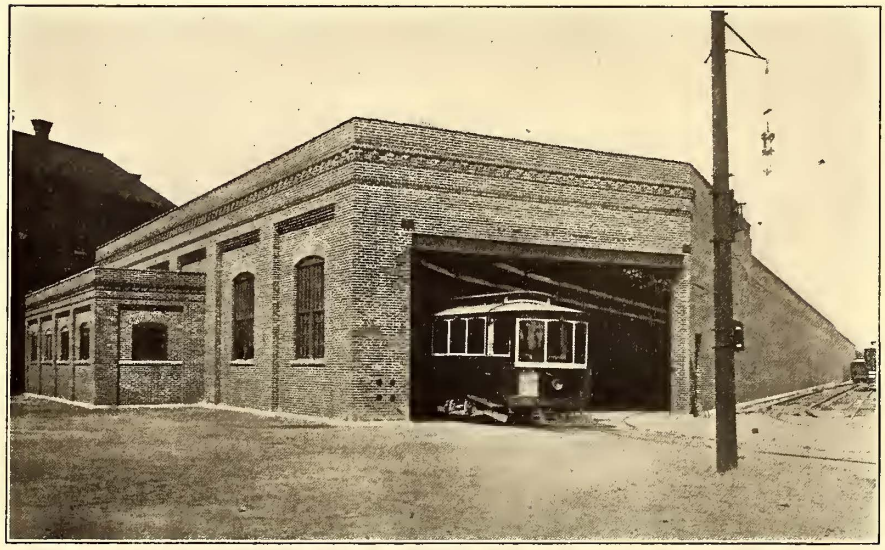
We are somewhat surprised to find the American single-fare system so cordially endorsed; it is, in fact, evidence of the very broad-minded way in which the Commission works. We have no doubt that once the British public gets used to it, it will prove as popular there as here. It is a system that is peculiarly well fitted to promote suburban expansion, even more difficult in London than in most large cities. A successful rapid transit system must be laid out on broad and simple lines, and unity of fares is essential to simplicity. The single fare is employed on the surface and rapid transit systems in Paris and Berlin, as well as on certain of the tube-lines in London, so it would not seem to be a very radical step to introduce it regularly in London. The value of regulating and directing surface traffic in co-operation with surface lines was also something which forced itself on the attention of the Commission, and should be highly developed in any plans for rapid transit in London. By adroit routing of cars and division of street traffic the capacity of the surface provisions for rapid transit can be very greatly increased.

We note, with more interest than enthusiasm, the strong sentiment of the committee in favor of the extensive use of subways. If they could spend about a couple of days riding in the New York subways some time next August, we are more than inclined to think that their approbation would ooze away to a very appreciable extent. We draw a distinction between the subway as a means of rapid transit and as a medium of human conveyance. In the former function it is quite unexceptionable, in the latter it leaves pretty nearly everything to be desired. There is a difference, of course, between a linear city like New York and a radial city like London, but London is enough larger than New York to make up for this difference. Seriously, the questions of public comfort involved in subway traffic are very grave indeed. The experience of the last two years has evolved problems in subway operation which were hardly suspected at the time of the Commission's visit in 1903.

We have no love for elevated roads as such, but from the standpoint of the passenger they are infinitely preferable to subways. The work of this kind that has been done abroad, notably in Berlin, is a lesson that should be studied. If elevated roads or viaducts were built in the same spirit as the subways, making the question of cost subsidiary to that of completeness, some very remarkable results could be obtained. The elevated road, as we have it in this country to-day, is distinctly a makeshift. It is too light and too resonant —in short, too cheap. The noise and vibration are more serious elements of damage to abutting property than is the necessary loss of light. A solider and more permanent structure, perhaps even of reinforced concrete arches, with side walls, improved road bed and rolling stock designed with the object of reducing noise, would rob the elevated road of the greater part of its terrors, and in most situations would be far cheaper than a subway. Certainly in some of the smaller cities now clamoring for subways such a structure would meet the requirements admirably, and would permit the easy access of suburban and interurban lines, now a matter difficult to arrange. We have not as yet reached the full benefit of multiple unit control on account of the discontinuity of service between the tramways proper and the outlying lines. One of the great problems of rapid transit is the treatment of the diverging lines of traffic as the suburbs expand. To-day there is no unity of treatment possible. Could converging cars group into trains and come fairly into the heart of a city over suitable viaducts, the problem would be solved. We, therefore, while not denying the value of subways for certain purposes, cannot regard them as a general solution of urban rapid transit, at least in their present shape, and we would recommend to our London friends a supplementary visit to the Continent before committing themselves to any comprehensive scheme of construction. We have made great advances in this country, but we cannot lay claim to a monopoly of all that is best, certainly so far as tasteful and noiseless elevated railway construction is concerned.

THE NEW CAR HOUSE AND REMODELED SHOPS OF THE INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

Within the past year the management of the International Railway Company, of Buffalo, N. Y., has begun to carry out a number of extensive improvements in its car-house and shop facilities at the Cold Springs depot. The buildings



THE MAIN STREET, OR FRONT, END OF THE NEW CAR HOUSE

comprising this station are located within a few feet of the important Main Street line, and are also only a few minutes travel from most of the other city lines. It is therefore a most central place for car storage and repair work, as it obviates the large amount of useless mileage incident to locating car houses and repair shops at some outlying point. The car house has already been completed, and the company is now changing the old car house into a carpenter shop, mill and truck shop. In addition important changes have been made with regard to the paint shop, wheel shop, and stock rooms, etc.

The general lay-out of all the buildings at Cold Springs is shown in the accompanying plan, on which are also shown the tracks used for storage of cars in the open. In carrying out the new work the endeavor has been made so to arrange the different departments that a car in going through the shops will follow its natural course and not be in the way of later ones. However, most of the buildings were in existence before the changes mentioned were started, and it was found advisable to utilize them under the new arrangement in preference to tearing them down and erecting new structures. Aside from securing a practically fireproof construction, the company has recognized the importance of having plenty of daylight; in fact, the splendid natural illumination of these buildings is one of their commanding features, and can not help but lead toward securing better and quicker repair work than is possible under artificial lighting.

GENERAL TRACK ARRANGEMENT

Cars bound to the car house can come from either up or down Main Street or from the crosstown lines without reversing their trolleys, and then proceed the length of the property to Masten Street and thence to the new car house, as shown. This track arrangement, therefore, does away with the necessity of turning trolleys at any point.

CAR HOUSE

The new car house is located near the intersection of Balcom and Main Streets, forming the first of the group of buildings at Cold Springs. It is 520 ft. 4½ ins. long on one side and about 600 ft. long on the other. The structure is divided into two bays, each of which is 51 ft. 6 ins. wide between the inside columns and accommodates five tracks in the front half of the car house and four in the rear half of the structure, which contains the pits. The heights from the floor to the lower chords of the roof trusses vary from 18 ft. to 19 ft., owing to the grade of the floor. The foundations for the walls are of concrete and project 4 ins. above grade, the walls themselves being of brick. The roof is supported on brick piers 21 ins. x 24 ins., and the space between piers consists of an 8-in. curtain wall. This wall is carried up 2 ft. above the roof and capped with a tiled coping for fire protection. The roof and the walls of this structure to within 4 ft. of the floor are painted white, the rest of the walls being finished in black.

The footings, foundation walls, pit walls, pit piers, floors in the pit section and the stock and oil rooms are made of concrete. The mixture used for the foundation and floors in the rear half of the car house and that portion of the building walls

VIEW FROM SAND DRIER, LOOKING TOWARD MASTEN STREET, OR REAR END OF CAR HOUSE

for heights of 4 ins. to 14 ins. from the grade line (due to the slope) was composed of one portion of Portland cement, two and one-half parts of sand and five parts of limestone or granite crushed to pass through a 2-in. ring. For the pit walls, pit piers and footings for the same, as well as for the roof of the oil and stock rooms in this building, the mixture

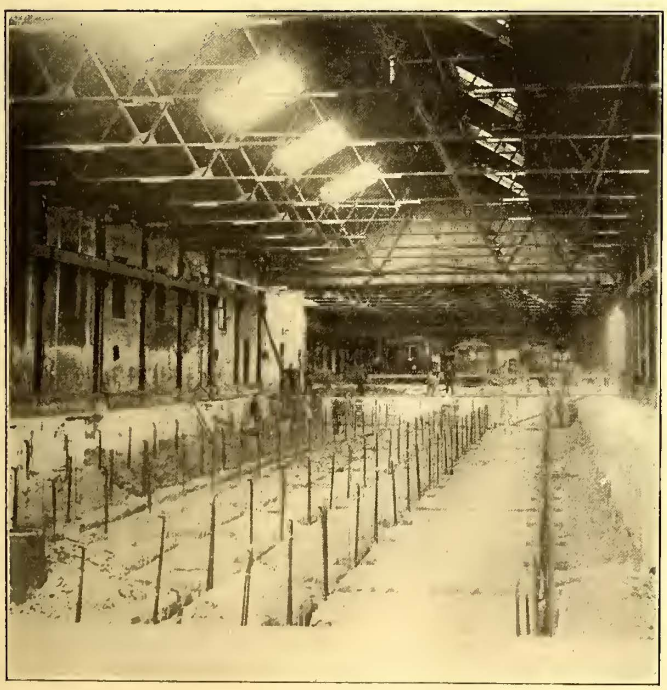
chosen contains one part of Portland cement, two parts of sand and three parts of limestone or granite crushed to pass through a 1½-in. ring.

The concrete floors were first laid to a thickness of 5 ins. and were then finished with a 1-in. layer of Portland cement mortar, composed of one part of Portland cement to two parts of sharp sand troweled to a hard, smooth finish. Catch basins and gutters formed of concrete with malleable-iron perforated covers are used for carrying off the drainage. Part of the drains are of vitrified salt glazed tile pipe bedded in the trenches. All drains which cross the car pits or connect with conductors in the two sections of the building fronting Masten Street are of extra heavy cast-iron pipe, provided with a metal swing check valve to prevent all water from backing up into the pits.

The floors of the two west sections of the car house and also the alley between the east and west sections are of cinder concrete 6 ins. thick, made of one part of Portland cement, three parts of sand and ten parts of soft coal cinders. As this part of the house is used only for the storage of cars ready for operation, it was considered that a floor of this type was good enough. It can be kept clean easily without causing much dust to arise, besides preventing dirt from getting into the cars

To fireproof thoroughly the stock and oil rooms, which are placed midway of the pits at the rear of the building, it was decided to use concrete roofing for this section. The roofs of these rooms are made of old 6-in. rails placed 4 ft. centers, covered with expanded metal and concrete 4 ins. thick, with the concrete and expanded metal haunched down and around the bottom of the rails. The skylights for each room are 6 ft x 10 ft., and are built on a concrete curb 12 ins. high and 4 ins. thick.

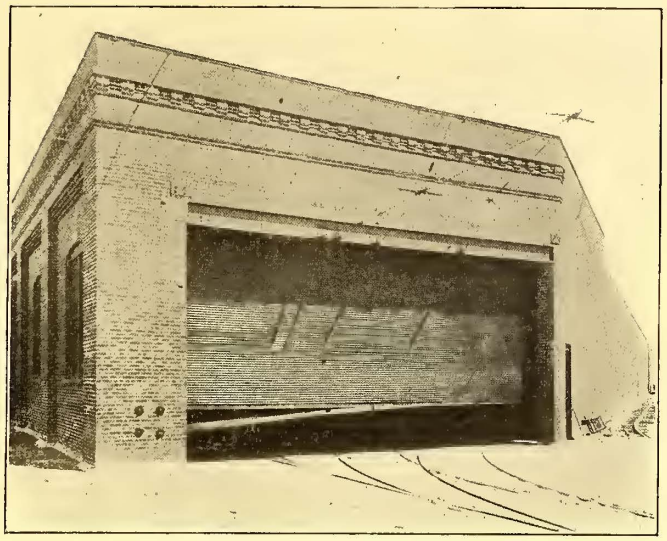
The gable ends of the building at the rear or Masten Street



TWISTED RODS IN POSITION FOR CONCRETING TO FORM THE PIT PIERS

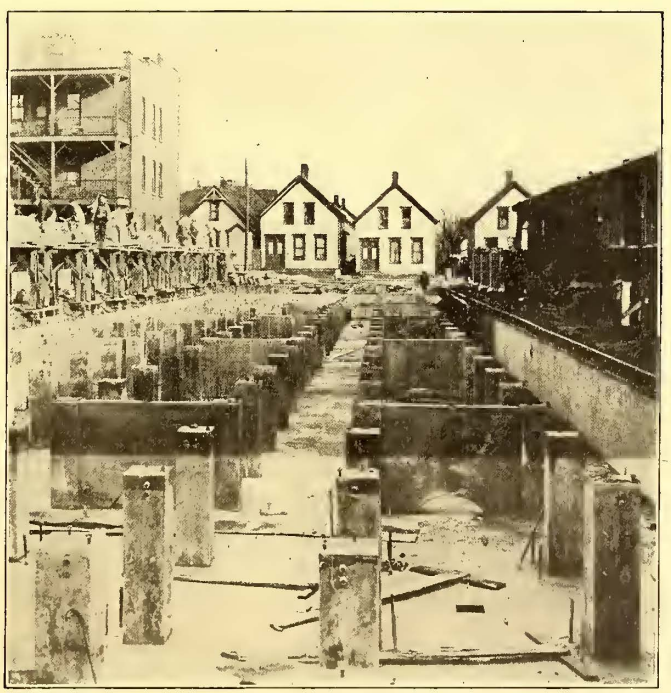
end, and at both sides of the alley in the center, were first covered with heavy gage expanded metal securely fastened to the steel trusses with metal clips. The gables were then plastered with cement mortar at least ¾ in. thick, and mixed in the proportion of one part cement to two parts of sand. Plastering was put on both outside and inside as well as at all panels and joints, at the brick work, roofing plank, and above the steel rolling doors.

All of the lumber for the roof purlins and roofing plank consists of long-leaf yellow pine. The purlins are 6 ins. x 10 ins. and 4 ins. x 10 ins., and are bolted to angles. The



A 30-FT. STEEL ROLLING DOOR IN FRONT OF THE CAR HOUSE

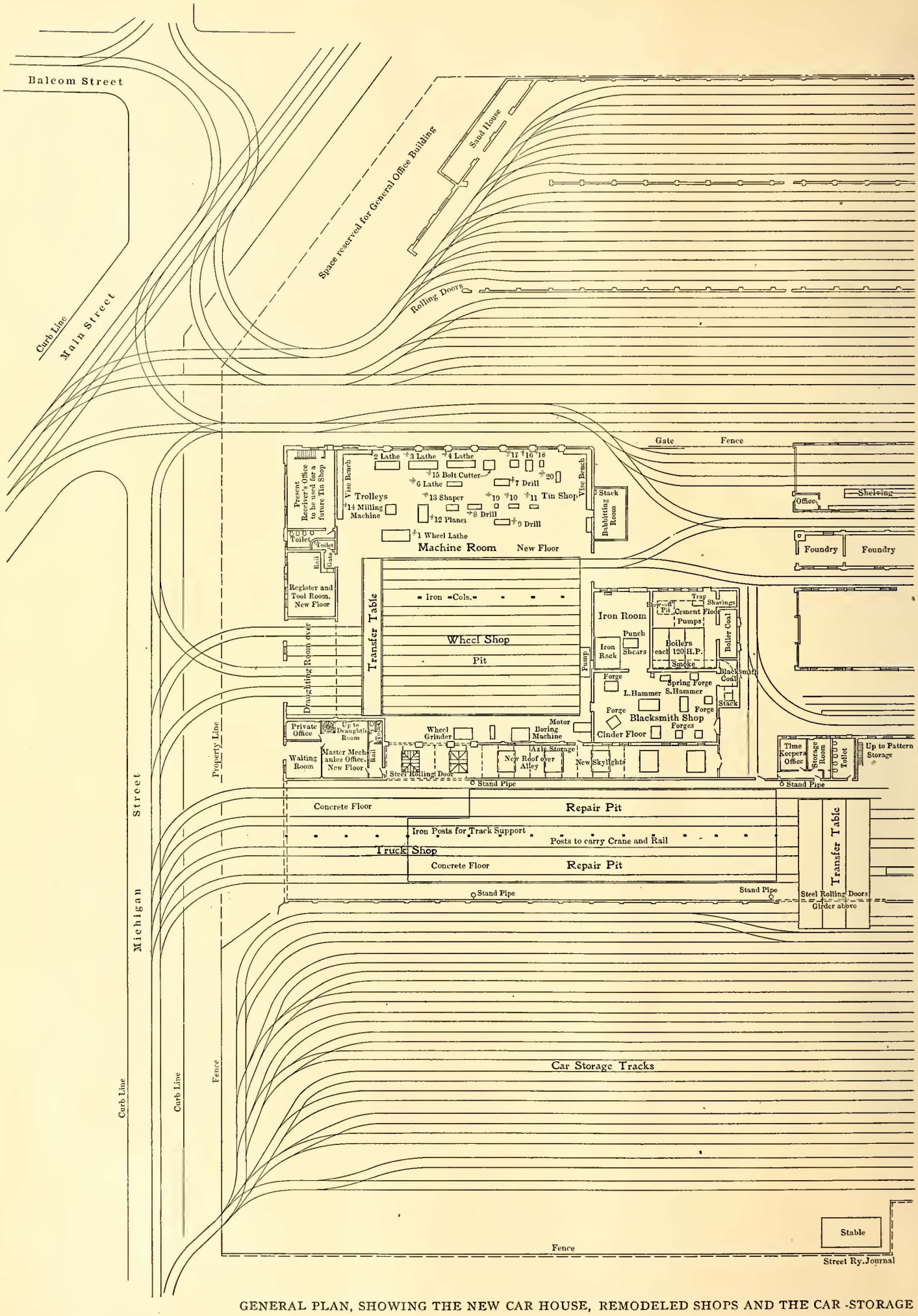
skylights curbs, except for the stock and paint rooms, are 2½ ins. x 10 ins., fastened to the iron work and roof planks, which are 2 ins. thick. The ends of the lanterns are 2-in. matched yellow pine. The trolley troughs are of No. 1 white pine, painted with one coat of boiled linseed oil to preserve the wood. These troughs have 2-in. x 6-in. braces secured to the bottom of the roof trusses, with 5-16 in. bolts between the angles of the trusses to prevent the trolleys from striking



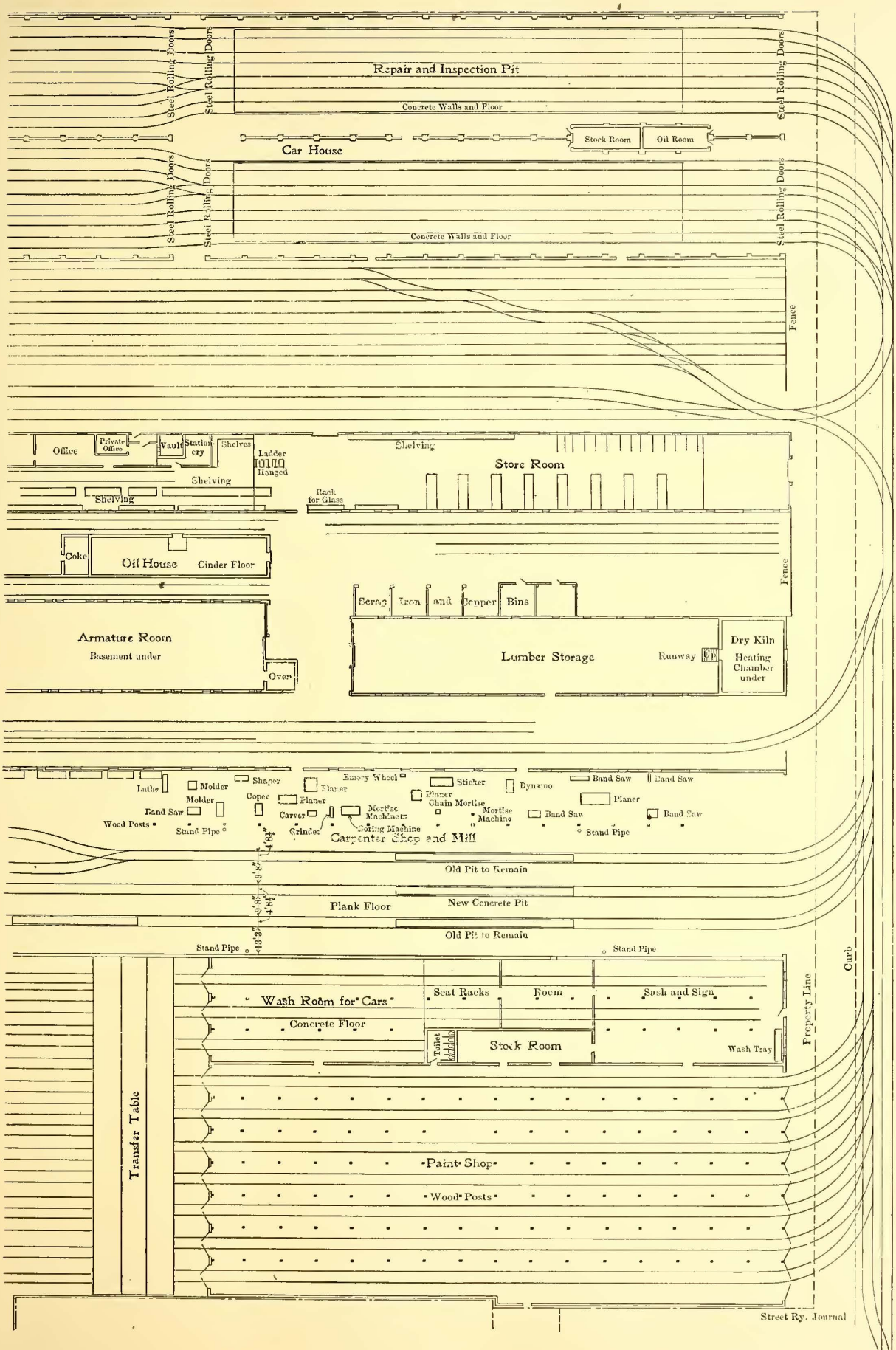
CONCRETE PIERS BEFORE THE RAILS, CHECKER-PLATES AND RADIATORS WERE INSTALLED

the ironwork of the roof. In addition to these, wooden insulators are attached to the ironwork to prevent carrying current through possible contact with the trolleys.

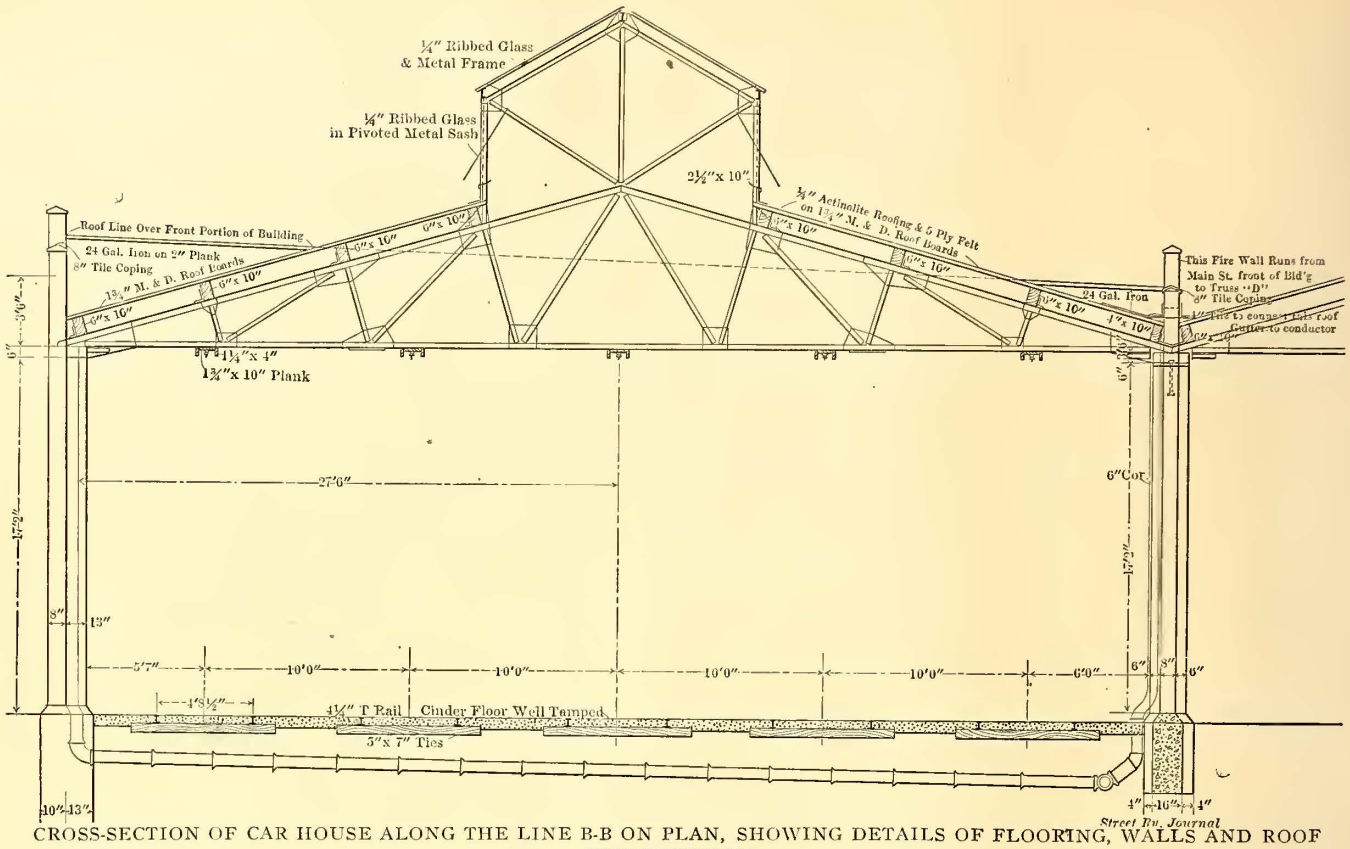
As noted above, the greater portion of the skylight curbs is made up of 2½-in. planking, the frames for the glass forming the roof. The sash in the sides of the skylights is made



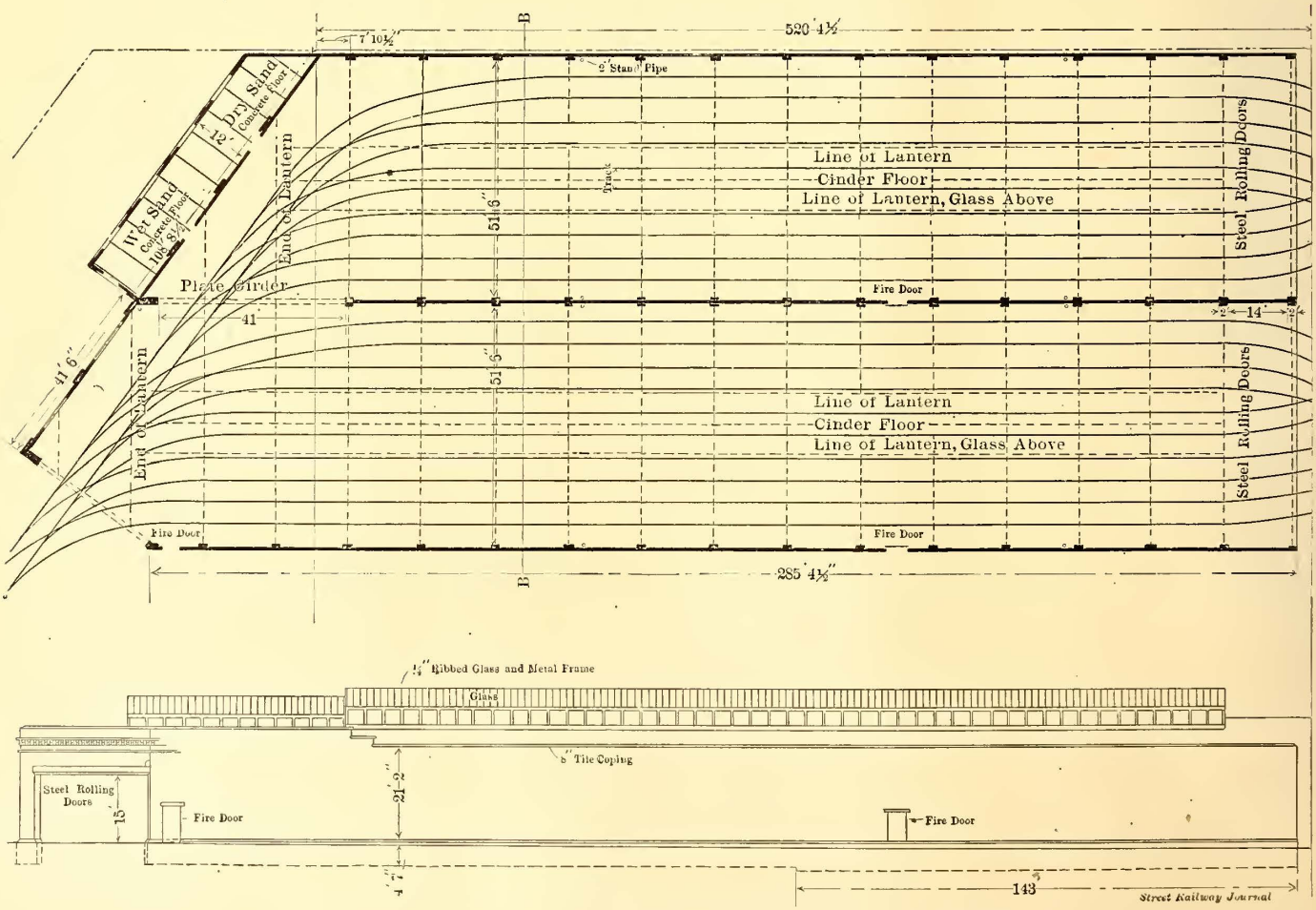
GENERAL PLAN, SHOWING THE NEW CAR HOUSE, REMODELED SHOPS AND THE CAR-STORAGE



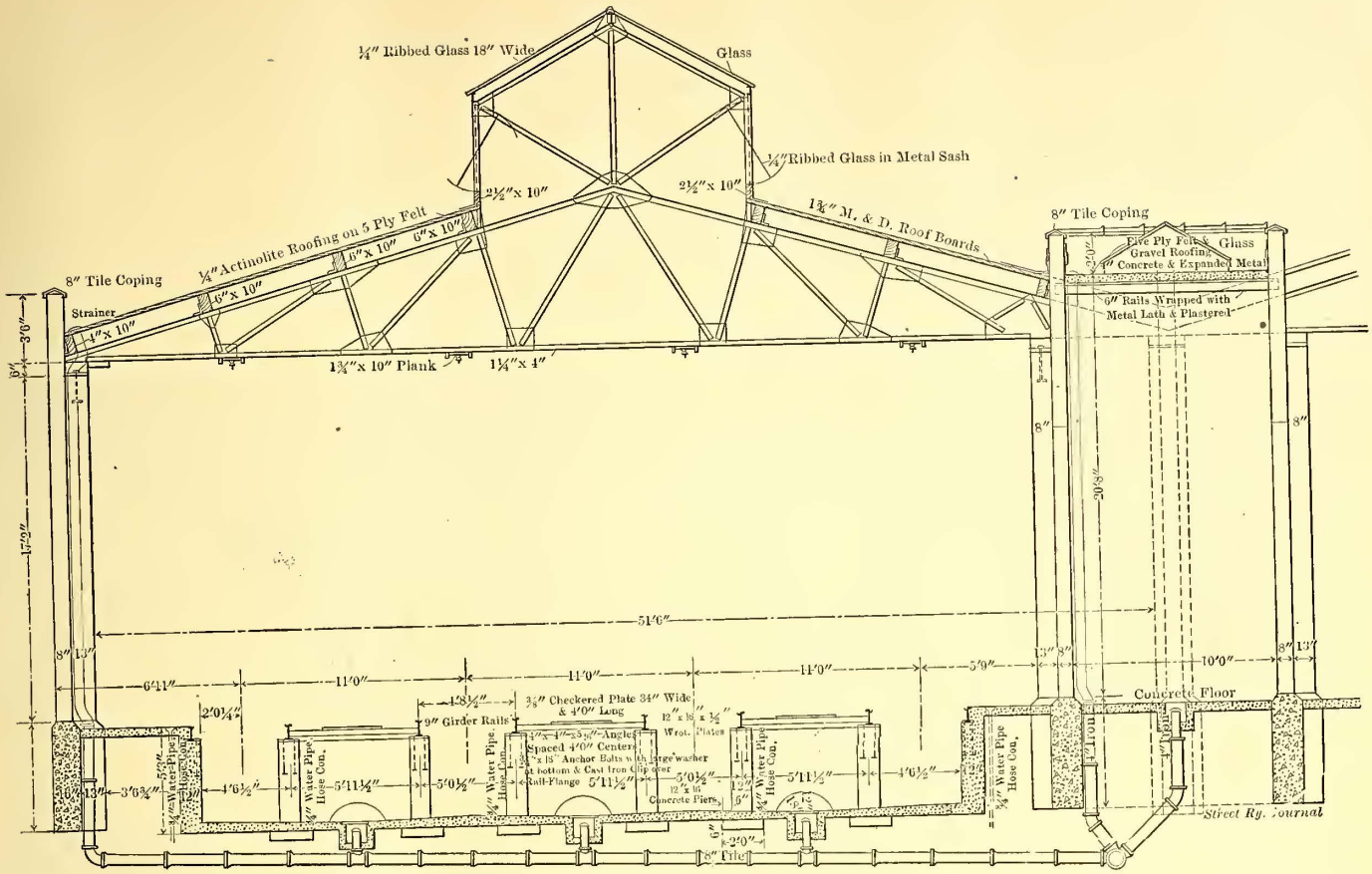
TRACKS OF THE INTERNATIONAL RAILWAY COMPANY AT COLD SPRING, BUFFALO, N. Y.



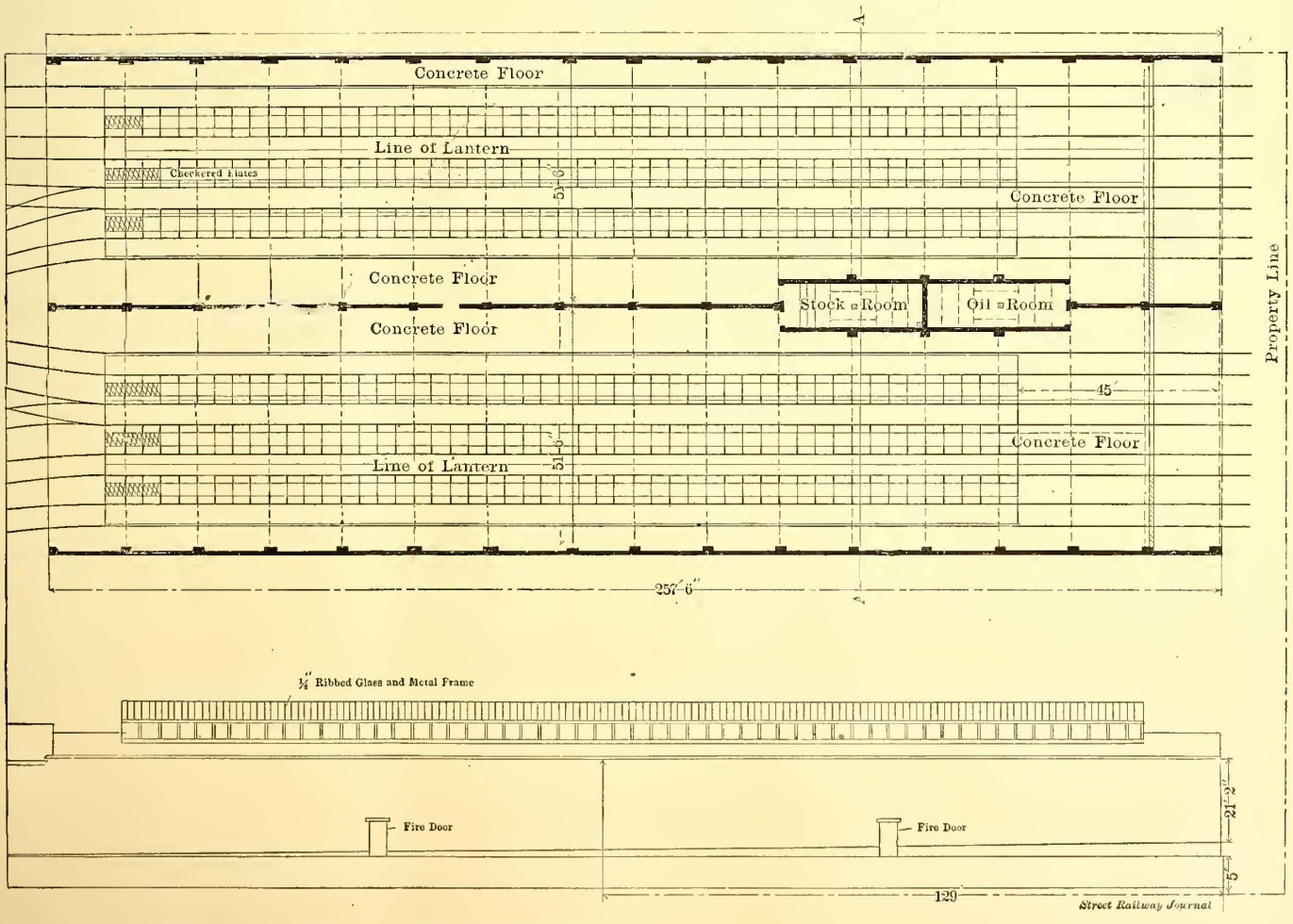
CROSS-SECTION OF CAR HOUSE ALONG THE LINE B-B ON PLAN, SHOWING DETAILS OF FLOORING, WALLS AND ROOF CONSTRUCTION



PLAN AND SIDE ELEVATION OF THE NEW COLD SPRING CAR HOUSE



CROSS-SECTION OF CAR HOUSE ALONG THE LINE A-A ON PLAN, SHOWING THE PIT DIMENSIONS, GIRDERS, ROOF DETAILS, ETC.



OF THE INTERNATIONAL RAILWAY COMPANY AT BUFFALO, N. Y.

of galvanized sheet iron formed over stiffening bars. These bars are spaced for 1¼-in. ribbed glass 18 ins. wide, and their lower ends rest upon channels at the top of the side walls. The sash in the sides of the skylights are made of heavy galvanized iron and are pivoted at the center of each side. All of them may be easily opened and closed, as ventilating conditions and weather demand, through a simple skylight gearing having operating levers on the walls. The roof conductors are 4 ins. x 6 ins., cast iron, and are leaded into the sewer inlets. At the top they are fitted with 16-in. copper conductor heads which extend through the roof, are turned down on the same and fitted with galvanized wire screens which project 3 ins. above the roof and prevent refuse close to the walls, securely attached with wrought-iron straps. At a height of 3 ft. above the floor they are equipped with a 3-in. hose valve, above each of which is a capped air chamber 12 ins. long. It has been found that greater efficiency is secured in car and truck washing by combining compressed air from the car reservoirs with the water from this piping, a pressure of 70 lbs. often being obtained. There is a swinging hose rack at each stand pipe which holds 50 ft. of 2-in. rubber line cotton hose in one length. Each line of hose is provided with brass couplings and spanner and a 12-in. brass nozzle.

One of the most commendable features of this car house is the pit construction. Each section of the rear half of the

VIEW THROUGH THE CAR HOUSE, SHOWING THE PITS, CHECKER PLATES, RADIATORS AND SKYLIGHT CONSTRUCTION

from clogging the conductors. Around all the walls and skylights was placed a flashing of No. 26 galvanized iron, 6 ins. on the roof and 12 ins. up the walls. After counter-flashing this was cemented with oil cement.

In constructing the roofing, the roofing boards were covered with one thickness of dry felt, and over this were put four layers of No. 1 roofing felt weighing about 15 lbs. single thickness to 100 sq. ft. These layers were cemented, after which the roof was entirely covered with a coating of fireproof fibrous actinolite cement troweled on not less than ¼ in. thick.

