Street Railway Journal

VOL. XXX. NEW YORK, SATURDAY, DECEMBER 21, 1907. No. 25

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

James H. McGraw, Pres. Curtis E. Whittlesey, Sec. & Treas.

MAIN OFFICE:
NEW YORK, 239 WEST THIRTY-NINTH STREET.

BRANCH OFFICES:
Chicago: Old Colony Building.
Philadelphia: Real Estate Trust Building.
Cleveland: Schofield Building.
San Francisco: Atlas Building.
London: Hastings House, Norfolk St., Strand.

Cable Address, "Stryjourn, New York"; "Stryjourn, London"—Lieber's Code used.

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Mexico and the Canal Zone:

Street Railway Journal (52 issues).....$3.00 per annum
Single copies .....10 cents
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—Feb., Aug. and Nov.).....$4.00 per annum
Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

To Dominion of Canada:

Street Railway Journal (52 issues), postage prepaid.....$4.50 per annum
Single copies .....10 cents

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid.....$6.00
25 shillings. 25 marks. 31 francs.
Single copies .....20 cents

Remittances for foreign subscriptions may be made through our European office.

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Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1907 *to date,* 419,250 *copies, an average of* 8220 *copies per week.*

Preserving Construction Records

It ought not to be necessary in these days to urge the importance of preserving construction records in proper shape for future reference, but the frequent absence of such data in projects where extensions or alterations of existing plants are planned justifies further reference to the matter. The trouble is not so much that figures of construction progress and cost are not kept at the time the work is under way, as that they tend to disappear after the contracts are paid, or fail to show the information peculiar to special conditions. In very large engineering undertakings, and especially in electric railway construction work, these special conditions are almost always present, and if the costs and data are properly brought together and then filed for convenient reference they are certain to be highly valuable when wanted in future estimates and comparisons.

In the stress and hurry of starting operations on a new line it is difficult to take the time to make these notes, but as some particular engineer on the work is always specially acquainted with the exceptional circumstances a little forethought will preserve the data in sufficiently complete form to enable deductions to be drawn from it in the future. The cost of excavating power house foundations may be double the usual expense, for example, because of the existence in a special case of sunken wharf timbers or parts of old piles; the cost of building a certain thousand feet of track may be as great as the expense of the balance of the mile on account of insecure ground; or the cost of building a sub-station in an out of the way spot may be much increased over the normal, on account of the remoteness from the skilled labor market. All such cases need the qualification of special circumstances when costs per kilowatt, per foot of area or length are considered, and unless the data are completed at the time construction is ended, there is usually small chance that the future will witness the bringing of the notes up to date.

Battery Houses and Battery Practice

Upon looking over many of the storage battery buildings in use to-day, one is led to wonder why the design of the structures housing this valued adjunct of electric railways should be so often neglected. A battery house, as a matter of course, should be well lighted and liberally ventilated. Although the attendant may be in the building only for a few minutes at a time every day, he should not be encouraged to neglect his duties by being obliged to work in darkness and in an atmosphere filled with the throat-tickling and eye-smarting vapor of the battery chemicals. What likelihood is there of a battery receiving proper care when it is installed in a cellar, as is actually the case in certain installations? Proper ventilation is one of the most important factors in keeping a battery in the best condition. When the natural airing secured by louvres proves ineffective on account of atmospheric and temperature conditions, good ventilation can be secured by operating fans to remove the fumes.

Concerning the care of the battery itself, one may mention the extensive use of both rubber and glass covers to protect the electrolyte from the deposition of foreign matter and to reduce the evaporation. A special condition, such as the presence of iron particles in the air, is enough to make such protection advisable, but it is also worth the

trouble in cases where the amount of evaporation or spraying is liable to be excessive. This is true in the case of large batteries, which are subject to heavy peak discharges each day followed by a corresponding continuous charge. It is during the latter period that the greatest amount of evaporation and spraying takes place, and the loss of electrolyte may be considerably reduced by covers. This reduction not only saves considerable expense in labor for refilling with water from time to time and supplying additional acid to make up for that which is carried off in the spray, but it also tends to prevent excessive corrosion of any iron work and preserves the insulation between the tanks and the ground. If the battery room is filled with acid spray, it is apt to settle on the insulators and impair the insulation, and it may also settle on and deteriorate the woodwork of the tanks.

Where a small battery is used merely for charge and discharge to regulate a rapidly fluctuating load, and is not doing any appreciable amount of peak work, the amount of charging is much less and the beneficial effect of the covers is not nearly so marked. In many such plants, covers are not advisable, as they add somewhat to the difficulty of inspection and of taking proper gravity readings in the different cells.

It should be remembered that no one has better opportunities to study battery house design and operation than the battery manufacturer. Power engineers would do well, therefore, to take advantage of this fact whenever the question of a battery installation presents itself. The makers of storage batteries naturally desire to see their product used under the most effective conditions and through their special experience they can be relied upon to be of material assistance in the solution of battery house problems.

The Cost of Electric Freight Service

One of the most difficult problems in steam railroading is to determine the relative cost of passenger and freight service. In some quarters it is considered useless to attempt to solve this question, for the complications are almost unlimited. The same question is coming up with reference to electric express service, but fortunately the limitations are fewer in these cases. Few roads have as yet settled the cost of their freight and express service in any standard way, but certain items are of fundamental importance on all systems which attempt to determine the actual profit of their merchandise business. A sound sense of proportion will count heavily in the accuracy of this important work.

Few managers of electric railway properties are so shortsighted as to believe that their freight and express service costs practically nothing. The considerations of power, wages of express-car crews and possibly of clerks, repairs of merchandise cars and motors, and special advertising, are clearly legitimate charges on the freight traffic. Compared with the total operating cost of the road, these totals are generally almost insignificant percentages in large systems on which scores and perhaps hundreds of passenger cars are run. The proportions of these expenses are important in so far as they show what items can be roughly estimated and what lumped together as an aggregate of small costs; but the real question is whether the charges and volume of traffic are sufficient to clear a good profit on the service rendered, regardless of whether the total cost of freight and express service is a large or small percentage of the total operating charges of the road. It is doubtless true that in the passenger end of the business, particularly in city systems, the lines of heavy traffic often pay a profit on routes which, in themselves, are poor revenue producers; but this is no reason why an electric road should maintain an unprofitable express service on the proceeds of its passenger business.

One of the great difficulties in estimating the cost of trolley freight service all told, is the selection of a perfectly satisfactory unit of comparison. Cost per ton-mile is well worth knowing, but in proportioning the fixed charges and operating expenses, common to both the passenger and freight service, one cannot secure much of a comparison on this basis. The different classes of freight in force complicate the problem still further, but if the car-mileage records and the weights of merchandise transported are kept carefully, and if the charges and bills are properly filed in the office, a good idea of the operating cost on the unit basis of weight can be secured; we must go farther afield, however, to prorate the items of line repairs, roadway and track maintenance, general expenses, power cost (unless wattmeters are used on the cars), taxes, interest, depreciation, sinking fund, telephone and other office expenses. Insurance, legal expenses, accidents, repairs of buildings, provender and stabling, tolls for trackage rights, removal of snow and ice, and rentals of buildings must all be considered. Some of these items are proportional to the freight equipment investment, but others can only be figured on the basis of the one unit common to both the passenger and express traffic—the car-mile. Every auditing officer recognizes that there is no unit which is in all particulars a satisfactory one for these comparisons, but the discrepancies arising from different sizes of cars are far less troublesome than the risks of figuring the profit on the freight service without reference to other than the barest costs of running the cars.

Graphic Studies of Competitive Schedules

The comparison of time tables maintained by different transportation companies in competitive territory is an essential feature of every analysis of traffic conditions in such a district. Usually this work is done by tabulating the running times of the rival steam and electric companies in as compact form as possible and interpreting the parallel figures as the case requires. Under some conditions, however, the use of graphic methods of comparing schedules is much to be commended, and particularly in cases where the various factors are to be shown to non-technical boards, or at public meetings and hearings.

The most familiar graphical method of plotting schedule times is doubtless to set off as abscissæ the hours and minutes, and as ordinates the points reached at different times. A line drawn through these points represents a train or car trip, and such diagrams are the usual method of locating turn-outs. To compare the running times of rival companies, however, a still more effective scheme is to plot the schedule of each road in the form of a skeleton map, but instead of making the distances between centers served pro-

portional to the miles between them, making the former proportional to the schedule times. Thus, if A, B and C are three cities connected by a highway trolley line and an interurban road with running times of 30 and 45 minutes between each pair by the former and 20 and 30 minutes by the interurban on private right of way, a diagram drawn on a scale of ½ in. per minute would show by a line 15 in. long the schedule from A to B by street railway, and by one 22½ in. long extended from B in the actual direction of C, the running time from B to the latter point. Similarly, a second diagram for the interurban road would illustrate by a 10-in. line the schedule from A to B by the high-speed route, and a 15-in. extension to C would complete the parallel. The difference in size of the two parallel diagrams shows at a glance the difference in schedule times.

In the estimation of these times, it is often necessary to determine the average walking time between points, such as from a certain street corner to a station. This can be plotted on the diagram or time-map with ease when it is ascertained. To secure average walking time, however, allowance must be made for the passing of persons on the sidewalks and streets. By allowing just as many persons to pass the counting observer as he himself passes in traversing the route, the average walking time becomes known, and can be plotted on the time-map to scale to enable the total elapsed time between origin and destination to be exhibited. As we have often pointed out, it is this total elapsed time which so often settles the choice of the passenger upon one route in favor of another, and for this reason it deserves careful study for a great variety of conditions. It will pay the time-table man now and then to make a few walking tests between certain districts and his lines in the study of competitive traffic. After the conclusion of a celebrated murder trial in Massachusetts, a year or so ago, the Governor of the State personally timed the walking distance between the various points bearing upon the case, in order to assure himself that the condemned man could have traversed the ground as indicated by the evidence. A similar test made in street railway territory might now and then be instructive to the manager who finds himself at a loss to explain the diversion of traffic to rival routes, perhaps making slower schedule speeds from point to point, but more quickly accessible from certain localities. There is clearly a broad field for the analysis of traffic causes and conditions along still more scientific lines than have been commonly followed in the past.

Trolley Service to Railroad Terminals

Recent experience with inadequate trolley service connecting with steam railroad terminals in several large cities inclines us to emphasize again the importance of developing this class of business in a better way. It is hard to understand the indifference betrayed in some quarters toward the facilities which can profitably be accorded the public in providing rapid transit between important railroad stations and the business districts, as well as interterminally. We believe that it would pay many companies to make a study of the travel on lines serving the railroad stations, with particular reference to the volume of traffic at different hours of the day, and in a general way its origin and destination. It is certain that in many communities the total movement of people to and from the railroad terminals far exceeds the traffic handled on the particular trolley routes serving the stations. A count of the number of persons entering and leaving the doors of a railroad station during one day compared with the number riding on the company's cars to and from that destination would furnish some instructive figures for the manager who thinks that he is carrying a large percentage of the possible traffic.