The water supply is secured through a 4-in. main connected to the 6-in. city main in Masten Street. The stand pipes are run from this 4-in. main, as indicated on the plan drawing These stand pipes are of 2-in. galvanized iron, carried up

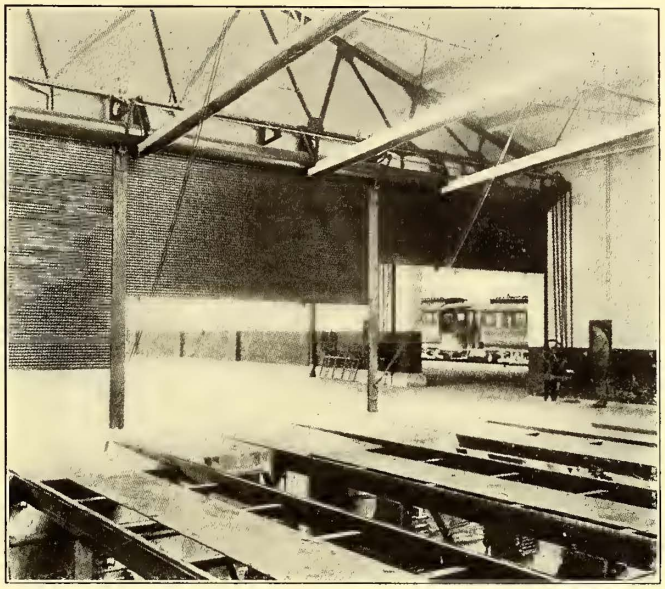
building contains four continuous pits 200 ft. long. The pits have a concrete floor and carry their tracks on 12-in x 16-in. concrete piers, spaced 8 ft. centers. Attention has already been called to the excellent natural lighting in this structure, but this illumination would be of trifling advantage if the construction were such that little light could reach that portion of the pits covered with cars. To prevent this the checkered-plate devil strip or walk between the pits is only 34 ins. wide, which allows, as the view on this page shows, a considerable opening on each side through which light can penetrate. The position of the devil strip also makes it convenient for men to work on the sides of a truck and makes it easy for the foreman to see just what his men are doing.

Steps made of checker plates are used at the ends of each pit for the convenience of the men working in them. In the

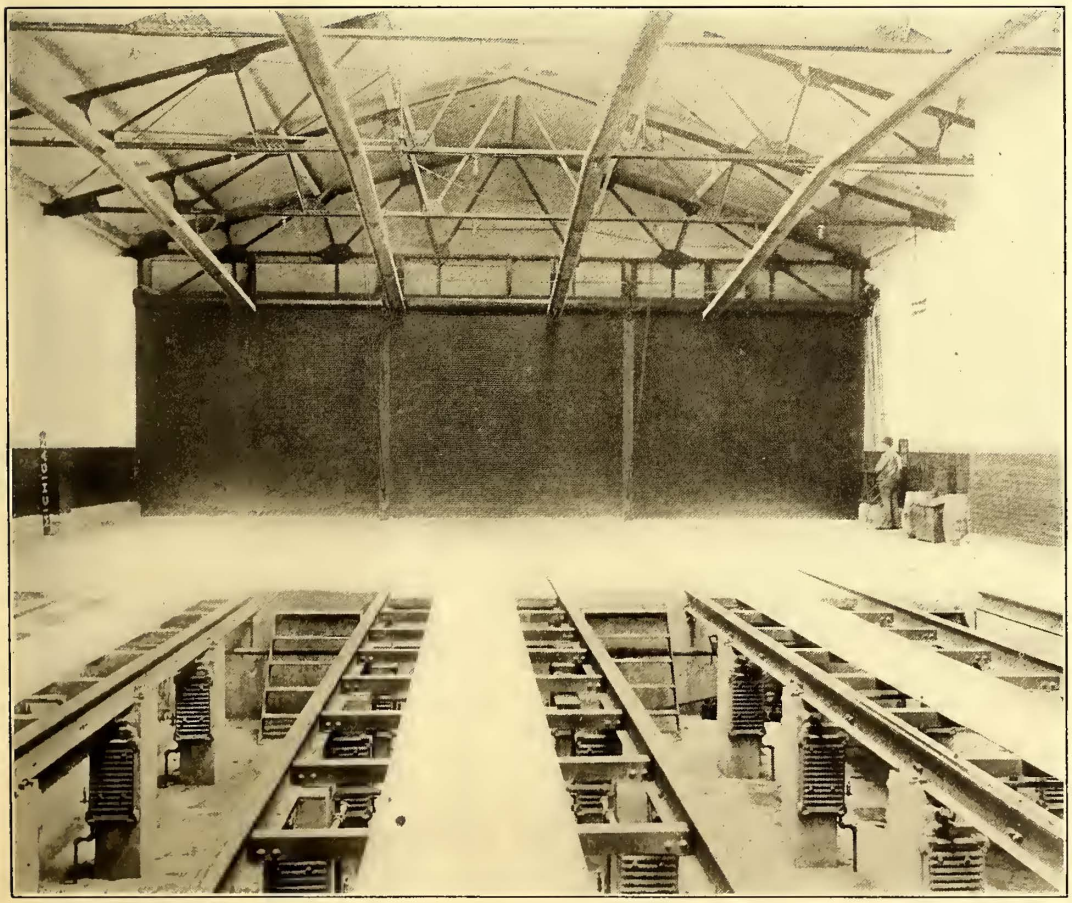
pits are used Watson-Stillman hydraulic motor lift jacks which when closed are 34 ins. high, and extended are about 6 ft. high.

Steam for heating the pits is delivered from the central plant under a pressure of 40 lbs. to the square inch, and is capable of heating the entire building to a temperature of 60 deg. F. when the outside temperature is zero. The main distributing pipes running under the floors are insulated with magnesia covering and encased in vitrified split tile large enough to permit at least 1 in. air space. At the supply and return end of each series of the wall radiators valves are placed. The valve on the return end is below the floor line and is protected by a piece of 6-in. pipe extending 1 in. below the line of the floor. The total amount of radiating surface exclusive of the mains is 41,000 sq. ft. The radiators, which are of the American Radiator Company's Colonial pattern, are divided into units of 7 ft. each, two of which are placed on each pit pier. Each unit is supplied with a duplex automatic air valve. Both the radiator and piping are thoroughly insulated. All condensation is returned through a Wright emergency steam trap located in a special pit and provided with a by-pass and draw-off with connections to sewers. The special pit is 6 ft. wide by 6 ft. long, and is several feet lower than the regular pits. It receives the reducing valve in addition to the trap. The top has a cover of iron checkered plate ⅜ in. thick. This plate is in an angle-iron frame and can be raised by two lift rings.

All of the conduits carrying the wiring for the pit lighting are of ¾-in. iron and are imbedded in the concrete floor about 2 ins. below the surface. At all points where the junctions are made iron junction boxes are placed in the floor. These are 6 ins. in diameter and 5 ins. deep, with the conduit pipe entering the sides and flush with the inside of the box. These boxes have round brass covers ¼ in. thick screwed to the iron flange of the junction box and flush with the top of the concrete floor. All of the outlets in the sides and back of the pit piers project ¾ in. from the face of the latter and are provided with bent plate with rounded end, as shown in detail



THREE STEEL ROLLING DOORS BEING OPERATED AT DIFFERENT HEIGHTS FROM ONE MOTOR AT THE RIGHT

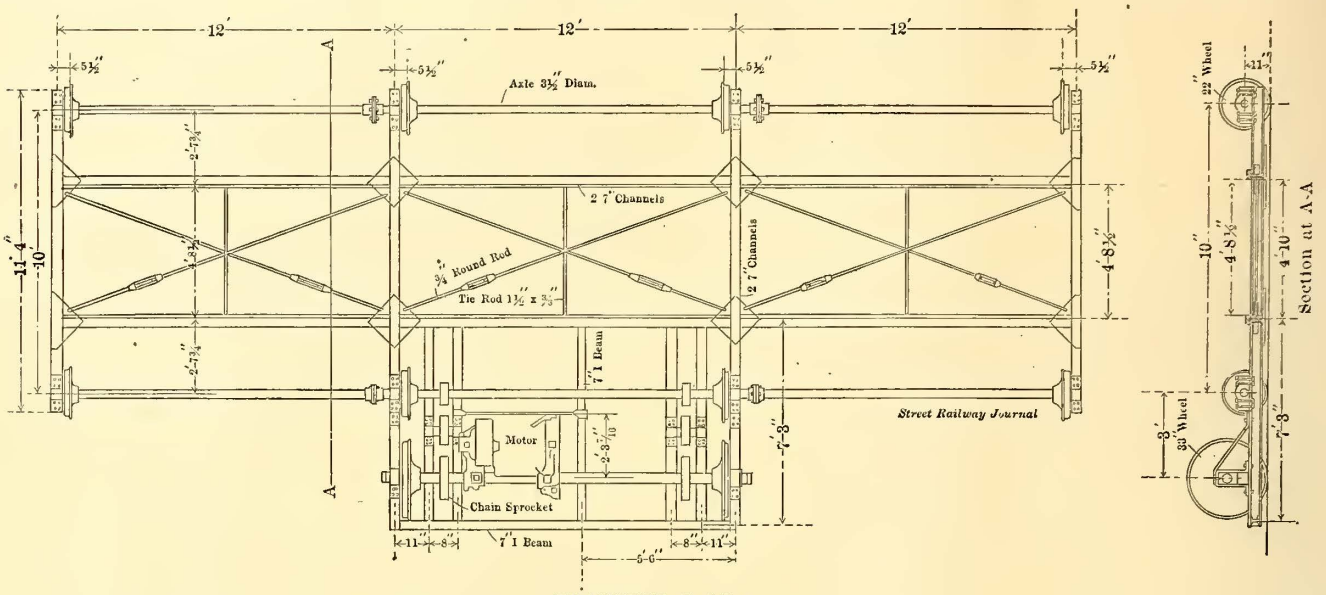


ROLLING DOOR AT THE REAR END OF THE CAR HOUSE, SHOWING ALSO DETAILS OF PIT CONSTRUCTION

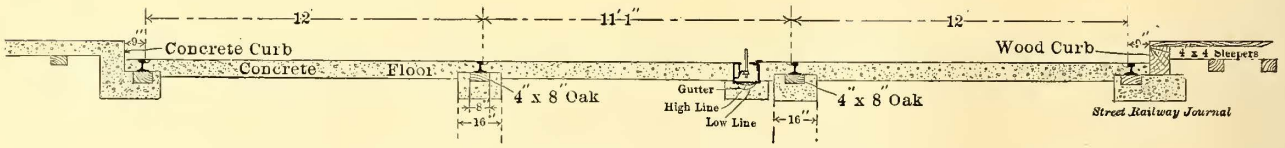
of pit construction, in which holes are punched to receive the lamp receptacles. Lead-cased wire is used for carrying the lighting current in the pits. Plug boxes are placed at the backs of the concrete pit piers at several points for attachment to clusters of five lamps which can be moved around for making close inspection of trucks or other parts. The lamps are of 16 cp and are placed on opposite sides of each pier. For the overhead lighting 50-cp lamps are used, five to six lamps being attached to each truss.

In this building there are nineteen steel doors of the Kinnear type, to cover six openings 51 ft. 6 ins. wide by 15 ft. high and one opening 30 ft. wide by 15 ft. high. A decided novelty in connection with these doors is the use of electric motors for their operation. For this purpose 3-hp shunt-wound motors of the General Electric Company's CQ-3 type are used. Where fully a minute would be required to raise or lower a door by hand these small motors accomplish the same work in from twelve to fifteen seconds—a saving valuable almost any time, but especially in an emergency when

a lot of cars must be taken out of the car house quickly. Each of the larger openings is furnished with three doors of equal width, namely, 17 ft. 2 ins., with 2-in. posts between them. There is one door for the 30-ft. opening mentioned before.



TRANSFER TABLE



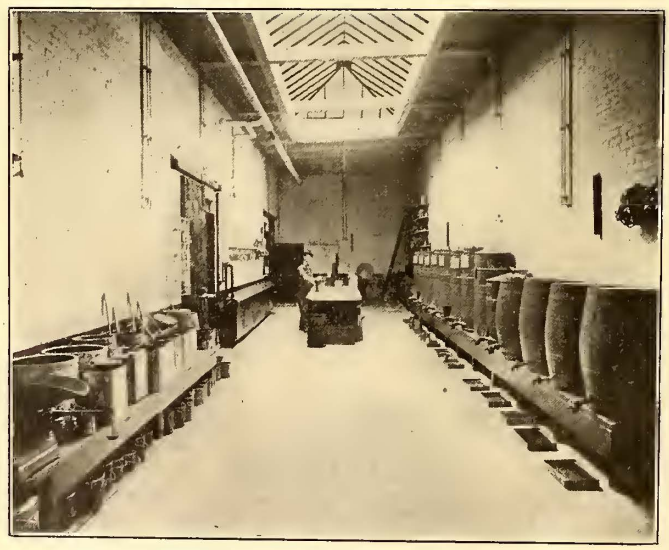
SECTION OF TRANSFER TABLE, LOOKING NORTH

The two groups of three doors each in line across the building are controlled from one motor, through separate sets of operating levers, friction clutches and Jeffrey silent chains. One of the accompanying half-tones illustrates the possibility of letting down the doors in a group at different heights with the same motor.

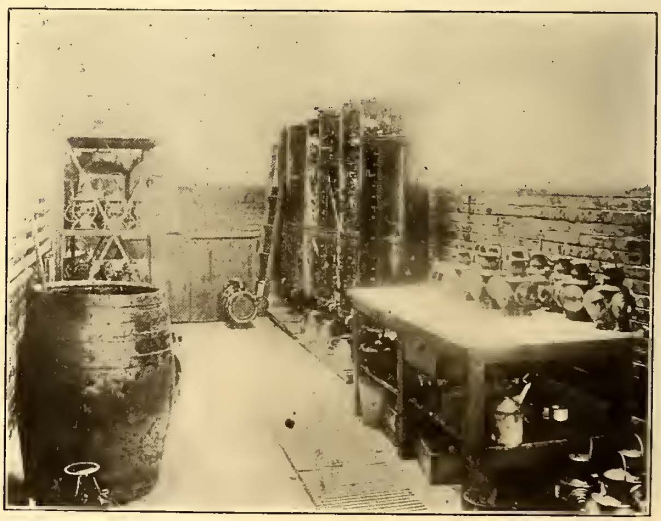
All of the doors are constructed of No. 18 gage galvanized steel except the 30-ft. door, which is made of No. 16 gage galvanized steel. The shafts for the doors contain oil-tempered helical springs. These are enclosed in steel barrels sealed to protect them from atmospheric exposure. The doors are made of steel units hinged their entire length. This permits the use of heavy gages suitable for large openings, and requires less power to coil and uncoil them, due to the fact that the coiling movement occurs in the hinge and does not require the bending of the material. For the same reason, the door returns to its original form and hangs free in the grooves.

A sand drying room is located at the Main Street end of the building, convenient to out-bound cars. The sand is brought to the building in cars and is dried by a series of steam coils which contain about 2000 ft. of 1-in. pipe in all, and operated at a pressure of about 75 lbs.

It will be noted from the general plan that the oil and stock rooms, whose features of construction have already been mentioned, are located so as to be conveniently accessible from both sections of the car house and for receiving supplies from Masten Street. In line with the progressiveness manifested in the other features of this structure, the



PAINT SHOP, STOCK AND MIXING ROOM

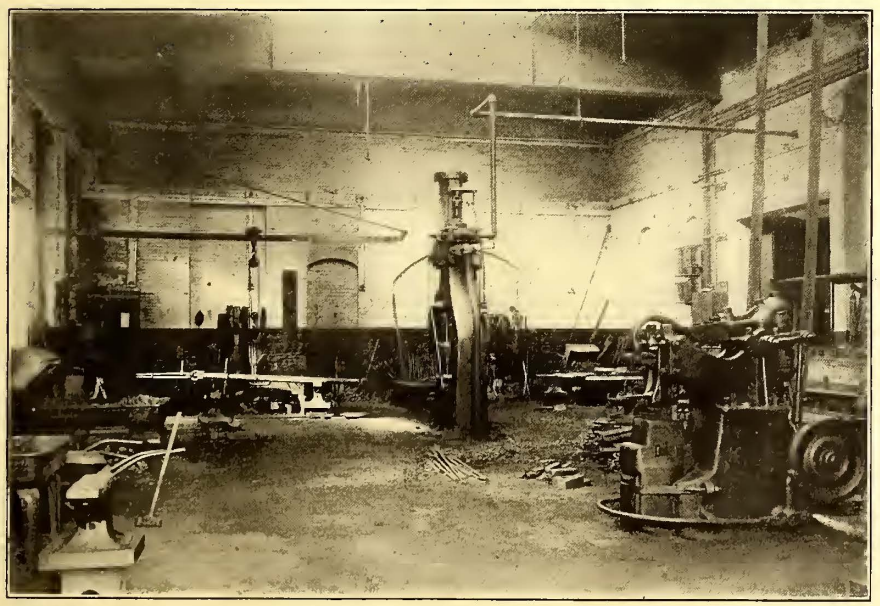


FIREPROOF OIL ROOM IN CAR HOUSE

company has installed a large number of metal lockers of the Merritt type for the convenience of its employees in this and other buildings.

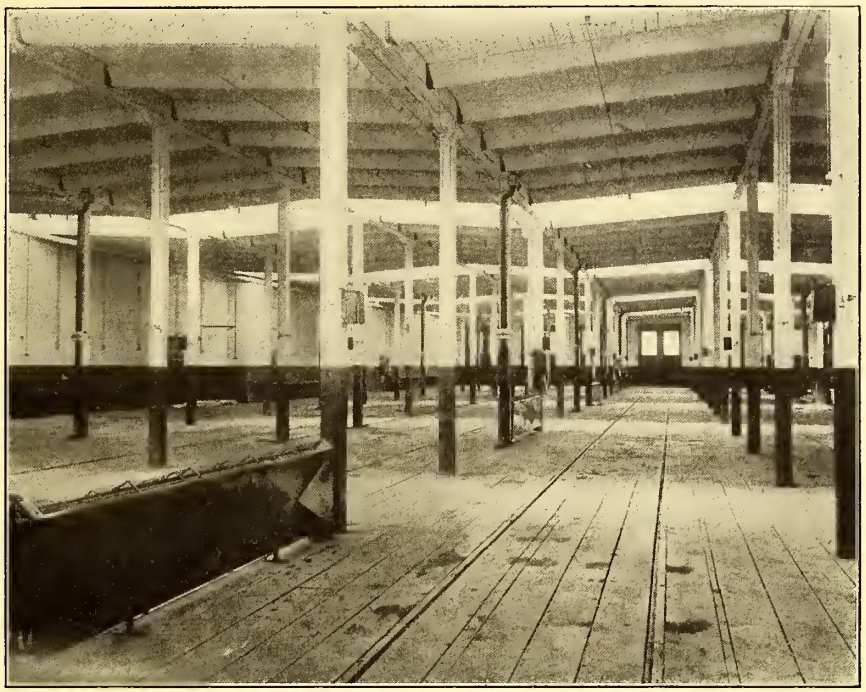
THE TRUCK SHOP

The truck shop is located in the western half of what was formerly the car house. New windows and skylights have been put in to get additional light, and the track system has been entirely changed to the layout shown in the general plan. The pits in this shop extend over the entire width of the building from the outside tracks and three-quarters of the length of the shop. They are built with 16-in. x 24-in. concrete piers spaced 7 ft. 9 ins. centers, which in turn support the track rails. These are 9-in. girder rails weighing 87 lbs. per yard, this weight having been chosen simply because a lot of rails of that size was in stock at the time. This weight was also used in the car house. At the back of these rails is located a 12-in. checker plate which can be removed to permit the dropping of bolts from the outside of trucks, and also for the convenience of men when working on the outside of the trucks. Next to the track rails these plates are supported by angle-iron attached to the track rails, and on the other side they are supported on old 6¼-in. girder rails kept in line by 1¼-in. tie rods. The floor between these rails is made of concrete and expanded metal 6 ins. thick, supported on the 6-in. rails and a 6-in. I-beam which runs the length of the pit between the rails. The heating of these pits is somewhat similar to that of the car house, with the exception that all returns are made accessible at all times by putting plates in grooves in the pit floors, these grooves being covered with checker plate 5 ins. wide. The lighting arrangement is similar to the car house.



THE BLACKSMITH SHOP AT THE COLD SPRINGS DEPOT

The doors on the west, of Michigan Street, end and dividing the truck shop from the carpenter shop, as well as the doors on the south side of the transfer table, are of the steel rolling type used in the car house. The truck shop is furnished with four electric traveling cranes of the Northern Engineering Works low type, for handling cars and trucks. Each crane has two 7½-ton electric hoists. Two of these cranes are operated on one side and two on the other side of the shop. The bridge travel and the hoisting is done by motors, but the hoist travel across the crane is by hand. A row of iron columns through the center of the building supports one end of the crane track, the other being supported on the side walls of the building. On the row of columns through the center of the shop several jib cranes with air hoists are to be attached for handling smaller truck parts. The timekeeper's office, toilet and store room for car trimmings are adjacent to the truck shop in a very central location.



INTERIOR OF THE NEW PAINT SHOP, SHOWING ALSO LINE OF SHEATHED HEATERS BETWEEN TRACKS

TRANSFER TABLE

The transfer table between the truck and carpenter shops is of special design for this service, and was built in the shops of the company. It has an underrunning trolley, and the total height of the table is only 8¼ ins. from the track it runs on to the track of the shop. This table will take cars from the storage yard to the truck and carpenter shop or vice versa. Its general features are shown in the illustration on page 12.

CARPENTER SHOP

The carpenter shop or mill is also located in the former car house at the east end. Additional skylights and windows were added and a 2-in. plank floor laid throughout. Two new concrete pits were constructed, 80 ft. long, and four of the old brick pits retained. The mill machinery is located so that the machines are very handy to the cars, and cartage of material over long distances is avoided. All machinery is run through belting from a large dynamo. At the west end of the shop are located the carpenters' benches and a pattern storage loft is over the timekeeper's office and toilet.

THE PAINT SHOP

The paint shop is on the south side of the property between

the car-storage yard and Masten Street. It has a capacity of about fifty cars. There is a washroom in connection with this shop in which six of the largest cars can be cared for at a time. Cars after being washed are shifted by means of a transfer table to the paint shop. They are then worked through the paint shop, coming out through the Masten Street end when finished. The building itself has brick walls and concrete foundations, with yellow pine roof framing. The lighting is by means of skylights 12 ft. wide, with hinged side sash placed at 35-ft. centers throughout the length of the building. There is a 2-in. plank floor throughout the shop. The artificial illumination consists of 32-cp lamps placed on each side of the posts of the building about 8 ft. from the floor. There are also plug boxes for portable clusters. The steam coils for heating this shop are in clusters of three enclosed at the sides with galvanized-iron casing and

BLACKSMITH SHOP STOCK ROOM, CONTAINING SHEAR AND PUNCH DIRECT CONNECTED TO MOTOR

with a wire screen at the top. This side casing prevents the heat striking directly against the car panels, and thus prevents their cracking or splitting. The doors at either end of the building are wooden with the upper halves of glass. The store room is made fireproof by brick walls and concrete roof and floor. The transfer table at the west end of this shop is of similar construction to that of the truck shop.

THE BLACKSMITH SHOP AND MISCELLANEOUS BUILDINGS

The blacksmith shop and iron storage room have been reconstructed and made fireproof. This shop is equipped with one 1100-lb. Bell steam hammer, a 100-lb. Bradley hammer, and three large and three small down-draft forges and one spring forge, all made by the Buffalo Forge Company. The supply and exhaust fans for these forges are run by an old railway motor located on a platform suspended from a roof truss. The iron room is furnished with racks for bar-iron storage and wall racks for templets. In this room is also placed a shearing and punching machine, which was formerly run by a belt, but is now equipped with a separate motor.

The power plant, which is used for heating the entire system and supplying steam for power uses, has been reconstructed. It is furnished with three 120-hp Lake Erie boilers run at a pressure of about 100 lbs. The pumps for returning condensation to the pumps are in a pit in the boiler room. The fuel bins are placed so that all coal can be brought in on cars. By means of ducts in the fans the shavings from the mill are blown to a bin in the boiler room, where they are used for fuel.

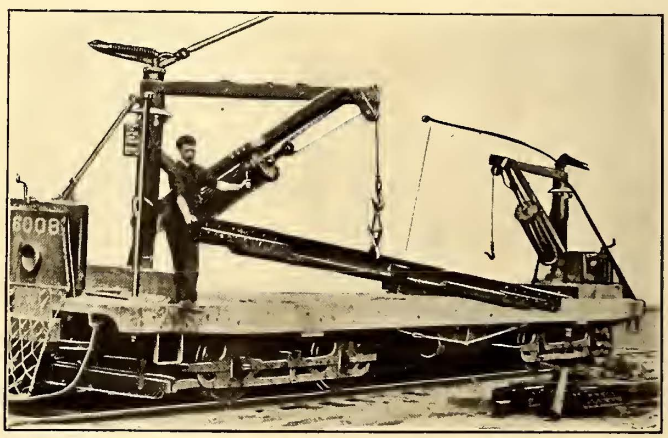
The machine shop, lumber-storage shed and dry kiln are to be erected at the places shown on the general plan. The master mechanic's office is now in a building which was formerly a sub-station. The store room is in the former carpenter shop and mill, which is a wooden building, and the intention is to construct a new fireproof building on this site in the near future. The fireproof oilhouse has been erected between the stockroom and armature room for the storage of oil and similar material. This is under the supervision of the storekeeper.

The car house was erected under a special contract, but the company is doing all of the other work directly. The entire undertaking has been designed and carried out under the supervision of J. W. Wilson, general manager of the company, Thomas Pumfrey being the engineer in charge.

CAR FOR HANDLING RAILS AND SPECIAL WORK

The Maintenance of Way Department of the United Railways & Electric Company, of Baltimore, is using a novel form of construction car for handling special work, rail and other heavy material. The illustration shows one of the cars of which four have been built. Each car is equipped with two cranes, which are provided with air hoists. The cranes have a capacity of 2000 lbs. each and will swing a distance of 8 ft. from the center of the car. The air cylinders for operating the hoists are 10 ins. in diameter by 40-in. stroke. The car shown is equipped with a 24-ft. air compressor and with two air reservoirs, so as to give ample storage capacity for storing the air used in connection with the air hoists.

The method of bracing the mast of the cranes is rather novel. Each mast is braced from the floor of the car by two 1-in. rods, which are enclosed in what is known as hydraulic tubing or hydraulic piping. This tubing is 1⅛ in. inside diameter and 1 15-16 in. outside diameter. It will thus be understood that the walls of the pipe are 13-32 in. thick, giving a very stiff pipe which, when used in the manner indicated, is ample to take care of any compression or tension stresses which may be thrown upon the braces when the hoists are in use. The car is 41 ft. 11 ins. over bumpers and 8 ft. 2 ins.



CAR FOR MAINTENANCE OF WAY DEPARTMENT AT BALTIMORE

wide. It is not intended to carry anything longer than 30-ft. rails upon this car, but these lengths may be handled readily as the distance between the masts of the cranes is 31 ft. 3 ins. The car is equipped with air brakes. The accompanying engraving shows the convenience with which a heavy piece of special work can be loaded or unloaded.

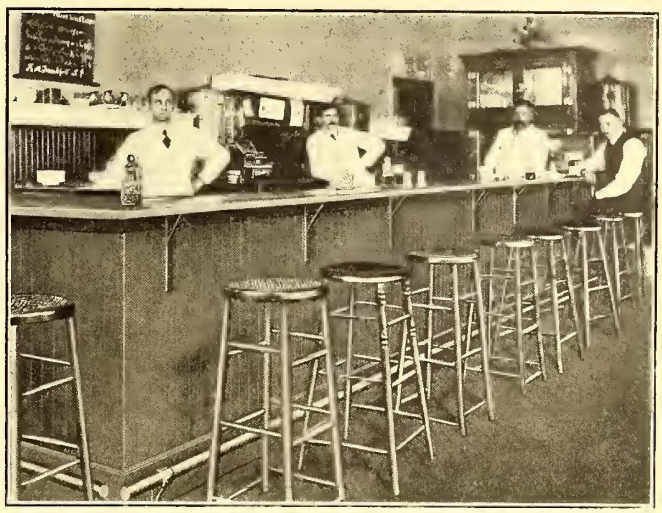
THE APPLICATION OF Y. M. C. A. WORK TO ELECTRIC RAILWAYS

BY E. M. WILLIS,
Railroad Secretary International Committee

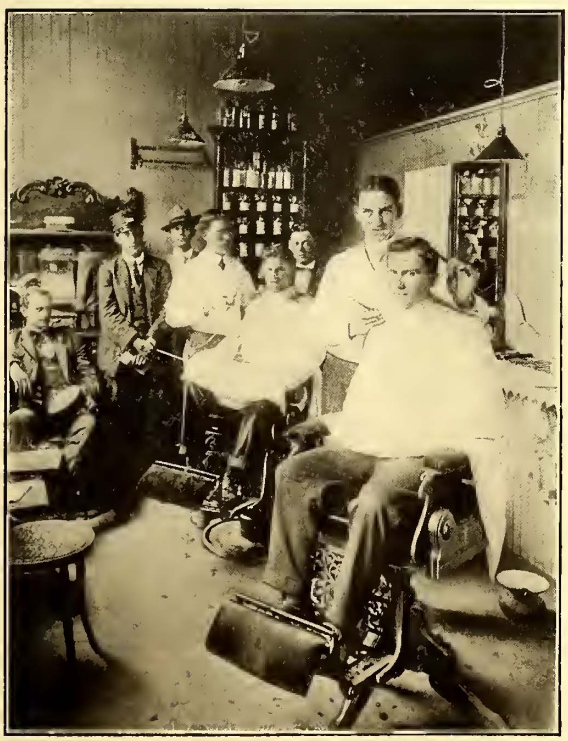
The object of this paper is first to outline in brief the work that has been accomplished by the Young Men's Christian Association among the employees of the steam railroads in this country, and then to state what has been done in this direction among the employees of electric railways, and to forecast the possibilities for a larger work in the electric traction field.

Nearly thirty years ago an association for promoting the welfare of steam railroad employees was organized in Cleveland, Ohio, under the direction of the Young Men's Christian Association. Since that time the movement has grown, until there are now 215 Y. M. C. A. railroad associations at division points, junctions, and railroad communities, where the men spend their leisure time. The membership of these associations is over 76,000, with many men daily using the buildings, of which there are now 135, valued at $2,350,000. Many of these buildings are as well furnished as the average club house. The equipment includes well-appointed wash and bath rooms, barber shop, lunch room or restaurant, where good, wholesome food is served at a moderate cost, social and game rooms, including billiards, pool, bowling, and other attractions; well selected libraries; and good, comfortable beds in the dormitories. There are also auditoriums where lectures, informal talks, concerts, and other entertainments are given and where religious services are held from time to time. These buildings are arranged with the view of serving the needs of the men, so that when train employees reach the terminal they can go directly to the railroad building, and whether the lay-over be short or long, have a good, comfortable place to spend their time when off duty.

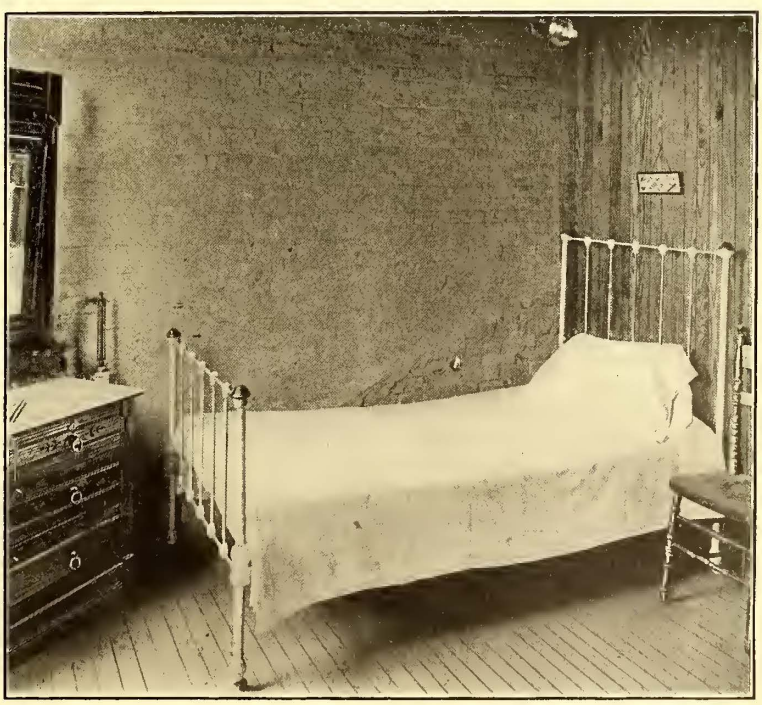
The usual cost of membership in these associations is $5 per year and the ticket of one association is honored in any one of the other railroad associations of the country. The buildings are under the direction of a general secretary, who gives all of his time to the welfare of the men and seeks in every possible way to help them as occasion may require. Generally the undertaking is in charge of a committee of management, consisting of officials and employees, and this committee has the direct oversight of the work of the general secretary. The general supervision of the railroad associations is, to a considerable degree, under the direction of the Railroad Committee of the International Committee. This committee assigns secretaries to the railroad systems in various parts of the country, and it is the duty of these secretaries to look after the associations on the roads to which they have been assigned and to help maintain the standard, so as to secure unity in plan and action for the associations as a whole. The work of these secretaries is directed by a committee of business men prominent in the steam railroad world. The chairman of this committee is John J. McCook. The other members are Charles F. Cox, Dr. John P. Munn, William A. Patton, and B. D. Caldwell, with Morris K. Jesup as



RESTAURANT, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER



BARBER SHOP, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER



ONE OF THE REST ROOMS, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER

advisory member. The work of this committee is supplemented by state committees and secretaries in many States. The appreciation and interest on the part of railroad officials is increasing year by year, and at points on roads representing over 80 per cent of the entire mileage of North America the Railroad Young Men's Christian Association work is now organized as a recognized and valued betterment.

The recent developments, as applied to electric railways, have brought the association work to the attention of electric railway officials. Electrical equipment is being rapidly improved and interurban electric lines are now reaching out in all directions over the country, with longer runs and larger forces, so that more time at the end of the run is given the men for lay-overs. These conditions have given occasion for the consideration of the association by electric railway men. Moreover the acquirement of electric railway properties by steam railroad interests is serving to form a link between the work of the association in the steam railroad field and the movement as applied to the newer electric traction industry. There are now several very successful electric railway Y. M. C. A. associations, which will be mentioned later, and a number of other companies are planning to establish branches on their roads.

SOCIAL ROOM, DOWNTOWN BRANCH, STREET RAILWAY Y. M. C. A., AT ROCHESTER

READING ROOM, STREET RAILWAY Y. M. C. A., AT MEMPHIS

As to the value of this work to the companies and men, it may be said that a well organized railroad always looks carefully after its rolling stock, rails, roadbed, and other property, and repairs and improvements are constantly being made. It would seem that if it is worth while to repair the rails, it is equally worth while to do something for the men. If the motormen and conductors are to be courteous, neat, and gentlemanly in their conduct, a place where they can be under good influence when off duty is very desirable, and the association provides such a place. As indicated, association buildings are fully equipped with all that is essential to a man when off duty. If he spends his leisure time in the rooms he will be in a better condition when called for service than if, as is very often the case, the time is spent in the saloons which abound in the vicinity of any railroad terminal.

Wherever one of these associations has been organized, it has very seriously affected the business of the saloons in the vicinity, and in several instances has been the means of reducing their number. This is inevitable because the majority of men in the street railway employ are anxious for betterment and will take advantage of a respectable place where they may spend their leisure time.

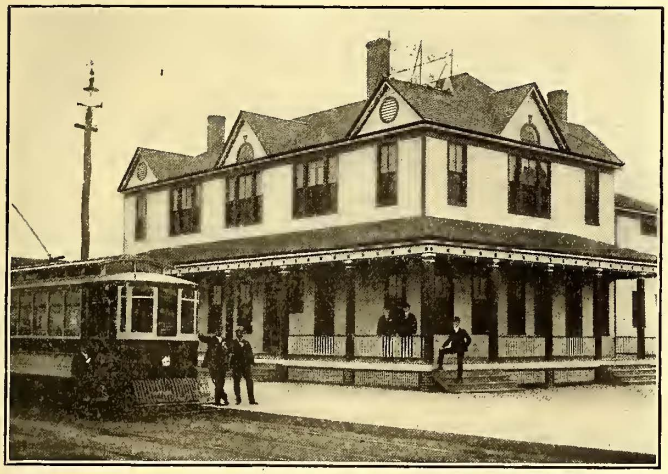
One of the great elements of success in the organization is that it is based on Christian principles. In the early stages of its life fear was sometimes expressed that this fact might hinder its largest development. Experience, however, has demonstrated that there is no need for anxiety in this direction, for every man, whether he be Jew or Gentile, whether he has a belief in religious things or otherwise, if he is a man who is disposed to be decent, has the full privileges of these associations. In other words, every employee who is trying to make himself a respectable, law-abiding citizen is welcome to the ranks of membership. Sometimes it is doubted whether the men will coöperate in a plan which is endorsed by the company. Here also experience shows that the Railroad Young Men's Christian Associations bring about the coöperation of both men and employees.

Local associations can be organized in one of several ways. Frequently railroad employees will learn of an association at some other point, and will draw up a petition asking the officials of the company to coöperate in installing such a work at a particular center. In other instances, the railroad company anticipates the men, and asks for an investigation by the International Committee of certain terminals or points on a particular system where a large number of men are congregated.

Generally the company is asked to erect or fit up a building for the use of the men, to make a monthly appropriation of $100 per month, and to care for rent, light, and heat of the building. The men are asked to become members at the rate of $5 per year, and that amount, with the receipts from the restaurant, dormitories, and contributions of the company, generally gives sufficient funds to carry on the work successfully. Where there is no local constituency, as in a purely lay-over point, it has sometimes been deemed unwise to form a permanent committee or board. In such places a provisional organization is formed, with a chairman and treasurer, who, in connection with the general secretary, become responsible for details. Wherever local conditions warrant, a more permanent organization is effected with a full committee of management, consisting of president, vice-president, recording secretary and treasurer. The president and treasurer (or chairman) are often officials of the railroad company. The

general secretary is the executive officer, and has charge of the plans and details connected with the association.

Effective organizations among electric railway men have thus far been established at Rochester, N. Y.; Richmond, Va.; Memphis, Tenn., and Birmingham, Ala.; at all of which places a most satisfactory and aggressive work is carried on. At Rochester the Rochester Railway Company has recently opened up a second Y. M. C. A. branch in its downtown car house for the use of the men who have lay-overs in that



STREET RAILWAY Y. M. C. A. BUILDING, VIRGINIA PASSENGER & POWER COMPANY

part of the city. The Rochester company has a well-equipped all-round association, and the building is frequented by the men at all hours of the day, with an average daily attendance of over 400 at the rooms. Over 250 luncheons are served every day at the lunch counter. The association in Rochester has been very successful in competing with the saloons and pool-rooms, and one of the public pool-rooms directly opposite the car house has gone out of business. The welfare work at Rochester includes sleeping accommodations, barber shops, bowling alleys, lunch counters, etc.

At Richmond, Va., the Virginia Passenger & Power Company has a well-equipped club house at Reservoir Park, which is the terminal of one of the electric lines. This branch has a membership of 706, and an average daily attendance of over 300. There is in this building a small, but attractive, library, given by Miss Helen Gould, which is used by the men very largely. While it contains books on all subjects, the library is especially equipped with books of an electrical character. The work at this point has so prospered that a branch has been opened by the same company at Petersburg, Va., on the other end of the line. (The Y. M. C. A. work that has been accomplished in this vicinity was described in the STREET RAILWAY JOURNAL for June 4, 1904.)

At Memphis, Tenn., the association has been organized less than a year, and has at present a membership of over 600. In the judgment of the street railway officials at this point the association has materially increased the efficiency of the men in the service.