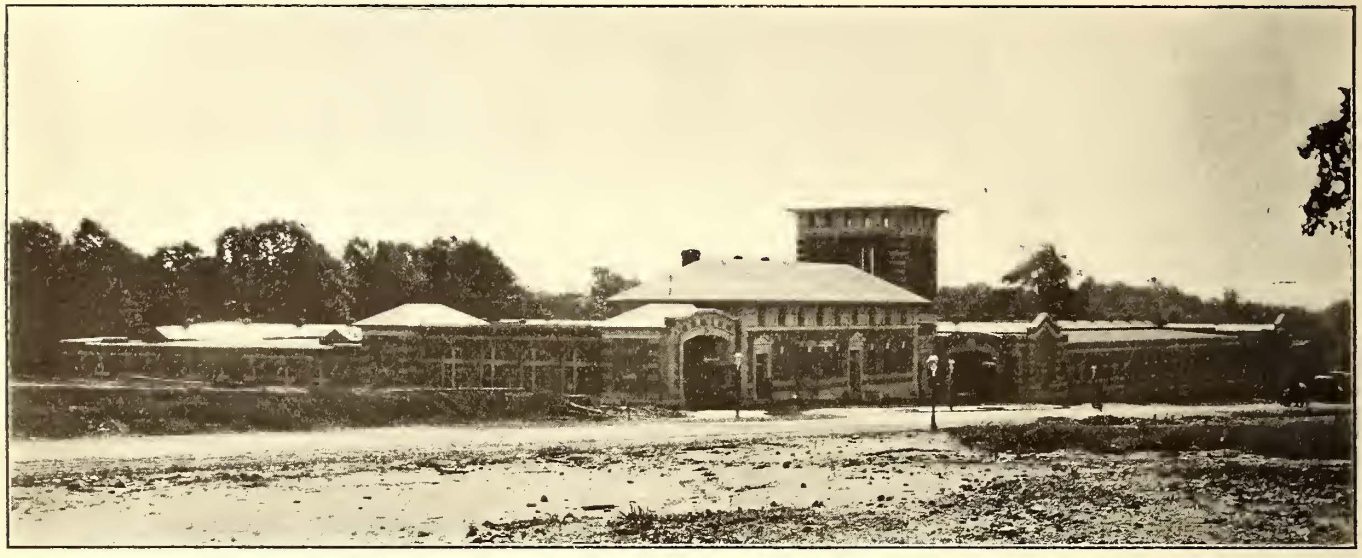
Local conditions must inevitably determine the frequency of the service which will pay. In a very large city well supplied with facilities, the condition of meeting every train will be more than exceeded, perhaps. It would be interesting to compare the total number of inbound and outbound trains per day with the number of cars to and from the station on all the routes focussed upon it, but we fancy that few managers have ever compiled such data. Theoretically, every train should be met by at least one car, but while this is possible for cabs and busses in the smaller towns, which are not as closely bound to schedule as are the trolley lines, it is exceedingly difficult to bring this to pass when the steam service is irregular, except in the largest cities. In cities of medium size only a study of the depot traffic will show how frequent the service should be, and it requires frequent watching after a decreased headway has been inaugurated. Careful analysis will show whether every train should be met or not, taking into account the stimulus of active advertising in the station and its vicinity upon the growth of trolley traffic to and from it.

The competition of the cab, the automobile and the hotel omnibus, ought to be more keenly appreciated in connection with terminal service. Most people gladly take a trolley car to their destination in a strange city if they know, in the first place, where the cars run and how often they leave given points. After a company has found out the percentage of persons who reach the stations by other means than its own lines in a given time, measures should be undertaken to attract more of this traffic, as was recently emphasized in these columns. The trouble is that few street railway managers realize the magnitude of traffic flowing into and out of the steam railroad stations in their cities, but in the larger communities of several hundred thousand population, it may easily amount to several millions per station per year. Although the location of the station, with respect to the business district, makes a great difference in the number of passengers that can be diverted to the trolley lines, there is prospective business not yet touched in not a few cases which should at once be investigated. It ought not to be necessary to wait even five minutes for a railroad station car on a double track line in a large city serving a terminal whose trains per day exceed two or three hundred. Even through the business center may be within ten minutes' walk of such a station, many more fares can be secured by proper advertising and regularity of short interval service. Again, the failure of a street railway company to stop its limited cars at the local railroad station simply deflects travel to the hackman and the bus. The baggage question is a complicated one at times, but it is not enough of an obstacle to discourage the kind of investigation needed in connection with railroad station service in many cities, and from the lack of which substantial earnings on certain routes have long suffered.

THE NEW FOURTEENTH STREET CONCRETE STORAGE CAR HOUSE OF THE CAPITAL TRACTION COMPANY, WASHINGTON

In deciding on the character of the construction for the car house built about one year ago at the northern terminus of the Fourteenth Street line, by the Capital Traction Company, protection of the cars from the weather was considered with more weight than is customary. The people of Washington are more insistent than residents of other cities that the cars make a good appearance. This fact alone put open storage out of the question and necessitated more than a mere shelter for the cars. Moreover, the location where it was desired to store the cars, in what is destined to become one of the best resident sections of the city, necessitated more than the usual amount of attention being given to the exterior appearance of the terminal erected.

The car house as built is of particular interest from the standpoints of size, type of construction, architecture and interior arrangement to facilitate car handling. It is in fact one of the largest and most extensively equipped terminal structures in the country.



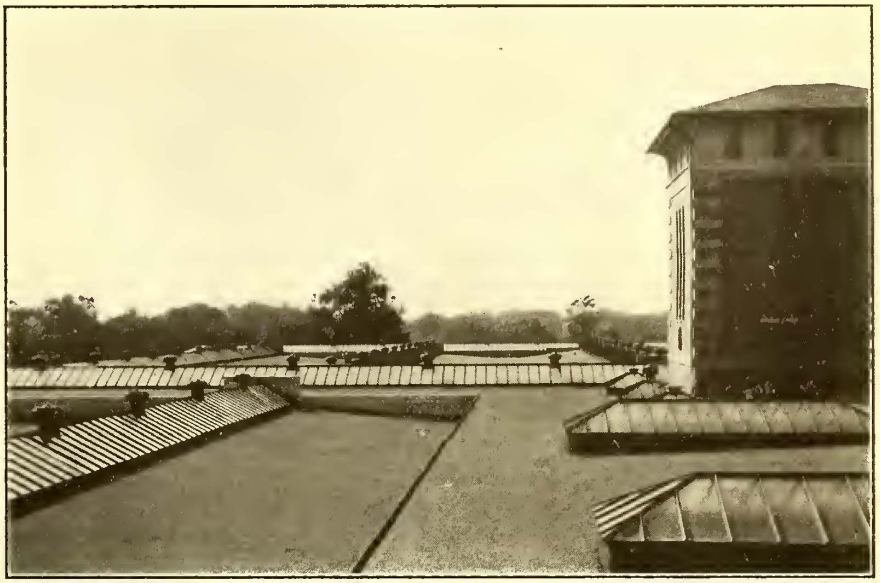
GENERAL VIEW OF THE NEW FOURTEENTH STREET CAR HOUSE OF THE CAPITAL TRACTION COMPANY. THE OFFICE BUILDING IS IN THE FOREGROUND

INTERIOR VIEW, ILLUSTRATING BOTH THE CONCRETE CONSTRUCTION AND THE FIRE PROTECTION SYSTEM

The building which covers an area of 109,000 sq. ft. is approximately square and measures 537 ft. 6 in. x 208 ft. It has about 7900 ft. of storage track on the first floor with a capacity for about 250 cars, and 3000 ft. of track will ultimately be laid in the basement. In addition, it contains a portion of the terminal loop of the Fourteenth Street line, the terminal offices, a small heated shop in

which minor repairs to cars are made and the transfer tables.

The walls of the building are of red brick trimmed with white brick and Indiana limestone. The tower in which the storage tank for the sprinkler system is located, the arched entrances of the tracks and the roof construction of the office section add much to the appearance, while the monotony of the long, low line of the car storage section which fronts the street is relieved by two gable ends at the transfer table runways.



VIEW OF THE ROOF, SHOWING THE GREAT AMOUNT OF SKYLIGHT SURFACE AND THE LOCATION OF THE SKYLIGHTS

CONSTRUCTION DETAILS

With the exception of the walls, the tower and the more prominent roofs, the building is of reinforced concrete construction. The roofs of the office and of the tower are of green slate, while the interior partition walls are of 8-in. hollow tile.

The site was a somewhat uneven piece of ground which sloped abruptly from a point over which the loop is now located. Instead of filling in it was considered more economical to build a basement under the southern portion. This basement is now enclosed by retaining walls which in places are 12 ft. thick. The concrete used in the building consists of Giant Portland cement mixed in the proportions of 1, 2 and 4 with a good quality of bank sand obtained near the work and with "Potomac blue gneiss stone" of ¾ in. and gravel size. A cubical rotary mixer located near the center of the building was employed. After the concrete was mixed it was distributed in wheelbarrows and for the roof work was elevated in automatic dumping buckets. The columns are reinforced with plain round bars, but Johnson corrugated bars are in all the other concrete construction.

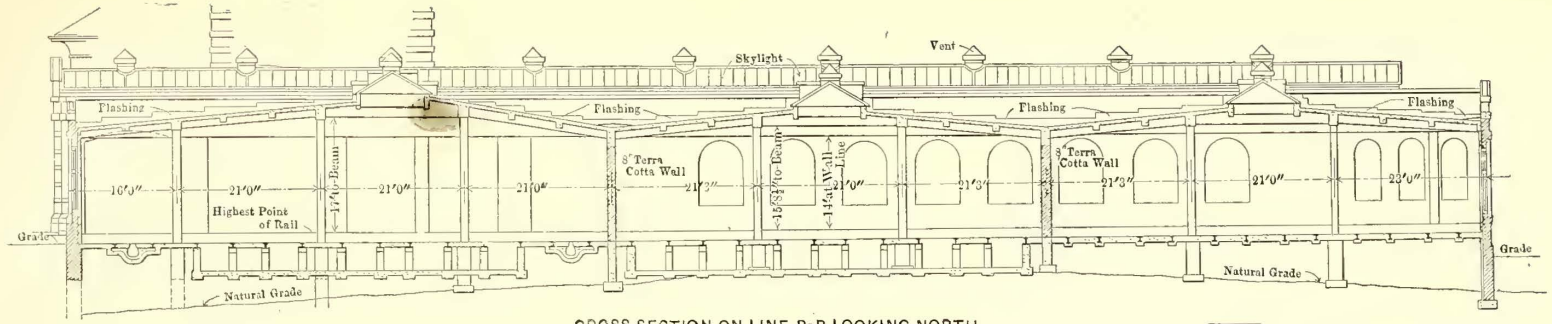
VIEW ALONG THE UPPER TRANSFER TABLE RUNWAY, ILLUSTRATING THE HEAVY ROOF BEAMS, HOLLOW TILE PARTITIONS AND THE ROOF DRAINS

The floors over the basement were designed to carry 20-ton cars and for this reason were rather heavily reinforced. They are supported on concrete columns 18 ins. square placed about 21 ft. 3 ins. between centers. The columns rest on bases 6 ft. square and 16 ins. thick, and are reinforced with ⅞-in. x 1-in. rods. Those under the pit tracks are capped with 18-in. x 36-in. concrete beams running at right angles to the tracks. The pit floors, which are 3½ ins. thick, rest directly on the 36-in. transverse beams, and are reinforced with ½-in. rods placed at right angles to the tracks on 10-in. centers. The pit walls, 9 ins. thick and 45½ ins. high, have reinforcement at the bottom and serve as longitudinal girders. In this capacity they remove the necessity of girders parallel to the tracks between the columns.