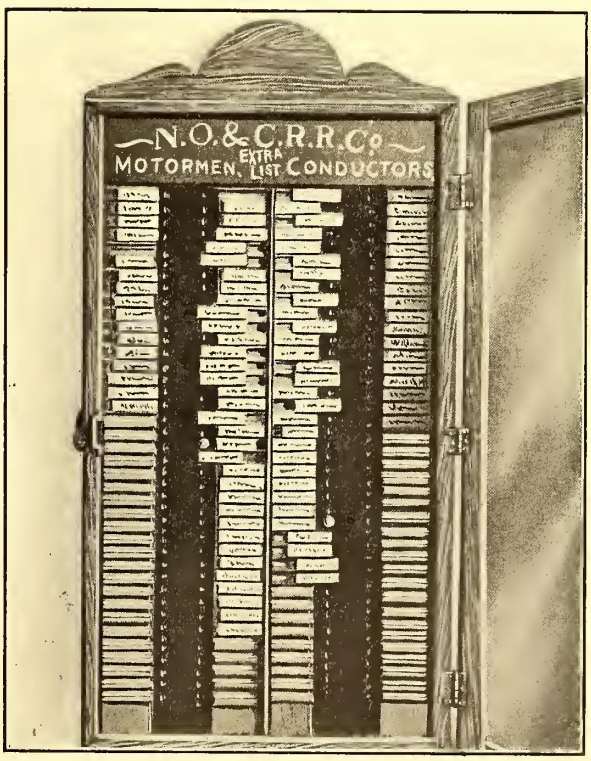
As an example of what this association has done, the following instance is cited. In February, 1906, at a meeting of the Newman Properties Association, composed of officials of the various electric railway properties in the South (including the road at Memphis), controlled by the Newman interests and managed by Ford, Bacon & Davis, an opportunity was given for a representative of the Street Railway Y. M. C. A. at Memphis to present the value and advantages of the work. The matter was then informally discussed, after which the officers unanimously voted to aid in establishing similar associations at each of the points represented. One of the officials present had made a careful study of the clubs for welfare work for street railway men in some sixty cities, and prepared a paper embodying his views on this subject, but the value of the Y. M. C. A. had so impressed him that he decided to withhold his paper, and voted heartily instead in favor of following up the work of the latter organization.

As a result of this conference, an association has just been opened at Birmingham, Ala., in the car house of the Birmingham Railway Light & Power Company, which is one of the Newman properties. Several rooms in the car house will be converted for reading, socials, entertainments, baths, pool and billiards and other games. It is also proposed to furnish dormitories for the benefit of unmarried men in the employment of the company.

At a number of places in this country this plan is now being considered, and it is expected that a number of electric railway companies will inaugurate the work of the Railway Young Men's Christian Association in the near future.

HANDLING THE EXTRA BOARD

The practice followed by the New Orleans Railway & Light Company in handling the extra board is somewhat unique. The names of the men that are on the extra list are placed on small wooden slides, which are arranged in columns of grooves within a shallow box, as indicated in the half-tone engraving. At the side of each slide is a hole to accommodate a small movable peg. When a man is working, his slide is pushed in, so that the names that are pushed out indicate the men who are to receive work. The peg starts at the top of the column of names and is gradually worked down the board as the men are assigned to runs, that is, the peg always passes the names that are pushed in, and stops at the first name that is pushed out. The man who has the peg is the first man to get the next vacant run. In order to be posted on the board, all extra men must report for roll call three times a day, namely, at 5 a. m., 11:30 a. m., and 3:30 p. m.



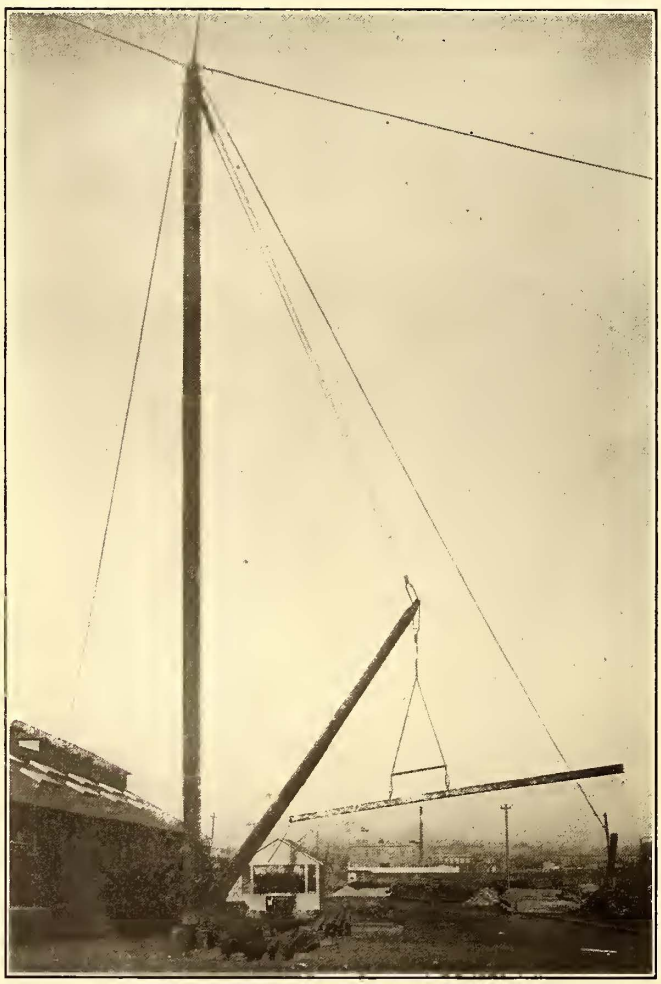
EXTRA BOARD, NEW ORLEANS RAILWAY & LIGHT COMPANY

The working board is made up immediately after each roll call.

The practice, with reference to handling the regular runs, is to post the list of runs at the end of each month, and the regular men then pick their choice of run, according to seniority. The runs are then entered in a book, together with the name of the regular crew assigned to each run. If a regular man asks off, his run is assigned to the first extra on the list, and the name of the extra man is entered at the side of the run number, to indicate who is working for the regular.

DEVICES FOR SHOP YARDS AT BALTIMORE

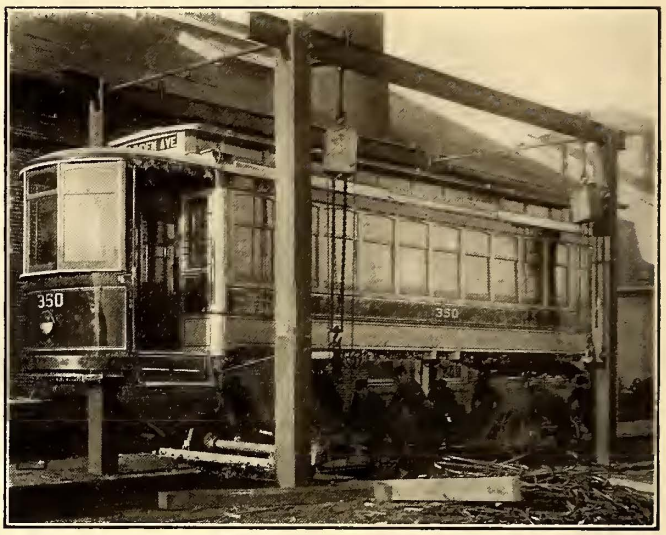
The United Railways & Electric Company, of Baltimore, Md., has in the yards adjacent to its Carroll Park shops a number of labor-saving devices especially designed to expedite the work of unloading heavy material from freight cars. A spur steam railroad track runs directly into the yards, and considerable thought has been given to the matter of reducing to the minimum the time and labor consumed in delivering material to the points of distribution.



DERRICK FOR UNLOADING RAILS AT YARDS OF THE UNITED RAILWAYS & ELECTRIC COMPANY, OF BALTIMORE

For handling short and long rails, special work and other bulky castings and material, the powerful derrick shown in one of the engravings has been erected. This derrick is operated by electric motor, and has materially reduced the cost of handling heavy shipments. It has been of particular value in unloading and loading long rail sections.

Another exceedingly useful device is the rigging illustrated in this connection for unloading car bodies from steam railroad flat cars. (This device was described in the Street Railway Journal for Sept. 5, 1903, but the accompanying engraving is shown herewith to indicate the method of actually handling a car body). The rigging consists of four heavy uprights, two on each side of the track, with a heavy channel girder connecting the tops of each pair. On these girders



RIGGING FOR UNLOADING CAR-BODY FROM STEAM RAILROAD FLAT CAR, BALTIMORE SHOP YARDS

run small traveling trolleys, from which depend chain block and fall. In unloading a body, the flat car with the car body in place is run under the rigging, the body is raised by means of the hand cranes, the flat car is then run out of the way, the motor trucks are pushed under the suspended body, the body is lowered onto the trucks, and then can be easily moved into any portion of the shops. The rigging was of particular assistance in unloading the shipment of 200 new cars recently received for service on the United Railways & Electric system.

STEAM—ELECTRIC COMPETITION IN INDIANA

Some of the steam lines in Indiana have concluded to compete with the interurban railroads in Sunday excursion business. In some instances they have announced a rate considerably less than that charged by the interurbans. As an example, the Pennsylvania line is running a Sunday excursion from Richmond to Dayton, O., for 75 cents for the round trip, as against $1 charged by the electric railways. Other steam roads in the State having similar competition have advertised Sunday excursions at cut-rate tariff. The steam roads contend that they give the fastest time and cheapest rate. The arguments advanced by the interurban roads are that their service is more frequent and that riding over their lines really is a pleasure, for dust and cinders are unknown to the trolley.

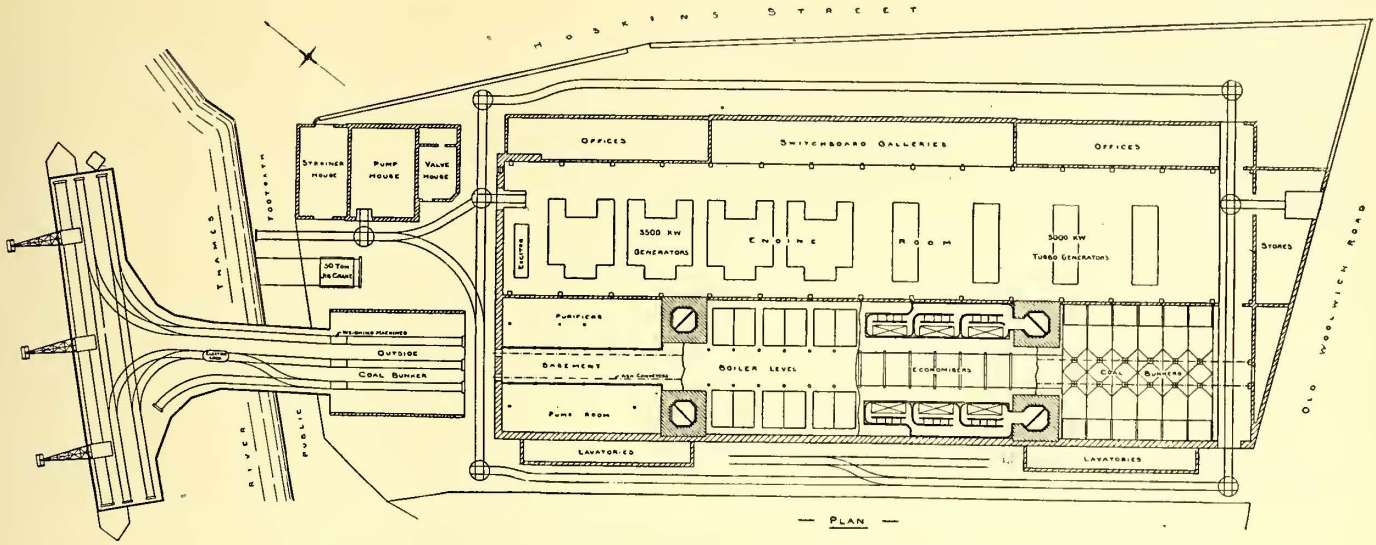
The idea of utilizing old horsecars for consumptive patients has been carried into practical operation in Leith, Scotland. In a field with a southern exposure near the Pilton Hospital for Infectious Diseases four old cars have been stationed. Very little has been done to them. Merely the window glass has been knocked out on the south side, and one of the seats fitted up for two bunks. Not a penny has been spent in painting or in any unnecessary work. On the top of the cars the fixed seats are cleared off, and garden chairs placed ready for the patients when the weather is sufficiently favorable to allow of them sitting without shelter.

GREENWICH GENERATING STATION FOR LONDON TRAMWAYS

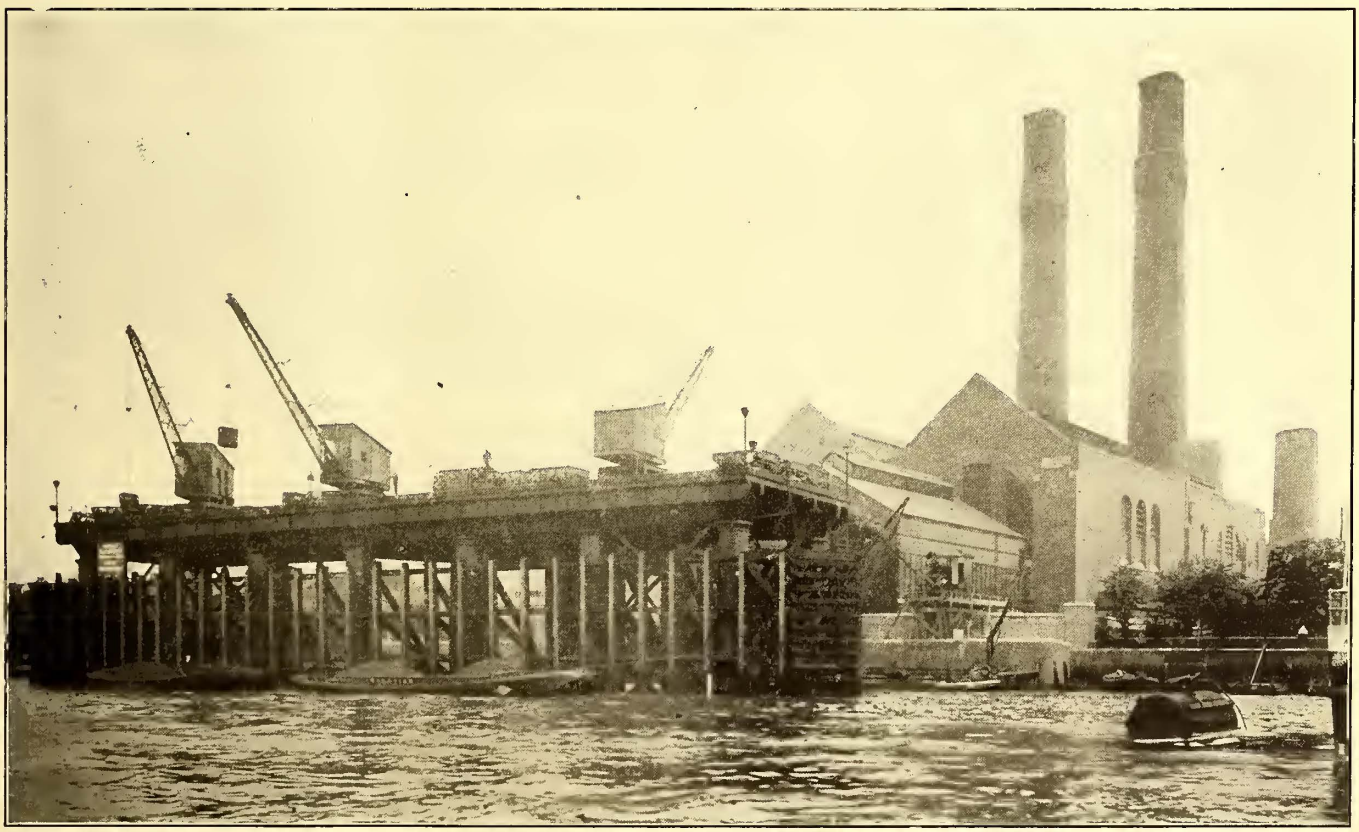
On May 26 the London County Council formally opened for operation the city's first power plant for the supply of power to the London municipal tramway system. Hitherto current for these lines had to be purchased from local power companies. For the station site the Council utilized the Greenwich tramway depot and land adjoining.

The station, which was designed to supply energy for the whole of the present tramways and early extensions, will be one of the largest in England. The ultimate capacity will be about 52,000 hp. Current is generated at about 6600 volts three-phase, and is transmitted by underground cables to various sub-stations. At these sub-stations it is reduced by rotary transformers to 550 volts direct current. Sub-stations have been provided at Clapham, Streatham, Brixtonroad, Elephant and Castle, Camberwell, New Cross and Greenwich. Other sub-stations are now in course of erection.

The Greenwich sub-station is part of the site of the generating station and adjacent to the first portion of it. The sub-station building ultimately will form part of the second portion of the generating station. The work of erecting the sub-station was carried out concurrently with that of the superstructure of the first portion of the generating station, and by the same contractors. The general arrangement of the generating station was designed by the Council's architect in consultation with the tramways electrical engineer, and the building was erected under the supervision of W. E. Riley, the Council's architect, and equipped under the supervision of A. L. C. Fell, the Council's chief officer of tramways, and Mr. Rider, the tramways electrical engineer. The



PLAN VIEW, SHOWING THE LOCATION AND DIVISIONS OF THE GREENWICH GENERATING STATION

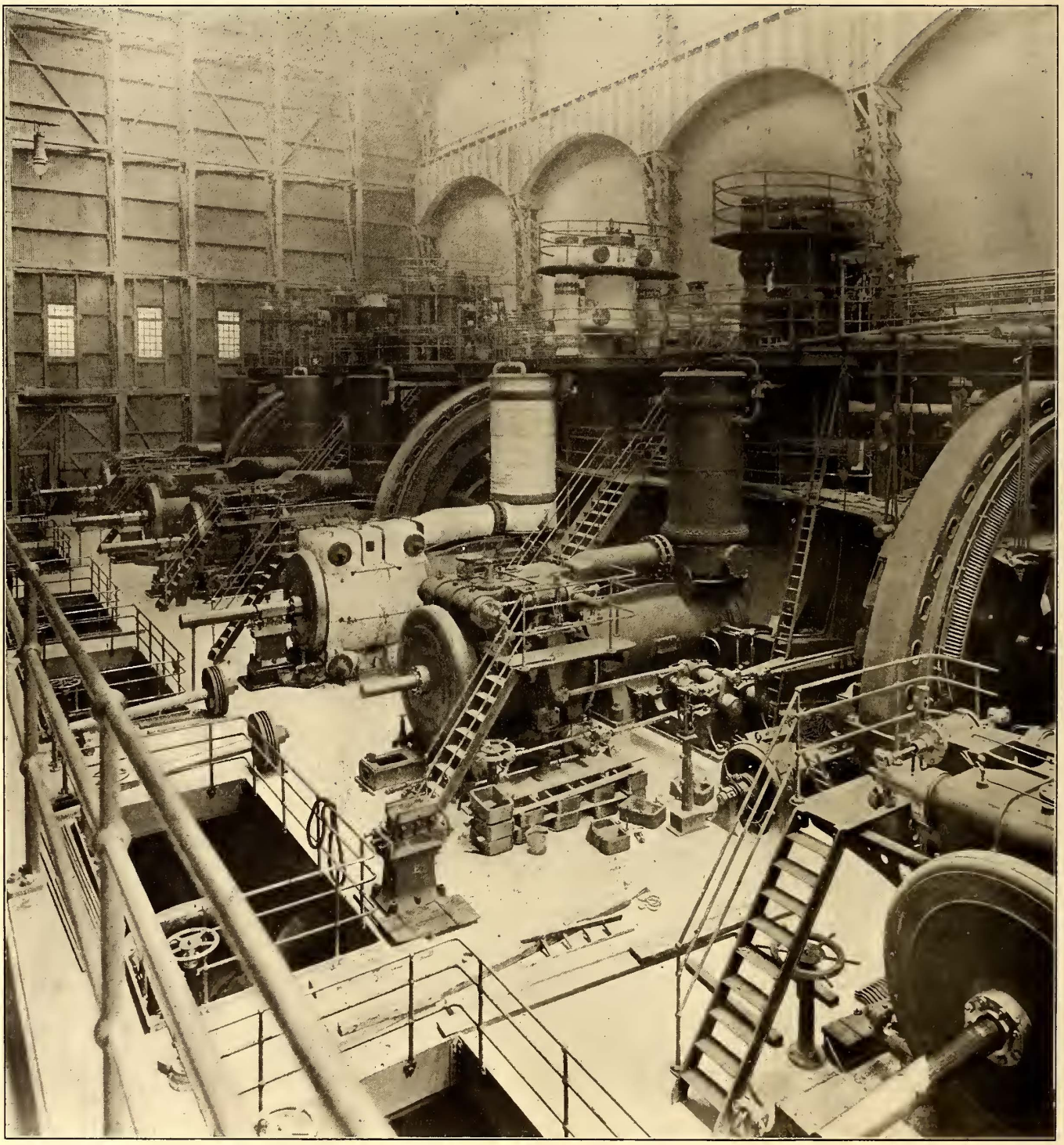


THE GREENWICH POWER PLANT FOR THE LONDON COUNTY COUNCIL TRAMWAYS, SHOWING ALSO THE COAL-HANDLING DOCK AND MACHINERY

pier and condensing water pipes were designed and erected under the supervision of Maurice Fitzmaurice, the Council's chief engineer.

The site is on Thames River, at Greenwich, covering approximately 3¾ acres, with frontages to the river of 240 ft., to Hoskins Street of 648 ft., and to Old Woolwich Road of 300 ft. The principal entrance is in Hoskins Street, where the general offices are located. Other entrances are in Old Woolwich Road, and there is an approach for the conveyance of material from the river wall. The building is in two parts, the first of which is now completed; the second part is in progress, and is at present separated from the first by a temporary corrugated iron screen. The complete structure will measure about 475 ft. x 195 ft., and about 80 ft. in height.

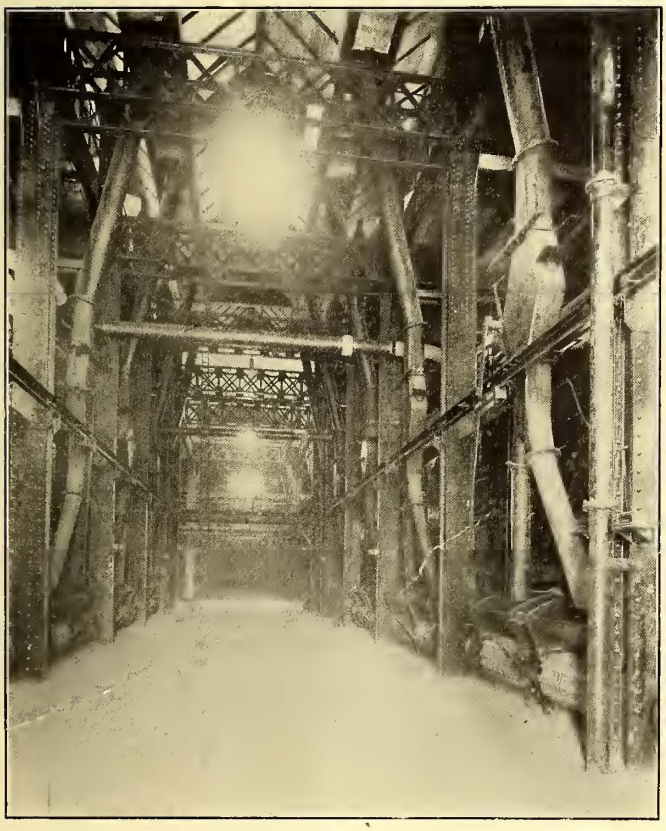
The general arrangement of the station consists of a boiler-house, engine-room, offices, sub-station, workshop, pump and strainer houses, outside coal bunker, and a pier for unloading purposes. The ashes from the furnaces are removed by the conveyors on their return journey, and are shot into barges at the wharf. The steam is generated in Stirling boilers and conveyed to the engines (four of which are erected in the first portion), giving a total of 26,000 hp. The current generated is passed to the switchboard galleries adjoining the engine-room, and distributed to the various sub-stations. The sub-station for the particular section of tramways near the generating station adjoins the switchboard galleries.



A VIEW OF THE INTERIOR OF THE GREENWICH POWER PLANT

There are administrative offices, stores, mess-rooms, bath-rooms, and sanitary arrangements for the whole of the staff employed. At the northeast corner of the site a strainer-house and pump-house have been placed, and a partial supply

of water has been obtained by an artesian boring into the chalk. The principal function of the pump-house is to obtain a supply of water for condensing the steam after it has passed through the engines, the condensed water being used again for the production of steam. The water before entering the boilers is partially heated by economizers. There will be four chimney shafts. Those already erected rise to a height of 250 ft., with an internal diameter of 14 ft.



BOILER ROOM OF THE GREENWICH GENERATING PLANT

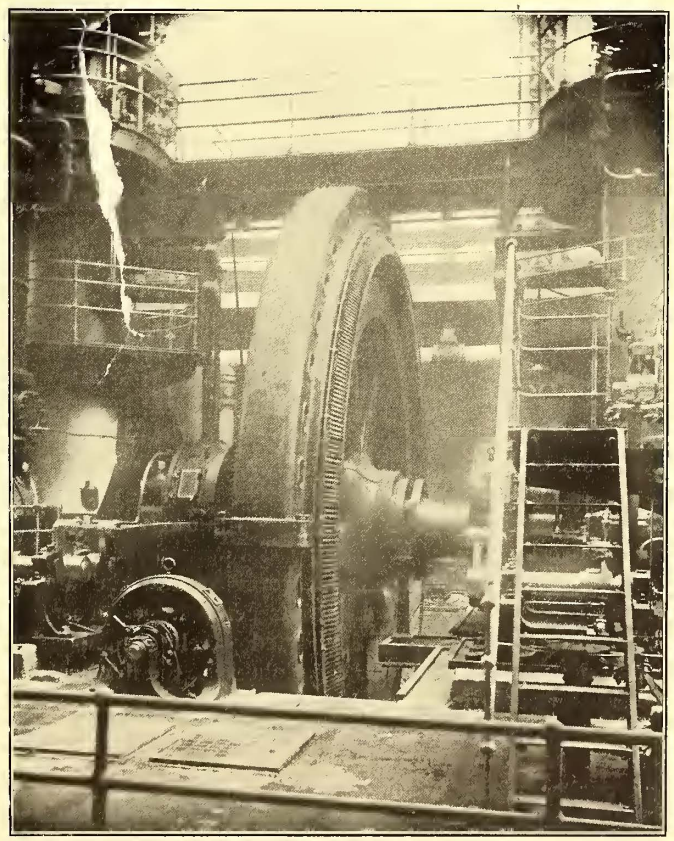
The construction of the superstructure is of a steel framework enclosed externally with brick walls, having Portland stone dressings. The foundation is a concrete raft 6 ft. in thickness, extending over that portion of the site covered by buildings. The roofs consist of steel principals carrying minor steel members which support a covering of coke breeze concrete, the exterior being slated. The interior wall facings are of ivory white-glazed bricks with a brown glazed dado. The floors are of concrete and covered with terazzo paving.

Coal will be brought to the station by ocean steamers, holding up to 2000 tons, which will lie at a specially constructed pier in the Thames. The coal will be unloaded by three electric cranes, with grabs, holding about 2500 lbs. each. The grabs will discharge into trucks on the pier, which, after passing over weighbridges, will discharge into a large steel bunker holding 200 tons. From this bunker the coal will be conveyed by gravity bucket conveyors to the bunkers immediately over the boilers. The object of using an outside bunker of this capacity was to enable a steamer to be unloaded in the shortest possible time without being dependent upon the comparatively slow rate of travel of an ordinary conveyor. The bucket conveyors are two in number, identical with each other, each having a capacity of 40 tons per hour. These have been erected by the New Conveyor Company, of Smethwick. On their return journey the bucket passes through a tunnel under the boiler house, and takes the ashes from hoppers below the boilers, and carries them to a storage hopper under the pier.

The boiler house contains twenty-four water-tube boilers of the five-drum Stirling Company's type, arranged in pairs in two rows, with a firing floor between. Each boiler has an evaporative capacity of about 16,300 lbs. of water per hour, works at 200 lbs. pressure, and is fitted with chain grate stokers. In addition a superheater is placed between the first and second banks of vertical tubes, and forms an integral part of the boiler. The amount of superheat will be sufficient to raise the temperature of the steam to 500 deg. F.

The pairs of boilers are set in groups of three with their economizer block and main flue inlet to the chimney above. These boiler groups are equivalent to one of the engine units, and the present station may, therefore, be said to be divided up into four units of boilers, economizers, flues, engines, etc. Each pair of boilers has its own economizer on the floor above, consisting of 320 tubes, arranged in thirty-two sections. The economizers have been made and erected by E. Green & Sons, Manchester, and the scrapers are driven through worm gearing by small independent three-phase motors. Above the economizers, and at the top part of the boiler house, are situated the coal bunkers. These are built of steel, and have a capacity of 6500 tons total, for the present station, with sub-divisions for each boiler, so that different grades of coal may be stored and to minimize the risk in case of spontaneous combustion.

In the basement of the boiler house are placed on the one



A DIRECT-CONNECTED GENERATING SET

side two feed pump rooms, each containing three horizontal ram pumps by John Cochrane, of Glasgow. Each pump is driven by a series-wound Bruce Peebles motor of 35 hp, and the pumps will deliver 8000 gallons of water per hour against a pressure of 225 lbs. The motors are of the direct-current type, and are controlled by means of rheostats in the main circuit. In addition, two voltages, viz., 125 and 550, are provided with a changeover switch, so that the pumps can be run at a low speed. On the other side of the boiler basement

are situated hot well tanks, from which the feed pumps take their supply. These are filled from the condensers, after the water has passed through Harris-Anderson purifiers, which are of the chemical type, and effectively remove all particles of oil from the feed water. Make-up water is obtained from an artesian well, 350 ft. deep x 8½ ins. diameter, in the outside pump house. A water-softening apparatus, also of Harris-Anderson type, is provided in this connection.

The engine-room lies parallel with the boiler house, and contains four steam generating sets of 3500 kw normal capacity each. The engines were made by John Musgrave & Sons, Ltd., of Bolton, and are of the vertical-horizontal type. Each engine consists of two complete half-engines, one on each side of the generator, consisting of a vertical high-pressure cylinder, 33½ ins. in diameter, and a horizontal low-pressure cylinder 66 ins. in diameter. The stroke in each case is 4 ft., and the two connecting rods on the one side of the engine work on to a common overhung crank pin.

The engines run at 94 r. p. m., and work at 180 lbs. steam pressure. Corliss valves are used, both on the high-pressure and low-pressure cylinders, and the exhaust steam from the high-pressure cylinder passes through a receiver on its way to the low-pressure cylinder, and is there reheated by live steam direct from the boilers. All of the engines are entirely enclosed, and work with forced oil lubrication, pumps in duplicate being provided. By the placing of the high-pressure cylinder in the vertical position the drainage becomes perfectly natural, and there are no places in which water can lodge. An independent steam supply is given to each high-pressure cylinder, and each low-pressure cylinder has its own condenser in the basement.

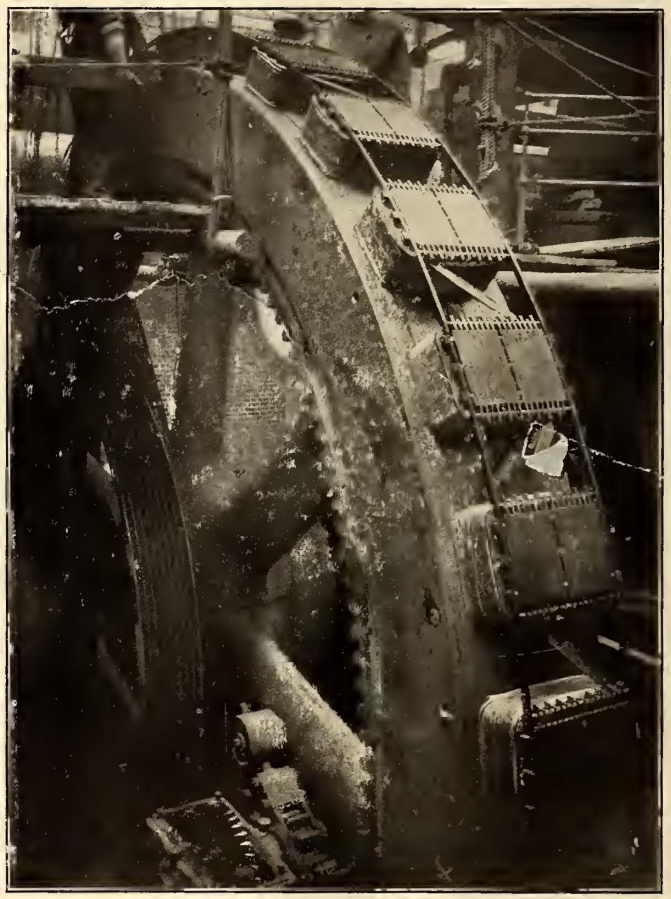
The condensers are of the surface type, with separate motor-driven air-pumps, and the circulating water is obtained from the Thames in a manner afterward described. On its way to the condensers the exhaust steam passes through Barker oil separators, by means of which the greater proportion of the oil is taken out. This has the effect of saving the condenser tubes, but before the condensed water passes to the hot well, it is treated in the purifiers mentioned.

The generators were built by the Electric Construction Company, Ltd., of Wolverhampton, and are mounted directly on the engine shafts, each generator being erected between the two half-engines of each set. They are all of the revolving field type, and deliver three-phase currents at 6600 volts between phases, at 25 complete cycles per second. The normal output is 3500 kw or 306 amps. per phase, and 4375 kw on emergency overload. The stators are star wound, with the center point earthed. The coils are form wound, and are laid in open slots. There are five slots per pole per phase. The magnets are built up of laminated steel stampings, secured in dove-tailed slots on the periphery of the flywheel. The coils are wound one layer deep, of bare copper tape on edge, and are held down by laminated pole tips. The excitation is at 125 volts, and each alternator has its own independent exciter by driven ropes from a pulley on the main shaft. A standby is provided by the steam auxiliary sets mentioned below.

In addition to the four main generators, there are two independent direct-current steam sets, each of 150-kw capacity, which are used for lighting the station, a standby for excitation, and other uses. The engines are by Belliss & Morcom, Ltd., of Birmingham, of 250 hp each, running at 375 r. p. m. The generators are of 150-kw capacity, and were built by Dick, Kerr & Company, Ltd., of Preston.

The steam pipes between the boilers and engines are laid on a most simple system. Each pair of boilers is coupled together as one, and has a single steampipe leading directly to a main steam header in the engine room. From this, header branches go to the engine separators, and there is a continuous fall in the pipes all the way from the boiler stop valves to the engine separator.

The main switchgear is mounted on two galleries in the center of the long side of the engine room, farthest from the boilers. The oil switches are on the top gallery. The switchgear throughout is of the oil-break, remote-control, electrically-operated type, and has been built by the British Westinghouse Electric Manufacturing Company, Ltd. Provision is made for eight generators, and thirty-two feeders, and each generator is coupled directly to a section of four feeders. The various sections are connected by the main bus-bars, but when required the bus-bars can be easily disconnected, leaving the generators entirely on their own feeder sections. The oil switches are mounted on brickwork com-



GENERATOR BEING INSTALLED

partments, and the whole arrangement is entirely fireproof.

The operating table is on the lower gallery, and contains the small switches which control the main oil switches. The operation is carried out by direct current at 125 volts pressure, and the operator faces the engine room and the instrument panels when at his work. Immediately behind the operating desk is the auxiliary switchboard for controlling the station lighting, station motors, auxiliary machines, and certain low-tension tramway feeders, which supply the tracks in the neighborhood of the station.

The main cables between the generators and the switchgear and the street are carried in chases formed in the east wall. Each cable has its own separate chase, in which it is carried by means of clamps bolted to cast-iron bricks built into the brickwork. The feeders leave the station in two groups by means of two separate tunnels. One tunnel carries the cables for supplying the north of London, via the

Blackwall Tunnel, and the other the cables for the south of London.

Adjoining the switchboard recess is a sub-station, which contains three Dick, Kerr & Company motor generators for supplying direct current to the local tramway lines and for station purposes. Each machine is of 500 kw capacity, runs at 300 r. p. m., and transforms the 6600 volts three-phase current to direct current at 550 volts. A battery of 280 Tudor accumulator cells is provided in the basement, close to the sub-station, for use in conjunction with the sub-station plan.

CONDENSER PUMP HOUSE

For obtaining the condensing water from the Thames River, four 30-in. cast-iron pipes have been laid under the bed of the river at a point below the lowest known tide. These pipes are bell mouthed at their extremity, where they are carried in a concrete basin. Three of these pipes are used either as suction or discharge pipes, and the fourth entirely as a discharge pipe. Elaborate straining facilities have been employed because of the difficulty which has been experienced in previous attempts to use the Thames water for condensing purposes.

YARD

In the yard, close to the outside pump house, a Ransome & Rapier 30-ton electric jib crane has been erected. This has been of great service in handling material for the building of the station.

It is estimated that when completed the station will cost about £900,000.

REPORT OF THE ROYAL COMMISSION ON LONDON TRAFFIC

Volume IV. of the Report of the Royal Commission on London Traffic has just been issued, and brings to a close the publication of what has been undoubtedly the longest and most complicated inquiry into city transportation conditions ever conducted. Though numbered four, the section just published is in fact the last to be issued of the eight large volumes forming the report of the commission. It is an octavo of 1250 pages and 102 plates, and is in many respects the most interesting of all of the sections of the report, certainly from the American standpoint, because it recites the testimony and other data secured by the members of the commission who visited the United States in the fall of 1903. These members were Sir David Barbour, Lord Ribblesdale, Sir John Dickson-Poynder, Bart., M. P.; Sir George Bartley, Sir George Gibb, with Mr. Lyden Macassey, the secretary. Mr. Macassey preceded the other commissioners and spent about five weeks in this country before their arrival, making the preliminary arrangements for facilitating the inquiry.

During their trip the members of the commission visited New York, Boston, Philadelphia and Washington, and secured the evidence of the following witnesses among others: William Barclay Parsons, chief engineer of the Board of Rapid Transit Railway Commissioners; Bion J. Arnold, expert of the Chicago City Council; H. H. Vreeland, president of the New York City Railway Company; E. W. Winter, president of the Brooklyn Rapid Transit Company; Samuel Rea, fourth vice-president of the Pennsylvania Railroad Company; A. R. Piper, second deputy police commissioner of New York City; W. J. Wilgus, fifth vice-president of the New York Central Railroad Company; Gen. William A. Bancroft, president of the Boston Elevated Railway Company; C. S. Sergeant, vice-president of the Boston Elevated Railway Company; Hon. George C. Crocker, chairman of the Boston Transit Commission; Howard A. Carson, chief engineer of the Boston Transit Commission; Hon James F. Jackson, chairman of the Massachusetts Board of Railroad Commissioners; John B. Parsons, president of the Philadelphia Rapid Transit Company, and W. S. Twining, chief engineer of the Philadelphia Rapid Transit Company.

The commission went very thoroughly into the franchise conditions of the roads in the cities investigated, statistics of traffic, street congestion, relative advantages of surface railways, shallow subways and elevated railways, the effect of rapid transit systems on the distribution of population, and policies which are followed in the development of transportation facilities in American municipalities. Information was sought of each gentleman interviewed, not only as to the conditions of the city or cities served by his own system, but with regard to the application of different transit systems to London conditions, and the effect of well-developed urban transportation systems on street traffic and housing conditions. It is, of course, impossible in an article of this kind to digest any considerable portion of the data secured, but attention might be directed to one or two points, to which considerable study was given by the commission. One was in connection with the effect of electric car service upon reducing congestion in crowded streets. There was an interesting and marked unanimity of opinion that a reduction of congestion of this kind follows, partly by giving direction to the other vehicles on the street, and partly by the fact that the cars carry the people in a more compact way than is otherwise possible. Mr. Vreeland's testimony on this point was especially complete, as he reviewed the history of Broadway from the time that the only transportation south of Fourteenth Street was done by omnibuses. At this period there would be times when there would be a mass of vehicles standing still from twenty to thirty minutes at a time, particularly at congested corners like Canal Street and Fulton Street, and many people claimed at that time that it would be impossible to operate a street railway on Broadway with any facility to the public. Some conception of the conditions of that period can now be obtained by observing traffic congestion at certain times of the year on Fifth Avenue, which is the only north and south avenue in the central section of New York City where there is no railway. Captain Piper's testimony corroborated that of Mr. Vreeland, and Mr. Sergeant, of Boston, recited instances of streets in which vehicular congestion in a street had been relieved, through the reasons cited, by the installation of a double line of cars and tracks on the street.