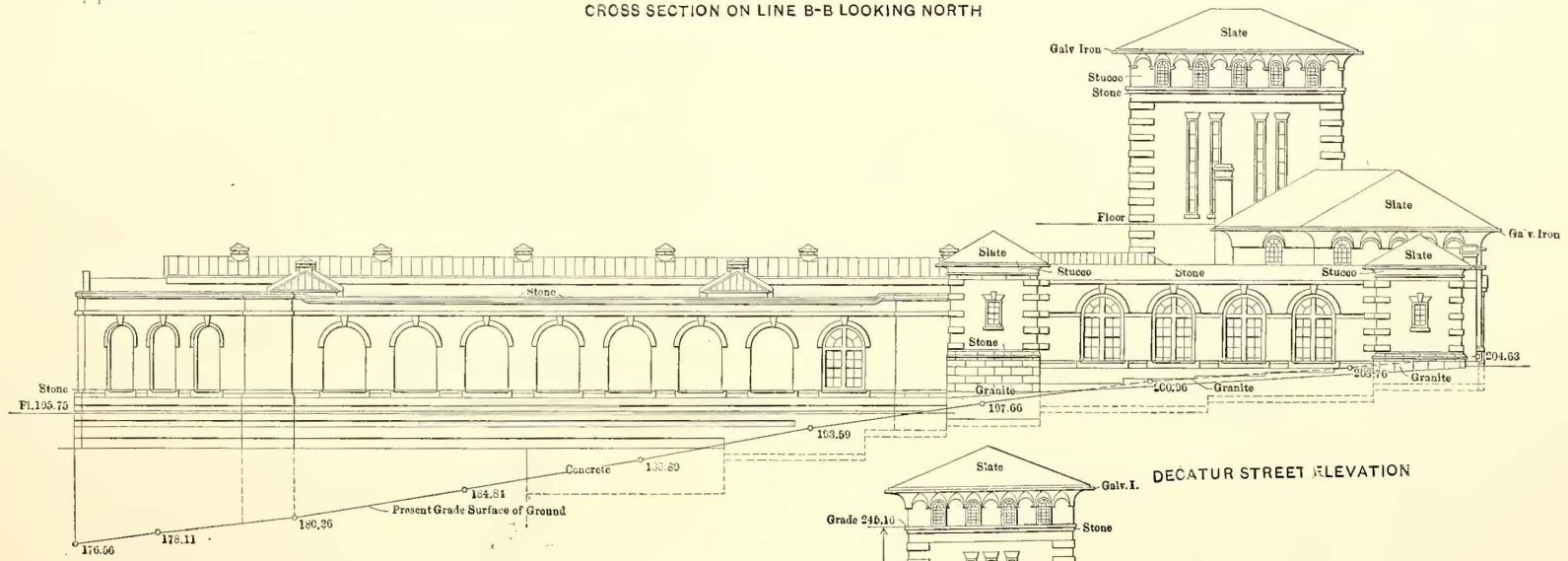
The construction under the east bay where the tracks are not provided with pits is radically different, due to the absence of the trussing effect of the pit walls. Under this bay 14-in. x 36-in. beams run parallel with the track and connect the columns. The floor is supported on these and on 12-in. x 32-in. transverse beams, placed 7 ft. 1 in. center to center.

The roof over all of the space devoted to the storage of cars is supported on 12-in. x 12-in. columns placed about 21 ft. apart. The columns alongside the transfer table runways, however, are 12 ins. x 14 ins. All these columns are reinforced with longitudinal round bars and in addition by ties of ½-in. rods placed 12 ins. apart which enclose the longitudinal rods. The roof girders capping the columns and running at right angles to the tracks are generally 9 ins. wide and 18½ ins. high. The ribs running parallel to the track immediately over the columns, equidistant between them and on either side of the skylight openings, are usually 6 ins. x 15 ins.

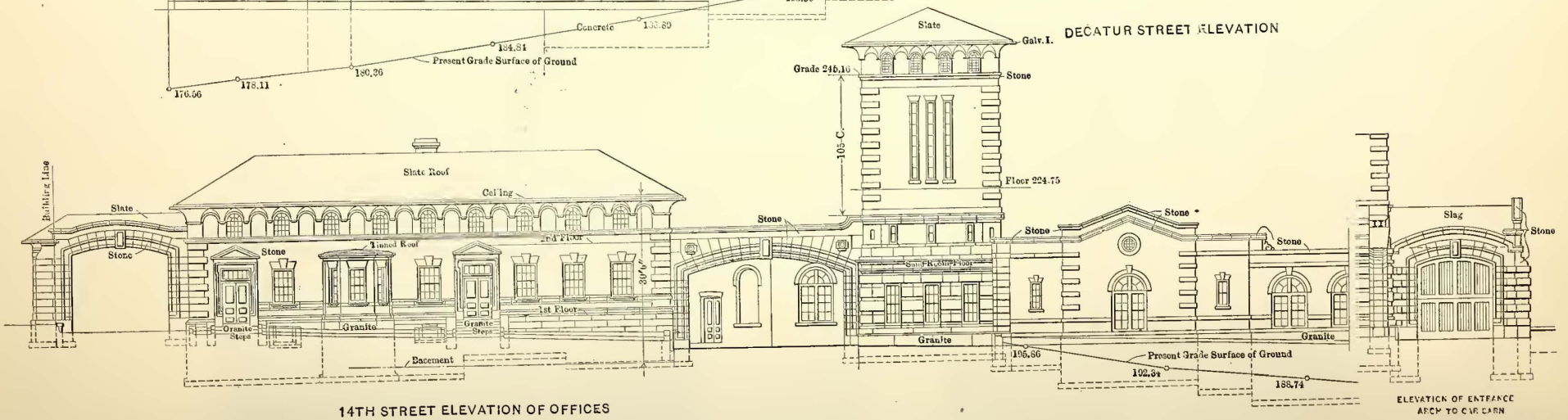
Over the transfer table runways the roof span of 46 ft. 9 ins. is carried on a concrete beam 10 ins. thick and 48 ins. deep at the center. The depth decreases gradually to 29 ins. near the columns. The beams are 23 ft. apart and



CROSS SECTION ON LINE B-B LOOKING NORTH



DECATUR STREET ELEVATION



14TH STREET ELEVATION OF OFFICES

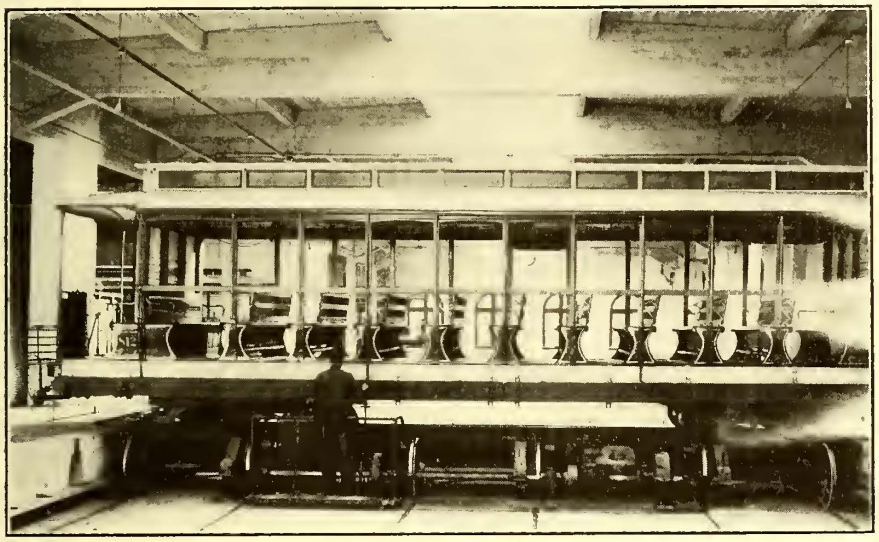
ELEVATION OF ENTRANCE ARCH TO CAR BARN

Scale: 28½ feet to 1 inch

Street Ry Journal

CROSS-SECTION AND ELEVATIONS OF FOURTEENTH STREET CAR HOUSE OF THE CAPITAL TRACTION COMPANY

are reinforced with six 1¼-in. rods at the bottom and three ⅞-in. rods at the top. Although this span is a comparatively long one for concrete construction only a very slight deflection was observed when the centering was removed after having been left in place about six weeks. The roof proper is made of 3½-in. concrete slabs resting directly on the girders and ribs. The slabs are reinforced with ½-in. rods placed 12 ins. center to center. The top coating is of slag and pitch.



ONE OF THE TRANSFER TABLES IN OPERATION

Skylights 9 ft. wide, of wire glass held in metal frames, extend the full length of each bay. The frames are provided with ventilators placed about 21 ft. apart. There is a total of 8700 sq. ft. of skylights. An idea of the skylight arrangement may be obtained from one of the accompanying illustrations.

TRACK CONSTRUCTION

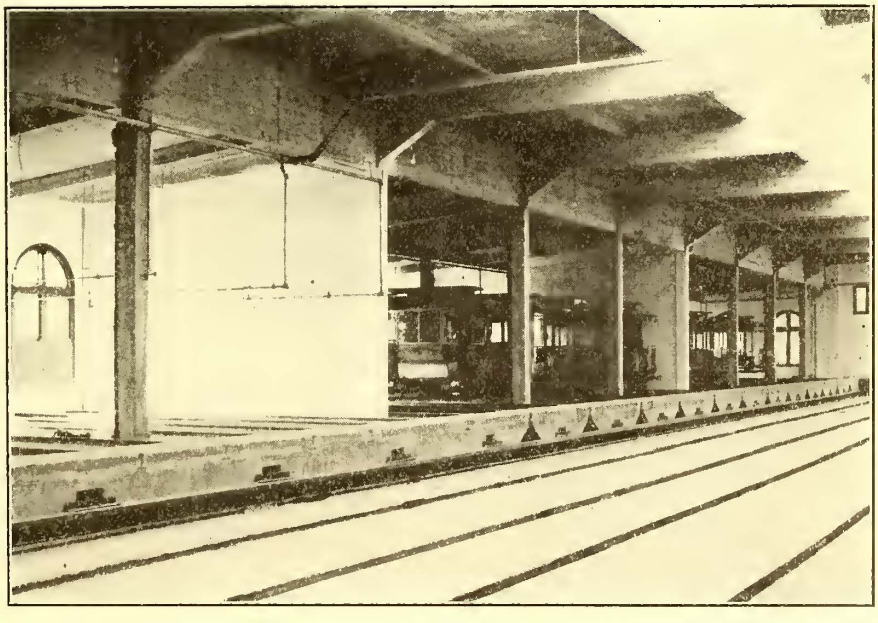
The car storage space is divided into three sections by the two transfer table runways. Moreover, the hollow tile walls separate the sections into bays containing six and seven tracks each. All tracks, with the exception of those in the central and southern sections of the east bay and the outside tracks in the west bay between the transfer tables, have pits under them their full length. Those in the central section and the east bay have pits 50 ft. long at the north end. This section is intended for the storage of out of season equipment from which the plows are removed, the short pit facilities being provided for removing and replacing the plows.

The storage of cars operated by underground trolley necessitated several departures from the usual track construction. The necessity for pits and in addition the expense prohibited conduit construction throughout. As a substitute for the trolley, terminals for 600-volt current were placed at 50-ft. intervals in all pits. Current is applied to the cars by plugging in these terminals long flexible leads having at the car end a yoke which fits over the collecting plow under the car. As each transfer table is provided with conduit and trolley connections, it was necessary to construct guides at the ends of the pits to conduct the plow into the slot on the table. The guide as designed also serves as a walkway over the pit.

The conduit tracks in the westernmost bay are of practically the same construction as the tracks in the streets. The standard yokes employed are supported on reinforced concrete. Manholes are 12 ft. 9 ins. apart to correspond with the columns of the building. The rails of pit tracks are held in position by metal ties embedded in the concrete floor between two adjacent tracks. Wherever the strength and the rigidity of the rail would be of benefit, as in the tracks over the basement, new 80-lb. 6-in. T-rails were employed. Other tracks were built with 40-lb. relaying T-rails. The light rails were used in the runway of the upper transfer table and the heavier ones were employed in that of the lower table, as this is immediately over the basement.