In connection with this point the question arose as to the minimum space which should be allowed between the outside of the rails and the curb. Mr. Vreeland cited Fifty-Ninth Street west of Columbus Avenue, where there is just enough room on each side of the track for an ordinary 5-ft. 2-in. vehicle to be passed by a car, but where a man driving a furniture van would have to put the wheels of the van over the curb if he wanted to stand still on the street to load or for any other purpose. Mr. Arnold, speaking of Chicago conditions, gave it as his opinion that if there was room with two tracks for one vehicle between the car and the curb, the use of a double-track line would decrease congestion rather than increase it. General Bancroft referred to a street in Somerville only 45 ft. in width, in which the company had recently laid street railway tracks. Mr. Winter, of Brooklyn, however, called attention to the fact that the introduction of a line of cars on a street tends to draw travelers from adjacent streets and so increases the liability to accident.

The relative merits and costs of elevated railways and subways were also very carefully considered. Mr. Twining estimated the construction of the Philadelphia four-track subway at about $500 per running foot, and the elevated railway in

Philadelphia, exclusive of foundations and rails but including stations, at about $40 per running foot. Gen. Bancroft referred to the difficulties of subway construction in the streets of Boston on account of their crooked character which prevented securing high speed, whereas the elevated railway is outside of the congested district and straighter. The initial difficulty of noise with the elevated road has been largely reduced and the public is now asking for extensions. Others, among them Mr. Arnold and Mr. Carson, called attention to the greater desirability from the standpoint of the passenger of the elevated railway, but Mr. Arnold concluded that under American conditions it often would be more expensive than a subway on account of payments for damages to abutting property.

The testimonies of Mr. Wilgus and Mr. Rea were devoted principally to the plans of the New York Central and Pennsylvania Railroads in entering New York City. The testimony of both, however, give facts and opinions outside of the technical descriptions of the plans of their companies, which were of great interest. Thus Mr. Wilgus outlined his ideal of suburban transportation when possible. This is for local cars operating throughout suburban towns and villages to take up passengers along the route, and then join the express line where, consolidated into trains of the desired number of cars, they would pass at high speed to urban points of distribution. Here, if desired, they can be again disintegrated into separate units so as to pass to different parts of the city over the local means of rapid transit. This is possible with the multiple-unit system. Mr. Rea differed somewhat from Mr. Wilgus, and did not think that the trunk lines in the neighborhood of large cities certainly could handle strictly local traffic to advantage. He said that he expected that the Pennsylvania tunnel in New York would soon be filled to its normal capacity with through trains. He also said that he did not believe that there should be stations within four or five miles of the terminal, as that traffic could very well be left to local transit systems. The Pennsylvania Company's average rate for commuting riders out of Philadelphia is 0.7 cent per mile, so that for five miles the company only gets 3½ cents, whereas the average cost of putting passengers through the Broad Street Station is figured by the company at 3 cents, leaving only 0.5 cent to pay for the transportation. He said that when electric railway operation started around Philadelphia the company's Philadelphia-Washington line began to lose suburban travel heavily, but this has now come back, because the trolleys induced dense building within the first few miles, while in the outer sections people had to use steam railroads.

The testimony of the experts mentioned is followed in the report by fourteen appendices. Appendix A includes statistics of passenger traffic and car service of the New York City Railway, contributed by Mr. Vreeland; of the Manhattan and Interborough Rapid Transit Companies, contributed by Mr. Bryan; of Brooklyn, contributed by Mr. Winter; of Philadelphia, contributed by Mr. Twining; statements relating to the Pennsylvania extension to New York and the traffic of the New York Central, contributed respectively by Messrs. Rea and Wilgus; memoranda on the transit conditions and the subway in New York, by Messrs. Parsons and Macassey, secretary of the commission; sections of the New York State constitution, New York City charter, New York State Railroad law relating to street and steam railroads, police regulations on traffic; memoranda on transit conditions in Boston, by Messrs. Crocker and Macassey; Massachusetts Street Railway law; article on transportation conditions in New York by Hon. Robert P. Porter, and extracts from the Census Reports. While a large part of this information has, of course, been published previously in other places, including the report of the Merchants' Association and the Railroad Commissioners' reports, some of it is new, such as the passenger traffic of the New York Subway by months up to December, 1905, showing the passengers carried from each station of the subway. This table shows that the following are the stations with an average of more than 100,000 passengers per month during the year ending Oct. 31, 1905. They are arranged in their order of patronage:

Brooklyn Bridge, 1,309,806.33; Grand Central Station, 611,425.17; Fulton Street, 475,801.33; Times Square, 411,265; Twenty-Third Street, 353,201.08; 116th Street and Lenox Avenue, 343,704; 125th Street and Lenox Avenue, 303,478; Astor Place, 262,319.25; 135th Street and Lenox Avenue, 249,688; 110th Street and Lenox Avenue, 244,272.63; Wall Street, 239,857.25; Columbus Circle, 214,865.25; Ninety-Sixth Street, 206,095; Eighteenth Street, 190,603.66; Seventy-Second Street, 188,051.83; Bleecker Street, 181,470.08; 103d Street, 177,209.75; Thirty-Third Street, 168,820.25; Spring Street, 168,718.66; Twenty-eighth Street, 167,733.08; Fiftieth Street, 161,993.08; Third Avenue, 149,380; Canal Street, 146,739.75; Eighty-Sixth Street, 138,905.08; South Ferry, 135,366.66; Sixty-Sixth Street, 131,870.17; 145th Street, 131,163; Seventy-Ninth Street, 121,542.91; Jackson Avenue, 114,235; Prospect Avenue, 111,887.81; Manhattan Street, 100,308.41; 157th Street (opening Oct. 28), 100,008.33.

Appendix B gives notes of the visit to the United States contributed by Sir John Dickson-Poynder, member of the commission. He calls attention to the tremendous distribution of urban population secured through the highly-developed street railway systems of this country, and to the effect on land values and rents. He also refers to the increase in the amenities of life due to the street railway systems. It not only encourages people to live in independent houses, but tends to widen social acquaintance and affords opportunity for those to attend places of entertainment and instruction of the best kind in the central parts of the city. In London, owing to the absence of such facilities, the report states that the suburban inhabitant is in the town but not of it, and is practically debarred from many of the advantages of town life in the enjoyment of the higher class entertainments offered by the West End. The report also calls attention to the increase in usefulness through access of the street railway to public parks, ball grounds and amusement resorts, and to the development of resorts owned by railway companies.

Appendix C gives a memorandum on the rating of railways by Sir John Dickson-Poynder, and Appendix D notes on the visit to the United States by Sir George C. T. Bartley. Sir George's conclusions were as follows:

The experience of the United States seems to show that in that country the following conclusions may be drawn:

1. The establishment of some authority of considerable power subject only to the control of State Commissioners or the State itself seems to be regarded now as essential.

2. The extension of trams in the most densely peopled parts where the streets are sufficiently wide, and the building of subways in relief of the streets is regarded as an efficient and even necessary means of meeting locomotive needs.

3. The rapid handling of masses of travelers to busy parts, in the morning and evening, taking them without change as near as may be to their work, is only to be secured by a system ot practically continuous cars in every required direction. These cars to be either on the surface or in subways or both.

4. The co-operation of the main lines of railways in the distribution of traffic, and the use of some part or some floor of their large stations for this purpose.

5. The financial assistance of municipalities to private companies, safeguarding the former by conditions and periodical revisions of license.

6. The establishment of a universal small fare per journey, with but one class of carriage.

7. The granting of greater power to the police for regulating traffic and the selection of streets and routes of traffic of different kinds.

8. The fact that increased facilities, even in the same streets, so far from injuring the existing traffic, improves and increases the business of all traveling agencies.

9. That surface tram lines alone do not meet the difficulty of congestion in those streets, especially the narrow ones having a large amount of ordinary traffic.

10. That subways seem to be an essential part of any system, especially in the centers of large towns, and that with proper care they can be built with but little surface disturbance.

11. The subject of the widening of streets seems to be little considered in the United States, owing to the fact that the cities are usually built in blocks, with parallel streets.

12. Great care seems to be taken in America in obtaining the consent of a majority of the inhabitants of a street to any tram line or other change, though power is usually given to override the veto of the street, and even of the Mayor, in extreme cases.

AMERICAN RESULTS: HOW APPLICABLE TO LONDON

While fully appreciating the differences that exist between London and New York and other cities of the United States, it would seem that in many ways lessons useful to London may be learned from the cities visited.

(a) Though the authority and its power and mode of creation would have to be very different in London from New York or other American cities, it is clear that no complete practical scheme can be adopted or active steps taken to cope with the question of London traffic efficiently, as a whole, until some authority with great powers is brought into existence subject only to the superior authority of Parliament.

(b) Though not in a position to enter into detail as to what additions to the facilities for traffic are likely to be needed at once in London, it is clear from the places we have seen that a large increase in surface trams, subways, facilities at the existing stations, and in the center of the city are possible and must be freely adopted to bring London even up to the standard of New York.

(c) The authority above suggested would, as in New York, consider all matters of locomotion and gradually adopt them as part of one great scheme, to be developed and extended from time to time as occasion required. All extensions to be of course subject to Parliament sanction and control.

(d) From the nature of London streets, and the absence of all rectangular blocks and in many places of practical alternative routes, it is clear the question of new streets must enter more into the London problem than has been necessary in New York.

(e) As regards the cost, it would seem that much might be learned from New York. Here the great subway, costing nearly eight millions sterling, will really not add a penny to the burdens of the city. In America there is a strict limit to municipal indebtedness, which we have not in England, and these great works are carried on by a system of co-operation between private enterprise and the municipality which seems to be well worthy of imitation.

The remainder of the appendices of Vol. IV. are devoted almost entirely to statistical tables of London, report on tramway systems in the United Kingdom, laws relating to tramway concessions in France, notes on foreign tramways and indices. The summary of facts and conclusions of the entire committee is as follows:

SUMMARY OF FACTS AND CONCLUSIONS

1. In the cities we visited, omnibuses have almost disappeared, and cabs are only used to a very limited extent.

2. For the ordinary means of locomotion, reliance is placed on surface tramways, elevated railways, and underground railways passing along "shallow" subways; all these are worked, or are to be worked by electricity. The crowded streets of New York are practically as crowded and congested as similar streets in London, but the bulk of people are able to get along them with fair speed and comfort in the tramcars. The evil of crossing traffic is felt in New York as well as in London, and no means of overcoming the evil has been attempted, or, so far as we could learn, practically suggested. The obstructions caused in crowded streets by vehicles standing at the curbs are also as great, and equally beyond the power of the police authorities to cope with. The suburban rush at the usual morning and evening hours is as great in New York as in London, and the problem of dealing with it is equally pressing. Indeed, we have nothing in London so bad as the rush at Brooklyn Bridge to enter the tramcars.

3. Authority for the laying down of street tramways is now generally given by the municipal authorities, application to the legislature for sanction not being necessary. There is a marked tendency in the case of tramways towards amalgamation for operating purposes, and even towards the inclusion within such arrangements of both elevated railways and underground railways. In Boston, as in other towns of Massachusetts, the concessions for tramways used to be revocable at the discretion of the local boards. The sanction of the State Railroad Commissioners has now been made necessary to the validity of a revocation. On this and other questions connected with tramways, the report of a special committee on "The Relations Between Cities and Towns and Street Railway Companies," appointed by the State Legislature of Massachusetts, and presided over by Hon. Charles Francis Adams, contains valuable information.

4. The elevated railways possess certain advantages as a means of locomotion, but without going so far as to say that in no place and under no circumstances should an elevated railway be built, they are clearly not suited for London streets.

5. The "shallow" underground railway is preferred to the deep-level, and the latter style of railway will not be accepted unless when the former is out of the question. The reasons for preferring the "shallow" underground railway will be found in the first report of the Boston Transit Commission (Aug. 15, 1895), referred to in the memorandum on Boston. The "shallow" underground railway is likely to be largely used in the future, as the increase in traveling is such that the surface tramways alone, in many places, will be unable to carry the traffic without producing intolerable congestion. The "shallow" underground railway will be specially useful in forming a connection between different portions of the tramway system when the intervening streets do not admit of a satisfactory tramway service along them. The protection of the street traffic, and of the business of frontagers while such railways are being constructed, appears to be chiefly one of expense, but this is a question on which, in connection with London, the best engineering and expert opinion should be taken.

6. Valuable opinions have been obtained on the expediency of laying surface tramways in streets crowded with traffic. It seems obvious, however, that each case will have to be considered on its merits: the character of the street (whether residential or business, and the kind of business), the amount of traffic, its nature, the extent to which the passengers carried by other vehicles will be absorbed by the tramcars, and the possibility of heavy traffic finding an alternative route, being all important factors.

7. The tendency towards the amalgamation for operating purposes of urban tramways and railways, and the practical impossibility of rival tramways or railways being constructed when once the field has been occupied by such a combination, confirm the belief that competition through private ownership cannot be relied upon in such cases for the protection of the interests of the public. The owners of the amalgamated tramways and railways acquire a monopoly within the area which they serve, and it becomes essential that their tenure and management of their lines should be subject to equitable regulations.

8. Neither in New York, Boston or Philadelphia were any surface tramways found to be owned by the municipality. In both New York and Boston underground electric railways were being constructed at the cost of the city, but the construction was carried out under the control of a body of commissioners, and the lines when constructed, though owned by the municipalities, were to be operated by lessees.

9. In New York State there exists a body of State Railroad Commissioners, with wide powers of supervision over railroads, and also with power to recommend drastic measures, these measures being enforced by mandamus of the Supreme Court if they are "just and reasonable."

In Massachusetts there exists a similar body, which also possesses wide powers of making recommendations, these recommendations being dealt with by the legislature and not by the courts of law. The recommendations of the Massachusetts Railroad Commissioners are generally accepted and acted upon by the company concerned. Extracts from the acts constituting the New York State Railroad Commissioners and Massachusetts State Railroad Commissioners are appended, which show the nature of the powers they possess. In both cases the Commissioners were said to command general confidence, while their working was beneficial to the public interests, and satisfactory to those immediately concerned. These facts show the valuable influence that can be exercised by a body of competent and independent persons who are authorized to act as arbitrators on the many and unforeseen causes of dispute that must arise between

the public and the companies possessing, to a greater or less extent, a monopoly of the means of communication.

10. In dealing with the question of the housing of the working classes reliance is placed on the provision of quick transport, the cost being within the means of those affected and the building of suitable dwellings is left to private enterprise.

SOME GUIDING PRINCIPLES IN THE ADJUSTMENT OF THE RELATIONS BETWEEN EMPLOYER AND EMPLOYEE*

BY H. H. VREELAND

In no respect has the great advance of modern industry been more disorganizing—if I may, for want of a better, use that word—than in the relationship between employer and employee.

In the earlier stages of industrial life, when great artisans gathered about them journeymen and apprentices, the numbers were so limited and the conditions of life so restricted that there was established, of necessity, a relationship almost of guardian and ward. Master and man not infrequently lived together, had identical tastes, shared the same social, artistic and commercial ambitions, and were inspired with a common civic pride, vivified by the comparatively amiable rivalry involving other cities and towns whose people were engaged in work of the same class. This patriarchal relationship, of course, has its limitations and would be quite impractical in the vast hives of industry made necessary by modern conditions. To linger in regret over its departure would, to practical minds, be a waste of sentiment much like bewailing those good old stage-coach and canal-boat days now happily forever gone.

I have no sentimental protest to make about the altered conditions which now make it possible for twenty men, in a day, with the aid of machinery, to do as much as one thousand could have formerly done with their hands in six months; but in the change there has come about an alteration in the relationship of employer and employee that I, in common with every right-minded citizen, must recognize as not for the best interests of the State at large, and assuredly not for the best interests of those immediately involved and affected by it. One of the most conspicuous results of the sudden and still active expansion of the personnel of great industries has been the annihilation of individuals; the utter submergence of single human units. This inundation in some places is so great as to be utterly destructive of all possible individual development. In some of the industries the numbers are so great that the ultimate managers, for mere clerical convenience, are compelled to consider their employees in classes, some of these classes or units comprising as many as 10,000 men; and so, as business grows, the distance between employers and employed seems daily to widen.

This separation has, as was inevitable, given rise to a lack of sympathy between the two extremes of all great industrial concerns that needs the attention of thoughtful men. It has, in the past twenty-five years, expressed itself in many wasteful efforts at readjustment. Workingmen do not understand the besetments of the employers, and it is equally true that amid the anxieties of competition and preoccupations which far-reaching enterprises entail on them, the employers are not fully awake to the conditions of those they employ.

As I see the situation (and I have been familiar with it for a great many years) there seems to be very little possibility of bringing about the re-establishment of anything approximating even the condition I spoke of in opening this talk. This conviction long ago turned my attention to a close study of the situation in order to ascertain if some substitute for the old lost relationship might not be found.

In searching for the small human beginnings of a number of classical industrial disagreements, I was surprised to find that it was not so much a lack of sympathy between the capitalists or executive directors of these great concerns and their men that caused the trouble, as an utter lack of sympathy or executive ability among petty subordinates; men clothed with brief authority, who failed to exercise it beneficently and intelligently. In my search I took in the history of several great enterprises that seemed to have escaped the troubles that beset others, and there I found further corroboration of the truth that intelligence and humanity were potential and that the reason these concerns had not had trouble was because of the intelligence, sympathy and firmness of the subordinate heads in charge of the various groups and classes of men. From my own experience, with a very miscellaneous lot of men numbering about 15,000 in the city of New York, men gathered from all quarters of the country and of all nationalities, I have had abundant proof that firmness tempered with the intelligent sympathy for their necessities works wonders.

And so, if I had to speak a word of advice concerning the most important principle in the proper adjustment of the relations between employer and employee, it would be, "have a care in the selection of your subordinate heads." Only a man who knows the conditions and point of view of those he commands has the capacity to control or influence workingmen for their own good. If he has knowledge and experience that is common to them, if he knows the kind of lives they lead, the anxieties that pursue them, the ambitions they have for themselves and their families, he is surely the man indicated for advancement and control, it being always understood that he has executive capacity. To take a man who has executive capacity and has administered it in one field, or among a certain class, and place him in charge of a group of men with whom he is not in the kind of sympathy I have stated, and expect him to control them intelligently, is out of the question, in my opinion. Such a man may take his orders from his superior and execute them with military decision, and yet fail to get what would be naturally expected out of his men. Nor will such a man keep his subordinates contented, and this element to my mind is of quite as much importance as a wage scale.

There has grown up also, my investigation shows me, a custom that from the human point of view is very cruel, but which from the economic point of view is absolutely essential. It is the custom of estimating the potential of men in mass as you would an engine, and by hard and fast rules expressing from the mass a given number of units of product. When this custom is put into operation and there is lacking the sympathy and knowledge of conditions that I have spoken of, the result is at once brutalizing and disappointing. It is bound to break down of its own rigidity, and in my experience in the long run it is not economical. On the contrary, I think experience shows it to be wasteful. In the great aggregation of men and capital which go to make up our modern industrial units, it may have been inevitable that in concerns suddenly brought into life, new and strange foremen or department heads were necessary, and I suppose that much that is justly complained of by working men and those who investigate their status will gradually disappear, as there is enlightened recognition of the profitableness of blending into the relationship of employer and employees the intelligent understanding I have spoken of, and which to my mind is essential to the peaceful and profitable prosecution of any kind of work in which great masses of men are engaged.

*Paper presented at the Philadelphia Convention of the American Academy of Political and Social Science.

THE STONE & WEBSTER ORGANIZATION, AND THE PROPERTIES IT MANAGES

So far as the electric traction and lighting industries are concerned, the firm of Stone & Webster, of Boston, was one of the pioneers in that important movement, now becoming more and more widespread, whereby the indisputable advantages of centralized management and administration have been applied to independent and widely scattered properties. As early as 1890 this firm formulated certain definite policies looking to the acquisition of financial and executive interests in a special class of public utility companies. These policies, it may be said, have been consistently and steadfastly followed with the result that the firm is now interested in some twenty-eight electric railway, gas and electric lighting, and power properties located in widely separated sections of the country and for which it acts as financial advisor and executive head. The following is an attempt to outline some of these policies; to indicate certain unique features of the organization, and to show how, by reason of a centralized executive office, the firm has been able not only to administer the properties with greater economy but primarily is able to give the communities interested the benefits of better service and improved facilities that could never be assured by a small local corporation working entirely alone.

The firm buys properties with the idea of operating and holding, as distinguished from promoting with the view of selling. It has taken over public service corporations in certain growing communities with the purpose of reaping whatever benefits may accrue from intelligent and broad-minded development and operation. In its relation to the companies under its management the practice of the firm is unique, inasmuch as Stone & Webster's financial interests lie largely in the stocks of the various companies. It is the endeavor of the firm to develop the properties and maintain them at the highest efficiency, thereby insuring increased earnings and enhancing the integrity of the bond issues. The firm has for the most part confined its interests to public utility properties of what may be termed the "middle size." These are the properties whose individual earning capacity does not warrant the engagement of trained specialists for handling departmental work, but whose manager must combine in himself many of the functions that in a larger property are distributed among several specializing heads of departments. Stone & Webster meet the limitations of the smaller enterprise by putting in charge as local manager a competent all-round operating man, and then placing at his command for advice and help the corps of highly trained experts in the Boston office.

The organization of Stone & Webster, so far as the management of companies is concerned, is built around an executive committee, which consists of six men, each one of whom is a specialist along certain lines of practical work. The members of this committee come within the scope of the popular definition of "all-round men," but, in addition, each has special aptitude and qualifications for solving a particular class of problems. For instance, one member is an expert in street railway management, another is a specialist in the administration of electric lighting utilities, another in waterpower development, and so on. The apportionment of responsibility among the individual members of the committee is not entirely along the lines of specialized work, but is also geographical; that is to say, each member of the committee is responsible for the general supervision of certain of the properties or groups of properties, and it is his particular province to follow the condition of the companies assigned to his care. In this he may at all times avail himself of the advice of any other member of the committee, or of the committee as a whole. In the direction of fostering the spirit of coöperation and mutual helpfulness, it is the practice to have each member of the executive committee visit at intervals the properties for which he is responsible, and to the same end all the local managers make a visit to the Boston office at least once a year.

In conjunction with the executive committee the central office is divided into departments, each with an expert at its head, and each one of which looks after one particular class of work. It will be understood, however, that the departmental divisions are not absolute, but to preserve the continuity of the organization as a whole there is a certain overlapping and interdependence between all the divisions of the staff. The departments may be enumerated as follows:

Engineering.
Purchasing.
Auditing.
Corporation.
Statistical.
Securities.
Library and document filing.
Miscellaneous office departments, as mailing and letter filing, stenographic service, office force, etc.

Before explaining in detail the work of the individual departments, it is in order to refer back to the original starting point, and examine more at length into the fundamental principles underlying the whole structure of the Stone & Webster organization. It should be kept in mind that the companies controlled are distinct corporations, each standing on its own merits, with its own officers and board of directors, and its own bank accounts used only for its own purposes. This complete independence is a necessity, because, with the exception of Stone & Webster, the holders of the securities are not common to the different companies.

The central office has endeavored to add to the benefits of this independence the indisputable advantages of a large executive organization. These advantages may be summarized in the possibilities that come from a broader view and the bringing to bear of a more consistent management than can be assured with any small or middle-size isolated property under the control of one manager. They include the providing of trained men for the study and handling of special problems, especially along the following lines:

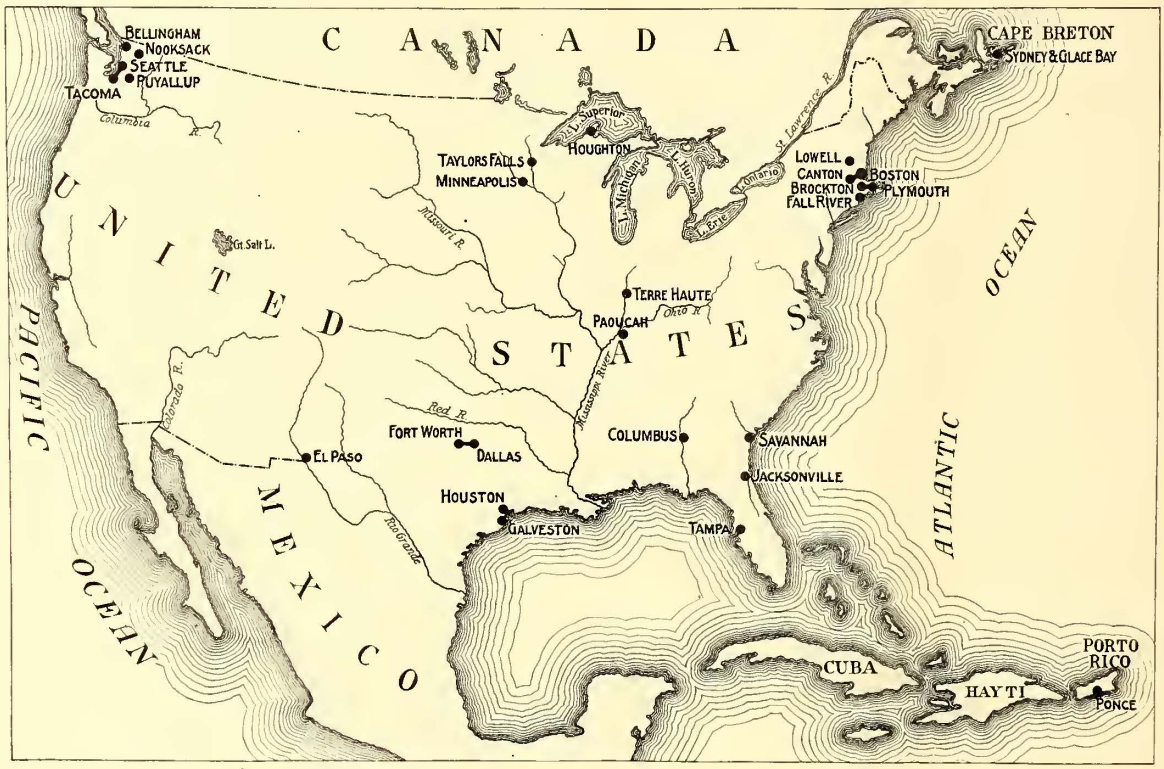
Good engineering.
Benefits of purchasing in large quantities.
Proper and uniform accounting.
Economical financiering.
The keeping of proper and systematic records of the acts of the corporations.
The compilation and study of statistics of operation.
The advantageous marketing of securities.
The gathering and dissemination of information.

In conjunction with all these advantages, and because of them, are the undeniable advantages to the local communities that accrue through broad and consistent management and the rendering available of the financial backing necessary for making the essential improvements, betterments and extensions.

While the administration of the various properties primarily centers in the Boston office, there is no intention of hampering or curtailing individual endeavor on the part of the local managers.

In empirical discussions on this subject of centralizing the handling of public utilities, fears have sometimes been expressed that the concentration of managerial authority into a distant "home" office will have the effect of gradually destroying the usefulness of the local manager, by limiting him as to initiative thought and action, and by breaking down his

power to think and act for himself. The prevailing spirit in the organization under consideration is directly contrary to this tendency. The aim in this regard is to build up and not destroy individual suggestion and endeavor, so long as the ideas advanced are tenable and logical. As a matter of fact, it is recognized that the value of the local man depends solely on his ability to originate and execute. The Boston office stands in the relation to the local manager not so much as censor as a storeroom upon which he can draw for suggestion and advice. Necessarily, inasmuch as Stone & Webster are heavily interested financially in the properties they manage, they require that the properties be operated along certain lines of their own definition, just as any well-handled enterprise should be subject to restrictions imposed by the owners. The local manager is at his post to look after the local well-being of the company in his charge, to take care of the thousand and one details; to develop the business and



MAP SHOWING LOCATION OF ELECTRIC RAILWAY AND LIGHTING PROPERTIES MANAGED BY STONE & WEBSTER

activities of the company; to develop and keep in mind the interests of the community served; to plan and suggest and improve; to execute; and to keep the home office fully informed as to the conditions and details of the property committed to his care. Machine-managed properties are not desired, nor are the local managers in any sense regarded or treated as machines. The supervision of the home office is directed solely to the securing of uniformity in standards and practice; the elimination of opinionated and illogical management, and the supply of competent and expert advice in the formulation and execution of policies.

Matters that are distinctly local are left with the individual companies. These include such questions as claims, which are settled by the management on the ground, of course, in consultation when necessary with the Boston office; mechanical maintenance of cars and equipment; formulation of schedules, and similar details. On these points the local managers are judged solely by the results achieved.

Again, in line with consistent management, a standard set of rules for trainmen has been codified and is in use by all the companies. The body of the rule book is the same for all companies, but to the standard code are appended such few additional rules and regulations as are necessary to serve the local requirements.

Touching upon the treatment of employees, the Boston office encourages the formation of local benefit associations, social and recreation organizations, such as bowling clubs and baseball teams, the furnishing of rooms for the men, and any other local endeavor in the direction of securing conveniences for employees, and bettering the conditions under which they work.

Supplementing the local effort in this direction, the Boston office maintains a Savings Association. This association was founded in January, 1901, for the purpose of encouraging the spirit of saving among those in its employ. The firm contributed a large reserve or trust fund, to which are added deposits of individual employees. Any person employed by the firm or by any of the companies controlled, in whatever capacity, may deposit money in small or large amounts, and money so deposited begins immediately to bear interest and continues to do so until withdrawn. The money is invested in securities of known value, and the interest so accruing is distributed to the depositors. The trust fund and its management are in the hands of trustees chosen from among the depositors.

ENGINEERING

This department deals with the broad schemes of development, such as the remodeling of a power house or the laying out of a distributing system, that would ordinarily call for the services of a consulting engineer and a large engineering force. The department passes on the general problems involved, prepares the plans and then either turns over the execution to the local management or carries out the work under the supervision of its own representatives. Minor engineering questions of station development, track work, etc., are, as a rule, left to the local management.

The firm is gradually working toward uniformity of en-

gineering standards, although no attempt has been made to arbitrarily apply rigid standards to all of the properties. Accumulative data and results of experience are being kept, and it is not improbable that classifications will be made of various general conditions and practice will gradually crystallize into certain uniform standards in track, rolling stock and power generation wherever similar conditions of service prevail.

PURCHASES

The ordinary run of everyday supplies are bought by the local managers, and in this connection local dealers are patronized in so far as possible. The larger orders, as, for instance, for rails or for cars, and orders for supplies that are used by several of the companies in large quantities are placed through the Boston office. The advantages of a centralized purchasing bureau to the individual companies are manifest. This bureau is able to keep in close touch with changes in the market, and by buying in quantities is in a position to obtain better prices and more favorable deliveries. The importance of buying with the market is especially evident with regard to such items as copper, lamps, carbons, etc. In case of especially low markets in any of the commodities upon which the price fluctuates, the Boston purchasing agent ascertains the approximate needs of the local companies with respect thereto and buys accordingly. Frequently contracts are let as blanket orders, that is to say, an order is placed for a million lamps, and the local manager is informed what portion of this order has been alloted to him and he draws on the manufacturing company direct for his allotment.

In the operation of the purchasing department there is, again, no thought of hampering or curtailing the local manager. The manager makes his requests and requisitions for supplies upon the head office, about as he would upon his board of directors, except that the Boston organization goes further and helps him save money for his company by buying through a central purchasing bureau.

AUDITING

In 1901 Stone & Webster devised and adopted a standard system of accounting for all of the companies which they manage. The classification is very similar to the standard form adopted by the Street Railway Accountants' Association of America, and the National Electric Light Association.

The individual companies make detailed monthly reports to the auditing department in Boston, where the auditing is done in conjunction with traveling auditors, who visit all of the properties at intervals. It is the duty of the auditing department to handle the general finances of the individual corporations; to see that funds are provided for any proper work; to see that dividends, interest on bonds, and other charges are properly met, and in general to supervise the finances and accounting of the properties.

It should be stated that there is no merging of accounts as between the individual companies controlled. The funds of each company are deposited in a separate bank under the individual company's name, and, in this respect, each property stands absolutely on its own basis. This principle is carried into all matters of finances, and if one company requires new revenue from capital or bonds the money is raised on the individual credit of the individual company. Naturally some companies can secure funds at a lower rate of interest than others, but in this respect there is no intermingling or lending of the credit of one company to the advantage of another. The only thing that is done in this regard is that in each case Stone & Webster lend their prestige and reputation to the local companies in their efforts to secure proper and necessary capital. Thus, without losing its individual standing, each company secures the advantage accruing from centralized interests.

In the classification of construction accounts the idea has been to secure a simple, understandable and logical grouping of costs. All expenditures on construction account are divided into thirteen accounts, which give the information required by the home office and show as a summary of construction costs. These are divided into sub-accounts and these sub-accounts are again divided into a third series, covering expenditures in greater detail.

CORPORATION

Each company has one or more attorneys to advise on all legal questions, and it is the duty of the corporation department to keep in close touch with all such matters pertaining to the companies, and to see that they receive the necessary attention from the attorneys.

In conjunction with the attorneys, the department sees that all the requirements of the laws under which the companies are incorporated are complied with, that the provisions of the mortgages, trust deeds, by-laws, etc., are carried out, and that all necessary formalities are complied with in the issuing of new securities.

The department is responsible for the keeping of proper and systematic records of the acts of the corporations, arranges for the holding of stockholders' and directors' meetings, and sees that the minutes of such meetings are properly kept. It also sees that all contracts, agreements, mortgages, trust deeds and other legal papers are properly printed, recorded and filed.

The department prepares each month what is called a "Calendar," which contains detailed information in regard to corporate matters, which must be attended to during the month, such as, payment of coupon interest, sinking funds, dividends, renewal of contracts, etc.

COMPILATION AND STUDY OF STATISTICS

The statistical department of Stone & Webster is one of the unique, and at the same time one of the most important, features of the organization. This department receives each month two reports from all of the companies. One of the reports covers the financial results, and is practically a duplicate of the financial report prepared for the auditing department, as previously mentioned. The second report covers operating statistics of the physical property, and includes such items as number of cars, number of employees, details of service, accidents, transportation data, car miles run, and power station data. Accompanying these monthly reports the local manager presents, in the form of a letter, a review of the condition of the property during the month. In this he discusses changes in the municipal conditions or relations; competitive franchises applied for or suggested; changes and general information in regard to labor situations; general information in regard to the condition of the business, specifying any special causes which have affected the company's earnings and their probable bearing upon the future; changes in rates for light and power (lighting companies); changes in fares and fare limits (railway companies); explanation of accounts that show extraordinary increases or decreases. In other words, this monthly review of each property by its local manager is intended to enable the home office to understand the variations and conditions in each property without further correspondence.

When these reports are received by the statistical department, they are checked over and all computations verified. The department then begins a comprehensive study and analysis of each statement. Such ratios as have been found to be the best indices of the company's condition and opera-

tion are figured out and are used in comparing the results of each company with its own previous operation, and each company with all the other companies. From the results of these computations, curves and tables are prepared on individual items, studies are made indicating the trend of development, estimates of future requirements are prepared and, incidentally, letters of advice and suggestion are sent out.

The statistical department keeps records and descriptions of all real estate and other property owned by the different companies, including photographs of every type of car, and maps showing location of tracks, distributing systems, paving, rail sections, land owned, etc. It handles insurance matters, seeing that the proper amount of insurance is carried on all buildings and property, and checks the renewals of policies and the payment of premiums. It keeps records of the forms and blanks used by each company, properly codified and indexed, and supervises the preparation of new blanks by the local companies to make sure that these forms will give the information desired.

The department makes special compilations, computations and reports of any special subject or investigation required for the solving of a particular local problem. It obtains from the local managers estimates of the anticipated earnings and expenses of each company for the coming year, each item being shown separately. This work has been peculiarly successful, and the estimates made for the current year are being verified very closely by the actual results obtained. This practice of requiring detailed estimates is proving of great value to every one responsible for the operation of the properties, as it trains the men to look ahead and study conditions, and enables a much more intelligent laying-out of plans for financing improvements, extensions, etc.

New propositions offered to the firm for consideration pass through the statistical department, where the data submitted is checked, and any additional information added which will assist in determining the merits of the enterprise.

The department is responsible, in general, for the training of new men to administer the affairs of the firm and of the individual companies. Young men are taken into the department and given every facility and assistance to become familiar with the methods of the organization and to acquire knowledge of the companies. The aim is to render available trained men, rather than specialized men.

SECURITIES

The securities department handles all details with reference to the marketing of the securities issued by the various companies, and is the channel through which information concerning the financial condition of each company and its securities is given out.

It prepares numerous circulars describing the properties and their securities, prints monthly statements for each company, showing the earnings, and comparing them with previous figures, and at the close of each calendar year prepares a booklet, giving a description of each property and the information concerning it which is desired by the average investor. These publications are distributed to all stockholders and others who are interested.

The department also endeavors to bring together the companies or holders of securities who may wish to sell, and bankers or others who may wish to buy, and keeps a careful record of quotations on all securities, together with bids and offerings.

LIBRARY AND DOCUMENT FILING

This department receives, extracts and files copies of the representative technical periodicals, the local papers published in the communities served by the individual properties, and technical and engineering text books, hand books and publications that may be required for reference purposes. It is also responsible for the proper filing and indexing of all documents, such as agreements, contracts, reports and similar papers, in connection with the affairs of the head office and the allied properties.

In connection with the handling of the technical publica-

EARNINGS AND EXPENSES FOR TWELVE MONTHS ENDING DECEMBER 31, 1905, OF COMPANIES MANAGED BY STONE & WEBSTER

	Character of Service.	Miles of Electric Railway Track.	Gross Earnings.	Operating Expenses.	Net Earnings.	Interest Charges.	Balance.	Dividends.
Blue Hill St. Ry. Co., Canton, Mass.	R.	19.56	$84,125.64	$70,080.38	$14,045.26	$19.691.04	*$5,645.78	.....
Brockton & Plymouth St.Ry.Co.,Ply'th,Mass	R.	24.06	102,143.48	70,665.04	31,478.44	21,291.17	10,187.27	.....
Cape Breton Elec. Co. Ltd., Sydney, N. S.	R. & L.	30.86	211,980.53	155,262.24	56,718.29	44,295.45	12,422.84	.....
Columbus Electric Co., Columbus, Ga.	R.L.G.& W.	24.32	.....	.....	.....	.....	.....	.....
Net earnings applicable	.....	....	.....	.....	68,603.05	30,753.25	37,849.80	.....
Columbus R. R. Co., Columbus, Ga	.....	See C.E.CO.	173,699.90	110,322.05	63,377.85	22,779.91	40,597.94	.....
Dallas Electric Corp., Dallas, Tex	R. & L.	53.71	934,706.75	572,228.26	362,478.49	182,667.62	179,810.87	$40,500.00
Edison Elec. Ill. Co. of Brockton, Mass.	L.	....	145,979.44	103,368.91	42,610.53	8,452.24	34,158.29	12,500.00
El Paso Electric Co., El Paso, Tex	R. & L.	18.72	288,943.16	190,560.68	98,382.48	43,326.77	55,055.71	12,000.00
Fall River Gas Works Co., Fall River, Mass.	G.	....	352,958.53	219,233.45	133,725.08	4,906.68	128,818.40	63,500.00
Galveston Electric Co., Galveston, Tex	R. & L.	32.59	†194,597.57	117,382.36	77,215.21	33,333.34	43,881.87	10,500.00
Houghton Co. Elec. Lt. Co., Hancock, Mich.	L.	....	211,723.41	101,190.30	110,533.11	26,250.00	84,283.11	38,000.00
Houghton Co. St. Ry. Co., Houghton, Mich.	R.	26.23	‡111,106.84	71,952.13	39,154.71	22,464.48	16,690.23	6,000.00
Houston Electric Co., Houston, Tex.	R.	43.90	517,315.15	313,524.51	203,790.64	105,504.42	98,286.22	15,000.00
Jacksonville Electric Co., Jacksonville, Fla.	R. & L.	22.25	305,639.91	180,865.90	124,774.01	37,856.41	86.917.60	52,000.00
Lowell Electric Lt. Corp., Lowell, Mass.	L.	....	254,935.31	155,305.69	99,629.62	9,420.08	90,209.54	52,000.00
Minneap's Gen. Elec. Co.,The,M'n'p's,Minn	L. & W.	....	724,581.91	383,801.35	340,780.56	111,710.00	229,070.56	60,000.00
Northern Texas Trac. Co., Ft. Worth, Tex.	R.	66.70	661,036.89	391,862.75	269,174.14	118,127.38	151,046.76	75,000.00
Paducah Traction & Lt. Co., Paducah, Ky.	R. L. & G.	12.80	.....	.....	.....	.....	.....	.....
Ponce Electric Co., Ponce, Porto Rico.	R. & L.	4.30	88,573.80	56,391.53	32,182.27	28,443.74	3,738.53	.....
Puget Sound El. Ry., Tacoma, Wash.	R.	52.22	511,338.88	304,034.23	207,304.65	180,501.32	26,803.33	.....
Proportion of earnings of Tacoma Ry. & Pr. Co.	.....	....	.....	.....	.....	.....	65,804.25	.....
Puget Sound Power Co.	W.	....	.....	.....	.....	.....	.....	.....
Savannah Electric Co., Savannah, Ga.	R. & L.	57.49	586,235.95	348,027.00	238,208.95	127,694.13	110,514.82	60,000.00
Seattle Electric Co., Seattle, Wash	R. & L.	108.70	2,565,913.81	1,674,011.93	891,901.88	291,648.99	600,252.89	288,000.00
Tacoma Ry. & Pr. Co., Tacoma, Wash.	R.	85.95	657,451.22	451,581.20	205,870.02	132,802.87	73,067.15	.....
Tampa Electric Co., Tampa, Fla.	R. & L.	30.53	411,763 26	237,153.38	174,609.88	21,765.84	152,844.04	70,000.00
Terre Haute Tr. & Lt. Co., Terre Haute, Ind.	R. & L.	76.23	629,760.38	414,517.51	215,242.87	122,418.20	92,824.67	.....
Whatcom Co.Ry.& Lt.Co.,Bellingham,Wash.	R.L.G. & W.	16.84	195,009.02	136,395.62	58,613.40	29,299.15	29,314.25	11,700.00

Note.—R—Electric Railway. L—Electric Lighting. G—Gas. W—Water Power Development.
* Blue Hill St. Ry. Co., deficit. † Galveston Electric Company, 8 months. ‡ Houghton Co. St. Ry. Co., 6 months.

tions and literature, an important feature of the work is the preparation and issuance of what are termed "current literature sheets." As the various periodicals are received they are first read by an experienced reader, who notes special articles or information that may be of interest to any of the departments or individual members of the staff, or to any of the local managers. The current literature sheets are then made up periodically from these notes and copies are circulated among the staff of the Boston office and to the local organizations. The sheets give the titles of the articles and the page and issue of the publication in which they appear. This service is not intended to take the place of personal reading of current literature on the part of individuals, but its object is to encourage examination of the technical papers, by keeping all members of the organization posted as to the articles that are appearing in the technical press. The department is also of service in securing individual subscriptions to the periodicals at club rates.