INTERIOR ARRANGEMENT

The present interior arrangement was adopted after considerable study as to the best method of handling cars. Partly with a view to assisting in the handling of cars, the tracks between the transfer tables were made on a 2 per cent grade sloping south, and shifting cars is very much facilitated by the use of the two tracks with standard conduit construction in the east bay. Connections with the city system are made by two tracks leading to the loop inside the building. The track openings into the building are provided with Cross folding doors. In storing cars at night or after the rush periods the upper transfer table is placed at the west end of its runway and cars from the loop are backed down on it. The table is then set opposite the desired track and the cars are run off. The grade of the track and the momentum obtained on the table are usually sufficient to run the cars wherever desired. In getting cars

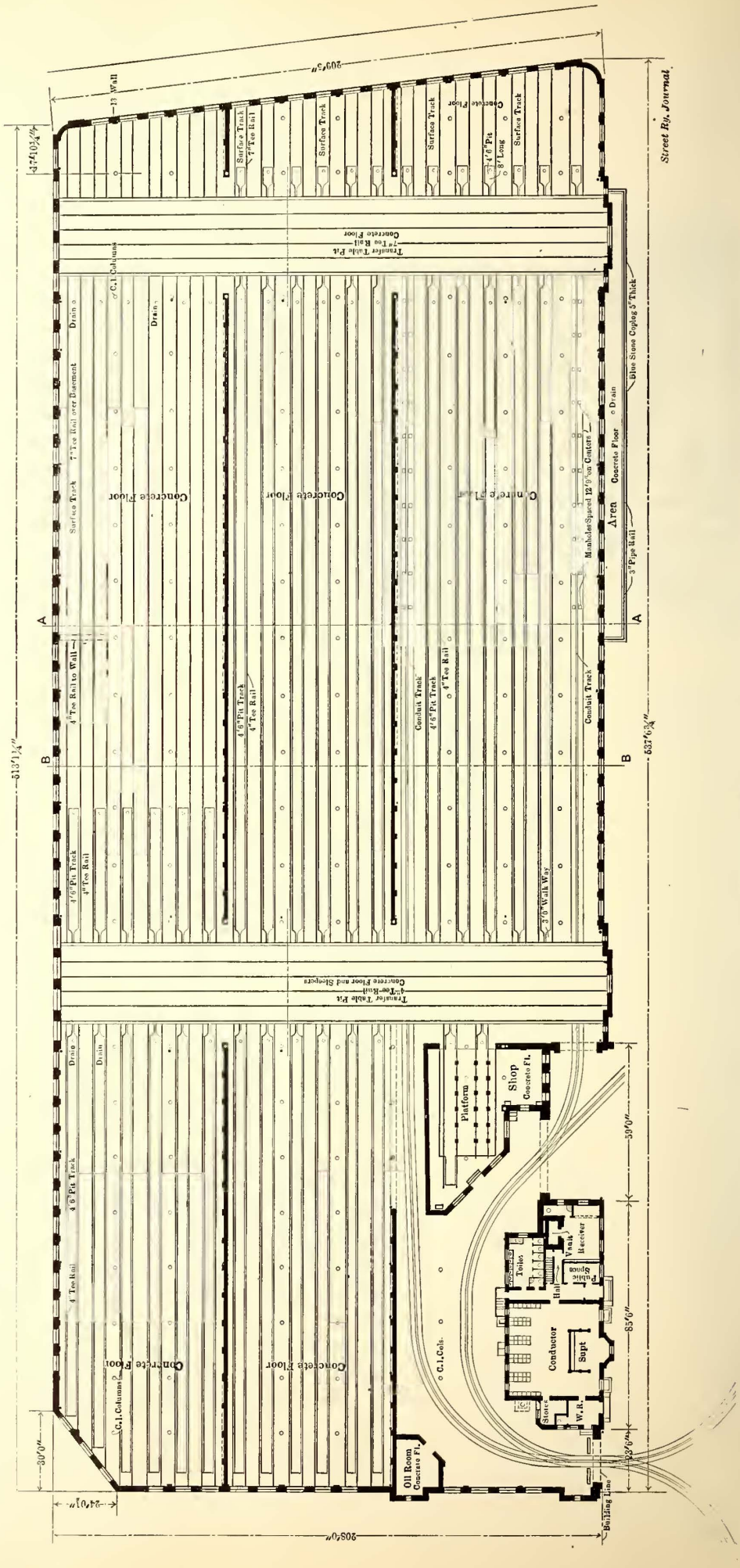


VIEW SHOWING THE SHORT BAYS AT THE SOUTH END OF THE CAR HOUSE

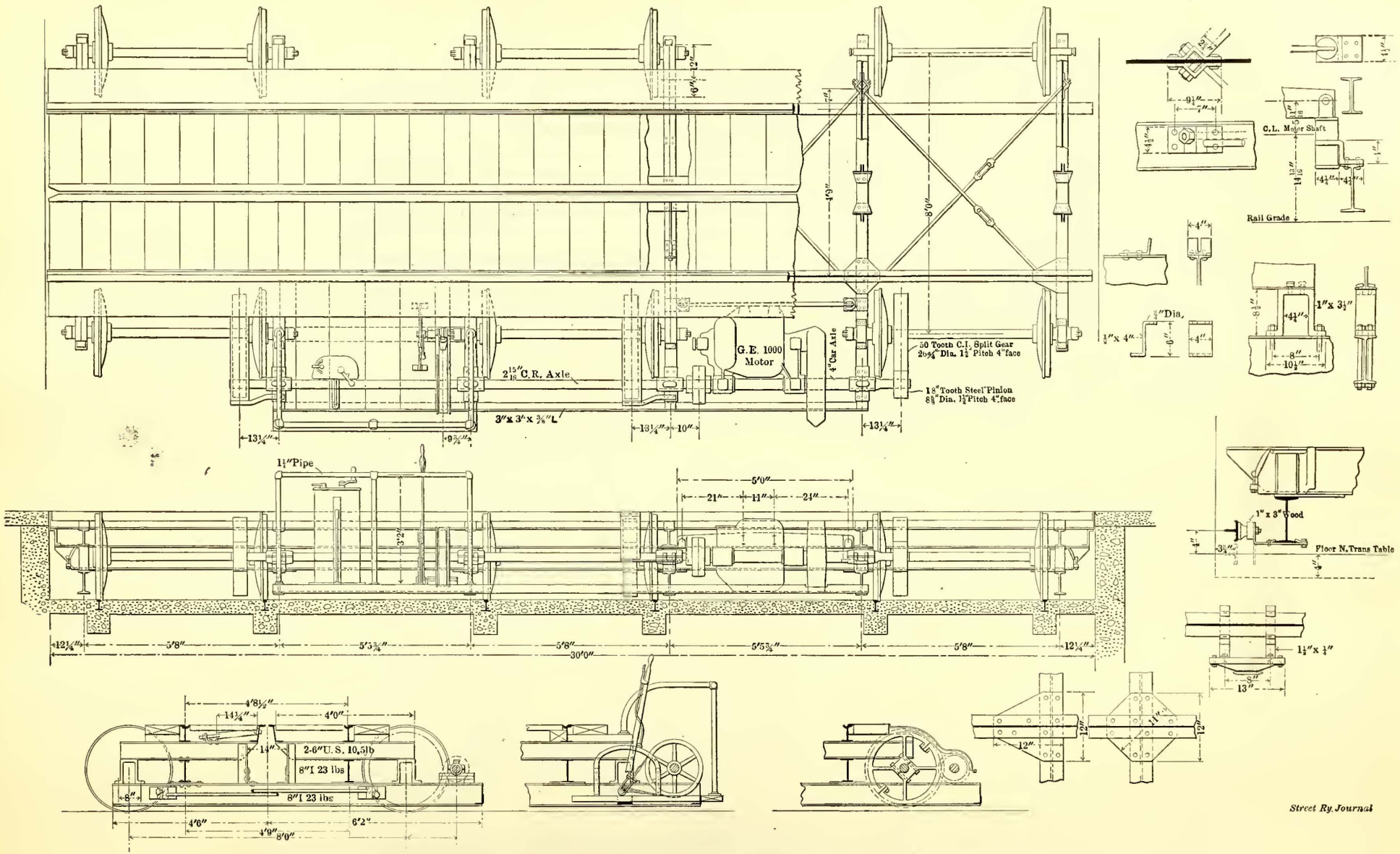
out of the middle section the upper transfer table is left connecting the east conduit track with the spur to the upper portion of the loop. The cars to be gotten out are then let down on the lower table by gravity and are transferred and run off on the east conduit track. They are then run across the upper transfer table and out of the building by their own motors. To get cars out of the section north of the upper transfer table it is necessary to run them to the table by connecting the plows through leads to the 600-volt outlets already referred to. The conduit track nearest the roadway is usually reserved for sprinklers, sand cars and cars which it is desired to get out quickly. It may appear at first thought that the movement of cars is dependent on both transfer tables being in good working order. However, those cars in the middle section could be gotten out with very little inconvenience in the event of either one of the tables being out of order. Should the lower table be disabled, the cars could be run up the grade and onto the upper table under their own power. With the upper table out of order, it could be left in a position to bridge the runway and the cars could be shifted to the proper tracks by the lower table.

THE TRANSFER TABLES

Both transfer tables were designed by the company and were built in the repair shops. They differ radically from the usual table in that they are constructed for cars with underground trolleys, and for this reason it was necessary to carry all strains on a bottom member. Each table runs on six sets of car wheels mounted on car axles, provided with the ordinary type of journal boxes. The lower member of the turntable, an 8-in. 23-lb. I-beam, is suspended from the boxes by means of saddles. Upon this I-beam is built a structure for the support of the track and the conduit. The table is driven by a G. E. 1000 motor, geared to a shaft which corresponds to a car axle. This shaft is provided with pinions for driving



GENERAL FLOOR PLAN OF THE FOURTEENTH STREET CAR HOUSE OF THE CAPITAL TRACTION COMPANY



CONSTRUCTION DETAILS OF ELECTRICALLY OPERATED TURNTABLE USED BY THE CAPITAL TRACTION COMPANY

the three sets of wheels on the motor side of the table. Near the K-type controller is the brake apparatus, which consists of a band wheel on the driving shaft and a lever for tightening the friction band on this wheel. Current is obtained through sliding shoes from protected conductors, supported on standard insulators and placed against the side walls of the runway.

THE SHOP

The shop, which is intended for minor repairs only, has a capacity for three or four cars, depending on their size. The pits are of the open type, the track being supported on concrete piers as shown in an accompanying illustration. The shop is supplied with compressed air for blowing out motors from the compressor used in connection with the sprinkler system. It is heated by a steam heater in the basement. The two entering doors are of the Kinnear rolling steel hand-operated type.

THE OFFICE SECTION

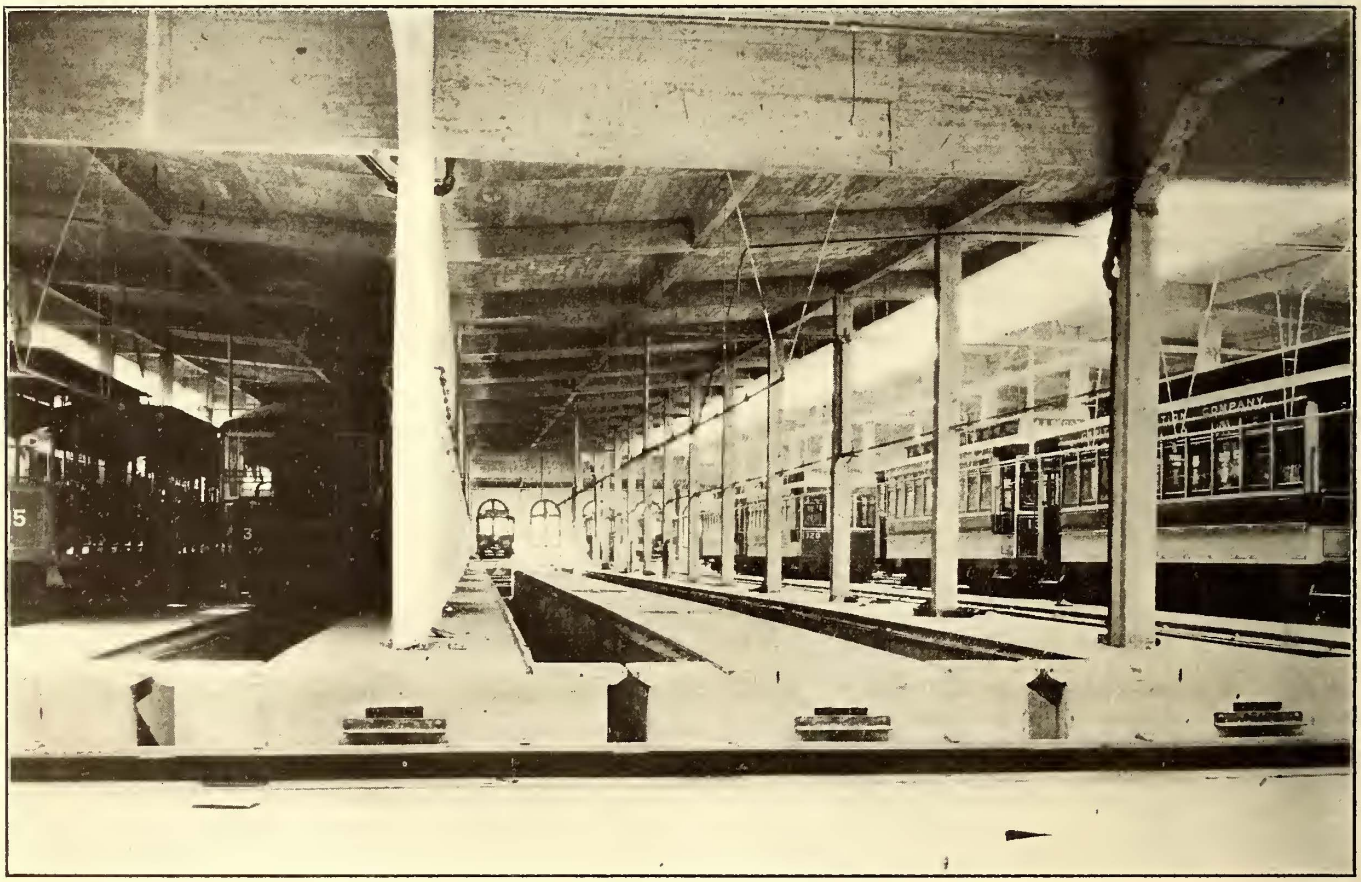
The office section is a two-story structure and, like the remainder of the car house, has concrete floors. A small room on the second floor is used for storage of material and a terminal storage battery may at a future time be installed in the one room which takes up the greater portion of the second floor. The lower floor contains a superintendent's office surrounded by a conductors' room, a small terminal waiting room, receiver's office and vault, an alcove in the rear of the receiver's office for lost articles and toilet rooms. All the rooms have plaster walls and are finished in yellow pine. The conductors' room is provided with tables for making out reports and with expanded metal clothes lockers. The basement contains a boiler for heating the offices and the small repair shop, space for coal storage, a switchboard for controlling the lighting circuits in the building and the lighting transformers.

THE LOOP AREAWAY

The loop areaway has a concrete floor and its roof structure is contiguous with, and is of the same construction as, that of the storage bays. The track openings are not provided with doors. Both openings were purposely made to the west, with the idea of avoiding draughts through the areaway. In one corner is a fireproof room for the storage of oils used in the barn.

THE TOWER

The tower was built primarily for enclosing the tank used as a reserve in connection with the sprinkler system. Nevertheless, it adds considerably to the appearance of the building. The tank of 50,000 gallons capacity is located in the top of the tower. Below it is a room for drying and storing sand.



GENERAL VIEW OF THE CENTRAL BAY BETWEEN THE TRANSFER TABLES, SHOWING ALSO THE PROTECTED TROLLEY FOR THE TRANSFER TABLE AND THE CONSTRUCTION AT THE ENDS OF THE PITS

SAND DRYING APPARATUS

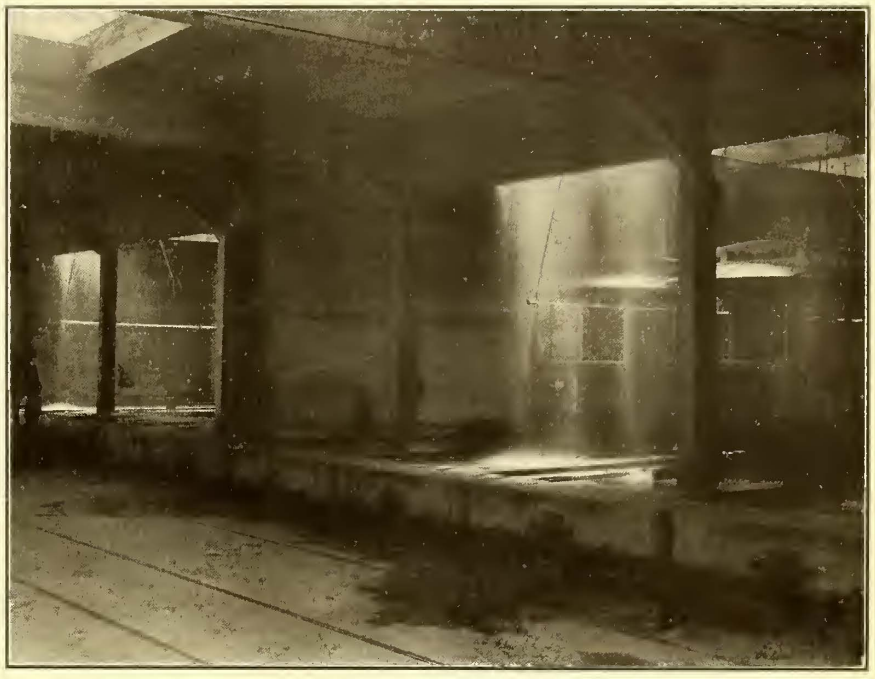
Sand is elevated to a drier on the first floor of the tower by a motor-driven bucket conveyor. After being dried it falls into a hopper with chutes leading to the ground floor.

THE SPRINKLER SYSTEM

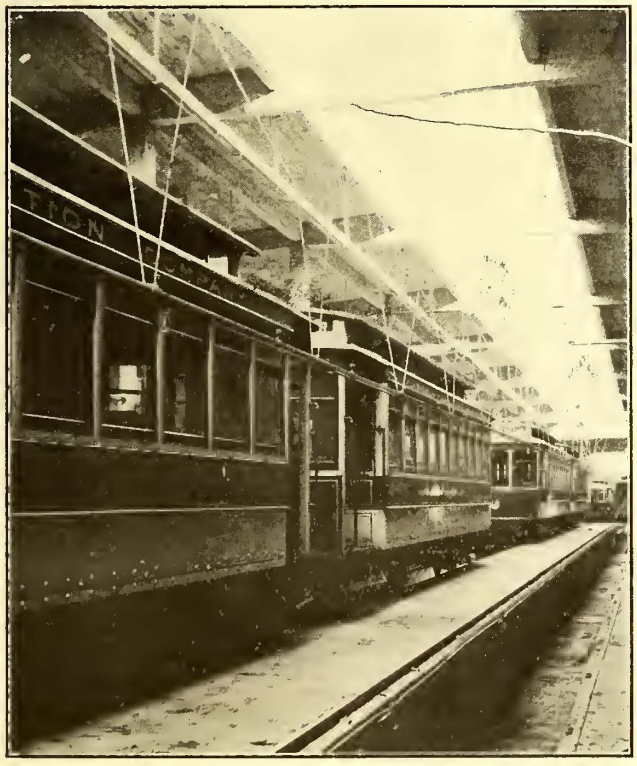
The structure is equipped throughout with an automatic sprinkler system installed by the International Sprinkler Company. A total of 1613 sprinkler heads is installed, 1165 being on the first floor and 488 in the basement. Most of the heads are placed on lines varying in size from 1 to 1½ ins., run between the tracks, and between walls and tracks about 6 ins. below the tops of the windows of the cars. These heads are located 7 ft. apart and are automatically controlled.

In addition to the automatic protection, the first floor is

divided into separate fire sections by curtain sprinklers which extend lengthwise on three sides of the two transfer tables. It was, of course, necessary to omit the fire walls across the transfer tables and these curtain sprinklers are installed as a substitute. The heads have a ⅜-in. orifice and are placed 8 ft. apart. They are installed on an independent line, controlled by a hand-operated valve, outside the building. The automatic sprinklers are supplied with water through ten independent 6-in. Evans air valves. Two of these are for the basement sprinklers. Each bay north of the upper transfer table and the central bay south of this table has its independent valve, while each of the two outside bays south of the table has two valves. These valves are installed under the floor in groups in concrete pits, which are reached by doors in the walls of the track pits. All sprinkler lines are supported and thoroughly braced by galvanized hangers extended from hanger spuds, which were placed in the forms before the concrete was poured. The overhead equipment is provided with galvanized fittings throughout, and all turns in the feed mains are made easy by the liberal use of long turn fittings.



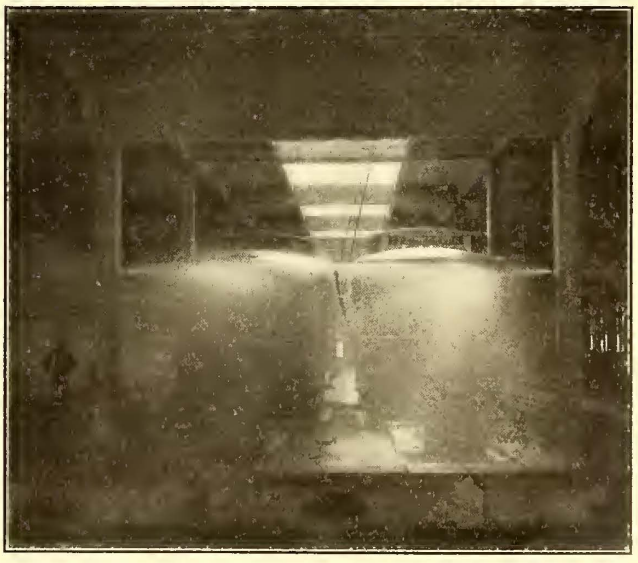
ROOF SPRINKLERS UNDER TEST



VIEW ALONG SPRINKLER LINES WITH REFERENCE TO THE CAR WINDOWS AND SHOWING THE METHOD OF HANGING THE LIGHT CONDUITS AND LAMPS UNDER THE SPRINKLER PIPES

WATER SUPPLY

The primary water supply is through an 8-in. connection to a 12-in. city main on Fourteenth Street. The secondary supply is obtained from the 50,000-gallon tank already mentioned as being installed in the tower. This tank is elevated 25 ft. above the highest point of the roof and is connected with the underground piping system supplying the dry valves by an 8-in. drop. As an auxiliary supply a Siamese steamer connection in the street has an 8-in. pipe connection with the sprinkler system. The system is supplied with air by the electrically driven compressor located in the repair shop. An independent line of ¾-in. galvanized pipe laid underground with control and check valves at the compressor is extended to each separately controlled system. This pipe affords a means for readily examining and manipulating the apparatus to replenish air pressure.