MISCELLANEOUS DEPARTMENTS

The Boston offices of the firm occupy two and a half floors of the modern office building at No. 84 State Street. The suites have been laid out with the needs of each department clearly in mind, and with the view of expediting the intricate details involved in the dealings of the firm with outside interests and within its own organization. The miscellaneous departments include a separate stenographic bureau in addition to the special departmental stenographic assistants. It also comprises an elaborate and comprehensive system for handling mail, telegrams and correspondence in general, including arrangements whereby incoming letters are opened, numbered, recorded and routed through the proper channels, and means for making sure that every individual letter received is properly answered and then filed. The system also embraces the collection, copying and checking of outgoing mail.

EARNINGS

It is the policy of Stone & Webster to give out information regarding the earnings and the condition of the companies managed by the firm. A list is given on the opposite page of all the properties controlled, with a statement of operating results for the last fiscal year.

[Note—Since the foregoing description of the Stone & Webster organization was prepared, a separate engineering and construction company has been organized by the firm to take over the engineering part of its business.—Editors.]

LIGHTING CURRENT SUPPLIED BY A RAILWAY

Except for lighting purposes, not much effort was made by the Kokomo, Marion & Western Traction Company, of Kokomo, Ind., toward the introduction of electric current for use in the home until the beginning of this year. Since that time, however, this company has been experimenting, and as a result has undertaken a systematic campaign for extending and augmenting their general lighting and power business

The company has already placed orders for additional electric and power equipment to take care of the new business. The company now handles at one station the electric lighting of Kokomo and Swayzee and also the street railway system of Kokomo and the interurban railway between Kokomo and Marion. The new equipment now on order consists of a 1000-kw Allis-Chalmers turbo-generator unit, wound for 60 cycles, 2300 volts, three-phase, which corresponds with the current generated at present in the company's plant for distribution in Kokomo. It is there stepped down and supplied to the interurban railway and for lighting at 208 volts on the three-wire system.

SARATOGA MEETING OF THE NEW YORK STATE ASSOCIATION

As outlined in the last issue of the STREET RAILWAY JOURNAL, the twenty-fourth annual meeting of the Street Railway Association of the State of New York was opened on Tuesday morning, June 25, at the Grand Union Hotel, Saratoga, N. Y., and continued until the afternoon of the following day. In all three sessions were held, two on Tuesday and one on Wednesday. All of the meetings were well attended, and great interest was manifested in the several reports and papers presented. The president's address, the reports of the special committees, and the papers read at the two sessions on Tuesday were published in the last issue. In this week's issue are published the paper by Mr. Carver read on Wednesday morning, together with an extended abstract of the discussion and proceedings at all the sessions during the convention.

TUESDAY MORNING SESSION

After the reading of the president's address (for the address in full see page 1032 of the last issue) and the general business of the association had been disposed of, the report of the committee on standard application blanks and forms (for report see page 1029 of last issue) was received, and was referred to a later meeting for discussion. The report of the committee on collection and compilation of mechanical costs (for this report see page 1029 of the last issue) was next taken up.

Secretary Fairchild, as a member of this committee, outlined what the members had in mind at the time they made up their report. At the Schenectady meeting, which was devoted to the discussion of mechanical costs, there were presented a number of records on the cost of various items, but as the records had not been kept in the same terms it was very difficult to reduce one road's records to the terms of some other road. The item was often similar but the particulars as to what details had been included in each case were confusing. The committee was appointed primarily to decide upon a common basis so that the members of the association could make up cost records in the same terms or units of comparison. The members of the committee knew that they would get into deep water if they tried to do too much, but they decided that something could be done to make a start. In making up the forms recommended, the committee went over the standard classification of accounts and selected those items which appeared to be the most important and which would help to start the ball a-rolling. The suggestion of the commitee is that the members of the association, starting July 1, keep records as to the cost of the various items included in the blank forms so that at a future meeting it will be possible for members to compare costs of the individual items and possibly arrive at some conclusion that will help the high men to get their figures nearer the average. The committee requests a discussion of these items and of the blanks in general. It took some little time to get up a convenient blank and decide the arrangement. The committee decided that the forms submitted were about the simplest, but as this was intended only as a preliminary report, any suggestions as to the arrangement of other items that could be included in the final report would be very acceptable. C Gordon Reel asked if it was intended to include in the cost of the items the cost of labor in installing. The secretary replied that the committee thoroughly canvassed that subject and decided not to include the cost of the labor for making the actual installation on the car, as many roads do not keep their accounts in as great detail as that. The committee felt if it tried to include too much it would not accomplish anything. It was the sense of the committee, four of whom are

active master mechanics, that it would be easier to get the cost of these items up to the point where the articles are ready for the car than to attempt to secure also the cost of putting them on the car, because, in the judgment of the members, the records of few companies are carried so far. In answer to a question by a delegate, Mr. Wilson, of Buffalo, said it would simplify matters by leaving out the cost of installation.

The secretary also explained that the committee was particularly anxious to secure the cost of maintenance of motors by types as called for in the forms, so as to get data for comparative purposes with different roads, and also for comparisons of various types on the same road under different conditions. Space was therefore left on the blanks under "armatures" and "field coils" for filling in the type of the motor. In considering such units as car-miles, wheel-miles and motor-miles, the sense of the committee was that the items should be kept upon the logical basis in taking up any particular item. The committee recommended, however, that every road fill in the thousand-car-mile record on practically all the items, as this is the simplest basis, but it also recommended that all the roads fill out all three columns where the figures will apply, namely, car-miles, wheel-miles and motor-miles. For instance, brake shoes would require car-miles and wheel-miles but not motor miles.

The committee realized that if it made its report complicated the recommendations would call for considerable clerical work in the master mechanic's office. The members were anxious to make the recommendations so simple that there would be no excuse for not following them. In the judgment of the practical men on the committee the records proposed can be kept by practically every road with but slight changes in the accounting department of the master mechanic's office. In some cases slight changes in the method of accounting may be required, but it was realized that if the report required the aid of an extra clerk but few figures would be forthcoming, but that if the cost of keeping the records was not increased the roads would be willing to carry out the suggestions.

Mr. Pardee, of the Rochester & Eastern, said in his opinion the great advantage of the report was that all the companies will attempt to keep the data necessary, unless they find it too expensive, as it will make it possible for one road to make comparisons on the same basis with another road of the same description. As it is now, the average reports covering car mileage as statistics do not give accurate results for comparison, but with these blanks specifying mileage records on particular items it would be possible to make accurate comparisons. He cited as an example that he had found trolley wheels on his road were costing more than on the Utica & Mohawk Valley Railway. He was trying to find out why, but it took both roads some time to reduce their figures to get the same basis. With the blanks submitted in use this would be accomplished right away.

Mr. Wilson, of Buffalo, agreed with Mr. Pardee that this report was very valuable. It might need some whipping into shape, and he therefore moved that the report be accepted as presented and the committee be continued to correspond with different roads to see how the suggestions work out in practice, and at the next meeting present another report.

Before the motion was put the secretary asked if the companies represented thought they could reach the results desired without a great deal of trouble. A number of delegates present answered that they could secure these results without much trouble or complication.

Mr. Pardee offered an amendment to the effect that the committee prepare and send out to all roads in the State in the near future a list of instructions as to its ideas of how the records should be made up so that all the members will be able to keep the forms on the same basis. The motion, with the amendment, was carried.

The report of the committee on interchangeable coupon books, of which J. H. Pardee was chairman, was then read. (For this report in full see page 1027 of the last issue.) On closing his paper Mr. Pardee suggested that a discussion of the matter be taken up later, after each delegate had read the contract, and report presented by the committee.

Mr. Fassett, of Albany, chairman of the committee on rules, stated that his report was not yet ready, but would be presented at a later meeting.

The report of the committee on revision of the constitution and by-laws was then read. The report, which provides for associate and allied membership in the New York State Association, will be found on page 1030 of the last issue. The secretary explained that the creation of the allied member class was brought about by the recognition on the part of the executive committee of the desirability of formulating a definite and positive policy in regard to the association's good friends—the supply men. The association wants the supply men at its annual meetings, and this allied membership was created to give them a definite standing in the association. The associate membership was created for those railway men from neighboring States and Canada who attend the meetings and should be recognized in some form.

Emphasis should be laid on the point that the executive committee in formulating this recommendation wished distinctly and positively to put itself on record as having no desire or intention of encroaching upon the field of the American Street and Interurban Railway Association and its allied associations. The national association has planned a broad scheme of policy and endeavor which it is carrying out well, and the executive committee of the New York State organization wishes to disclaim any intention of belittling or interfering with the parent association's work by taking members or opposing its progress in any way. On the other hand, the New York Association has gone on record repeatedly as wishing to extend co-operation and assistance to the parent association in every way in its power. But as Mr. Stanley had remarked, there are a number of companies near New York State that have no affiliation with a sectional organization. A sectional organization affords a simple and convenient method of getting together oftener than once a year to thrash out important problems. The idea of extending the scope of the association to take in these other roads is that they may have the advantages of a sectional association, and the New York organization is therefore glad to invite them to co-operate with it in work of this kind.

Mr. Cole, of Elmira, believed that, as the association is gradually establishing standards through the State, any engineering or manufacturing and supply firms affected by these standards should certainly be admitted to some class of membership, because the changes adopted by the electric railway companies of this State indirectly affect the business of the manufacturing and supply men. He therefore thought that they should be given recognition.

Mr. Fassett, of Albany, agreed with Mr. Cole. The only criticism he had to make was that the dues were too small. The fee should be $50 and $25 instead of $25 and $15 for the members and associate members respectively.

Mr. Stanley, of the Public Service Corporation of New Jersey, said that the corporation which he represented in the State of New Jersey would be more than glad to have the privilege of affiliating itself with the New York State organization in an active way. Those familiar with the conditions

in his State would appreciate the difficulty of forming any association in that State, as it would be in the nature of a family party. He believed that the railways contiguous to the State of New York should become actively identified with the association.

Mr. Allen, of Utica, thought it would be a mistake to make the dues for associate and allied members higher than $25 and $15, respectively, as those amounts had been decided upon after careful consideration on the part of the executive committee. The New York State association is operating today under changed conditions due mainly to the fact that the conditions of five or ten years ago in railway matters have changed considerably. The association now holds quarterly meetings, and it has been found the work done at these quarterly meetings has been of the greatest value to the practical operating, mechanical and electrical men. These meetings have been attended by representatives from companies outside the State, and the New York organization is desirous of continuing to benefit by their presence and attendance at the discussions. In connection with this subject the question of dues for active members has been thoroughly discussed by the executive committee. There is a feeling on the part of a large number of roads that the present fees are excessive. If the allied and associate members are taken in at reasonable cost, then the full membership dues can be somewhat reduced. It takes about $5,000 to run the association each year. That cost can be somewhat reduced by dispensing with some of the features—particularly entertainment at the annual convention. Speaking in relation to allied membership, Mr. Allen said in the past four years the association had had four different policies toward the supply men. One year there was an exhibit, and the next year none. One year the supply men were charged for a banquet ticket, and the next year a ticket was included in the registration fee. By taking in the supply men as allied members the association can hereafter pursue a definite policy and co-operate with them. The speaker believed the suggested increase in allied and associate membership fees made the fees too high, and it seemed to him that the figure given in the original report should be adopted. It might be well to have further expression upon this subject before the motion was put.

President Danforth, speaking for the executive committee, said the committee in its recommendation as to fees put the dues as high as was believed to be fair and reasonable. It is hoped in another year the full membership due can be put on a more equitable basis. He believed Mr. Allen had expressed the sentiment of the executive committee very clearly, and hoped the report of the committee would be adopted as presented. Mr. Fassett then withdrew his suggestion and moved that the report be adopted as read. The motion was seconded and carried. A recess was then taken for luncheon.

TUESDAY AFTERNOON SESSION

The entire afternoon session was devoted to the reading and discussion of three papers on the "Sale of Water Power," one by S. B. Storer, general manager of the Niagara, Lockport & Ontario Power Company; Charles E. Parsons, chief engineer Hudson River Electric Power Company; and G. A. Harvey, electrical engineer International Railway Company, of Buffalo. These papers were printed in full on pages 1016 to 1027 of the last issue of the STREET RAILWAY JOURNAL.

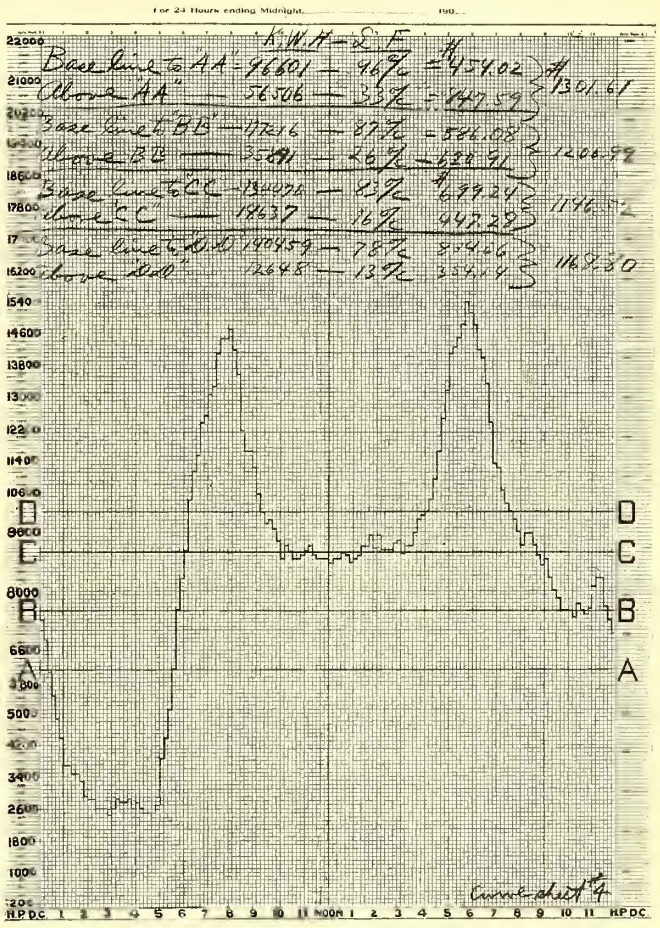
In opening the discussion, G. A. Harvey presented three additional curves and an extended explanation of them as an addenda to his original papers. This additional matter will be found below.

As an example of the economical location of the firm line of purchased hydro-electric power, the load curve shown on sheet No. 4 is submitted. The experimental firm lines are located on the total load curve at the points *AA*, *BB*, *CC* and *DD*.

With the firm line at *AA* there are 96,601 kw-hours, with 96 per cent. load factor below the line, costing $454.02, and 56,506 kw-hours with 33 per cent load factor above the line, costing $847.59, or a total power cost of $1,301.61.

With the firm line at *BB* there are 117,216 kw-hours below the line, with 87 per cent load factor, costing $586.08, and 35,891 kw-hours above the line, with 26 per cent load factor, costing $620.91, or a total power cost of $1,206.99.

With the firm line at *CC* there are 134,470 kw-hours with



CURVE SHEET NO. 4

83 per cent load factor below the line, costing $699.24, and 18,637 kw-hours with 16 per cent load factor above the line, costing $447.28, making a total power cost of $1,146.52 for this location of firm line.

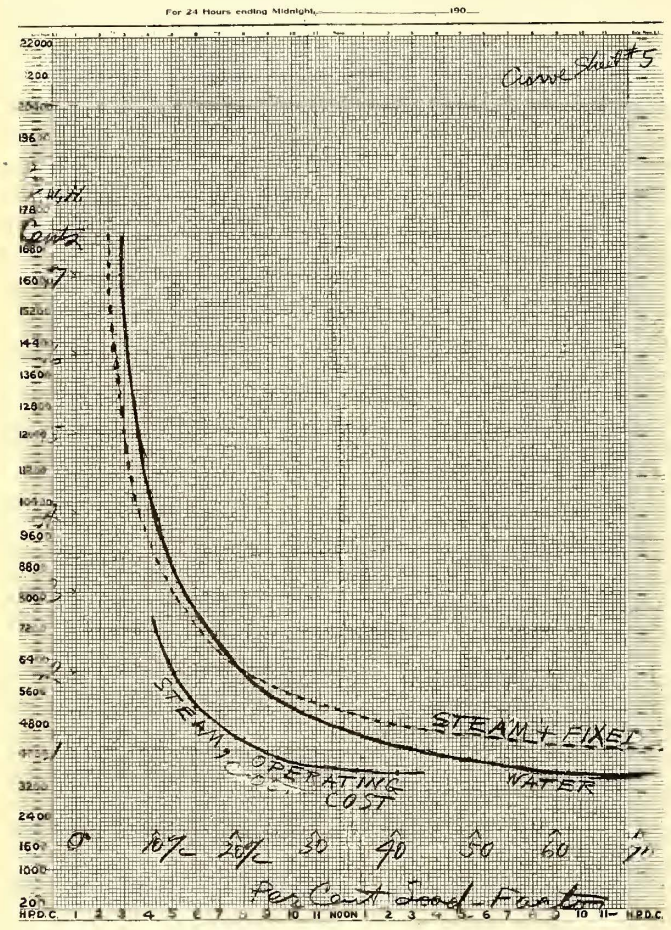
With the firm line at *DD* there are 140,459 kw-hours below the line, with 78 per cent load factor, costing $814.66, and 12,648 kw-hours with 13 per cent above the line, costing $354.14, or a total of $1,168.80.

These costs are based on the assumed figures of $50 per horse-power year at 100 per cent load factor for steam power, and $30 per horse-power year at 100 per cent load factor for hydro-electric power, as shown on curve sheets No. 1 and No. 2 of Mr. Storer's paper on "Sale and Measurement of Power."

It is to be seen that in raising the firm line of purchased power from point *AA*, the total cost decreases up to the point *CC*, and then increases at the point *DD*. The economical location for the firm line at these prices for power is, therefore, somewhere in the neighborhood of the line of *CC*, which represents, as previously suggested, the base of the fifteen-hour load peak.

As mentioned in the last paragraph of the paper on "Con-

tracting for Use of Hydro-Electric Power," the fixed charges on the steam plant should not be considered in determining the relative amounts of steam power and purchased power to be used, but merely the operating costs should be considered in connection with the steam power in this case. (The fixed charges on the steam plant still enter into the total cost of power.) Curve sheet No. 5 shows a reproduction of Mr. Storer's curves on his sheet No. 2. There is added, however, another curve showing operating cost only of steam power per kilowatt-hour at various load factors. Using figures derived from this latter curve, the firm line of purchased power would obviously be located at a lower point than *CC* on sheet No. 4, and instead of the steam plant being economical only under conditions where the load factor is 20 per cent or less, it is economical over a considerably greater range, as the



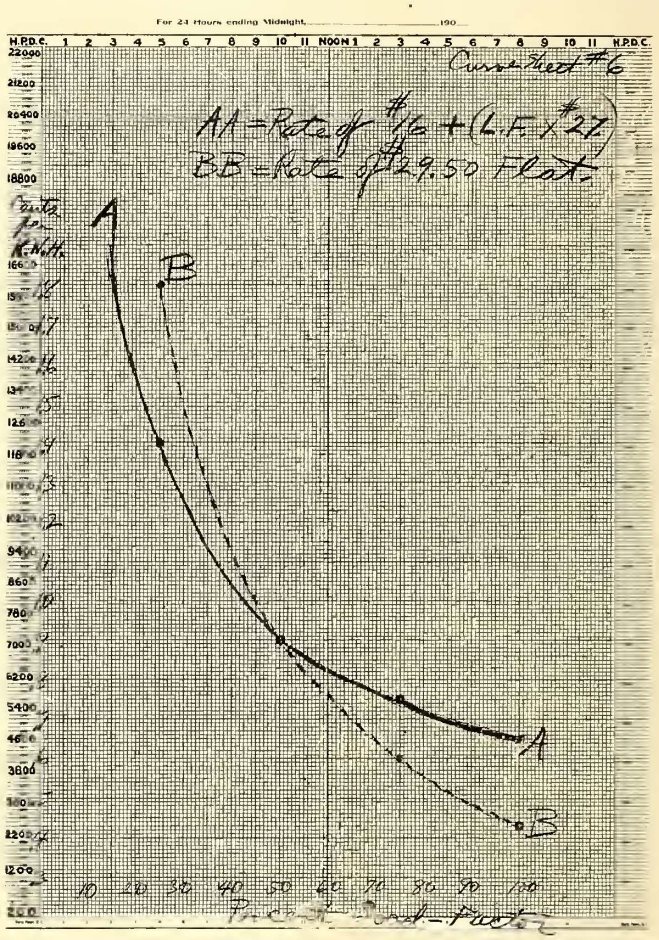
CURVE SHEET NO. 5

curve of operating cost of steam plant will cross the water-power curve at a point somewhere near 50 per cent load factor.

Taking Mr. Storer's example of a rate per horse-power per year of $16 + (load factor by $27), and plotting this in terms of cost per kilowatt-hour at various load factors, we have a curve as at *AA* on sheet No. 6. As power companies seldom hesitate to offer a flat-rate contract, it would seem that the rate depending on load factor could be appropriately compared with the flat rate which comes closest to the same effective cost per kilowatt-hour. Such flat-rate would be the one which equals at 50 per cent load factor, the 50 per cent load factor of the $16 + (load factor x $27) rate. This flat-rate curve is shown at *BB*, and represents a rate of $29.50 per horse-power per year. There is an inconsistency in this, as the rate depending upon load factor makes the cost to the customer lower at a low load factor and higher at a high load factor, which is contrary to the arguments which are always presented by power companies. This same inconsistency exists in the rates shown on curve sheet No. 1, but the differences between the lines are not so great.

DISCUSSION ON WATER-POWER RATES

Mr. Cole, of Elmira, referring to Fig. 1 of Mr. Storer's papers, pointed out that the cost per horse-power per year increases rapidly with the load factor. There is no question about that. In Mr. Parson's paper the author says: "The load factor is the third and most important item in determining the cost of power, load factor being the ratio of average to maximum load. It is evident that when the load factor is near 100 per cent all of the machinery is in operation on all parts of the system, and the transmission lines are carrying their full load." Mr. Cole pointed out that the same thing applies to the steam station apparatus. He said this could be



CURVE SHEET NO. 6

explained by taking a chart, drawing on it a circle, and dividing that circle into twenty-four hour periods on the outside line. Then draw an inner circle representing the firm load, and beyond the outside circle have an angle representing the peaks of load above the hydro-electric power loads. It will then be found that the steam load peaks have increased almost in proportion to the slant of the line of the angle. The steam apparatus is working at the point of economy when it is carrying a normal rated load, but when used for carrying peaks there is put upon it the kind of load which is most expensive. Unless a storage battery is installed to carry a given load beyond the normal load, the cost per kilowatt-hour of these peaks will be brought up to about 20 cents, which can be demonstrated. The question of determining just what can be carried is a difficult one. For instance, on a station carrying 5000 kw (which is the figure used generally on comparisons of stations) there may be a firm load of anywhere from 3000 kw to 3500 kw, but

a storage battery would have to be used in conjunction. The peaks of about 500 kw run from one-half hour to an hour a day. In carrying such a load on an auxiliary steam plant it would be necessary to charge up to say 20 cents per kilowatt-hour for the peak power. On many roads in the summer months, where there is a pleasure ground, it is sometimes necessary to start off thirty to forty cars in say half an hour. Yet this peak period may come on only twice in twenty-four hours. With an electric light plant there are many large office-building loads coming on for about an hour a day. Still the company must pay for the twenty-four hours on account of that hour where the load runs above the firm load line.

Mr. Harvie, of Utica, said his company purchased hydro-electric power on the kilowatt-hour basis, and from their standpoint this method seems to be all right.

Mr. Wilson, of Buffalo, agreed with Mr. Harvie, of Utica, on the way to pay for power. When a company can get down to a kilowatt-hour basis it knows what its power is going to cost. The speaker did not like the sound of anything based on peaks—whether they are one-minute or two-minute peaks. Mr. Harvey, of Buffalo, had figured it out for the Buffalo proposition, and found it very much more expensive to buy power based on peaks. It figured out about $30,000 more a year than on the kilowatt-hour basis. Mr. Pardee, of Canandaigua, asked what was the difference between one-minute and two-minute peaks, that is, as to whether the two-minute peak could be allowed with safety by the power company instead of a one-minute peak. It appeared to the speaker that a two-minute peak could be allowed as well as the shorter one, as the difference to the railway company seemed to be much more important than to the power company. For instance, in the plant described by Mr. Parsons the turbines have considerable overload capacity. It is quite unusual that the turbines should be rated so much higher than the generators. There are a great many characteristic curves in the turbines. For instance, one turbine runs down very rapidly in efficiency after passing the rated load of the generator. In the case of Mr. Parsons' plant, a two-minute peak should be no hardship at all. If the machines had no overload capacity it would be more of a hardship.

Mr. Storer said, in reference to one or two-minute peaks, that in connection with the system of charging explained in his paper, if a two-minute peak is used it would mean that the probability of peaks overlapping on different railway or other loads is increased just double. The power company could not oversell its plant with two-minute or longer peaks as easily as it could with one-minute peaks. Whatever peak is used the cost must eventually come back to the same thing, based on the requisite amount the power company must get for the maximum output from its station. The speaker had found in the negotiations he had had with power customers that they all look at their individual conditions and try to get a time limit on their peaks long enough to take in their maximum demand. For example, one customer had a load to carry up a hill which would mean a fifteen-minute peak. The customer thought the power company ought to sell him power on a fifteen-minute peak. It does not make any difference what the peaks are, the income must be a certain amount, and if the load factor is based on a one-minute peak to determine the cost per kilowatt-hour, it all comes to the same cost per kilowatt-hour, because the kilowatts consumed on a five-minute peak are more than on a one-minute peak. As far as the question of selling power on a kilowatt-hour basis pure and simple with a guaranteed load factor is concerned, the consumer runs against the same thing as on the maximum demand basis. From the Niagara, Lockport & Ontario Power Company's standpoint, that company considers it much more to the consumer's advantage to be permitted to take these peaks and pay for them only when they occur, rather than have the circuit breakers throw off the entire load and interrupt the service if only for a few minutes. According to Mr. Cole's remarks on peak loads, he counts the load he gets in the summer time for the park service as put on as an addition over the firm load line. On top of that he puts the lighting load from buildings and some other kind of power service. The chances are that in Mr. Cole's particular case the park load in the summer time will come at a time after the ten-hour factory load is off. It will also come at a time when the lighting load in offices is not a factor. Therefore, taken as a whole, the same law of probability would enter in that case. The point of measurement being the same for all of these different usages, the total peak would be very much reduced below the individual peaks of each class of service supplied by the buying company. Therefore the retail company could oversell this purchased block of power in the same way that a power company can oversell the capacity of its plant.

Mr. Royce asked why Mr. Harvey in his paper omitted the fixed charges on his steam plant. The fixed charges must be paid, and the speaker did not see why it is fair to omit them in figuring how much power you can buy. Mr. Harvey answered this question in the addenda to his paper published elsewhere in these proceedings.

Mr. Allen, of Utica, did not feel that everybody should be afraid to discuss this power question. Approximately 17 per cent of the gross receipts of the electric railways in this State are paid out for power, according to the report of the State Railroad Commissioners. The Superintendent of Public Works, in his annual report four years ago, called attention to the fact that the State of New York, aside from Niagara Falls, had more undeveloped water power than any other State in the nation. It seems to have taken us a long time to discover that hydraulic plants are available as a source of cheap power. It also seems to be a fact that when a traction and power company begin to negotiate they start from a common point but proceed in opposite directions. In California there is one water-power company that furnishes all the lighting and moves all the traction lines north of Fresno. There are something like sixty plants making up this high-tension transmission system. The prices which the power company has named to the power and lighting interests have been somewhat less than those quoted to customers by the Eastern power companies. The question of whether hydro-electric power is the right thing for a traction company to use depends, first, upon the price, and, second, upon the quality of the service. If the price and service are as good as with a steam plant, there is no doubt that the traction interests are suffering by not purchasing hydro-electric power. Whether such power service will prove satisfactory or not depends a great deal upon the form of contract. In the past five years the Utica & Mohawk Valley Railway Company has had three forms of contract, two unsatisfactory and the third satisfactory. It has been operating under the latter since July 1, 1905, and it has proved mutually satisfactory. The first contract was for block or firm power to be paid for at so much per horse-power per year, measured by a horse-power meter. The maximum demand for the month was to be regarded as 75 per cent of the average maximum demand, and was to be paid for at the rate of $25 per horse-power. All power in excess of this 75 per cent was to be paid for at $33 per horse-power per year. That was not satisfactory either to the railway company or to the power company, and was repudiated by both. As an arbitrated agreement the

railway company purchased power for two years on the kilowatt-hour basis, the railway company having no power plant that it could use. The price in that contract was so high that instead of paying 16.66 per cent of the gross receipts for power, the railway company paid 32.8 per cent for two years. The present contract is not wholly a kilowatt-hour contract. The railway guarantees a minimum load per month, and if the total kilowatts used in one month do not clear a certain amount the railway must pay the minimum anyway. There has been but one month when the total kilowatts used has fallen below the minimum. The quality of service that has been received in the past year has been one that the speaker is glad to speak of favorably. It has been satisfactory in every way. The contract, besides being an hydro-electric contract, embodies two other features which have not been spoken of. As a supplemented contract there is a a steam-power plant which the power company maintains and agrees to have ready for operation on thirty minutes' notice; the other is the penalty feature. If the power for any one day be deficient for thirty minutes, there is such a penalty that if these deficiencies continued for thirty consecutive days in one month the power company would owe the railway company money. But the railway has never yet had to penalize the power company. It seemed to the speaker that in any question of such vital importance as the cost of power the members ought not to sit down and be afraid to talk about it. He asked Mr. Wilson, of Buffalo, to give his experience.

Mr. Wilson said the International Railway has two forms of hydro-electric contracts, one for the city lines and the other for the Lockport interurban division. In Buffalo the railway pays a certain price per horse-power per year for 7000 hp firm. In summer the company shuts down the steam plant. The company pays for peak loads at a certain rate per kilowatt-hour. In the winter the railway carries the peak load with a steam plant and batteries. On the interurban contract the company pays a certain price per horse-power year, and has a sliding firm line such as Mr. Harvey recommended, and excesses are paid for at a certain price per kilowatt-hour. The total cost per kilowatt-hour is $.0067. The price for Buffalo the speaker considered high. It is a long-term contract which was entered into some time ago when the power business was new and the railway was new. The speaker believed the price per kilowatt-hour given compares favorably with modern steam plants. He asked what was the cost of power in New York City. Mr. Root, of the New York City Railway, replied about $.006 per kilowatt-hour. Mr. Wilson thought the main objection to water power is the possibility of interruption. A modern steam plant is practically continuous. His company considered the water-power service last year was pretty fair. Before that they had considerable trouble, principally on account of ice.

Mr. Cole, of Elmira, asked Mr. Harvey, of Buffalo, if there is no interest on the fixed charges of the steam plant to be counted against steam power, is there not an operating charge on account of its "readiness to serve"? The power station men are there and the boilers are fixed up for use during a short period, while for the other six or seven hours the men will be doing work for which otherwise cheaper labor could be used.

Mr. Harvey replied that in the case cited the economical point for this line is on the fifteen-hour line. At such a point, where the station carries a load for fifteen hours or more, there would have to be two shifts of men anyway. As to the matter of dropping out the fixed charge on the steam plant, the speaker explained that this charge is not to be ignored in the total power costs. Mr. Pardee, of Canandaigua, said he had made some careful calculations on the use of water power, and the "readiness to serve" came up in one of the propositions. He found that the readiness to serve the peaks (which were liable to come almost any time) would be about 80 per cent of the cost of what little power that steam plant would have to furnish. The actual coal and wages that would be needed amounted to a very small proportion of the total cost, the remaining cost being the expense for having the men ready on three minutes' notice.

The meeting then adjourned.

WEDNESDAY MORNING SESSION

The meeting Wednesday morning was called to order at 10:30, and after announcements had been made concerning the various trips and excursions for the day, D. F. Carver, general superintendent of the Rochester Railway Company, read a paper on "Car Inspection and Cleaning," giving some of the results of trip inspection as compared with night inspection, concerning which subject the author read a paper at the Schenectady quarterly meeting of the association in January. Mr. Carver's paper follows:

CAR INSPECTION AND CLEANING

The roadbed and track may be the finest in construction; the alignment and grades may be the result of much money expended; the power house may have all the appliances and up kinks for keeping the current on—as nearly as may be—constantly; it may even be a double-tracked suburban line, and if a single-track high-speed one, its despatching system may be perfect; the crews may be most thoroughly trained and efficient; the motor equipments may have much surplus capacity and be of the most reliable design,—but, if there is not a regular and efficient equipment and car inspection the trains do not get over the road; the traveling public becomes dissatisfied at delays which it cannot account for, and blames the management for some vague shortcomings which it does not understand—but perhaps may think it does.

This subject of regular and systematic inspection is a very old one on railways. It is so old that it surely is self-evident, but in the drive of every-day business on our fast-growing electric properties, whose equipment is required to run excessive mileages at long periods of the day, the question of thorough and systematic inspection becomes of less and less importance in the pits, behind the front doors of a good, warm car house, as the day grows from midnight on to 4 a. m., or perhaps later. But as we sit in our offices the next day, and read our daily reports of crippled cars that had to be turned in, and of cars which started to go there out on some interurban and never got back (on time), then the subject of car and motor inspection is a most important one, worthy of most serious consideration and attention by the management; and as the present time here is practically the same as we give to it at home, I ask that we should approach it with the same amount of care.

Car inspection and cleaning is expensive, there is no getting away from it. It is expensive if you do, and it is also expensive if you do not. One can take his choice. The accountant does not bother his head about it. If things go right and regular he puts it into No. 20; if they go a little at odds with their surroundings he puts it into No. 33. How fortunate for us superintendents that it is not No. 23.

There isn't any legitimate way that a street railway company can better advertise itself to attract chance business than through the operation of cheerful, painted, polished cars, with clean interiors. The aesthetically beautiful car, in a town of hustling business and civic pride, will draw enough more trade (passengers) than a dingy, dirty, unkept car, to pay the additional cost of its upkeep. There would not be any doubt about this if we all thought alike, or at least acted alike.

But there are bulls and bears in railway properties. The one builds a property to its maximum efficiency and earning power, and spends a small surplus above actual bed-rock needs in keeping the property in the condition in which all should keep theirs; but he is Mr. E. Z. Mark for the bear operator looking for other fields to conquer, and one must not admit too much in the presence of the other; neither must he lay himself open to too much criticism from the other; so to protect ourselves we all run just a few dirty cars now and then. But seriously speaking, the cleaning of cars is slowly becoming a too elaborate and unwieldy operation for street railways to keep up, and it is now up to some one to get his inventive genius to work and devise some method of doing it at least more quickly, if not more cheaply. With water and waste, and a little of the right kind of soap—applied with the right proportion of elbow grease—at a moderate temperature of air in the winter time, the outside of a car can be cleaned up and polished with neatness and despatch. But the inside of the modern cross-seat city car is different. The small space behind the hot-water pipes collects any kind of rubbish, provided its bulk is not prohibitive; if so, it then goes under the seats between the footrests, which is not so bad at that, for it can be gotten out by the car cleaners without taking the car apart.

And then there are the windows and upper deck; the headlinings and lamps; and disinfectant now and then until it sums up to 30 cents to 50 cents a day to keep a car clean, depending on the size of the car—nearly as much as Madam spends in keeping her ten-room house sweet and clean; half as much as the steam railway division spends in keeping its palatial equipment spick and span. And the end is not yet, until some one devises a simpler and better method of interior car cleaning.

Far be it from the writer's intention to argue for a less beautiful or ornate car interior; but there must be a demand, sooner or later, for simpler methods, and quicker ones, in car cleaning, and this may be helped along by some changes in the floor work of our cars.

Whether or not a car should be cleaned in an operating depot, as it stands over pits and in amongst other cars, at any temperature that may happen to be in the shed at the time, or whether it should be cleaned in a separate washhouse, where water is plenty, drainage is good, temperature is right, and where it may stand protected in winter until thoroughly dry and in summer protected from dust, is a question to be argued on at this meeting. I hope we can settle it. We are doing on our own road now what we think is best, and would like to have it settled, naturally.

There is the question of cost, and also the inconvenience of shifting all cars into and out of a special house to clean them. It would be very interesting to the writer to listen to a further discussion of the matter from those who are doing one way or the other, or both.

Some months ago the writer had the honor to write a paper for this association, advocating trip inspection on a line where the time for inspection between cars was never more than eight minutes, sometimes less than six minutes. We were at that time making the experiment on one of our lines to see for ourselves if an inspector could really inspect, in such a limited time, or whether it was all a bluff. The result to date may be of some interest.

The per cent. of cripples to cars operated in January on this line was 5.55 per cent lower than the average of all other lines. In February it was 7.37 per cent. lower. In March it was 6.78 per cent lower. In April it was 5.20 per cent lower, and in May it was 5.09 per cent lower.

Long ago, when the only books written on railroading were English; long before they ever thought of electric railroading; long before there was any one in America who had the requisite knowledge of railroading and at the same time the leisure to write about it, they used to publish a story about the great George Stephenson, the builder of the first successful locomotive and the builder of the first successful road on which to run his new locomotive, that when he was before the English Parliament arguing for the right to build his railway, some one asked him how he was going to make a highly-polished rim of a driving-wheel stick to a rail—perhaps just as smooth—and pull anything, and the once mine boy said in reply that he didn't know how it was done, but he'd do it. Perhaps it is the same spirit working in the mind of the man in overalls that keeps the cars moving on such short time for inspection. They may not be able to tell you, scientifically, how they do it, but they can surely do it.