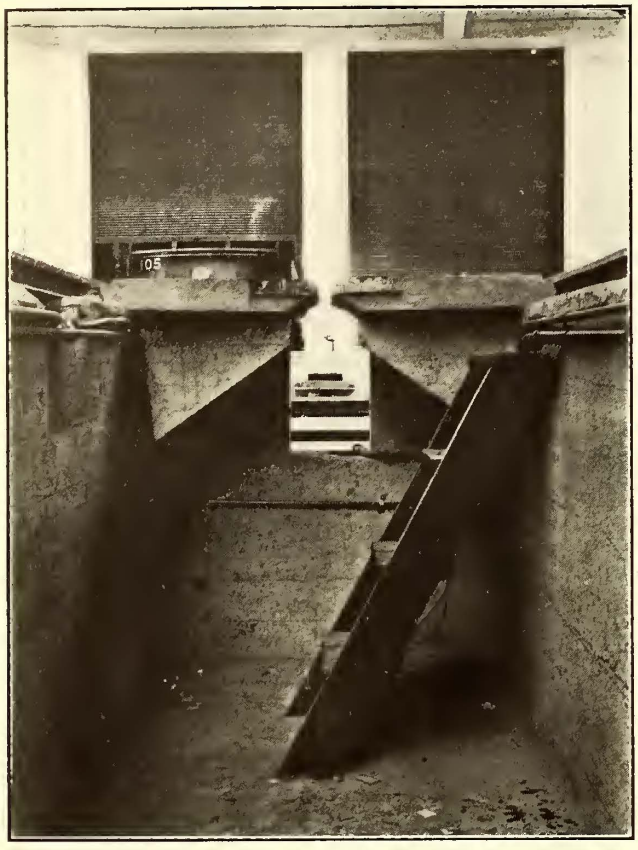


AISLE SPRINKLERS UNDER TEST

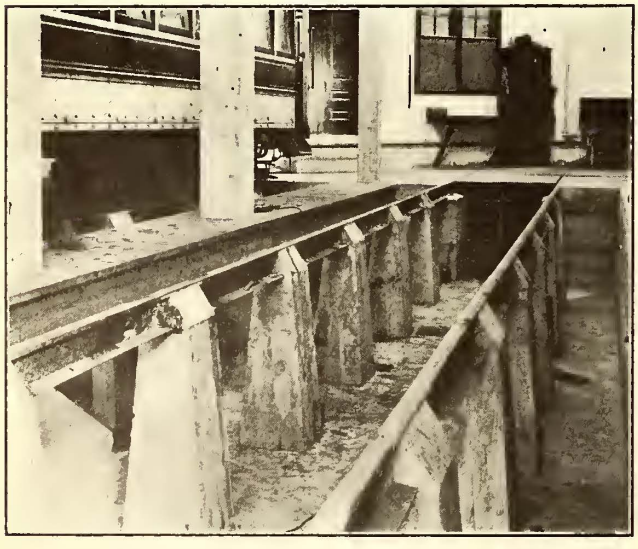
ALARM SYSTEM

Each air valve is provided with a circuit closer and is designated by a number. From the circuit closer, wires are extended to a ten-point annunciator located near the air compressor in the repair shop. A point on the annunciator is similarly marked with the number of the valve and

the opening of a sprinkler or the dripping of the air valve from any cause sounds a 10-in. alarm bell and indicates what system is in trouble. There is also an electrically-connected device in the gravity tank which indicates by means of an annunciator in the repair shop the height of the water in the gravity tank. In addition to the sprinkler system fire protection is afforded by risers provided with



WALKWAY AND GUIDE FOR PLOW AT THE ENDS OF THE PIT TRACKS. THE DOOR OPENINGS IN THE BACKGROUND ARE THE ENTRANCES TO THE REPAIR SHOP



VIEW IN THE REPAIR SHOP, SHOWING THE METHOD OF SUPPORTING THE TRACK ON CONCRETE PIERS

fire hose, and hand fire extinguishers are placed on the walls at frequent intervals.

LIGHTING AND WIRING

General illumination is effected by 16-cp incandescent lamps, there being 832 such lamps in the building. In addition, 5 arcs on a 600-volt circuit illuminate the loop areaway. There is not an exposed wire in the building; all are run in conduit, provided with "condulets" for outlets at the lamps. Lighting current is obtained from the city system through 2300-volt mains which are connected to transformers in the basement. Throughout the building the three-wire system with 110 volts between outside and neutral wires is employed. A rather ingenious method of installing the lamps for general illumination was employed. The conduits are tied to the under side of the sprinkler line, and the lamps are placed 25 ft. apart in condulets. Should it be necessary to repair the sprinkler line, the conduit may be dropped down by simply removing the wire hooks with which it is held in place.

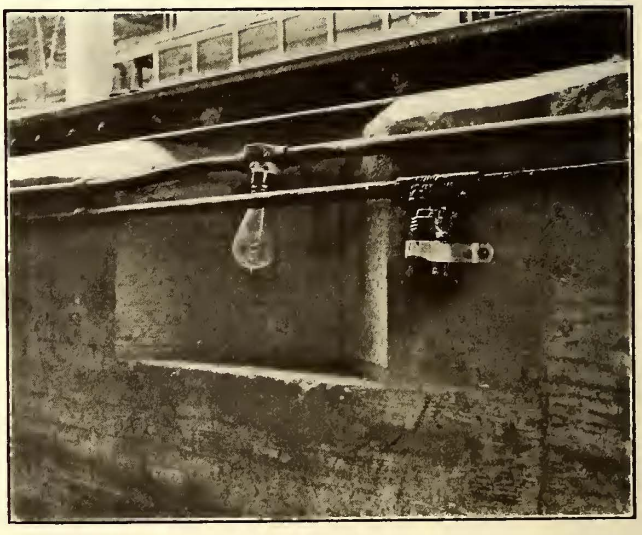
From the transformers three single O wires are carried overhead in conduit to a three-pole switch and cut-out located in a box on a column in each section of each bay, and from this box the distribution is overhead to the separate lines. Twelve lamps scattered throughout the building are on a separate circuit and at night are kept burning constantly.

PIT LIGHTS

For pit lighting three conductor No. 0000 lead cables are carried in conduits under the floor on each side of the upper transfer table and are distributed to separate cut-out boxes for each bay. No. 12 wires are carried to each pit and the lamps for each pit are controlled by a snap switch in the pit. In addition, key sockets are used. The lamps on each side of the pits are staggered and are 50 ft. apart. Where possible they are installed in recesses in the pit; but over the basement the reinforcement did not permit these recesses. The 600-volt wiring for the pit sockets is also carried in the conduits under the transfer table and the distribution to the pits is made in pipe conduits. One of the illustrations shows one of the maple terminals for the 600-volt wiring, which terminals are placed 50 ft. apart.

THE BASEMENT

Seventeen tracks to be laid in the basement will run at right angles to those on the first floor and entrance to them will be made through doors in the rear side of the building, there being one door for each pair of tracks between columns. Cars will be brought to the rear of the building over a track along the south side, and will be distributed to the tracks in the building by a transfer table running in front of the doors in the east wall.



SIDE OF PIT, SHOWING RECESS FOR PIT LIGHT AND MAPLE TERMINAL FOR THE 600-VOLT PIT CIRCUIT

DRAINAGE

The roof is drained through an independent system of pipes and tile to an 18-in. pipe which runs under the building and takes the flow of a small stream which formerly ran across the site of the structure. The pits are also drained into this pipe. The toilets in the office building have outlets into the city sewer running along Fourteenth Street.

GENERAL

The general arrangement of the floor plan was laid out in the office of D. S. Carll, chief engineer of the company, through whose courtesy this article is published, and the details were cared for by J. H. Hanna, assistant chief engineer and superintendent of the system. Credit for the architectural features is due to the firm of Wood, Down & Dunning, architects of Washington. The building was originally planned as a steel structure. Later the steel design was abandoned for one employing reinforced concrete, made by Sydney B. Williamson, at the time agent for the Baltimore district of the Expanded Metal & Corrugated Bar Company. The adoption of concrete construction instead of steel resulted in a saving of about 10 per cent in the first cost. The contract for the construction of the building was let to Richardson & Burgess, of Washington, in May, 1906, with O. L. Meigs, building superintendent for the company. The building was ready for occupation July 1, 1907. The entire cost of the building was about $300,000.

In the construction of the building about one and one-half million brick were used. Of the 9000 cu. yds. of concrete poured, 6500 cu. yds. were reinforced with 720,000 lbs. of steel. The remaining 2500 cu. yds. were used in the construction of retaining walls and footings.

THE ADVANTAGE OF NEW BOILER DESIGNS

BY W. H. BOOTH

If the numerous tests that have been published on steam boiler performances are carefully examined and the doubtful and extravagant ones are eliminated there will still remain quite a number of tests, conscientiously and carefully carried out, which show that steam boilers have been and are made which return in the form of dry steam heat to the amount of not less than 80 per cent of the calorific capacity of the fuel burned in the furnace of such boiler. Now an efficiency of 80 per cent is very great. There are numerous deductions to be made from the given calorific power of the fuel. There is loss in the shape of heat radiated from the walls of the boiler seating and from the parts of the boiler not covered by the seating and walls. There is heat lost in the ashes and there is the loss of heat in the waste gases which leave the boiler at a temperature very much above that of the atmosphere. Then there is loss by imperfect combustion, for there is generally some carbonic oxide and some hydrocarbon gas in the waste gases. All these losses have to be taken out of the 20 per cent of efficiency of which the boiler falls short of theoretically perfect efficiency. But no boiler of ordinary rational dimensions can ever reduce its waste gases below its own temperature so that an efficiency, as ordinarily rated, of 80 per cent, really represents 86 to 90 per cent of efficiency based on what it is theoretically possible to perform. Such figures of what has been accomplished should therefore be very carefully considered by all who set forth to improve the design of boilers except in respect of furnace arrangement or details of construction and fitting. Any improvement of efficiency appears extremely unlikely to be secured by any fresh design, any rearrangement of parts. Existing boilers showing low efficiency may be improved by the addition of such things as retarders in the fire tubes. Certain baffles which compel a better spread of the hot gases over the heating surface have often done good, but nothing has been done to improve boilers already returning 80 per cent. Boiler improvers should therefore think twice before going to the trouble of making new designs in any serious expectation of surpassing records, and their efforts should be confined to other matters. Thus recently a great German shipyard was looking for a boiler which, while of good and safe design, would provide more grate surface per square meter of the plan of the ship so that more coal could be burned and more power and speed obtained, for ocean vessels of high speed are already full from end to end with engines and boilers and cannot hold more, yet there must be room for coal and there must be passages by which to convey it to the furnaces and space in which stokers can stand to shovel the coal into the furnaces. Thus there may be new designs of boiler that will effect certain practical and desirable improvements of the above order, but no great hopes must be entertained in respect of better efficiency of performance.

GAS ENGINE ECONOMY

In the paper on gas engines presented at the annual meeting of the American Society of Mechanical Engineers, by G. I. Alden and J. R. Bibbins, and discussed editorially last week, the authors presented the following interesting table of distribution of heat in percentages at average load:

	Engine only.		Entire plant.	
	Brake.	Electric.	Brake.	Electric.
Useful work	24.9	22.98	18.38	16.97
Electrical losses	———	1.92	———	1.41
Friction and pump work	4.58	4.58	3.37	3.37
Jacket absorption	34.22	34.22	25.22	25.22
Exhaust and radiation	36.30	36.30	26.81	26.81
Loss in producer	———	———	26.22	26.22
Total	100.	100.	100.	100.

The plant tested belonged to the Norton Company, of Worcester, Mass., and consisted of a 500-hp Westinghouse horizontal double-acting engine connected to a 300-kw d. c. generator, with a bituminous gas generating plant of the intermittent type supplied by the Power Mining & Machinery Company. The consumption of coal per kw-hour averaged 1.402 lbs.

MASSACHUSETTS BOARD STUDIES THE QUESTION OF FARES

An interesting inquiry of importance to street railways as well as steam roads was started by the Massachusetts Railroad Commission with a public hearing on Friday, Dec. 13, looking toward a scheme for equalization of fares on the steam roads. The board acts in this matter under the following, Chapter 82 of the Resolves of 1907, of the Massachusetts Legislature: "Resolved, That the Board of Railroad Commissioners is hereby directed to investigate the matter of fares charged for passenger transportation upon railroads within the Commonwealth, and to report what changes, if any, are required to remove inequalities therein, and to make the rates paid for travel upon such roads more uniform. Said board shall report to the next General Court on or before the fifteenth day of January." It is the intention of the board to include in this general inquiry several specific complaints as to suburban and other fares which have been filed at its offices within the past three or four months.

AN EXHAUST STEAM TURBINE PLANT*

BY HENRY H. WAIT.

At the Wisconsin Steel Company's mill at South Chicago, the turbine utilizes the exhaust steam from a reversible 42 in. x 60 in. double cylinder engine which drives the blooming rolls. The steam passes first to the receiver which takes out the shock of the puffs of steam, thence to the steam accumulator or "regenerator," and from there to the turbine and condenser. The average i.h.p. while the engine is actually running is 1010, and if the total work per hour were distributed evenly over the hour, the average i.h.p. for the hour would be 820. Figuring back from the total steam consumption, gives 64 lbs. of steam per average i.h.p. for the hour, or 54 lbs. during the running period. This large consumption is readily understood when we consider that the engine takes steam for practically the full stroke when starting the passes, and is running on very light load most of the rest of the time.

When the engine is exhausting directly to the atmosphere and is taking steam at nearly full stroke, the puffs of steam shoot a long distance up in the air and make a noise like a number of big locomotives puffing in unison. The receiver relieves the accumulator of the strains which would occur if the puffs went directly to it. It consists of a vertical tank with baffle-plates and drains for water and oil. At the top of the receiver, between it and the vertical exhaust-pipe, used when desired to exhaust directly to atmosphere, is a relief valve to permit the escape of steam to the air during the periods when there is more than the demands on the turbine and regenerator require.

The accumulator or regenerator is a very interesting piece of apparatus, and is virtually the same as the more recent Rateau regenerators built in Europe. The accumulator might be called a heat fly-wheel, absorbing or giving up energy in accordance with the requirements. It might also be likened to a storage-battery floating on the line. When the engine is running the exhaust steam comes from the engine through the receiver and is delivered to pipes immersed in the water in the regenerator. These pipes or ducts are perforated with a number of small holes, spraying the steam, so to speak, in through the water in the regenerator. A greater or less proportion of this steam is condensed in passing through the water, and gives up heat to the water in the regenerator.

It is usual to operate the regenerators at about atmospheric pressure. In other words, the steam coming to the regenerator will usually have a temperature of 212 deg. F., and will tend to heat the water to just that temperature. If the engine stops and the supply of exhaust steam discontinues, we will see that we have a large mass of water heated to 212 deg. F., and if there is a continuous load on the turbine the flow of steam through the turbine to the condenser will tend to make the pressure fall off slightly in the regenerator, and 212 deg. F. will then be slightly above the boiling temperature of water at this lower pressure, so the mass of water begins to give off steam and act like a boiler running at approximately atmospheric pressure. If, now, the engine starts again, steam will be delivered to the accumulator at a temperature slightly above that to which the water has fallen, due to the cooling effect of the evaporation of the steam for supplying the turbine, and the mass of water will again absorb heat from the exhaust steam.

In practice it is more convenient to run the regenerator at a pound or two pressure above the atmosphere, as in this case the piping is not under vacuum, so that so much care does not have to be exercised to avoid air leaks. However, in certain cases, it is desirable to run below atmospheric pressure. In this way the power of the primary engine may be augmented by letting it operate at a partial vacuum. Plants are running with a delivery pressure to the turbines as low as six pounds below atmosphere.

The accumulator at South Chicago being quite a large one, is divided by a diaphragm in the middle into two decks, each deck having a series of flues. The steam generated in the lower deck passes up through steam flues into the upper chamber and passes out with the upper steam through the steam dome. A small percentage of the steam delivered to the regenerator is condensed on account of radiation from the surface of the apparatus. This makes an accumulation of excess water in the regenerator which is automatically discharged by a float trap. Where the fullest possible amount of steam must be saved, the regenerators are lagged.

DATA FROM TESTS ON THE EXHAUST STEAM TURBINE OF THE WISCONSIN STEEL COMPANY.

Observed and Derived Values	Unit	Test No. 1	Test No. 2	Test No. 3	Test No. 4
Date of trial	1907	Mar. 11	Mar. 11	Mar. 12	Mar. 12
Duration of trial	hours	1.00	2.00	2.00	2.00
Condenser					
Average initial temperature of condensing water	deg.	38.40	39.30	38.90	39.55
Average final temperature of condensing water	deg.	80.00	68.30	61.50	66.55
Average condensing water per min	cu. ft.	151.9	192.8	247.2	295.4
Average barometer	ins.	29.6	29.6	29.2	29.2
Regenerator					
Average pressure at turbine, abs	lbs.	16.9	16.6	15.9	15.3
Average temperature of steam at turbine	deg.	215.5	217.0	216.3	213.2
Average temperature of air	deg.	48.0	48.0	64.0	64.0
Average steam delivered per hour	lbs.	19,500.0	20,220.0	22,050.0	29,280.0
Turbine					
Average pressure above controlling valve	ins.	32.9	32.4	30.93	29.75
Average pressure under controlling valve	ins.	18.6	19.0	21.47	24.85
Average vacuum at exhaust casing	ins.	25.31	26.6	26.95	26.40
Average brake hp at turbine shaft	hp	409.0	544.0	727.0	869.0
General					
Average power delivery in kw	kw.	265.1	365.7	489.2	591.6
Steam per minute to turbine	lbs.	326.0	337.0	367.5	488.0
Steam per kw-hour	lbs.	73.3	55.2	45.2	49.5
Steam per brake hp at turbine per hour	lbs.	47.7	37.1	30.7	33.7

If the primary engine shuts down for a considerable period, the heat stored in the regenerator will become exhausted and the pressure will fall below a workable amount for the turbines. To take care of this condition, there is an automatic reducing valve set so that it will open whenever the pressure falls below atmosphere and deliver live steam to the regenerator. At the Wisconsin Steel Company's plant the pressure usually ranges about 1 lb. or 2 lbs. above atmosphere; when the engine is exhausting heavily it runs up to about three lbs. The lower limit of pressure, when the reducing valve opens, is about atmosphere.

The turbine is of the well-known Rateau type, similar to those of the same character built in Europe, except that on account of American conditions it was necessary to

*Abstract of a paper presented before the American Institute of Electrical Engineers, Dec. 13, 1907.

make the construction heavier and stronger. As the turbine is of the impulse type, the pressure is the same on both sides of the wheel, and there is no tendency to leakage of steam through the clearance spaces around the periphery. These clearances can therefore be made as large as desired within reason, without having any material effect on the efficiency.

The governor regulates the speed by throttling, the valve being of the double-beat type. Of course, it will be realized that the steam admission pipe and the throttle valve have to be of abnormally large dimensions on account of the steam being delivered at such a low pressure.

When it was decided to put in this plant we found that direct-current generators of the speed and capacity required had not been built in this country, and were not obtainable, so it was necessary for us to design the generators ourselves. It might also be remarked that although larger direct-current turbine dynamos had been designed in Europe, there were none, as far as we could find out, adapted to the requirements of American steel-mill practice. To make the problem simpler and not run so much risk with abnormally long commutators, it was decided to divide the generating capacity into two direct-current interpole units of 250 kw. each, the pressure being 250 volts.

The condenser and air pump are of standard type. There has been no difficulty in maintaining a good vacuum in normal operation, and the plant is usually run at a vacuum of about 28 in.

The accompanying table gives the details of the more important observations. The steam consumption was determined by temporarily putting a Venturi meter in the pipe delivering the condensing water to the condenser and measuring the temperature of the entering and discharged water, in this way using the condenser as a calorimeter to determine the heat rejected from the turbine. To get suitable temperature ranges, and on account of other local conditions obtaining at the time of the test, the vacuums were not as high as the turbine was designed for, so although the steam consumption was better than the guarantees, the values given do not represent the actual capabilities of the turbine.

The general result of the installation of this low-pressure turbine equipment is that it enabled the mill to shut down the two 250-kw engine-driven generators which formerly operated the mill, and for a long time the turbine carried the entire electrical load of the steel mill, operating from the exhaust of the blooming engine, and not taking any live steam except during abnormal stoppages of the blooming engine.

At this plant the boilers are supplied principally by gas from the blast furnace, but the supply of gas is quite variable and usually not adequate to give all the steam required, so that more or less coal has to be used. The installation of the turbine, therefore, results in a saving of the coal corresponding to the steam required for operating the generator engines. This, as indicated above, is quite a variable quantity, but has been variously estimated at from $10,000 to $20,000 per year. In figuring on the installation of the turbine plant, it was estimated that the turbine would effect a considerable saving, even if the supply of gas were generally adequate, as the maintenance of the turbine plant would be considerably less than the corresponding engine and boiler plant, or even a gas-engine plant.

During three months when the steel plant was running at nearly full capacity, the turbine delivered an average of 188,300 kw-hr. per month, or 51 per cent of the total possible kw-hours if run at its rated load the entire time. The operating expenses are at the following rates, based on the above output:

Oil, waste, etc.	0.002	cents per kw-hour
Attendance	0.074	cents per kw-hour
Maintenance and miscellaneous	0.011	cents per kw-hour
Total operating	0.087	cents per kw-hour
Fixed charges	0.212	cents per kw-hour
Total cost	0.299	cents per kw-hour

The fixed charges are figured on the basis of a cost of $80 per kilowatt. This figure would, of course, vary considerably with the conditions, but it can be taken as an average for moderate-size plants. Interest, depreciation, etc., are allowed for at 12 per cent. Nothing is allowed for superintendence, as no additional force is required for this item.

The cost being made up so largely of fixed charges, varies very markedly with the load-factor. In fact, if the plant is run 24 hours a day, the lubrication, attendance, and maintenance are only affected to a slight extent by the amount of load, so that they have almost the same effect as a fixed charge. Of course, if the plant were run only during the day shift, the operating expenses would go down.

If the exhaust steam turbine plant were used for electric smelting or similar purposes, it is probable that the load-factor could be kept up over 80 per cent, which would give a cost of 0.19 of a cent per kw-hour.

CARBON DIOXIDE RECORDERS

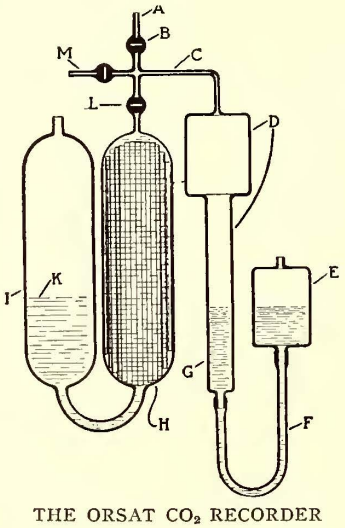
In a paper entitled "The Westover CO_2 Recorder," read in New York before the Dec. 13 meeting of the American Institute of Electrical Engineers, C. O. Mailloux discussed the value of CO_2 recorders in general, and also gave detailed descriptions of the original Orsat apparatus for this purpose and a later recorder designed by J. H. Westover.

It has been shown that there is an important and close relation between fuel economy and the percentage of CO_2 in the flue gases. In one case H. G. Stott had found that in one of the most efficient plants the loss to the stack was 22.7 per cent; in the majority of cases this loss exceeds 30 per cent. The application of a CO_2 recorder in the first case resulted in a saving of 19 per cent. High efficiency corresponds to high percentage of CO_2 in the flue gases. A falling off in percentage of CO_2 in the fuel efficiency is due primarily to excess of air. Thus it is obvious that the percentage of CO_2 in the flue gases, being influenced directly and solely by the conditions of combustion of the fuel, can serve as a criterion of the performance and efficiency of the boiler plant and as a means of detecting defects and suggesting improvements in operation.