As for the car bodies themselves, there is really very little need for systematic inspection as a specialty. The crews can report on proper cards the damaged condition of any car body, in ample time to avert trouble, and experience has shown that they are entirely capable of doing so. Then the art of car building has so progressed that one can tell which part at a general overhauling will not last till the next one, and can replace where necessary.

Broken glass is the cause of much trouble and expense between shoppings, but there is no help in sight for that. Some have tried using plate glass, which shows a smaller percentage of breakage but still at higher cost than the thin glass, so its use is very limited. It might be well to try a combination of AA glass and plate glass, instead of using all one kind or the other. There are a number of lights in the average car which, if of heavy glass, would not break easily and would still be comparatively cheap because of small size. Custom has established that the panes in the vestibule shall be large and in one piece in the sash, but they are too large for durability and are constantly being broken. There would be much less breakage of glass in the side windows if they were counterbalanced and then heavier plate used, but the counterbalancing mechanism is not for the street car, and there is no relief from that quarter.

If the inspection force has any motto at all it should be that "it is easier to produce the results required than it is to make excuses for failure."

DISCUSSION

In reply to a question as to whether with the trip inspection the night work could be done away with entirely, Mr. Carver replied that, while it would be an advantage to abolish night work, a certain amount of work must always be done at night.

Mr. Hanf, of Buffalo, asked if there was a pit at the end of the line for the trip inspection. Mr. Carver said no special pit provision had been made for this inspection, but there would be even less turning in due to defects if there was a pit for the purpose.

Mr. Smith, of Schenectady, asked what the inspector actually does on the car between trips. Mr. Carver replied that the principal duties of the inspector were brought out in the last sentence of the paper. It is better to keep out of trouble than it is to explain how you got into it. When the crew of a car makes a report on some trouble, it is up to the inspector at the end of the road to fix it if he can. That trouble may be one or more of a hundred things. If there was no inspector at the end of the line, the car would have to be turned in, although it may be only a broken trolley wheel, a bent controller finger, brakes out of adjustment, or similar things. If the inspector were to inspect every other car—say eight to sixteen minutes between cars—he could do better, but for the purpose of this experiment the company has given the inspector six to eight minutes between every

car. The paper gives only the differences in percentage. From that line (St. Paul-South) the percentage of cripples to operating cars in October, 1905, was 4 per cent; in November, 8 per cent; in December, 11.5 per cent. On Jan. 1 the Rochester company started this trip inspection system. The percentages of crippled cars dropped from 11.5 to 1.53 in one month. It was .43 per cent in February, 1.18 per cent in March, .38 per cent in April, and .80 per cent in May. Comparing this line with the others, it was found that the percentage of the latter for May was 5.89, as against the .80 given above. The St. Paul-South line on which the experiment is being tried is the best fitted for this inspection. In fact, the company could not inspect on other lines to advantage because they are not built for it. The company only tried it on this line to see what the results would be.

President Danforth said it should be borne in mind that on that line last winter the company was operating thirty-five full converted summer cars, each having an equipment of four GE-800 motors which would naturally require careful watching. As Mr. Carver had said, a large part of the pull-ins are due to brakes out of adjustment. This would naturally arise from the fact that the cars are not always carefully inspected at night because the men in the car house know that the inspector on the line would catch the cars the first trip in the morning. This system has proven so successful in Cleveland that it seems worth trying here. The speaker would suggest to railways having long lines where the motor equipments are subjected to heavy service that it is worth a trial at least. On this particular line, in making a change of cars, for instance, due to a defect, the car had to be run off the line 1½ miles to the car house, so that the cost of the crew making the shift is an important item. A company would not have to pull in many cars a day to pay the cost of inspection at the end of the line. Mr. Carver brought up the question of cleaning cars in a special washroom as against any place in the station. The speaker understood that a large part of the Buffalo work is being done in a special room, and wanted information on this point. Mr. Hanf, of Buffalo, explained that one section of the car house is used as a wash room. When cars are pulled in off the line they come in over the pits, where they are thoroughly inspected, and are then moved up into a washroom where they are cleaned and then run out ready for service. President Danforth said it was a comfortable arrangement to have a sufficient number of cars so that a car in regular service to-day can be used as a tripper to-morrow. Many companies are not so fortunately situated, and are obliged to clean cars at night. Those who have inadequate car-house facilities and means of regulating the temperature in winter find it difficult to keep the cars in shape. His company has been discussing the advisability of remodeling its car houses and providing a separate wash room as in Buffalo. That means the expense of car shifting. It is a question whether the cost of shifting would not offset the additional cost of cleaning a car whenever it happens to land in the car house, that is, considering the cleaning of the car body only.

Mr. Stanley, of the Public Service Corporation, said this matter of cleaning cars is a very vital one to railways. It is one that must be solved in some way. The public to-day will not tolerate uncleanly cars, nor frequent interruptions to service on account of crippled cars. Primarily this is a question of investment as to the amount of care taken of the equipment. When the present management took hold of the Publice Service system there were, properly speaking, no car houses at all. The company used old horse-car stables and open lots. Owing to other more pressing matters requiring investment, the company has for cleaning cars simply built a small place capable of taking care of two cars at a time. The room is heated by hot water, and the cars are run in and washed thoroughly. It is not a very satisfactory method, as it is slow and cumbersome, but it is the best under the circumstances. It is not altogether a question of cleaning the outside of a car, but also the inside. The speaker asked if any one present had had experience with the vacuum process of cleaning cars.

Mr. Cole, of Elmira, said his company had been cleaning cars with compressed air, but since experimenting with the vacuum process it had decided to change over to the latter system. It is not necessary to have any special car house, because the dirt is all taken up and deposited in a can. With compressed air the dirt is blown off the floor to the ceiling and from the ceiling to the floor, most of the dust remaining in the car. With the vacuum system a man can go through a car more quickly than with a broom, and accomplish better work. He can get the dirt from the ventilators, back of the heaters and other places which could not be cleaned by other means, and can do this effectively and efficiently in from ten to twelve minutes. There is one other condition in conjunction with the inspection of cars which comes up in accidents. The speaker has acted as expert witness in many cases, and nine times out of ten the case comes down in the cross-examination to the condition of the car at the time of the accident —for instance, there may have been a loose bolt on the running board or there may have been something wrong with the grab handle. A number of men from the shop will be called, but they are generally poor witnesses. Immediately, in case of an accident, the car should be examined by an experienced inspector of that division who is a good witness and who can afterward go on the stand and testify regarding the actual condition of the car right through. This should be part of the inspector's duties, and he should be trained in it.

Mr. Harvie, of Utica, speaking of car cleaning, said he had recently installed a system which combines compressed air and vacuum methods, but there is one thing the system does not seem able to do. It will not pick up paper, peanut shells and the like. The speaker wanted to know what will pick up these larger pieces.

President Danforth replied that the best thing is the old-fashioned broom and a faithful servant. Mr. Cole's suggestion that an inspector on every division who had sufficient experience to make a proper examination of a car after an accident, act later as a first-class witness, is a good one, but the speaker had not in a long time found a car-house man who made a good witness. The only thing left to do is to have the cars in good condition all the time by following up closely the car inspection work before the accident happens. One good point about car inspection at the end of the line is that evidence can be produced to show that at the end of every trip the car is looked over, and if anything is the matter the car does not go back into service until repaired. The motorman is not obliged to run a car for a half a day or so until some crew comes around with a relief car.

Mr. Fassett, of Albany, spoke of his method in accidents, which is to have the car inspected by a car-house foreman who makes a written report which forms part of the papers of the accident case. As the foreman is able to refresh his memory from his written testimony, he makes a better witness on the stand.

Mr. Carver, of Rochester, thought perhaps some of the gentlemen present who were running interurbans might be interested in the experience he had had with the Rochester-Sodus Bay line, which in certain sections is rough and hilly. The cars on this line weigh from 17 to 18 tons without pas-

sengers, and are equipped with four GE-67 motors. The company has instituted a limited service for three summers back, making the round trip of 77 miles in three hours and forty minutes, including thirty-two regular stops on the run. The average speed, including these stops, is 23 miles an hour with a 19 pinion and 65 gear. To this line the company has applied trip inspection, and for the last three months not one car has been laid up for electrical or mechanical troubles.

A delegate asked whether trip inspection was considered by Mr. Carver a better method of inspection than the practice of overhauling a car thoroughly after running a fixed mileage, or whether trip inspection is also necessary in addition to the mileage overhauling. Mr. Carver replied that the car should be overhauled regularly and thoroughly in addition to the trip inspection. There is no change in the general method of overhauling. The 65 cents extra daily charge mentioned in the author's previous paper, due to trip inspection, must be figured as the cost of increased reliability in operation. This supplementary paper was written to vindicate that expensive 65 cents a day by showing the decrease in the percentage of cripples brought about by trip inspection.

Mr. Harvie, of Utica, asked why it would not be possible to figure out the most economical mileage on which cars should be regularly overhauled, and thus simplify the inspection proposition.

Mr. Carver thought that theoretically that is all right, but it does not work out in practice.

President Danforth remarked that sight must not be lost of the fact that this trip inspection at the end of the line includes sweeping, cleaning windows, etc. Those matters cannot be left to be done every third day or so. Aside from the cleaning mentioned commutators and controllers are examined and other parts of the electrical and mechanical apparatus looked after.

Mr. Pardee, of Canandaigua, said his old system of cleaning interurban cars was very unsatisfactory, but he has adopted a system of oil cleaning which, though somewhat more expensive, gives absolutely clean cars. The car house is in the middle of the line, but at the Geneva terminal the company has a small pit where cars lay over forty minutes. An inspector and a car cleaner are stationed at this point. The inspector makes repairs such as putting on brake shoes, replacing broken wheels, tightening loose bolts, and seeing generally that all parts are in perfect condition; the conductor sweeps out the car and tests all overhead fittings; the motorman goes over his controller and other electrical apparatus; and the cleaner wipes the outside of the car, polishes metal parts and replaces the cuspidors with a clean set. While the other car is coming in the cleaner cleans the removed cuspidors, which are then ready to replace those on the next car. Formerly there were some complaints from passengers on cars that had been out for seven or eight hours, to the effect that the smoking compartment was filthy, but that complaint has now been eliminated. It is found that the inspection at the end of the line does away with many serious repairs that would otherwise be necessary. This is particularly true of cars in high-speed service, for even a loose bolt caught at the end of a trip may save a whole lot of trouble.

President Danforth asked Mr. Pardee if the two men maintained at Geneva replace men who otherwise would be required in the main car house. Mr. Pardee said yes, to some extent. This method is costing them a little more, but they get clean cars where they did not get them before. The extra expense amounts to about the time of one car cleaner at Geneva, but this is not a serious matter considering the results.

President Danforth then asked for expressions of opinion regarding the advisability of issuing interchangeable coupon tickets for use on interurban lines in accordance with the suggestions made by Mr. Pardee, chairman of the committee on interchangeable coupon books. Mr. Peck, of Schenectady, said he was in favor of the general scheme, and was prepared to recommend his company to use the books.

Mr. Wilson, of Buffalo, said he had noticed on a very cursory examination of the report that it provides for a reduced rate, and that the coupons are to be accepted at the ticket rate. At that rate his company would be making a reduction below its present lowest rate.

Mr. Pardee explained that the clause in relation to this reads as follows: "The conductor will detach, in the presence of the passenger, a sufficient number of coupons at their face value to cover the local cash fare on his train, or the local one-way ticket fare if same is lower than local cash fare." This clause was put in to meet the condition where the cash fare is more than the ticket fare. On his own road the one-way tickets are 1½ cents a mile, while the cash fare is 2 cents.

President Danforth said if it seems necessary, of course, the regulations can be amended to suit Mr. Wilson's or any other company's conditions. The intention is to sell one-way tickets in bulk, such tickets being good on any road for any distance by tearing out the coupons necessary to make up the fare. Special rules might be placed on the cover of the book to cover the use of the tickets on particular lines. There is no reason why a general rule should be made to cover all cases. It could be specified, for instance, that the coupons should be used in a certain manner on the International Railway. These coupon books have been found of immense advantage in the Middle West, and have enabled the interurbans to take a great deal of business away from the steam railroads. They have also attracted the drummer trade, a class of riders very profitable to interurban roads. Anything that can be done to encourage travel on electric lines ought to be carefully considered. It seemed to the speaker that, inasmuch as this system had been thoroughly tried out and found to work satisfactorily in Ohio, Indiana and Michigan, that the New York companies are not taking very great chances in trying it in this State.

It was then moved that the committee be continued and that each company now having a copy of the proposed contract go over it carefully and advise the committee of the results of the examination, either pointing out difficulties or advising the committee that this form of contract is satisfactory to them, and that the committee prepare a contract covering all cases and send it to the members for signature. The motion was seconded and carried.

President Danforth then brought up the subject of T-rails in city streets. Last winter, at the instigation of a village of New York State, an attempt was made to prohibit the use of T-rails on the public streets. There is some agitation now about this prohibiting interurbans desiring to lay track to use T-rail in cities and villages. This is due really to the prejudice against the old center-bearing T-rail and to some of the abominable track work done in the past with T-rails. No one would uphold the use of any kind of rails on the street which are dangerous to vehicles. The association and its individual members should make the public acquainted with the fact that with proper T-rail construction it is possible to maintain a better-looking street and a safer road for vehicles. This T-rail construction is not an experiment. It has been thoroughly demonstrated in the West in some very large cities that a Shanghai T-rail laid in the street with the pavement properly laid presents less obstruction to vehicles than any of the grooved rails. Many will doubt this unless they have seen it, but the wagon tires do not remain in a groove

and the wheels may be turned easily in and out, which is not true of grooved rails of the ordinary girder type. One of the companies in this State has been discussing this question with the city authorities for months, and the company turned to the Middle West for assistance in backing up its arguments in favor of T-rail in brick-paved streets. It has been found in Minneapolis, St. Paul, Milwaukee, Indianapolis and other large cities using T-rails, that this construction gives easier riding for both cars or carriages. The speaker suggested that in discussing this subject with the local authorities the members take pains to explain that the T-rail, like any other, can be an obstruction if the pavement is not properly maintained. In New York State the cost of maintaining the pavement is generally borne by the railway. The responsibility for seeing that it is kept in condition lies with the municipal officers, but it costs the taxpayer nothing.

Mr. French, of Utica, said on their system they are planning to lay a 7-in., 91-lb. Pennsylvania T-rail on Genesee street, the principal thoroughfare, and one therefore carrying heavy traffic. The company had this privilege because the original franchise was granted by a village outside the city, and the company has the right to lay T-rail under this old franchise. The tracks are to be laid in concrete with tie-rods, and the Arthur hump-block is to be used. There is no objection to this construction as compared with girder rail. The company also expects to lay in the village of Hartford an 80-lb. T-rail, concreting the track this year and paving next year.

At this point C. R. Barnes, engineer of the New York State Railroad Commission, entered the convention hall and was invited to address the meeting.

ADDRESS BY MR. BARNES

"I do not know of anything that I could present to you that would be new to you. You gentlemen are paying such close attention to details of construction, maintenance and operation that my position after a while will be a sinecure. There is, however, one matter in reference to which we have received numerous complaints; that is with reference to the height of car steps. These complaints have been referred to me during the past year, and I have reported to the commission that in my judgment it was a matter which no doubt would receive the attention of the Street Railway Association of the State of New York, and that it was a better way to tell them than to report or act upon individual complaints. That course has been pursued by the commission. I suggested to them that I would bring the matter to the attention of the State convention. I think the action by your body would be in the line of benefit to the members of the association and convenience to the public. A step 17 ins. or 19 ins. high is really too high for old and infirm people. It adds to their discomfort and your accident account. I would like to see some action taken by your convention proposing the appointment of a committee to consider the matter and bring about, if possible, some uniformity in that direction. Gentlemen, I thank you again for your kind invitation to address you and the pleasure I have had in attending this convention." (Applause.)

In line with the suggestion made by Mr. Barnes, a motion was made and carried that the president appoint a committee of three to study and report on the proper height of steps for local and interurban cars, and present its report at the next quarterly meeting.

The report of the nominating committee was then received, and the following officers were unanimously elected for the ensuing year. President, J. N. Shannahan, of Gloversville; first vice-president, T. W. Wilson, of Buffalo; second vice-president, E. S. Fassett, of Albany; treasurer, H. M. Beardsley, of Elmira; secretary, C. B. Fairchild, Jr., of New York City; executive committee, the officers and Oren Root, Jr., of New York City; W. H. Pouch, of Newburg; C. D. Beebe, of Syracuse, and C. Gordon Reel, of Kingston.

Before adjournment Mr. Allen, of Utica, called attention to the fact that B. B. Nostrand, Jr., who had been a member of the executive committee since 1902, was retiring from active business for a period of rest. Mr. Allen spoke feelingly of the regard and esteem in which Mr. Nostrand was held by his associates on the executive committee and by all the members of the association, and moved that there be spread upon the minutes a resolution properly acknowledging these sentiments. The motion was carried by a rising vote, and the president appointed a committee, consisting of Messrs. Allen, Wilson and Root, to draft suitable resolutions. Mr. Nostrand in a few fitting remarks expressed his deep satisfaction and appreciation of the action taken by the convention, and said, although he was severing his connection with the active work of the association, he would esteem it a privilege to show his interest in that work by becoming an associate member.

The convention then adjourned.

CLEVELAND'S THREE-CENT FARE COMPANY

Interest is evidenced in Cleveland over the prospectus and financing plan of the Forest City Railway Company, the so-called three-cent-fare company. The authorized capitalization is $2,000,000 6 per cent cumulative stock, of which $750,000 is to be sold immediately for lines in contemplation. The stock is offered to the public at 90. The property has been leased to the Municipal Traction Company and, according to the prospectus, no bonds or preferred stock can be issued. It states that the company has a twenty-year franchise for 13 miles of double track, including two miles of free territory in the heart of the city. Under the terms of the lease the Municipal Company guarantees stockholders of the Forest City Company 6 per cent on the cumulative stock. The Municipal Company is required to devote all surplus earnings, above operating expenses and dividends, to the extension of the service or acquiring the stock of the Forest City Company. Appended to the prospectus is a statement of A. B. Dupont, who is to manage the new company. He says that the cost of construction of 13.6 miles at $50,000 a mile, including overhead equipment and power, will be $680,000, and that the wards traversed by the proposed lines have a population of 124,506, which at the same rate of earnings per capita shown by the Cleveland Electric would earn $1,342,175. Assuming no increase in business, and dividing the earnings with the other company on a mileage basis, the earnings of the Forest City Company would be $384,000 a year. It is assumed that if the Cleveland Electric meets the competition it would cost the Forest City 25 per cent of its earnings, reducing them to $288,000. Figuring operating expenses at 70 per cent, which would leave 30 per cent for net earnings, the profits would be $86,400, or 11½ per cent on $750,000, the cost of the road.

Cleveland financial people find many weak points in the new company's argument. The company compares its earnings with those of the Cleveland Electric, yet under the terms of its franchise it can receive only 3 cents per passenger, while the Cleveland Electric has been getting something like 4½ cents. In the matter of extensions and betterments, the new company will have to pay 6 per cent on its stock, while other companies are obtaining new money by the sale of new bonds at 5 per cent and in many cases 4½ per cent.

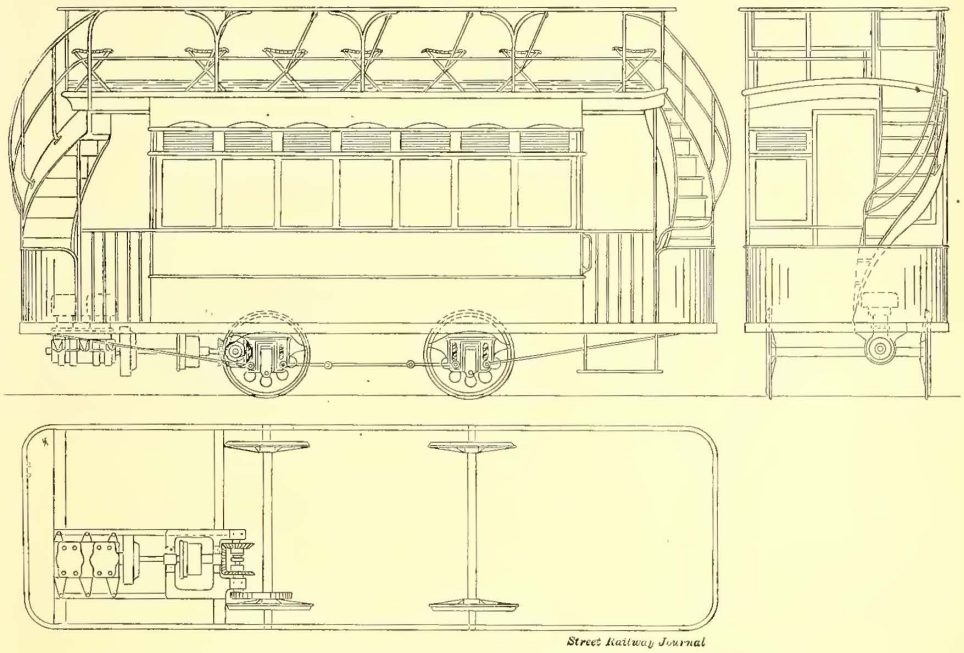
Students of the Cleveland situation believe that the company cannot earn its operating expenses and allow for depreciation, let alone paying 6 per cent dividend. The situation has been analyzed by a well-known traction expert in this way: The first ten miles of the new company's track, which it is stated will be placed in operation in the near future, will cost $500,000, according to the figures. Interest on this at 6 per cent is $30,000. At 3 cents per passenger it will take 1,000,000 passengers to pay the increased charges, or 2740 passengers a day. If cars are operated on five-minute headway, or twice as often as outlined in the prospectus, for eighteen hours a day, this make 24 trips per hour, or 432 trips per day. Thus the line must carry 6 1-3 passengers per trip to pay the interest charges. Figuring the depreciation at another 6 per cent, it means 12 2-3 fares to pay interest and depreciation. The 432 trips per day make a total of 2160 car-miles per day, and at 13 cents per car-mile, the operating expenses for the line will be $280.80 per day, and to raise this sum at 3 cents per passenger requires 9630 passengers, or 21¾ passengers per trip, to pay operating expenses. Adding to this the passengers necessary to pay for interest and depreciation gives a total of 34 1-3 fares to be collected on each trip to pay operating expenses, depreciations and interest. Four hundred and thirty-two trips per day with an average of 34 paying passengers means a total of 14,688 passengers per day, or 5,361,120 passengers per year, necessary to be carried on ten miles of single track.

Comparing these figures with the business of the old company: The entire system of 250 miles of single track carries about 100,000,000 passengers per year, or about 400,000 per mile of track. Thus on the average ten miles of track the Cleveland Electric carries 4,000,000 passengers per year, whereas, as shown, the new company with 3-cent fare must carry 5,361.120 passengers per year to pay expenses, depreciation and interest.

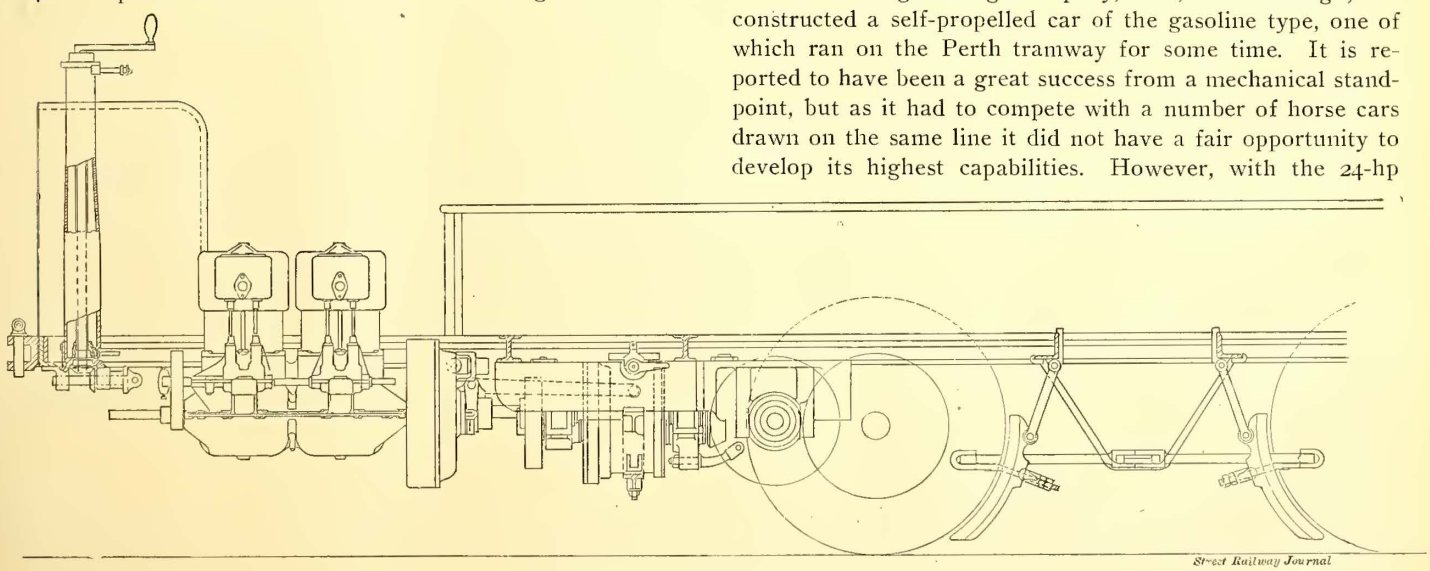
The route of the company is an indirect one and is probably not up to the average of the Cleveland Electric system as regards population; hence it is believed by the majority of conservative Cleveland people that the new line has little chance of earning enough to pay its interest charges.

A GASOLINE STREET CAR

In view of the present activity in developing gasoline cars for interurban work, it is not surprising to learn that like efforts are being made in the street railway field. Outside of the United States and Canada there are still a large number of horse tramways, notably in the Southern hemisphere, which would like to use mechanical power, but cannot afford the cost of electrification. To meet this condition the Scottish Motor Engineering Company, Ltd., of Edinburgh, has constructed a self-propelled car of the gasoline type, one of which ran on the Perth tramway for some time. It is reported to have been a great success from a mechanical standpoint, but as it had to compete with a number of horse cars drawn on the same line it did not have a fair opportunity to develop its highest capabilities. However, with the 24-hp engine used it was possible to operate at 15 miles an hour with a full load.



ELEVATIONS AND PLAN OF GASOLINE STREET CAR



SIDE VIEW, SHOWING THE LOCATION OF THE DRIVING MECHANISM

The car is of the double-deck type, capable of carrying forty to fifty passengers. The length over the body proper is 13 ft. 1 in.; width, 6 ft., and height from the floor to the

center of the roof, 6 ft. 8 ins. The platforms are each 5 ft. long. The weight of the empty car is from four to five tons, and it is capable of ascending a grade of 1 in 15 with full load. The motive power consists of a 24-hp to 30-hp four-cylinder engine mounted on a steel frame and firmly held in position by the bed-plate. The power is transmitted by means of a large diameter friction clutch, thence through a special compound starting gear and suitable gearing to the axles, no chains being employed. This gearing is fitted into a strong cast-iron frame, which is also secured to the steel framing and linable to the motor, the steel frame being bolted to the ends and sides of the car.

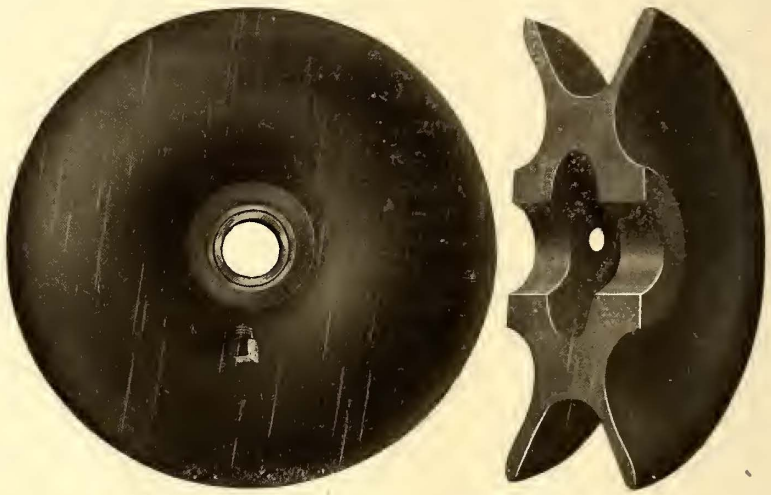
It will be seen from the accompanying drawings that the operating machinery for the car is so simple in construction that it can be manipulated by a novice or ordinary tram driver. The manufacturer simply fits a four-cylinder engine of 24 hp of the ordinary type as would be fitted to an automobile, but not running at so great a speed, with a direct drive from the fly-wheel instead of by cone clutch to the gear box. The gear box is merely a drum held up with a pair of shoes drawn tight with a lever from the front of the car. Pulling this lever over tightens the shoes on the drum and holds it so as to allow the internal gear to work and act as a driver, and by pulling it further over it brings in a second action and releases the shoes and allows the gear to drive direct from the engine. This is for forward motion. In stopping the drum it is only necessary to switch the lever back and the whole is disconnected.

To drive the car backward the driver disconnects his handle and takes it to the other end of the vehicle, and performs the same operation over again by a lever running on the then forward end of the car. As will be seen on the plan, from the gear box to the drive of the wheels spur pinions are used, one wheel being in mesh with the pinion from one end of the car and the second one from the reverse end of the car which forms the reverse drive.

The consumption of fuel, with full load of passengers, is on an average for a day's run, say 70 to 100 miles, about one gallon for 8 to 9 miles, with a gradient of not more than 1 to 8. The general running costs of a vehicle of this description, including motorman and conductor, fuel consumption, lubricating oil, storage, cleaning, and general running repairs, would be approximately 18 cents per mile.

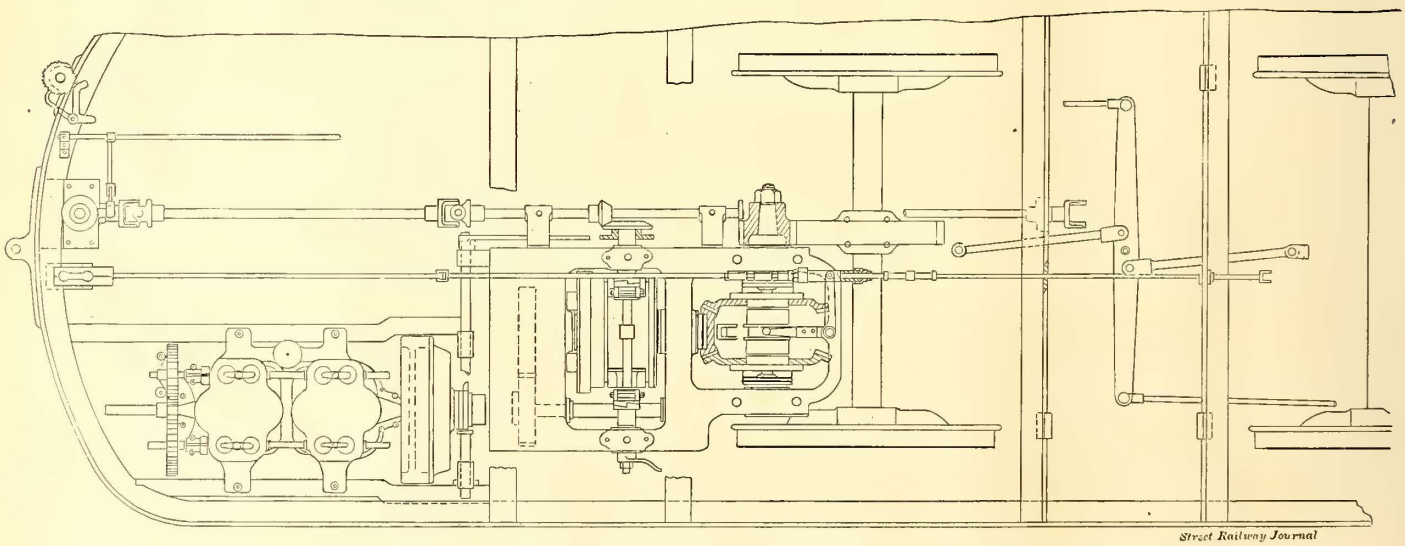
AN INTERESTING TROLLEY WHEEL

A trolley wheel said to be distinct from any other in use is being made by the Keystone Steel Company, of Sebring, Ohio, its unusual feature being that it is composed of a metallic and chemical alloy whose base is iron. The formula is a secret with this company, and it is claimed that it imparts to the metal a magnetic quality which renders it equal to copper as a conductor of electricity. It is claimed that the metal is possessed of a smoothness and uniformity of grain which eliminates arcing and a consequent wasting of current, and undesirable heating of the wheel and wire. It is said that the wheel is but a trifle harder than the ordinary brass wheel, and that there is no excessive wear on the trolley wire. It is cast solid without spokes, which renders possible the use of a larger oil reservoir than an ordinary brass wheel, and the statement is made that it will require only about one-fourth as much lubrication as the ordinary wheel. The wearing surface is thicker than in the brass wheel, to give increased life. Ordinary graphite bushings with standard axles are used.



SIDE VIEW AND SECTION OF TROLLEY WHEEL

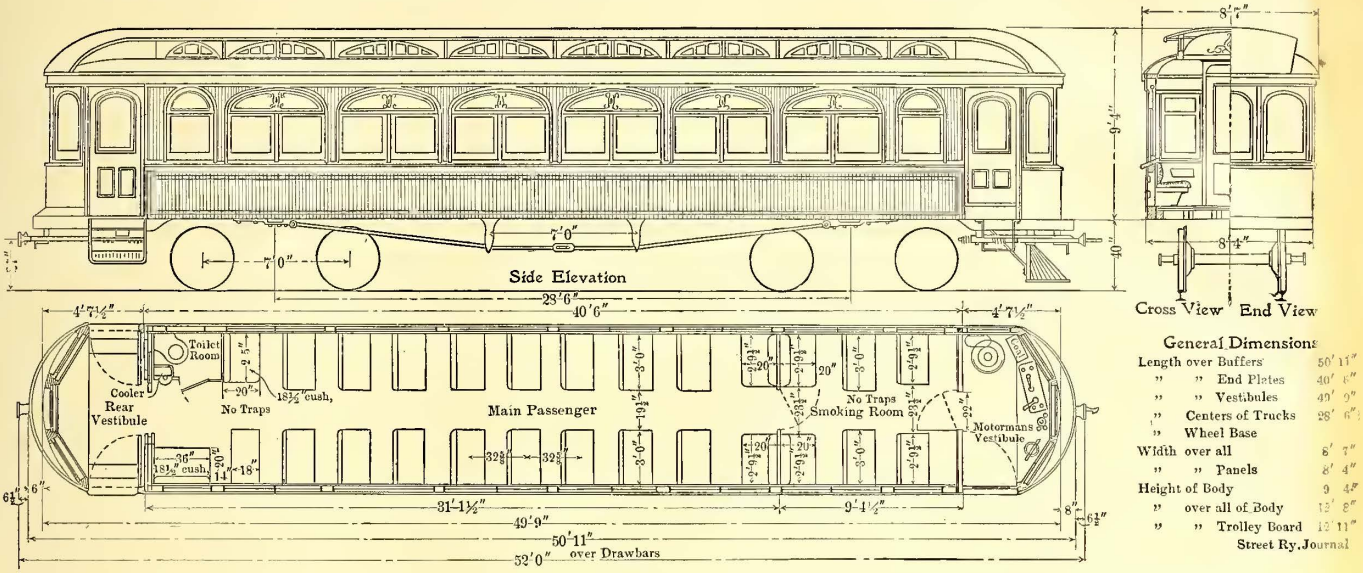
The Stark Electric Railway of Alliance, Ohio, has been using these wheels with satisfactory results for the past eight months, and now has all its cars equipped with them and uses them exclusively. General Mowrey, of this company, states that the wheels are averaging 4000 miles under severe service, and that so far as he can see they answer all the requirements.



LAYOUT OF GASOLINE APPERATUS, BRAKE CONNECTIONS AND OTHER OPERATING DETAILS

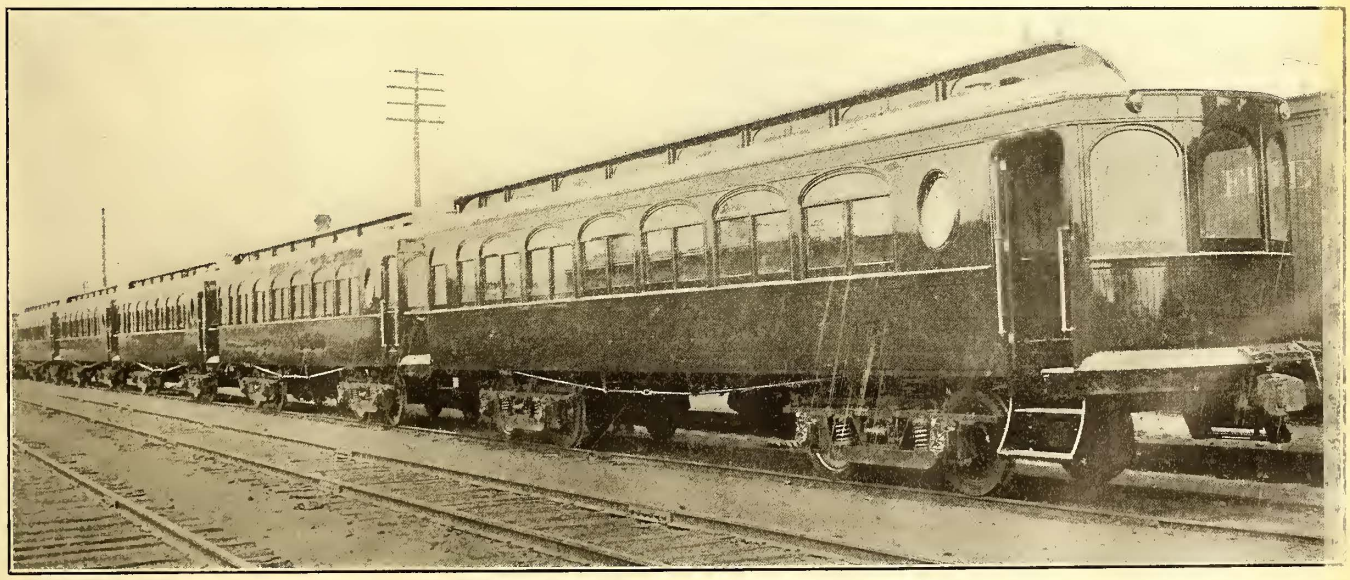
NEW LIMITED SERVICE FOR LAKE SHORE ELECTRIC

The Lake Shore Electric Railway has experienced such a tremendous growth in its limited business from Cleveland to Toledo that it has not only increased the number of trains from three to five a day each way, but since June 15 it has operated the cars in trains. This was made possible by the recent delivery of five very fine cars built by the Niles Car & Manufacturing Company, which are especially designed for train operation. The half-tone illustration herewith shows five of the cars as recently delivered to the company on their own wheels. Five more of these cars will be delivered by the same manufacturer within the next thirty days.



ELEVATION, END VIEW AND PLAN OF LIMITED SERVICE CAR FOR THE LAKE SHORE ELECTRIC RAILWAY

empire type. The seats are Hale & Kilburn high head roll upholstered in leather. The toilet rooms are finished with white tile. The cars are fitted with Van Dorn draw-bars and couplers, enabling them to take a 35-ft. radius curve in trains. They have Nichols-Lintern air sanders, and are heated with Radiant hot-water heaters. They are mounted on Baldwin Locomotive Company's high-speed interurban M. C. B. trucks, fitted with Standard forged and rolled steel wheels 37½ ins. in diameter. The axles are 6 ins. diameter, and the gears are solid 5½-in. face. Each car is fitted with four Westinghouse No. 121 motors developing 85 hp, and is controlled by the Type M automatic feed, and they have Westinghouse train-control air brakes and Peacock emergency



A TRAIN OF CARS ON THE LAKE SHORE ELECTRIC RAILWAY

The cars are 52 ft. over all, 40 ft. over corner-posts, and 8 ft. 7 ins. extreme width. The other important dimensions are shown on the accompanying drawing. In order to give extreme seating capacity, the baggage compartment was eliminated in the new car, but it is probable that they will be run in trains with some of the present equipment which have baggage compartments. The cars have Pullman shaped windows, with gothic and deck sash glazed with cathedral art glass. The interior finish is of cherry, the main panels having borders inlaid with white holly, the ceiling of semi-

brakes. An interesting feature is the use of the Lintern Car Signal Company's system of classification and marker lamps on both ends. These are operated in connection with storage battery which is also connected to two circuits of lamps in the cars, thus holding up the illumination when the trolley is off.

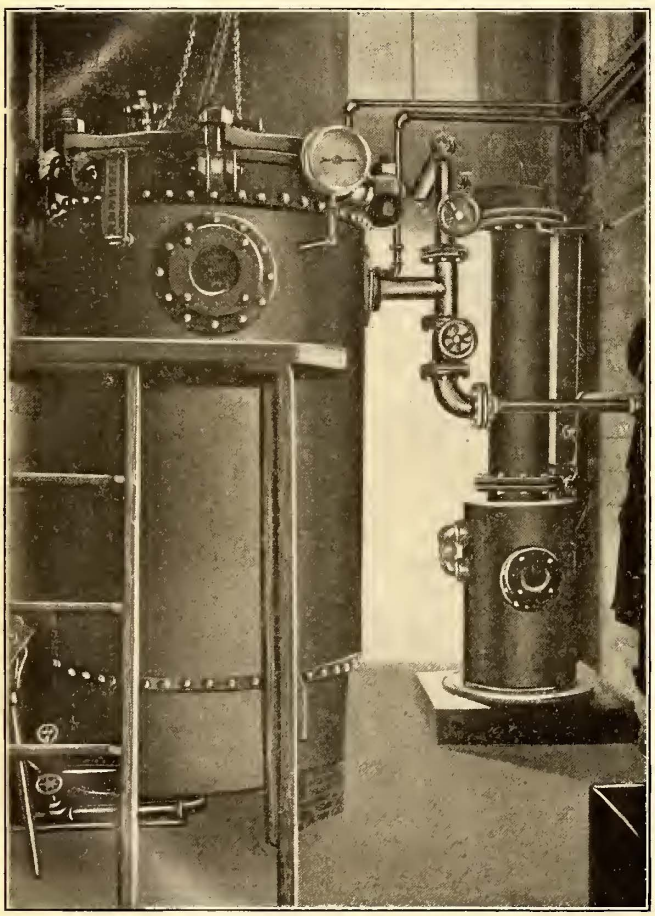
The train operation was tested out last week by General Manager F. J. Stout, representatives of the Westinghouse and General Electric Companies, and officials of the road. The train reached a maximum speed of 71 m. p. h. for

several miles, and it is believed that it will be possible to reduce the through schedule between Cleveland and Toledo to four hours without difficulty.

IMPREGNATING FIELD AND ARMATURE WINDINGS

The scheme of impregnating coils by means of a vacuum process, which has been adopted by several of the large electrical machinery manufacturers, is now being taken up by the manufacturers of repair parts.

The Dittrick & Jordan Company, of Cleveland, has recently installed an up-to-date outfit built by J. P. Devine Co., of Buffalo, operating under the Passburg patents. The outfit consists of two wrought-iron, air-tight tanks, one of them the vacuum chamber and the other the liquid tank. The coils are placed in the vacuum chamber, the field coils being



VACUUM IMPREGNATING OUTFIT IN SHOPS OF DITTRICK & JORDAN COMPANY

piled on a table, and the armature coils suspended from hooks. A combined vacuum and air pump exhausts the air from the vacuum tank, drawing with it all moisture contained in the air and in the materials used in the makeup of the coils. The moisture passes through a condenser and is drained off in the form of water. After the air is exhausted, the action of the pump is reversed and air is forced into the liquid tank at a high pressure, thus forcing the compound into the vacuum chamber and impregnating all parts of the coils. The vacuum tank has an observation glass, so that the amount of compound in the chamber can be seen. There is a thermometer showing the temperature of the compound, and a double-action gage showing the vacuum and the air pressure.

The coils are kept under vacuum pressure for a period of two hours or more, according to the winding of the coil, and under air pressure for a period of one hour or more. The air pressure is then reduced to a low pressure, the valve between the tanks is opened, and the compound is forced back to the liquid tank. The valve is then closed and the coils are left in the vacuum tank for half an hour to drip.

The outfit differs from similar outfits in that the two tanks have circular coils around the interior, in which live steam is circulated, thereby keeping a uniform temperature throughout.

The Dittrick & Jordan Company is using a solid compound having a melting point of from 280 to 300 degrees, and it is claimed that this is the only type of apparatus that will use the solid compound. The advantage claimed for the solid compound is that it requires a much higher degree of heat to melt it and there is less liability of the insulation running through the overheating of a motor while in use. It is claimed that coils made by this process will give two or three times the life of coils made by the old dipped process. As the coils are rendered practically solid, there is no chance for the slipping of wires, and the fact that the air and moisture are removed gives the best condition for the radiation of heat.

In the future the Dittrick & Jordan Company will follow the plan of cutting open one coil out of each lot as it goes through the process in order to insure that the impregnation is perfect. The fact that the impregnating compound enters the vacuum chamber without breaking the vacuum eliminates, it is claimed, any possibility of the dried coils absorbing moisture, as was the case in the old method of drying and impregnating in bake ovens and dip tanks.

The new outfit was tested recently and about twenty prominent city and interurban men from Cleveland and vicinity were present at the demonstration, and were entertained by the Dittrick & Jordan Company .

WESTINGHOUSE NO. 119 RAILWAY MOTOR

The Westinghouse Electric & Manufacturing Company has recently brought out a new direct-current motor, under the trade name of No. 119. This motor has a normal rating, under the normal conditions, of 125 hp at 550 volts. With stops every 1½ to 2 miles, a double No. 119 equipment has sufficient capacity for the operation of a car measuring 40 ft. to 50 ft. over all and weighing approximately 40,000 lbs., without equipment or load, over a level track at a schedule speed of about 30 to 32 m. p. h., and should develop a maximum speed of 43 m. p. h. Under similar conditions a corresponding four-motor equipment should easily maintain a schedule speed of 32 to 36 m. p. h. with a car weighing approximately 50,000 lbs., without equipment or load, and should develop a maximum running speed of 50 m. p. h. These conditions are based on a gear reduction of 24-in. to 51-in. and 33-in. wheels.

The frame is of cast steel in two parts, split at an angle of 45 deg. with the horizontal, and is so supported on the axle that most of the weight is borne by the solid casting and not by bolts. A large opening in the frame over the commutator, extending well down over the axle, provides easy access to the brushes and brush holders, and makes inspection possible from a pit. The clearance between armature and field coils may be inspected from a hole in the rear end bell and an opening under the commutator. Nose suspension with safety lugs is employed.

The bearing for the armature shaft at the commutator end is 3¾ ins. x 7 ins., and at the pinion end is 4 ins. x 10 ins. The axle bearings are 11¾ ins. long and may be made for any shaft diameter not exceeding 6 ins. The caps are split at an angle of 35 deg. with the perpendicular, so that the weight of the motor is carried almost entirely by the portions of the frame which extend over the axle, and the cap bolts are re-

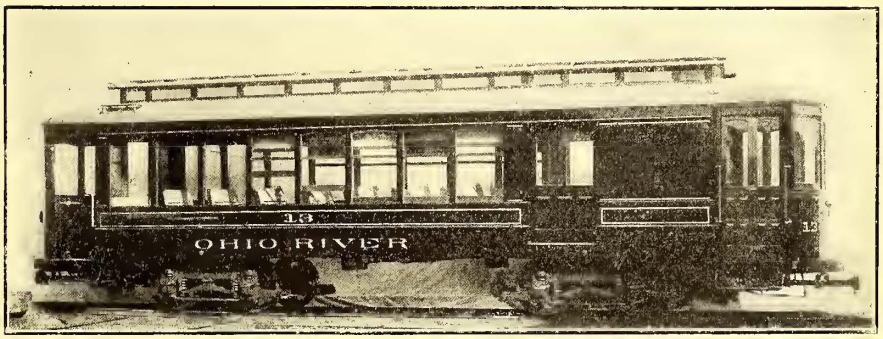
lieved of heavy strains. Oil and waste lubrication is provided for all bearings. The complete armature is 17 ins. in diameter. The total air gap between armature and poles is 7-16 in.

The commutator has 185 bars. It measures 14½ ins. in diameter, is 6 23-32 ins. in length, and provides a wearing depth of approximately one inch. The brush holders carry three ½-in. x 2-in. carbons. Gear ratios of from 17:58 to 24:51 may be employed.

The weights of the No. 119 motor are approximately as follows: Armature alone, 1340 lbs.; motor alone, 4175 lbs.; motor complete with gears and gear case, 4600 lbs.; double equipment with motors, two controllers and electrical details, 10,900 lbs.; quadruple equipment with motors, two controllers and electrical details, 21,080 lbs.

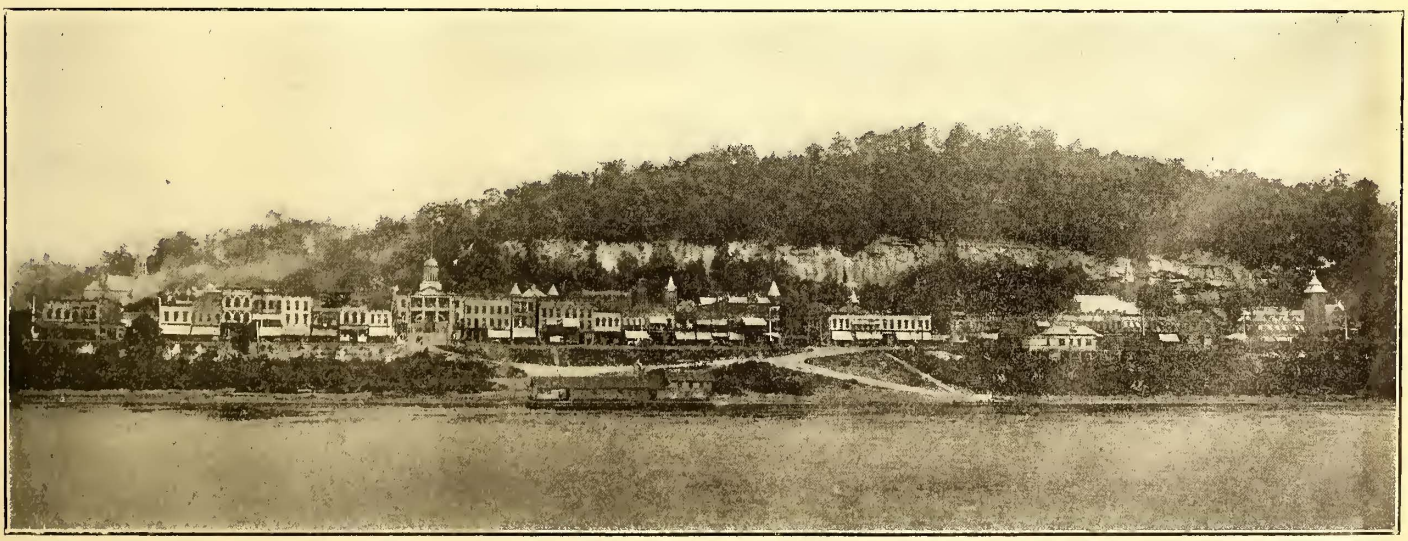
THE OHIO RIVER ELECTRIC RAILWAY SYSTEM AND ITS NEW EQUIPMENT

The Ohio River Electric Railway and Power Company operates 12 miles of street railway, extending from Middleport, through Pomeroy, Minersville and Syracuse to Racine, Ohio, paralleling the banks of the Ohio River with the towns of Clifton, Mason, Hartford, New Haven and Graham, W. Va., on the opposite side; serving a direct population of 16,000, with a contiguous territory of 10,000 additional. A unique feature of these towns is that the various corporation lines almost join one another, making it practically one little city the entire distance. The line occupies the well-known Pomeroy Bend, situated in the heart of the beautiful Ohio valley, bordered by precipitous cliffs on one side of the river and sloping hills on the other, presenting a panorama of scenic beauty rarely surpassed. The half-tone strikingly illustrates the natural beauties of Pomeroy. The city is in the center of one of the largest salt, bromine and calcium producing districts in America; along the lines of the street railway company are extensive coal mining properties, tapping the largest undeveloped body of bituminous coal in the State of Ohio. The road was built in 1900, since which time its business has steadily increased; it has been a potent factor in advancing the commercial interests of the community it serves, and has produced in that section an era of prosperity previously unknown. Much attention has been devoted to the development of carload freight business, which has proved to be a very profitable source of revenue. Last year 1934 carloads were moved on its lines by a 17-ton electric locomotive with a draw-bar pull of 4000 lbs., from or to the Hocking Valley Railway Company. In addition there is much local and way freight carried to and from all points on the line. This branch of the business offers almost unlimited possibilities, and its present growth is confined only to the limit of car service obtainable. An electric locomotive is shown in one of the illustrations, pulling a train of cars out of one of the industrial sidings. A five-car passenger schedule is operated with a twenty-minute service between Middleport, Pomeroy and Minersville, through cars running to Syracuse and Racine every hour. In 1905, 911,971 passengers were carried, and if the present ratio of increase is maintained the number of passengers carried this year will far exceed one million. The power house is located in Pomeroy near the mouth of a coal mine, giving the advantage of very cheap fuel. All machinery is built in duplicate. A 500-volt d. c. system is employed, with ample feeders extending in either direction. The company also does all the municipal and commercial lighting in Pomeroy, which is operated by an a. c. system from the same power house.



PASSENGER AND BAGGAGE COMBINATION CAR

Aside from the cars now being delivered by the J. G. Brill Company, eleven cars comprise the rolling-stock equipment for passenger service, all of which are frequently pressed into use during the summer months. Eight of these cars are of the Brill make, six being ten-bench open summer cars

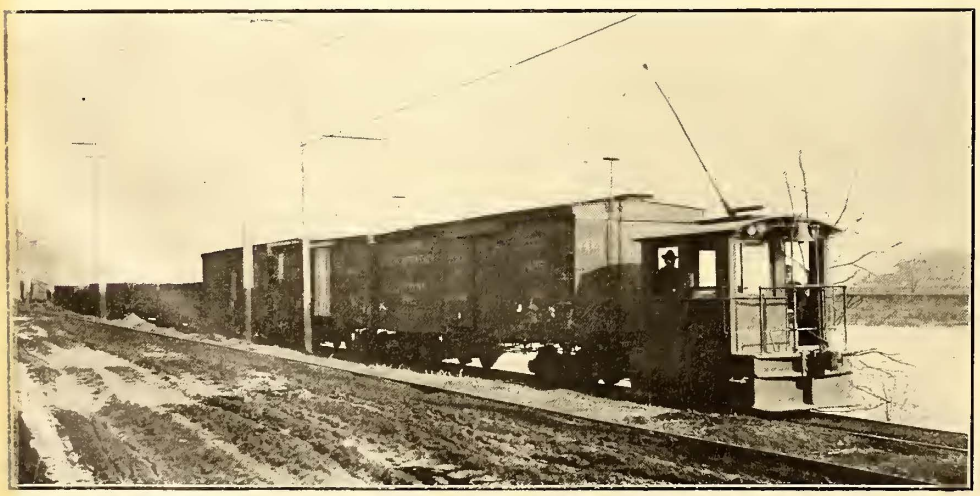


PANORAMIC VIEW OF POMEROY, AS SEEN FROM THE OHIO RIVER

mounted on No. 21-E trucks for 27-hp motors, and two closed combination passenger and baggage cars mounted on "Eureka" maximum traction trucks for 35-hp motors. An extension of 1½ miles is being built from the present Middleport terminus of the line, passing Fair View Park and on to Hobson, Ohio, the junction point of the Hocking Valley & Kanawha and Michigan Railways, and where is located the

INTERIOR VIEW, SHOWING PASSENGER COMPARTMENT

large K. & M. shops. This will serve a large number of shop men, train crews and train passengers, and will also handle the United States mails and express business, making it the best revenue producer of any single mile of the road. The new cars will at present be placed on the through service between Middleport and Racine, but after the completion of the Hobson extension it is contemplated to operate them hourly between Hobson and Syracuse, which is the most



ELECTRIC LOCOMOTIVE HAULING A FREIGHT TRAIN ON THE OHIO RIVER ELECTRIC RAILWAY SYSTEM

densely populated district on the line, and the present twenty-minute service will be extended to Syracuse.

The type of car illustrated is well suited to the form of interurban service in which passengers are carried comparatively short distances and enter and leave the car from the roadside. The short-base equalized trucks on which the cars are mounted carry the bodies low and at the same time are capable of 35 miles per hour. In the illustration a number of the windows at the rear of the car are raised into the roof pockets, giving a good idea of the openness when all the windows are raised for summer service. One of the excellent features of storing the sash in the roof pockets, which has not frequently been alluded to, is that the glass is not liable to be broken. Attention is directed to the bright and attractive interior and the wide aisle and commodious seats. The exterior width of the car is but 8 ft. 2 ins., while the interior width, measured between the side linings, is 7 ft. 10 ins., allowing the seats to be 35 ins. long and the aisle 22 ins. wide. The seats are of the builders' manufacture, and have push-over backs with corner grabhandles. Folding seats in the baggage compartment accommodate smokers when the compartment is not filled with baggage. The length of the car over the bodies is 31 ft. 8 ins., and over the vestibules 41 ft. 4 ins.

SAN FRANCISCO NOTES

The most interesting event of the week ending June 23 in San Francisco was the successful inauguration on June 21 of cable car service on the Geary Street Railway. The road passed through the earthquake and fire with very good fortune. Whereas the cable of the California Street road, resting on its pulleys 18 ins. below the surface of the street, was melted in places by the intense heat, the grease was not even melted from the Geary Street cable at any point in the burned district. On the Tuesday preceding the opening the cable was run through the slot and carefully examined as it passed over the drums in the power house, and was found to be intact and in good shape, barring an accumulation of dirt that had sifted into the slot. The company also found that at no place had the conduit suffered from the earthquake and fire, although the slot rails at places in the burned district were badly warped. The cars have been well patronized, and although, as previously, no transfers are given with other lines, the line relieves considerably the congestion of traffic on the electric lines of the United Railroads. In resuming operations with its cable cars the Geary Street road has found trouble only at one point, and that is at the outer end of the line. Heretofore the cars have turned into Fulton Street at Fifth Avenue and continued out Fulton Street to the Chutes, using the cable of the McAllister Street line for several blocks on the latter street. As the McAllister Street cable is no longer running, the Geary Street cars can be operated only as far as Fifth Avenue and Fulton Street, and must be switched at the outer terminus by horses. As a temporary makeshift, however, the arrangement works satisfactorily.

The management of the California Street Railway expects to have a portion of the system running by Aug. 1. Since the day of the fire the employees of the company have been working on the ruins, and most of the wreckage has been cleared away and the machine shops, 45 ft. x 100 ft., are again in working order. An inspection shows that the heavy driving wheels are in good condition. Other portions of the machinery are warped, but it is believed they can be repaired. Should they be beyond repair an order for new machinery will have to be placed and a new plant constructed. It will be a year and a half before the line can be operated by its own power, should this be found necessary. The company lost

fifty-two cars, all that were owned by the road. An order for twenty new ones, to be built on the same lines as the old, has already been placed with an Eastern concern, and these will be ready when needed. The cables of both the California Street and the Hyde Street systems were destroyed, but new ones are available. Work on the O'Farrell, Jones and Hyde Streets line will not be undertaken until the California Street line is in operation.

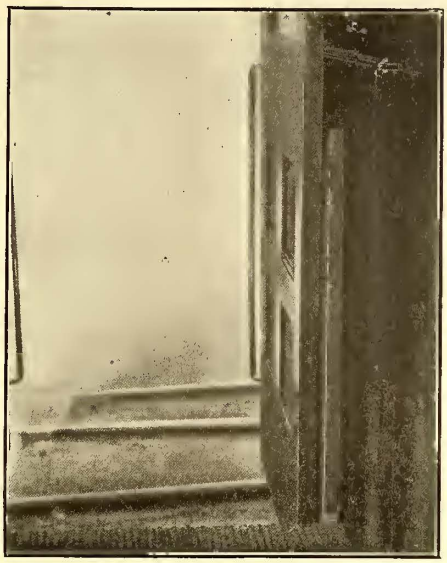
The new cars which the United Railroads has just received will soon be ready for operation. They are of the suburban type, 45 ft. in length, and entirely closed, and are an olive green in color. They were sent on by the Chicago City Railroad Company as soon as they learned that the San Francisco system would need the equipment.

The United Railroads has placed an order with the General Electric Company for twenty-five 4-motor, 40-hp equipments; fifteen 4-motor, 50-hp equipments, and ten 4-motor, 75-hp equipments, all to be supplied with the flexible Sprague-General Electric system of multiple-unit control.

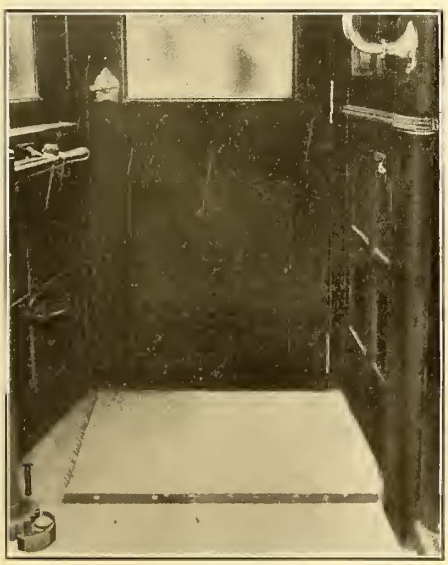
The general offices of the United Railroads have been moved from the Turk and Fillmore car house to the car house at Oak and Broderick Streets. With the exception of the master mechanic, who is still located at the Geneva Avenue car house, and the chief electrician and chief engineer of motive power, who will continue to have their offices at Turk and Fillmore Streets, all of the officers and departments of the company are now permanently located at Oak and Broderick Streets, and will probably remain there for the next year or two, or until suitable quarters of a permanent character can be provided in some modern building in the down-town section.

A FOLDING TRAP FOR VESTIBULES

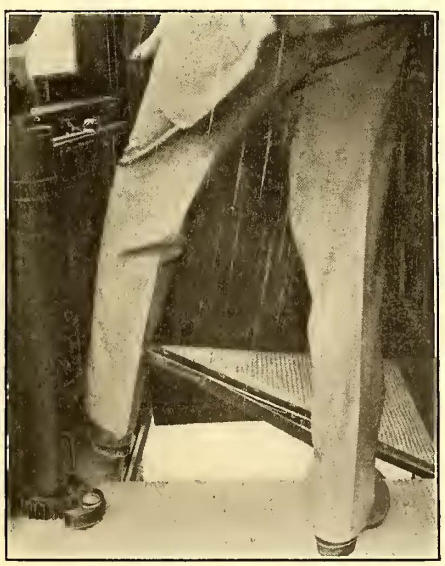
A short account was published in the issue of June 23 of the exhibit of the Filion folding trap at the exhibit of the Master Car Builders and Master Mechanics at Philadelphia. The accompanying illustrations, however, will make the construction of the trap and its method of operation more clear. As will be seen, the trap is in two triangular pieces, hinged together. The outer piece is also hinged to the door and the inner piece to the side of the car. The trap opens and closes with the door by the pressure of the foot upon a treadle. As the parts are hinged there is a tendency to crush any ice which may form on the lower side of the trap. When the door is open the two parts fold behind it so as to offer no obstruction to egress from the car. The trap is also arranged to be raised by a lever between the cars if desired. It is covered in the usual way with rubber, and the edges are bound with brass. The trap has been adopted by some eight or ten steam railroad companies, including the Canadian Pacific Railway, and is being manufactured by the V. O. Lawrence Company, of Philadelphia.



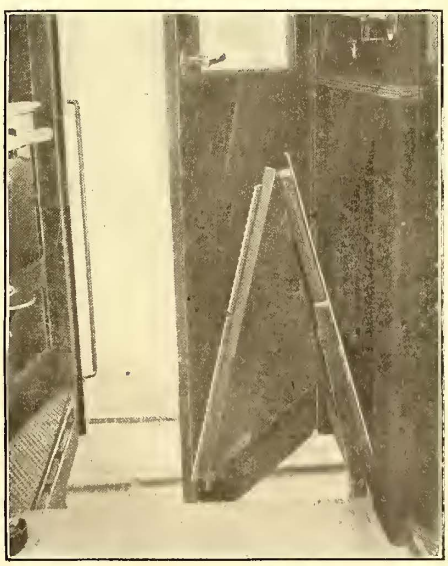
TRAP FOLDED BEHIND VESTIBULE DOOR



TRAP DOWN



RAISING TRAP



TRAP PARTLY UP AND FOLDED

MOTOR CARS TO BE SUPPLIED FOR THE ERIE RAILROAD'S ELECTRICAL DIVISION BETWEEN ROCHESTER AND MT. MORRIS, N. Y.

The Erie Railroad has ordered from the St. Louis Car Company a number of straight passenger motor cars to be used on the 35-mile division to be electrified between Rochester and Mt. Morris, N. Y. These cars will be 40 ft. long over the body, 49 ft. 10 ins. long over the vestibules, and 51 ft. 4 ins. over all; height of the car from the top of the rail to the top of the roof, 13 ft. 4 ins. The cars will be mounted on the car builders' No. 61 trucks, with 34-in. diameter wheels. In addition to the passenger cars there will also be one combination passenger and baggage car and four combination passenger and smoking cars. Further details and drawings of the passenger car will be published in the next issue of the STREET RAILWAY JOURNAL.

LONDON LETTER

(From Our Regular Correspondent.)

The eleventh annual convention of the Incorporated Municipal Electrical Association was duly held during the month in London, although the first meeting was held at Kingston-on-Thames, the president of the association this year being J. E. Edgcome, electrical engineer of that town. The headquarters of the association were, however, at the Great Central Hotel, London, and the convention was even more largely attended than usual, an especially large number of ladies being present. The first meeting was held at the Royal County Theatre, Kingston-upon-Thames, where delegates and their friends were welcomed by the Mayor, Councillor H. C. Minnitt, J. P., after which the presidential address was delivered by J. E. Edgcome. A most excellent paper was then read on the subject of steam turbines, profusely illustrated by lantern-slides, by Sydney Baynes, chief electrical engineer of St. Pancras, London. Luncheon was served at 1 o'clock at Nuthall's, Ltd., after which steam launches were provided for a delightful trip on the River Thames. First of all, the launches proceeded down the river, via Teddington and Twickenham to Richmond, where, by kind permission of the Thames Conservancy, the working of the special lock and weir were inspected, the visitors very happily arriving just at the moment when it was necessary to lower the weir. The party then proceeded up the river past Kingston-upon-Thames to East Molesey, where tea was served, after which a short, but interesting visit was made to Hampton Court Palace, which, by special permission of His Majesty's Office of Works, was kept open until late in the evening. A photograph was taken of the party in the courtyard, after which the return was made in the evening to Kingston, from which point a special train took the guests back to London. On the next day the meeting was held at the Hotel Great Central, and papers were read by S. E. Fedden, chief electrical engineer, Sheffield, and H. Collings Bishop, chief electrical engineer, Newport, Mon., on "The Commercial Development of Electricity Undertaking," and J. F. C. Snell, chief electrical engineer, Sunderland, on "Relative Economies of Electric Supply from Small Local Stations and from Power Companies," after which an adjournment was made for luncheon in the hotel. In the afternoon conveyances were supplied and the whole party departed to visit the power station of the Underground Electric Railway Company of London, at Lots Road, Chelsea, which was thrown open for inspection by the permission of J. R. Chapman, general manager and chief engineer. This particular station, at present perhaps the most important and interesting station in Great Britain, elicited the great interest of the delegates, the working of the turbines possessing special interest. Afterward the power station of the London United Tramways, Ltd., at Chiswick, was visited by the permission of Sir Clifton Robinson, managing director and engineer. The next forenoon was devoted to the annual general meeting, and also a special general meeting. After luncheon, conveyances were provided for a visit to the power station of the Charing Cross, West End & City Electric Supply Company, by permission of W. H. Patchell, engineer-in-chief. This station also elicited a great deal of interest, owing to its being one of the most modern of the electrical supply stations in London.

The association's annual dinner, which was largely attended, was as usual an entire success. On the final day of the meeting the following papers were presented: "Live Steam-Heat Feed Water; its Effect on the Output and Efficiency of Steam Boilers," by G. Wilkinson, chief electrical engineer, Harrogate; "The Efficiency of Steam Plant," by W. H. Vignoles, chief electrical engineer, Grimsby; and "The Supply of Power to Tramways from Small Stations," by S. J. Watson, chief electrical engineer, Bury. After luncheon a visit was made to the new power house of the London County Council at Greenwich, which is fully described elsewhere in this issue. On Saturday, an arrangement had been made with the director of the National Physical Laboratory, Bushy House, so that members of the association might visit the laboratory, and of this advantage was largely taken. In the afternoon, invitations had been issued to all members to attend the Kingston, Surbiton and District Life-Boat Saturday Fund Carnival and Water Sports, tickets having been issued for admission to the Albany Club Lawn. A most enjoyable afternoon was spent, and the thanks of all of the delegates were heartily extended to Mr. Edgcome for having provided in connection with the meetings of the convention so many delightful entertainments, at this season of the year Old Father Thames looking his very best, and provided a joy all his own.

As some return for the courtesy extended to the Institution of Electrical Engineers on several visits to the Continent, and the visit to the United States a year or two ago, elaborate preparations have been made this year to provide interesting and pleasant entertainment for a visit of kindred institutions, which takes place this month and extends practically a fortnight from June 23 until July 7. The central committee rooms of the Institution of Electrical Engineers will be situated at the Hotel Cecil, and the first day the visitors will be conducted to Teddington for the opening ceremony of the new electro-technical laboratories of the National Physical Laboratory, by the Rt. Hon. R. B. Haldane, H. M. Secretary of State for War, and a reception and banquet will be held at the Hotel Cecil the same evening. The next day will be devoted to visits to the general post office, telegraphs and telephones, and the London Wall Exchange of the National Telephone Company, the Greenwich generating station of the London County Council, the Bow generating station of the Charing Cross, City & West End Electricity Supply Company, the Lots Road power station of the Underground Electric Railways Company, and the Shepherd's Bush power station of the Central London Railway Company, the visitors being divided into groups as found desirable. In the evening a reception and conversazione by the president, the president elect, and the council of the Institution of Electrical Engineers will be held at the National History Museum, South Kensington. The following day a trip will be made to Windsor, and the next day to Stratford-on-Avon, to Rugby to visit the works of the British Thomson-Houston Company and Willans & Robinson, to Birmingham, where various works will be visited, and on to Manchester, where the party will arrive on June 29. Some of the most important of the electric lighting stations in that city will be visited, as well as the British Westinghouse Electric & Manufacturing Company's Works at Trafford Park, and the Manchester Ship Canal Works. Liverpool will also be visited later, and the important power stations in the vicinity inspected, after which a trip will be made by way of Windermere and the lakes to Glasgow, where entertainment will be provided by the Lord Provost and Corporation of that city. Luncheon will be provided at the famous City Chambers, and a reception and conversazione will be held at the University by the Rt. Hon. Lord Kelvin, chancellor of the University and chairman of the Glasgow local section. Babcock & Wilcox's Works will be visited in the vicinity, and the party will be entertained to a special excursion on the Clyde on the turbine steamer "Queen Alexandra" by that enterprising firm. On returning, a reception and conversazione at the Art Galleries, Kelvingrove Park, will be given by the Rt. Hon. the Lord Provost and Corporation. Edinburgh will be visited on a later day, and interesting excursions have been arranged for to various places in that historic city, after which Newcastle-on-Tyne and Leeds will be visited. Interesting visits to the various enterprises, electrical and otherwise, in both of these busy cities being made. The final day will be spent in Leeds, and visits will be made to certain of the manufacturing companies' works there, and the Yorkshire Electric Power Company's generating station. An excursion will be made to Harrogate, where all the visitors will have the opportunity of drinking the famous waters, and drives will be made to Fountains Abbey and Studley Royal, after which the party will return to Leeds and then by train to London.

Reference has been made frequently in these columns to the immense number of flotations of companies intending to purchase and operate motor omnibuses in the streets of London, and, following hard on their heels, comes now the flotation of a company called the General Motor Cab Company, Ltd., with a capital of £260,000. The company has been formed for the placing in the streets of London and elsewhere a service of motor cabs, which are to be equipped with taximeters in the same manner as the cabs in Berlin, Paris and other Continental cities, to show the exact amount of fare necessary to be paid to the driver. A contract has been entered into between this company and Renault Freres, of Paris, to supply 500 of these motor cabs, and with the proprietors of the taximeter, for the privilege of using this device on the cab. For some years a few motor cabs have been in operation in the streets of London, but they have not been in such numbers that one could say anything as to whether they are really successful or not. Should this company succeed in placing these 500 motor cabs in London, however, there seems good reason to believe that they will be a success, and the writer thoroughly believes that the use of the taximeter is certainly a step in the right direction. The company has got a good board of directors, and it seems to be well backed in every way, so that it is to be hoped that success will follow the company's efforts. Motor cabs are undoubtedly working with great success in Paris, and the writer recently saw large numbers of them in Berlin,

which seemed also to be operating with perfect success. There ought to be no reason why motor cabs should not do well in London, but the general public would have to be assured that the price were reasonable, as hitherto the few motor-cab drivers in London have been apt to extort rather large fares.

At a special meeting of the Oxford City Council, recently, a full report on the tramway situation was presented by the tramways committee. This committee had fully investigated the powers of the corporation to work the existing horse tramways, to take over the tramways themselves, to lease them to a company, to establish a system of motor buses, etc., and finally recommended the adoption of electric tramways, but to lease the undertaking by public tender to an outside company. After discussion the Council adopted the report in so far as accepting electric tramways was concerned, but decided for the present not to adopt the idea of leasing such tramways to an outside company. As an amendment, however, it was finally decided that public tenders might be invited for leasing the undertaking without pledging themselves to lease.

Another London tube involving the amount of £3,000,000, has been approved by Parliament. The bill, which is called the North-West London Railway, has been under the consideration of the committee during the past month. The bill necessarily got the full opposition of the London County Council, as it is promoting bills to put surface tramways on the same route. The route of the North-Western Railway is from Cricklewood to the Marble Arch, and this year the promoters have asked also for powers to continue the railway from the Marble Arch under Hyde Park to Hyde Park Corner, and thence under Grosvenor Place to Victoria.

The Association of Tramway and Light Railway Officials met during the past month at the Balmoral Hotel, Edinburgh, when the association was addressed by the president, H. England. A paper on "Radial Trucks" was read by G. Conaty, of Birminghani, and afterward members were entertained at luncheon by the directors of the Edingurgh and District Tramways Company, Ltd. A visit was afterward made to the Tollcross power station, after which a drive round Edinburgh was provided. The following day a paper was read on "Patent Recording Timekeeper," by A. A. Blackburn, of Belfast. After luncheon there was a discussion regarding the amalgamation with other associations and the usual business meeting of the association. Mr. England's presidential address was strongly in favor of the overhead trolley system, and he stated that he knew no town in the Kingdom which was disfigured by a properly erected overhead system, and even went so far as to say that the city of Edinburgh would have been no less beautiful with such a system. Mr. England also dealt with the opposition of motor buses, and stated that while he thought their unreliability, noise, discomfort and cost of operation prevented them from being feared as competitors at present, yet, in course of time, as these drawbacks were overcome, they might become much more formidable competitors. At the business meeting, J. E. Pitcairn, general manager of the Edinburgh & District Tramway Company, was elected president, and A. R. Fearnley, Sheffield, was elected vice-president.

Members of the managers' section of the Municipal Tramways Association held their annual conference in Sheffield this month. The visitors were received by A. R. Fearnley, of Sheffield, and the conference was presided over by J. B. Hamilton, of Leeds, who is president this year. Mr. Fearnley read a paper descriptive of the Sheffield tramways system, and J. M. McElroy, of Manchester, afterward introduced a discussion on tramways and motor omnibuses. On the following day, the subjects under discussion were: "Economy in Current Consumption," by C. Spencer, of Bradford; "Income Tax and Rates in Connection with Tramway Undertakings," by J. Dalrymple, of Glasgow, and "Track Welding," by J. B. Hamilton, all of which were well received and thoroughly discussed.

Work in various parts of London is being vigorously pushed by several firms of contractors, all working for the London County Council, on the south side, in the east end and also in the northern section, now that the North Metropolitan Tramways has been acquired by the Council. Cars are now being run direct from Westminster Bridge to Rushey Green and Catford by way of Lewisham, this new route being the longest over which electric cars are running at present in London, and the price of fourpence has been fixed as a through fare from Westminster to Catford, a distance of about 7 miles. A small extension has also been made on the Greenwich route by which connection with the Blackwall Tunnel has been effected.

In connection with the opening of the Greenwich power house, it is interesting to note that the Astronomer Royal, Sir W. H. M. Christie, has entered a strong protest against the generating station being built at Greenwich, where all the world knows that the Greenwich Observatory is situated, through which passes longitude zero. Sir W. Christie condemns the action of the London County Council for having placed the power station only half a mile away, as it interferes most extensively with the work of the Observatory. Naturally, the London County Council claims that this protestation should have been made long before the work was commenced for the station on this site, especially as the same trouble occurred only a few years ago in connection with the London United Tramways, which were bitterly complained against by the officials of the Kew Observatory for interference of their work. It is suggested that turbines should be installed in place of the large reciprocating engines which are now at work, but this change, of course, would take considerable time, and the London County Council naturally is not inclined to make this change at this late date. The Admirality is also bringing its influence to bear on the subject, as, from a naval point of view, Greenwich is the centre of the world, and the chronometers of every ship in the navy and merchant marine are set by Greenwich time, and to a thinking mind it is easy to infer that any disarrangement of the instruments in the Greenwich Observatory must have a most serious result in all shipping circles, and in work connected with the scientific observation of the stars. It seems impossible for both the County Council's station and the Observatory to remain where they are. Naturally the Astronomer Royal is totally averse to the removal of the Observatory from its historic associations, and the London County Council naturally is not anxious to close down an undertaking which has cost nearly a million pounds. The question has been brought up in the House of Lords, and it is evident that the Lords of the Admirality are taking the most serious view of the matter, maintaining that the reckoning of every ship at sea depends on Greenwich observations, as well as the position of countries. Our very geography depends on the Observatory, and it was the opinion of the Lords that the Observatory could not be moved, and that if one institution had to be moved it would have to be the power house.

The London County Council electric supply bill is still before the committee of the House of Commons, a fortnight having been consumed by the Whitsuntide vacation. This is the bill, as has already been pointed out, which the Council is promoting for furnishing current in bulk to the London area. The testimony of financial and electrical experts has practically all been concluded for the promoters, who have gone into the question most thoroughly, and the hearing of the opposition is now in progress. Mr. Merz, engineer of the Administrative County bill which failed to pass last year, has given evidence, and naturally is endeavoring to show how his company would be in a much better position to furnish bulk supply than the London County Council. Mr. Ferranti has also given evidence, and many of the electrical engineers of the various companies operating at present in the London area have been on the witness stand. Mr. Conacher, manager of the Metropolitan Electric Supply Company, stated that the authorized capital of the fourteen London companies was over eighteen and a half million pounds, of which more than twelve and a half millions were issued. Many of the companies possessed large generating stations, and he contended that there was ample capacity for furnishing all the current desired. A system of linking up the various companies was advocated by Sir A. B. W. Kennedy, while Mr. Highfield, engineer of the Metropolitan Company, emphatically stated that there was an equally good means of dealing with the problem at hand without the expenditure of such a vast sum of money by the London County Council. Independent experts are now being examined, and it is expected that the inquiry will be over very shortly.

A new and enlarged edition of the "Glasgow Corporation Tramways Official Guide to Glasgow and Neighborhood" has been prepared by the tramways department. The letter-press has been practically rewritten, and a great many additional prints included in the new volume. The guide has been enlarged to cover the extensions which have been opened during the past year, and also describes the districts beyond the present termini. Arrangements are being made to supply each conductor with a number of the guides, so that the traveling public may be able to secure copies on the cars. No change is made in price, which remains at 1d.

A. C. Eborall states that during the course of the present month he will resign his seat on the board of Witting, Eborall & Company, Ltd., to become managing director of Brown, Boveri & Company, Ltd., London. This latter company is now in course of

formation by the well-known Swiss company of the same name, its main object being to take charge of the interests of the Swiss company on Great Britain, the Colonies, and various other countries. The other directors of the English company will be Charles Brown, W. Boveri and C. Baumann, who are also directors of the parent company in Baden. The English Brown, Boveri Company has further arranged to purchase the well-known contracting business of Witting, Eborall & Company, Ltd., and to carry it on and further develop it as a part of the business of Brown, Boveri & Company, Ltd. As a result of this, Messrs. Witting, Eborall & Company, Ltd., have ceased trading, as far as new work is concerned, while their work and contracts in hand, and their various British and Colonial branch offices and agencies, are being taken over, as far as is practicable, by the new company. The offices of Messrs. Brown, Boveri & Company, Ltd., will be situated at Caxton House, Westminster, and Witting, Eborall & Company, Ltd., are also removing their offices from Temple Bar House to that building, where they will remain until such time as various outstanding matters connected with the settling up of their business affairs have been arranged. The English company will have the whole of the resources and experience of the Swiss company behind it, which is now a concern with a capital of £640,000, having works in Baden (Switzerland), Mannheim, Paris, Christiania and Milan, in which altogether over 5000 men, and about 500 engineers and officials are employed.

In connection with this statement, it may be interesting to state that Mr. Eborall was on the staff of Messrs. Brown, Boveri & Company, in Baden, for a considerable time about ten years ago. During the past seven years he has been connected with the firm of Witting, Eborall & Company, Ltd., and their predecessor, Witting Brothers, Ltd., during which time he has been instrumental in building up a business, which is now represented by about half a million pounds worth of machinery, operating in different parts of the world. It is almost needless to say anything regarding the firm of Brown, Boveri & Company, as their pioneer labor in high-pressure transmission work, and the development of the polyphase plant and apparatus is so well known. At the end of 1905, about 600,000 hp of Brown, Boveri turbine machinery was running in different countries, all of which was made at its own factories in Baden, near Zurich, Switzerland. One of the most important examples of their work is the new station at St. Denis, Paris, which will shortly have a capacity of 70,000 kw, the first four sets of which, each of 6000 kw, are already running. The capital of the English Brown, Boveri Company is £50,000.

The electrical equipment of the Hammersmith & City Railway is now approaching completion. The principal part of the work has been carried out by the Great Western Railway, which is thus the first main line entering London to make use of electric traction. The public in London has had some opportunity of estimating the advantages of electric traction since the steam service was replaced by electric trains on the District Railway and partially on the Metropolitan. On the latter, however, a large number of steam trains have continued to run into Moorgate Street, and this has prevented the full benefit of the transformation from being felt. As soon as the Great Western installation is in working order, all steam locomotives can be discarded and all trains can be run at the accelerated rate which can then be attained by electric trains on the Inner Circle. The full effect of the improved conditions will then be felt.

For this equipment the Great Western Railway Company has built its own power house at Park Royal. It contains eight sets of generators, each 750 kw at from 6300 to 6600 volts, built by the Electric Construction Company, of Wolverhampton, coupled direct to Beliss & Morcom triple expansion engine, running at 250 r. p. m., steam being furnished by ten Babcock & Wilcox boilers. Three sub-stations are provided, the motor generators being of the La Caur type, built by Bruce Peebles & Company, of Edinburgh. The whole work has been carried out to the specifications of Kennedy & Jenkins, of London.

At a meeting of the Swansea electric lighting committee, it was resolved to give formal notice to the tramways company to purchase that part of the tramways authorized by the act of 1880, viz., the Alexandra Road section to the docks, being the first section to fall in. The total cost of construction of the new tramways by the corporation, and upon which the rental to the tramways company is to be fixed, was reported at the same meeting to be £108,363 10s. 2d.

The Lancashire United Tramways Company has now commenced linking up their lines from Boothstown with those of the Salford Corporation. When these 2 miles are completed, Manchester and Liverpool will be connected by electric trams.

For some time there has been a yearly loss of £3,000 on the Corporation electric tramways at Lancaster, and there is a strong disposition in the town to lease the undertaking to an outside firm. One offer has been received from a Birmingham company. An alternative proposal was that the Corporation should buy up the horse car system to Morecambe, electrify it, and link it with the Lancaster system; but as the company which owns this system asked £3,000 for it more that the Corporation was disposed to give, the negotiations were abandoned. Another stage has now been reached. The Corporation has called in an expert tramway engineer to look into the whole matter, and in effect he advises the Corporation that the present system cannot pay unless it is extended, and the Lancaster to Morecambe line brought into it. In the end the recommendations of the tramways committee were adopted. These affirmed that the Council could not entertain the Birmingham offer to lease the Corporation tramways, but left it with the committee "to open negotiations with one or more responsible parties, agreeing on conditions, to their acquiring the undertaking of the Lancaster & District Tramways Company, Ltd." The resolution is so loosely worded that several members of the Town Council left the meeting not quite knowing what the Council were committed to.

The tramway committee of Edinburgh Town Council had before them, recently, a letter from Sir Alexander Kennedy, consulting engineer to the Corporation, informing the committee of a number of towns in England which might be visited for the purpose of seeing the various systems of electric traction, overhead, conduit, and surface contact, in operation. The committee decided to recommend the Council to appoint a deputation of seven to inspect the working of the electric tramways in five or six of the English towns. The committee also discussed the proposed agreement between the Edinburgh and Leith Corporations as to the laying down and working of tramway extensions to Granton. It is understood that considerable difference exists between the views of the city and Leith as to what may be regarded as a fair and equitable arrangement for the joint working of the lines. The town clerk of Edinburgh, however, is to have an interview with T. B. Laing, the town clerk of Leith, and after that has taken place the proposed agreement will be again considered by the respective Corporations.

The Parliamentary Commission who have recently been meeting in Glasgow under the chairmanship of the Duke of Argyll, had before them a provisional order promoted by the Glasgow & South-Western Railway Company, under clause 15, of which the company seek powers to run motor omnibuses in connection with their services for the conveyance of passengers and luggage. The clause was opposed by the Corporation of Glasgow, and other municipalities as setting up opposition to the tramway services. James Dalrymple, general manager of the Glasgow tramways, who gave evidence against the scheme, said that if power were given to the promoters and to the railway companies to run motor omnibuses, it would add seriously to the congestion of the street traffic. Cross-examined, he stated that the Corporation objected to the promoters' scheme altogether, because of the resulting opposition to the tramway cars. After hearing counsel, the chairman intimated that the commissioners had decided to disallow the clause.

A. C. S.

PARIS LETTER

(From Our Regular Correspondent.)

The period of labor troubles in France coincident with the month of May passed without effect in tramway and light railway circles, which apparently have not suffered. May and June are the months when annual meetings mostly take place and results are put before shareholders. This year no tales have been told other than continued prosperity or smaller losses than preceding years, according to the enterprise; 1905 was not marked by any great increase in the mileage of street railways in France, but several schemes were on paper and have been authorized. The labor troubles, however, have thrown the realization back to an extent, but the effect is but temporary.

The commission which is considering the question of reorganization of Paris transportation matters has not yet been able to arrive at any solution. Various propositions have been made and have been abandoned on account of opposition. There exists a tendency to divide the question into two parts, transport within and transport without the city. This method will not be acceptable to the operating companies, especially the Cie Générale des Omnibus. The latter company has received authority to

erect trolley lines outside the city over several of the existing steam lines now running from Paris to the suburban districts. This permission does not come too early, for some of the steam lines are keenly feeling the effects of competition with electric tramcars.

It was feared that the opening of the southern section of the Paris Metropolitan line No. 2, which runs pretty closely over a portion of the route occupied by the Tramway Sud in Paris, would seriously affect the earnings of the latter. It has been found, however, that such is not the case, and that for the summer at least the traveling public has not deserted the tramway for the railway, although the latter runs above ground for a considerable part of the distance. Yet the tramcar is convenient, and with a good service people are just as willing to take their turn for a tramcar, even at the expense of a little extra time. Within the tunnels of the Metropolitan Railway many a protest is heard against the state of ventilation. The line was not designed with regard to this problem, and experiments are still being made by the operating company to provide, at one or two stations at least, an efficient ventilating service. No great success, however, has attended these efforts, which have been confined mostly to the installation of electric fans or exhaust fans. Special ventilating shafts in the tunnels have not yet been seriously considered, apart from those existing in the stations themselves and afforded by the stairways.

The Nogentais Street Railway, which operates on the south and east of Paris, reports passengers carried during 1905, 24,400,000 for a distance of 4,206,970 car-km, or an increase of 580,000 pasengers and 130,863 car-km. The average receipts per kilometer of track amounted to fr. 42,500. The average receipts per car-km were fr. 72, and the operating ratio was 70.35 per cent. The Nogentais Company is one of the tramway concerns of Paris which has contracted for a supply of power from the new power station which is now under construction at Vitry, in which the units consist of 6000-kw Curtis turbo-generators. This station will probably be in service in a little over a year from date.

The Compagnie Générale de Railways et d'Eléctricité, one of the group of traction companies in which M. Empain is interested, and whose headquarters are in Brusels, has recently increased its capital from fifteen to twenty-five millions of francs. The price of the issue was 152 frs. 50, for a par value of 100 frs. This points to a very flourishing state of affairs.

The Compagnie Francaise Thomson-Houston which, with its associated companies, has a very important place in French traction affairs, reports the same dividend for 1905 as the previous year, viz., 5 per cent. Its report states that the organization of the transport problem within Paris is being keenly followed, and the company has taken a financial interest in all the three large traction companies which will be called upon to carry out the terms of the reorganization which will be made. The report also states that new works will be erected to undertake the construction of Curtis turbines, for which orders amounting to 32,100 kw have been received to date, a 30 per cent increase over the 1904 figures. Important orders for traction work have been received from the Paris Metropolitan, the Tramway Sud and the Tunis Tramways. The company is also supplying the electrical equipment of the new turbine station at Vitry.

The French Senate passed a law on June 12, some of the clauses of which deal directly with the sale of electric power within Paris. Although the new law will primarily affect the lighting industries of Paris, whose concessions are expiring, yet the clauses practically preclude the exploitation by the municipality of electric enterprises. The ultimate result will doubtless be the more general enlistment of private capital and use of electricity within the city limits both for lighting and traction.

The French Government is pledged to bring up for early discussion a bill tending to repurchase the steam railways of France, regarding which periodical discussion arises. The government has a large majority, and it seems that there is a good chance of seeing some such law pass soon for the purchase of the Ouest and possibly the Orleans railways.

BROOKLYNITES ORGANIZE NEW COMPANY TO BUILD ON LONG ISLAND

Prominent Brooklynites and several of the directors of the Brooklyn Rapid Transit Company are among the incorporators of the Suffolk County Traction Company, capitalized at $1,200,000. The plan of the company is to construct a street surface railroad 28 miles long, between the town of Brookhaven and the village of Babylon, running through Brookhaven, Bellport, Patchogue, Blue Point, Bayport, Sayville and Islip. The directors are Clinton L. Rossiter, D. H. Valentine, Henry Seibert, William F. Sheehan and T. L. Hughes, of Brooklyn; Charles A. Collin, New York; W. H. Jaycox, M. C. Wiggins, G. G. Rose, of Patchogue, and Benjamin H. Wood, of Babylon. Messrs. Seibert and Valentine are directors of the Brooklyn Rapid Transit Company, Mr. Rossiter is a former president of that company, and Messrs. Sheehan and Collin, as members of the firm of Sheehan & Collin, recently dissolved, were for many years counsel for the road.

SPECIAL TRANSIT BODIES APPOINTED IN NEW YORK

The appellate division of the Supreme Court has appointed two sets of Commissioners who are to hold hearings and report to the court whether two rapid transit roads or extensions of the rapid transit system, as approved by the Board of Rapid Transit Commissioners, shall be constructed and operated or not. One of these is known as the White Plains Road route, and the other as the Jerome Avenue subway. The Commissioners appointed to report upon the White Plains Road route are: William W. Niles, Edward H. Healy and Edward R. Finch. Those who are to report on the Jerome Avenue subway are: Charles P. Dillon, Rudolph Bloch and Edward J. McGean.

The White Plains Road route is practically an extension of the present rapid transit elevated viaduct going to West Farms. It is to begin at 177th Street and West Farms Road, near Bronx Park, whence a three-track elevated structure is planned to run along the West Farms Road, Morris Park Avenue and White Plains Road to its intersection with East 241st Street, which is the boundry of Mount Vernon. The Jerome Avenue subway consists, in the first place, of a four-track subway running under Jerome Avenue from about 164th Street to the junction with Woodlawn Road, opposite Woodlawn Cemetery. From the south end of said line, also, two connections are provided, with railways in Manhattan. The first is a three-track connection leading to the bridge over the Harlem River belonging to the Putnam division of the New York Central & Hudson River Railroad Company. The other is a two-track subway passing under the Harlem River to a point in Eighth Avenue near 154th Street so as to connect with a subway to be hereafter constructed under that avenue. A third spur is planned to connect with 153d Street, near Cromwell Avenue, so as to afford a junction with the proposed Lexington Avenue subway.

ST. LOUIS & SUBURBAN SECURED BY NORTH AMERICAN COMPANY

The St. Louis & Suburban Railway Company, with its constituent properties, the St. Louis & Meramec River Railroad Company, the St. Louis & Kirkwood Railroad Company, and the Brentwood, Clayton & St. Louis Railroad Company, will pass to the control of the United Railways Company, which is controlled by the North American Company. The basis of the transaction is that each share of Suburban stock will be exchanged for one share of United Railways preferred. The United Railways stock which will be thus acquired will be without dividends for eighteen months. The reason for the ex-dividend specification is that the money obtained in this manner will be needed to connect up the Suburban tracks in the city and the county with tracks of the United Railways lines and to make necessary improvements.

When the United Railways Company acquires control of the Suburban a policy of managerial economy will be applied. The operation of suburban and interurban cars will be changed in such a way as to dispense with unnecessary accommodations, and the service between the city and the county—that is, in the suburbs—will be improved. County lines will be connected up and practically a new suburban and interurban service will be established. The announcement of the basis of the transfer of the suburban properties has been made in order to give stockholders who are not in the Suburban pool a chance to get the same price for their holdings as stockholders who are in the pool. When the negotiations are concluded, a formal announcement of the transaction and the plans will likely be made. The St. Louis & Suburban Railway Company was incorporated in 1892 under the laws of Missouri, as a reorganization of the St. Louis Cable & Western, which was sold at foreclosure in 1890. It comprises the St. Louis & Suburban Railway, the St. Louis & Meramec River Railroad, the St. Louis & Kirkwood Railroad, and the Brentwood, Clayton & St. Louis Railroad. There are 120 miles of track in the city and county of St. Louis.

CHICAGO TRACTION MATTERS

The work of electrifying the electric and cable railway lines of the Chicago Union Traction Company inside the loop district is progressing rapidly. The wire is up on Adams Street as far as State Street, and the electric cars which were formerly hauled from South Fifth Avenue to State Street by horses are now carried to the end of the line by electricity.

The poles for the overhead construction on Dearborn Street have been distributed and are fast being set.

As announced briefly in the last issue of the Street Railway Journal, bids have been advertised by the Chicago Union Traction Company, for the lowering of the tunnels under the Chicago River. These bids are to be opened in the office of W. G. Gurley, counsel for the company, on July 5. The bids were "for lowering and making changes in Van Buren Street tunnel, under the south branch of the Chicago River; also for the building of a new roof over the river section of the tunnel under the south branch of the Chicago River at Washington Street; also for the building of a new roof of the tunnel under the Chicago River at La Salle Street." The advertisements stated that bidders must be prepared to commence work immediately on acceptance of their bids, or at such time within 90 days after acceptance as the chief engineer directed.

A report on street railway casualties in Chicago has been prepared by Maurice F. Doty, traction expert for Mayor Dunne. A summary of the report is as follows:

During fifty days fifty-two accidents occurred, 107 persons were injured, including twenty-one persons killed outright or died within a few days. Others are not expected to live.

The following conditions were in whole or in part the cause:

1. Crowded cars in seven cases particularly and in the majority of cases generally.
2. High fenders in eleven cases.
3. High or no wheel guards in seventeen cases.
4. Stepped on or off moving car, usually backwards, in twenty-one cases.
5. Flipping cars in three cases.
6. Faulty brakes in four cases.
7. Knocked off wagon in eight cases.
8. Ran into car in fourteen cases.
9. Collision in six cases.
10. Low platform in one case and probably in two other cases.
11. Rolled between the big wide cars in two cases.
12. Cars jumped track in three cases, owing to poor track.
13. Trolley pole broke in two cases.
14. Slippery rails in three cases.
15. Lack of coil springs between motor and trailer, presence of which might prevent some of the trailer accidents.
16. Rough, uneven, and crooked tracks.

Mayor Dunne in commenting on the report, said:

"It is astounding to think of the loss of life through the seeming carelessness or negligence of the street railway companies of Chicago. Think of it—twenty-one people killed in fifty days! Dr. Doty's report amazed me. It was almost unbelievable. But he seems to have the facts, and they speak for themselves.

"I recently read a report which showed that in Liverpool, which is a very large city, there were three people killed by street cars in eighteen months. If Liverpool makes a record like that in a year and a half, and Chicago kills twenty-one people in less than two months, it is time to make a searching investigation."

It is reported that the street railway corporations are preparing to combat the charges of responsibility for the accidents. The officials claim that nearly all of the accidents are due to carelessness on the part of the victims.

In a report to the committee of the City Council, of Chicago, made Monday, July 2, by B. J. Arnold, traction expert, and approved by Walter J. Fisher, the Mayor's special adviser in traction matters, downtown subways to aid in making a model street car system for Chicago are advocated. Through routes and universal transfers are insisted on. Mr. Arnold believes the old river tunnels, doomed to removal by the War Department, should be retained as part of the subway system. He estimates the cost of construction of the subways at $4,800,000.

IMPORTANT SOUTHERN PROJECT

The Roberts & Abbott Company, of Cleveland, has closed the contract for the engineering work for one of the most extensive interurban freight lines ever built in this country, and the largest interurban proposition in the South. The road will extend from Gadsden to Tuskaloosa, Ala., by way of Birmingham. The contracts were closed last week in Washington, where E. P. Roberts, president of the Roberts & Abbott Company, met J. M. Dewberry, president of the Tidewater Development Company, which is back of the railway project. The main line and sidings will include about 139 miles of track. The road will be essentially a freight line, and has for its object an independent freight route to the sea. Connecting with the Warrior River at Tuskaloosa, it is stated that the line will not only give the business interests of Birmingham the advantages of interurban passenger and freight service, but place the advantages of the river at the disposal of the mining and manufacturing interests of the district. The final surveys for the line will be made immediately. W. H. Searls, a prominent steam road engineer, will represent the Roberts & Abbott Company in the field and will have charge of a force of forty field men.

ANNUAL REPORT OF THE LISBON ELECTRIC TRAMWAYS

In London, on June 13, the directors of the Lisbon Electric Tramways, Ltd., of Lisbon, Portugal, presented the sixth annual report covering the company's business for the year ending Dec. 31, 1905. After deducting interest and amortisation, due on the debentures of "Companhia Carris de Ferro de Lisbon," and after the payment of $121,500 for interest on the debentures of this company, and the payment of London office expenses and directors' renumeration, the net profit was $445,867. As a balance of $78,475 was brought forward from last year the total balance was $524,341. From the last amount $170,100 has been placed to depreciation and $24,300 to the credit of exchange reserve account. Out of the surplus remaining a 6 per cent dividend will be paid on the preferred stock, and the directors have also recommended a 5 per cent dividend on the common stock.

During the year 40,065,125 passengers were carried, about 5½ miles added to the system, and many additions were made to the rolling stock and power house.

NEW PUBLICATIONS

Manual of Statistics for 1906. The Manual of Statistics Company, New York. 1056 pages. Price, $5.

This is the twenty-eighth annual issue of this publication, and contains, as usual, information in regard to railroad and industrial corporations, the quotations for securities in the New York, Boston, Chicago, Philadelphia and other markets, and complete statistics relative to cotton and grain, together with a comprehensive directory of banks at leading cities.

Single-Phase Commutator Motors. By Franklin Punga, translated from the German by R. F. Loser. London, Whittaker & Company. New York, The Macmillan Company. Cloth; 187 pages. Price, $1.75.

Moteurs a Collecteur a Courants Alternative. By Dr. F. Niethammer, Paris. Paper; 129 pages. Price Fr. 5.

The attention given commercially to the single-phase motor for railway purposes has created a demand for treatises on the subject like the above. A discussion on the single-phase motor is necessarily largely made up of a discussion on the sparking trouble, so that it is not surprising that both of these books should be devoted to a considerable extent to a consideration of the reasons for sparking and its remedy. The book by Mr. Punga also takes up the details of the design of the single-phase series and repulsion motors, while a considerable part of Dr. Niethaunner's work considers the construction of commercial motors and methods of control.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JUNE 26, 1906

824,118. Track-Sanding Device for Street Railway Cars; Denis Hogan, Denver, Col. App. filed March 23, 1906. In case of emergency the shutting off of the power automatically opens the sand discharge valves.

824,183. Track Clearer; William E. Knowlton, Portland, Me.

App. filed Feb. 20, 1905. A device for removing ice from street railways tracks, consisting of a series of pivoted discs set at an acute angle to the line of motion of the car and adapted to roll on the ice.

824,188. Removable Car for Railways, etc.; Philip J. Mitten, Milwaukee, Wis. App. filed Sept. 25, 1905. Details of construction of a repair car.

824,201. Trolley for Railway Vehicles; John D. Paton, Edgewood Park, Pa. App. filed June 28, 1905. A trolley for high-speed railways having a horizontal conductor, spring supported by a frame or trellis capable of yielding in a downward direction. The horizontal bar has certain link connections with the trellis whereby it maintains a horizontal position in use.

824,209. Railway Car; Myron Rounds, Boston, Mass. App. filed Jan. 12, 1906. A vestibule car in which the opening of the car door lowers a step, which is again raised by the closing of the door.

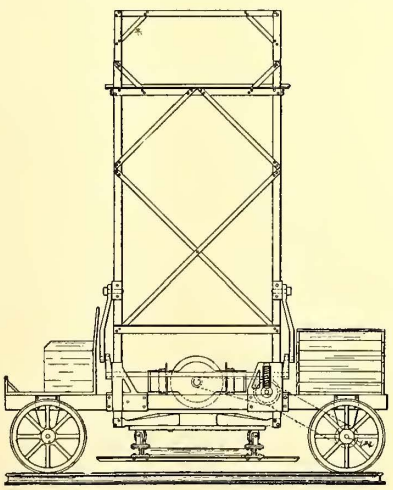
824,271. Portable Railway Cross-Over Switch; John B. Aldrich and Arbia L. Aldrich, Endicott, N. Y. App. filed April 9, 1906. A track section composed of rails of higher cross-section than ordinary rails, switch points for the ends of the sections having their upper sides inclosed and cross-over sections recessed in and detachably connected to the opposing ends of the first-mentioned sections where the latter are approximate to the inner track rails, and bearing on the heads of the inner track rails.

824,314. Electric Locomotive and Means for Controlling the Same; Frank L. Sessions, Columbus, Ohio. App. filed Aug. 6, 1903. A mining locomotive having a flexible cable which unwinds from a reel behind the car. Provides a stationary device at a point remote from the car for reversing the electric current passing through more or less of the flexible conductor sections and through one element of the motor.

824,393. Passenger Car; Henry F. Vogel, St. Louis, Mo. App. filed Feb. 8. 1906. The car seats are mounted upon revolving pedestals which themselves have a limited movement through their connection to the floor, thereby permitting adjustment by the passengers to suit their convenience.

824,467. Car Brake; Henry B. Burke, Windber, Pa. App. filed Feb. 20, 1906. Details of construction.

824,519. Car Fender; Mathias Wick, New York, N. Y. App. filed Aug. 5, 1905. Comprises a guard consisting of a series of pivoted frames, certain of which comprise a pair of bars telescopically connected together, a spring in the outer telescoping bar for forcing the inner bar in an outward direction, and means for connecting the inner bar with the stationary portion of the device for preventing the springs from acting beyond a certain point, and for retracting the inner bar when the frames move beyond a certain point.



PATENT NO. 824,188

824,541. Car Fender; Charles Hager and Thomas D. Finzie, New York, N. Y. App. filed April 10, 1906. A side fender which is hinged to the body of the car outside of the wheels.

824,542. Car Fender; Charles Hager and Thomas D. Finzie, New York, N. Y. App. filed April 10, 1906. Comprises a reticulated sheet-steel plate and a reticulated supplemental portion hinged thereto.

824,580. Signaling Device; Charles C. Phillips, Owensboro, Ky. App. filed March 29, 1906. Tappets adjacent to the track rail and specially constructed semaphore signals which are arranged to be mechanically moved to one position by the tappets and tripped to the reverse position by an electromagnet.

824,611. Trolley Keeper; Benjamin C. Bartlebaugh, Benwood, W. Va. App. filed Sept. 12. A spring guard mounted on the trolley harp and adapted to overlie the conductor and keep the wheel in place. The guard is displaced in passing hangers, etc., and may be displaced by a cord connection when it is desired to remove or replace the wheel upon the wire.

824,625. Rail-Bond; John P. Clark, Ypsilanti, Mich. App. filed Oct. 23, 1905. A rail-bond having a terminal provided with a piece of wire-cloth on its under side which is extended laterally beyond the sides of the terminals.

824,629. System of Control for Electric Motors; William T. Dean and Rudolph Tschentscher, Chicago, Ill. App. filed Nov. 2, 1905. A multiple unit control system having only two wires for connection between the cars for the pilto circuit.

824,649. Railway Cross-Tie; Luphfer I. Hart, Vanatta, Ohio. App. filed April 25, 1906. Consists of a wooden core surrounded wholly by a cement body.

PERSONAL MENTION

MR. JAMES B. McQUEENEY has been appointed general freight agent of the Brooklyn Rapid Transit Company.

MR. L. M. LEVINSON, manager of the Shreveport Traction Company, was on June 8 elected to the directory and secretaryship of the company. No other change was made in the directory.

MR. LORENZO BENTLEY has resigned as superintendent of the New London & East Lynne Street Railway Company, of New London, Conn. Mr. Judson S. Cousins has been appointed to succeed Mr. Bentley.

MR. LOUIS CASSIER, of New York, publisher of "Cassier's Magazine" and the "Electrical Age," was one of the unfortunate victims of the appalling railroad disaster on the London & Southwestern Railroad on Sunday, July 1.

MR. J. A. GIBSON, for six years local manager of the Meridian Light & Railway Company, of Meridian, Miss., has been appointed to the position of second vice-president of that corporation, and will be succeeded as manager by Mr. L. B. Patterson.

MR. J. EDWARDS WOODBRIDGE, of the British Thomson-Houston Company, was married June 19, at Rugby, England. Mr. Woodbridge was formerly with the General Electric Company, of Schenectady, and previously for several years was editor of the "American Electrician."

MR. HERBERT McNULTA, of Chicago, has been appointed chief engineer for the Cincinnati Traction Company, Cincinnati, Ohio. Mr. McNulta is a graduate of the United States Naval Academy, has had a wide experience in mechanical and electrical engineering, as applied to railway work.

MR. PAUL K. CLYMER, who for a number of years has been one of the directors of the Ithaca Street Railway Company and its subsidiary branches, the Cayuga Lake Road, the Ithaca & Cayuga Heights lines and the Brush Swan Electric Light Company, of Ithaca, N. Y., has resigned from these companies.

MR. JILSON J. COLEMAN, of New York, has just accepted an offer from the Murphy Varnish Company, of Newark, to become connected with the sales department of that company. The Murphy Varnish Company has never attempted to do very much business with the electric roads, but this appointment indicates that it will now actively enter the street railway field.

MR. B. H. FISHER, chief engineer of the North Shore Railroad, of California, is dead. Mr. Fisher was a graduate of Cornell University, and was well known on the Pacific Coast, having been connected with the Atchison, Topeka & Santa Fe Railway, Albuquerque Electric, Water & Gas Works, Oakland-Alameda Belt Railway, and the North Shore Railroad.

MR. EDWARD C. BOYNTON has been appointed representative in the East of the W. T. Van Dorn Company, of Chicago, and will shortly make a trip through the New England States and Canada in the interests of the Van Dorn couplers. Mr. Boynton was for a number of years electrical engineer of the New York, New Haven & Hartford Railroad Company, and under his supervision the original third-rail lines at Nantasket, Mass., and New Britain, Conn., were installed. Following this connection, Mr. Boynton was for a number of years in the air brake engineering department of the National Electric Company, and has lately been engaged on some special work in connection with Mr. Albert B. Herrick.

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. ‡ Report since opening of road March 17, 1906.

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., May '06	84,469	45 913	38,556	22,666	15,889
	1 " " '05	78,587	40,792	37,795	22,917	14,878
	5 " " '06	368,072	208,578	159,494	113,334	46,160
	5 " " '05	340,315	191,077	149,239	114,585	34,655
BINGHAMTON, N. Y.						
Binghamton Ry. Co	1 m., May '06	24,741	12,430	12,311	7,432	4,879
	1 " " '05	23,277	10,985	12,292	7,188	5,103
	11 " " '06	261,691	136,743	124,949	80,367	44,581
	11 " " '05	234,907	124,909	109,998	77,285	32,714
CHAMPAIGN, ILL.						
Illinois Traction Co	1 m., May '06	226,529	*127,406	99,123	------	------
	1 " " '05	187,120	*104,924	82,196	------	------
	5 " " '06	1,107,295	*633,095	474,200	------	------
	5 " " '05	905,631	*506,264	399,367	------	------
CHARLESTON, S. C.						
Charleston Cons. Ry. Gas & Elec. Co	1 m., May '06	52.879	32.649	20,230	12,967	7,263
	1 " " '05	50,016	29,241	20,775	12,917	7,858
	3 " " '06	154,875	96,000	58,875	38.901	19,974
	3 " " '05	142,981	86,730	56,251	38,750	17,501
CHICAGO, ILL.						
Aurora, Elgin & Chicago Ry. Co	1 m., Apr. '06	89,981	51,749	38,232	24,939	13,293
	1 " " '05	79,568	47.414	32,454	24,919	7,535
Chicago & Milwaukee Elec. R. R. Co	1 m., May '06	69,813	26,445	43,368	------	------
	1 " " '05	44,213	20,557	23,655	-----	------
	5 " " '06	247,318	116,538	130,779	------	------
	5 " " 05	158,756	81,751	77,005	------	------
CLEVELAND, O.						
Cleveland, Painesville & Eastern R.R. Co	1 m., May '06	23 190	*12,152	11,038	------	------
	1 " " '05	20,681	*11 463	9,218	------	------
	5 " " '06	86,630	*51,855	34,775	------	------
	5 " " '05	75,475	*49,946	25,529	------	------
Cleveland & Southwestern Traction Co.	1 m., May '06	47,028	26,253	20,775	------	------
	1 " " '05	54,219	30,202	24,017	------	------
	5 " " '06	188,818	121,963	66,855	------	------
	5 " " '05	230,219	141,383	88,837	------	------
Lake Shore Electric	1 m., Apr. '06	63,685	*37,786	25,899	20,404	5,495
	1 " " '05	54,734	*32,653	22,081	20,404	1,677
	4 " " '06	228,900	*138,477	90 423	81,616	8,806
	4 " " '05	200,584	*128,424	72,160	81,616	†9,456
DETROIT, MICH.						
Detroit United Ry	1 m., May '06	566.055	*314,373	191,682	105,478	86,204
	1 " " '05	433,734	*251,917	181.817	92,806	89,011
	5 " " '06	2,222,940	*1354612	868,328	499,447	368,881
	5 " " '05	1,884,455	*1167493	716,962	460,559	256,403
DULUTH, MINN.						
Duluth St. Ry. Co	1 m., Apr. '06	62,181	31,841	30,339	17,524	12,815
	1 " " '05	52,878	27,798	25.080	16,754	8,325
	4 " " '06	225,355	129,190	96,165	70,007	26,158
	4 " " '05	194,785	110,258	84,527	66,942	17,585
EAST ST. LOUIS, ILL.						
East St. Louis & Suburban Co	1 m., Apr. '06	114,439	60,195	54,244	------	------
	1 " " '05	111,024	50,546	60,478	------	------
	4 " " '06	349,652	194,433	155,219	------	------
	4 " " '05	328,762	160,798	167,804	------	------
FT. WAYNE, IND.						
Ft. Wayne & Wabash Valley Tr. Co	1 m., Apr. '06	79,543	50,947	28,595	------	------
	1 " " '05	68,509	42,834	25,675	------	------
	4 " " '06	311.631	194,680	116,951	------	------
	4 " " '05	266,597	168,230	98,367	------	------
FT. WORTH, TEX,						
Northern Texas Tr. Co	1 m., Mar. '06	64,738	39,826	24,911	9,942	14,970
	1 " " '05	53,689	31,221	22,468	9,938	12,531
	12 " " '06	694,654	419,063	275,591	120,429	155 162
	12 " " '05	581,717	336,173	245,544	110,908	134,636
GREENSBURG, PA.						
Pittsburg, McKeesport & Greensburg Ry. Co.	1 m., May '06	19,178	7.122	12,056	4,442	7,614
	1 " " 05	16,616	8,191	8,425	------	------
	5 " " '06	73,685	34,370	39 315	23,359	15,956
	5 " " '05	60,204	30,803	29,401	------	------
HANCOCK, MICH.						
Houghton County St. Ry. Co	1 m., Apr. '06	17,966	*11,647	6,318	3,937	2,382
	1 " " '05	2,056	*25,985	†23,929	3,615	†27,544
	12 " " '06	198,460	*144,527	53,933	45.303	8,630
	12 " " '05	173,308	*160,148	13,160	41,280	†28,120
HARRISBURG, Pa.						
Central Penn Trac. Co.	1 m., May '06	57,357	48,977	8,380	------	------
	1 " " '05	50,636	40,855	9,781	------	------
	5 " " '06	254,748	236 360	18,388	------	------
	5 " " '05	210,806	193,118	11,688	------	------
HOUSTON, TEX.						
Houston Electric Co.	1 m., Apr. '06	47,173	*30,811	16,362	7,692	8,670
	1 " " '05	40,377	*25,311	15,066	8,713	6,354
	12 " " '06	546,457	*339,441	207,016	102,547	104,469
	12 " " '05	385,828	*325,441	60,387	99,801	†39,414
JACKSON, MICH.						
Jackson Cons. Tr. Co.	1 m., May '06	12 170	7,371	4,799	2,879	1,920
	1 " " '05	9,935	5,863	4,072	2,687	1,385
	5 " " '06	51,377	------	------	------	------
	5 " " '05	41,321	------	------	------	------
LEECHBURG, PA.						
Pittsburg & Allegheny Valley Ry. Co	1 m.,‡Apr.'06	6,527	2,556	3 971	3,125	846
MANILA, P. I.						
Manila Elec. R. R. & Lt. Co., Railway Dept	1 m., May '06	44,000	22,250	21,750	------	------
	5 " " '06	218,830	109,485	109,346	------	------
	1 " " 06	72,000	37,650	34,350	------	------
Total, all depts	5 " " '06	366,286	186,678	179,609	------	------
MILWAUKEE, WIS.						
Milwaukee El. Ry. & Lt. Co	1 m., May '06	284,199	153,428	131,070	89,719	41.351
	1 " " '05	268,334	133,285	135,049	77,089	57,960
	5 " " '06	1,370,866	693,811	677,055	437.411	239,645
	5 " " '05	1,270,836	649,117	621,719	371,708	250,011
Milwaukee Lt., Ht. & Tr. Co	1 m., May '06	50,167	22,068	28,099	25.454	2,645
	1 " " '05	47,398	21,166	26,232	20,435	5.798
	5 " " '06	227,490	98,585	128,905	117,954	10,951
	5 " " '05	201,661	99,840	101,821	96,34-	5,480
MINNEAPOLIS, MINN.						
Twin City R. T. Co	1 m., May '06	448,104	209.263	238,841	110,592	128,249
	1 " " '05	389,425	172,504	216.921	97,208	119,712
	5 " " '06	2,070,018	998,838	1,071,180	549,425	521,755
	5 " " '05	1,778,942	861,674	917,268	486,508	430,760
MONTREAL, CAN.						
Montreal St. Ry. Co	1 m., May '06	264,252	149,074	115,178	47,236	67,942
	1 " " '05	236,399	134,693	101,706	28,749	72,958
	8 " " '06	1,906,190	1,214,359	691,832	266,975	424,857
	8 " " '05	1,675,791	1,120,927	554,865	169,654	385,211
NEWBURGH, N. Y.						
Orange Co. Trac. Co	1 m., May '06	11,726	7,552	4 174	------	------
	1 " " '05	11,445	6,789	4,656	------	------
	5 " " '06	43,898	34,793	9,105	------	------
	5 " " '05	39,016	31,651	7,365	------	------
NEW ORLEANS, LA.						
New Orleans Ry. & Lt. Co	1 m., May '06	470,901	261,047	209,854	154,806	55,048
	5 " " '06	2,452,810	1,279,149	1,173,661	761,481	412,180
OAKLAND, CAL.						
Oakland Trac. Con	1 m., Apr. '06	151,525	67,817	83,709	35,678	48,030
	1 " " '05	122,247	57,003	65,243	------	------
OLEAN, N. Y.						
Olean St. Ry. Co	1 m., Apr. '06	9,921	4,658	5,262	2,768	2,495
	1 " " '05	10,935	6,487	4,448	2,968	1,480
	10 " " '06	104,603	52,092	52,511	26,879	25,632
	10 " " '05	94,340	48,079	46,261	26,868	19,393
PHILADELPHIA, PA.						
American Rys. Co	1 m., May '06	225,648	------	------	------	------
	1 " " '05	211,210	------	------	------	------
	11 " " '06	1,852,720	------	------	------	------
	11 " " '05	1,750,256	------	------	------	------
ST. LOUIS, MO.						
United Railways Co. of St. Louis	1 m., May '06	805,183	*490,367	314,816	198,026	116,790
	1 " " '05	757,481	*475,566	281,915	198,954	82,961
	5 " " '06	3,608,865	*2240428	1,368,437	991,296	377,141
	5 " " '05	3,299,987	*2248051	1,051,936	996,497	55,439
SAVANNAH, GA.						
Savannah Electric Co.	1 m., Apr. '06	49,872	*29,982	19 891	10,978	8,913
	1 " " '05	46,333	*26,521	19,811	10,554	9,257
	12 " " '06	607,130	*366,706	240,424	129,169	116,256
	12 " " '05	557,209	*320,882	236,327	127,247	109,080
SEATTLE, WASH.						
Seattle Electric Co	1 m., Apr. '06	231,492	*153.058	78,434	27,076	51,359
	1 " " '05	203,425	*144,124	59,301	24,765	34,536
	12 " " '06	2,704,362	*1743138	961,224	297,099	664,125
	12 " " '05	2,367,280	*1633666	733,614	299,948	433,666
SYRACUSE, N. Y.						
Syracuse R. T. Co	1 m., May '06	87,628	50,724	36,904	23,257	13,647
	1 " " '05	77,590	45,521	32,069	20,386	11,683
	5 " " '06	428,125	244,315	183,810	112 400	71,410
	5 " " '05	373,268	219,781	153,487	101,952	51,535
TERRE HAUTE, IND.						
Terre Haute Tr. & Lt. Co	1 m., Apr. '06	61,133	*35,567	25,566	13,011	12,555
	1 " " '05	46,761	*34,779	11,982	8,744	3,238
	12 " " '06	683,996	*435,984	248,012	134,898	113,114
	12 " " '05	583,446	*374,229	209,217	113,049	96,168
TOLEDO, O.						
Toledo Rys. & Lt. Co	1 m., Apr. '06	156,396	*83,623	72,773	42,213	30,560
	1 " " '05	147,159	*79,153	68,006	41,765	26,241
	4 " " '06	616,543	*326,639	289,904	169,208	120,696
	4 " " '05	578,074	*300,148	277,926	170,149	107,777