To make clear the operation of these recorders, Mr. Mailloux presented the accompanying diagram and description of the Orsat apparatus, which is the oldest form used for making chemical analyses of flue gases.

The movable vessel *E*, of glass, containing water, is connected by a flexible (rubber) tube, *F*, with a stationary vessel, *GD*, of glass, of the general form shown, having graduations at the upper part of the tubular portion, *G*, and connecting by a small tube, *C*, with a three-way coupling in which are valves or stop-cocks, *B*, *L* and *M*. The cock *L* controls a connection leading to a receiving vessel *H*, filled with small glass tubes, and connected at the bottom by a bent tube with a supplemental receiver, *I*, open to the atmosphere at the top. The liquid put in the vessels

H and I depends on the particular gas to be analyzed. When the apparatus is to be used for determining the percentage (by volume) of CO_2 in flue gases, the liquid put in these vessels consists of a solution of caustic soda, or caustic potash. The process of making an analysis comprises various manipulations which must be made in proper order, with a certain care, each requiring a certain time. The cocks M and L being both closed, the cock B is opened, leaving a free passage from the receiver D to the atmosphere. The movable vessel E is then raised, causing the level of the liquid to rise in the vessel G and the liquid to fill the portion D as far as the small tube C. The cock B is then closed and the cock M, controlling the connection with the supply of gas, is opened, allowing the gas which is to be analyzed to enter. The vessel E is now lowered, and the gas enters and fills the vessel D and a part of the vessel G as far as desired. The exact quantity of gas allowed to enter is controlled by the position of the movable vessel E, which is adjusted to bring the level of the liquid in G to a certain mark, corresponding to a definite volume, say 100 cc of gas. The cock M is then closed and the cock L is opened. The vessel H is normally left filled with the absorbent liquid at the end of the preceding test. Therefore, on opening the cock L this liquid begins to fall in H and the gas begins to enter. The movable vessel E is now raised again until the gas has been entirely forced out of the vessel D by the rise of the liquid in G and D. The gas enters the vessel H, forcing down the absorbent solution, which is displaced into the vessel I. The glass tubes in the vessel H present a greatly increased surface, wet with the caustic soda or potash solution, whereby the chemical reaction on which the analysis depends is expedited. This reaction is the absorption of CO_2 gas contained in the sample of gas forced into the vessel H, and its combination with the soda or potash contained in the solution to form a "carbonate" of soda or potash, which remains in solution. The volume of the gas in the vessel H is diminished in proportion to the amount of CO_2 abstracted from it by this chemical reaction. After a certain time, sufficient for the reaction to be practically ended, the movable vessel E, which was held at its upward position during the time allowed for the reaction to take place, is lowered, causing the residue of gas to return into the vessel D. The vessel E is lowered until the liquid in H rises and fills the vessel to the top as far as the cock L. If the sample of gas contained no CO_2 it will not have been reduced in volume when it returns to the vessel D, and the level of the liquid in this vessel will be at the same mark as it was before the gas was sent into the vessel H. If the gas contained CO_2, the volume returned from H to D will be smaller than it was before; consequently, when the residue has all passed out of H, the liquid in G will stand at a higher mark than before. Suppose, for example, that the initial volume was 100 cc and that the residual volume is found to be 92.5 cc. Then the percentage (by volume) lost, in passing through the vessel H, was 100 — 92.5, or 7.5 per cent. Since the loss in volume was due to the absorption of CO_2 only, it follows that this sample of gas contained 7.5 per cent of CO_2. If the residue is not to be subjected to further analysis, the cock B is opened and the gas is forced out at A, by raising the movable vessel E and filling the vessel D, as before. If it be desired to analyze the residue for some other gas, say oxygen, for example, the pipe A is connected with another vessel similar to the vessel H and containing a chemical reagent which can absorb the gas whose percentage is to be determined. The reagent used for the oxygen analysis is pyrogallic acid dissolved in a solution of caustic potash. The operation is conducted in substantially the same manner as for the estimation of the percentage of CO_2. The residue of gas is returned to the vessel D, its volume is measured, and the loss of volume, if any, is noted, as before. Suppose the volume be now found to be 90 cc. Then the percentage of oxygen which was present in the gas was 92.5 — 90, or 2.5 per cent. A third analysis may serve to determine the percentage of CO (carbon monoxide), present in the sample. The reagent then used is cuprous chloride, dissolved in hydrochloric acid. The residue left after this determination will be substantially all nitrogen. From the data thus obtained it is possible to determine the percentage of CO_2, O, CO, N, and of air, contained in the flue gas.



THE ORSAT CO_2 RECORDER

That the results of flue-gas analysis may be of service, it is necessary that the analyses should be obtained under practical requirements, including the following: The apparatus should work automatically with little care and attention; it should give results quickly and regularly; it should give a visual indication and record of all the results. It is not necessary that analysis should be made of all the constituents of flue gases. This would require too much complicated apparatus, and would lengthen the time required for each operation. Practically, the determination of the percentage of CO_2 is all that is required.

In the Westover recorder, when used for, say, a four-boiler battery, there is a succession of steps or a cycle of operations very similar to those described in connection with the Orsat apparatus. All the manipulations are made automatically, the work incidental thereto being done by a small constant-speed electric motor.

The function of the movable vessel E is performed, in this case, by two movable vessels which are counterweighted and raised, lowered or held stationary at certain positions and at certain times, by cam-actuated devices driven by the electric motor. One of the movable vessels serves to displace the sample of gas when it is first received from the boiler flue. The other movable vessel serves to displace it during the operations of measuring, "treating," and remeasuring the gas. The rising of displaced liquids results in a float making contacts to close an electric circuit which actuates a recording mechanism. In practice, when the same recording apparatus is used for several boilers, the recording point and recording strips used are repeated.

The external features which distinguish this recorder from all previous forms, is the liberal use which has been made of metal to the exclusion of glass in its construction. Glass has been eliminated everywhere except where it is desirable to allow the operation to be seen at any point or at any stage.

The tests made by Mr. Stott and others have shown conclusively that the CO_2 record gives accurate information regarding the efficiency of a steam boiler. For a boiler

working constantly at the highest possible theoretical efficiency, the CO_2 record would be a straight line, corresponding to a little over 20 per cent of CO_2. In practice, such high CO_2 values are seldom attained, even momentarily. Occasionally, the records may "make a jump" to 16, 17 or even 18 per cent; but even those results are infrequent and of very short duration, and may be considered abnormal, since they correspond to conditions of combustion which cannot be maintained for any great length of time without affecting the output, or steam capacity, of the boiler.

The above-mentioned CO_2 record corresponds to the condition of perfect combustion, in which only the quantity of air theoretically necessary for perfect combustion is admitted into the furnace. We all know that this ideal or theoretical condition could not be satisfied in practice. There always is, and, indeed, there must always be, a certain excess of air, as there are always some parts of the fire which have a deficiency of air even when there is an excess of air in the rest of the fire. The consequence is that practically the highest efficiency attainable corresponds to a CO_2 record, which is seldom higher than 15 per cent, and is usually considerably lower, being as low as 9, or even 8 per cent, in some cases. This highest attainable line depends upon the design of the boiler plant and, especially, upon the kind and quality of coal and the way in which it is burned. For the very lowest grades of culm, the line of highest attainable practical efficiency probably could not be higher than 8 per cent.

One of the important lessons which the CO_2 recorder has taught the boiler-room expert is that the damper must be adjusted much more often, and usually much less at a time, than it has been hitherto, if we expect to get very near the maximum efficiency obtainable in any particular plant. In the case of boiler plants which are operated at more or less constant load, and with automatic stokers, the damper adjustment may not need to be so frequently changed; but, in the case of boilers which are hand-fired and which supply steam for variable loads, it sometimes seems, judging from the CO_2 records, as if the damper adjustment ought to be changed every few moments.

If we admit the necessity and desirability of frequent changes of damper adjustment, the question of finding ways and means of doing it properly and cheaply assumes some importance. In several cases the problem has been partly solved, and with satisfactory results, by making the fireman himself watch the CO_2 records, and adjust and readjust the dampers accordingly. In some cases, in large boiler plants, it might even be profitable to have a special attendant for the purpose of watching the CO_2 records and of adjusting and readjusting the dampers. The ideal solution is, obviously, automatic damper control.

At the shops of the Cleveland Electric Railway Company a passenger car is being converted into a postal car to be used on the local lines in collecting mail and in carrying incoming mail to the various sub-stations. The car will make a route as follows: From the main office to East 105th Street over the St. Clair Avenue line; from this point to Euclid Avenue over the 105th Street line; thence west to Fifty-Fifth Street; south on Fifty-Fifth Street to Woodland Avenue and on to a station on Broadway. From this point the car will go to a station on Detroit Avenue near West Twenty-Fifth Street, after which it will return to the main office. Four such trips a day will be made and mail will be picked up from certain boxes, which will be painted a different color from the others. The car will be ready for service in about two months.

THE RATIO OF HEATING SURFACE TO GRATE SURFACE AS A FACTOR IN POWER PLANT DESIGN

At the Dec. 13 meeting, in New York, of the American Institute of Electrical Engineers, Walter S. Finlay, Jr., presented a paper on the proper relations between heating surface and grate surface. A rule of boiler and grate practice, he said, was that all other conditions remaining constant, capacity developed is, with slight modifications, in direct ratio to the area of the active grate surface. An increase in capacity, while the heating surface remains constant, caused by an increase in grate area, is accompanied by a loss in economical evaporation, due to the increased temperature of the escaping gases. Under normal conditions, this loss varies from practically zero to as much as 15 per cent fuel economy for an increase of 100 per cent in boiler capacity.

Lately, however, the opinion has been advanced that considerable increase in capacity can, without great sacrifice in economy, be obtained by proportional increase in grate area. This idea is based on the possibility that combustion, heat distribution and transfer could be much improved under the new conditions, when in increasing the grate area careful attention is given to details of design most conducive to these features. With a belief in the correctness of this theory, a change was made in the design of eighteen of the boiler furnaces in the Fifty-Ninth Street plant of the Interborough Rapid Transit Company, New York. This change gave the possibility of operating within the range of the original single-stoker boiler, together with the higher range of the double stoker. The second stoker installed has an area of 80 per cent of the original stoker, local conditions preventing an installation of a larger size. The second, or lower stoker, is constructed practically within a so-called "Dutch oven."

From the tests made after the installation, it appears that in this particular case double-stoker operation covers the entire range of single-stoker operation and adds an increase in capacity proportionate to its larger grate surface with but slight loss in economy; and that an increase of 71 per cent in capacity was accomplished with no loss in economy.

Taking the foregoing results as a basis, Mr. Finlay considers the effect of this change on a plant, as a whole. He assumes a plant with a first cost of $125 per kw, equipment including turbo-generators and boiler stokers with, say, sixty to one ratio. Relative costs are given as follows:

		Per cent
Total cost per kw	$125.00	100
Building	43.75	35
Boilers	6.875	5.5
Grates	1.75	1.4
Piping	5.625	4.5
Coal-handling apparatus per kw	2.30	1.84
Balance of equipment	64.70	....

Interest on investment is assumed to be 5 per cent, depreciation 6 per cent, taxes and insurance 1 per cent, making the total fixed charges 12 per cent.

The effect of a change, as outlined on the different items making up the plant cost, is then considered as follows:

Piping: In the case involved the cost of steam piping between boilers and manifolds, plus boiler feed piping and boiler blow-off piping alone, has been considered. With any change in number of boilers, capacity remaining the same, the cost of piping will vary in the same ratio times a factor due to change in size of pipe.

Coal-Handling Apparatus: Fixed plant capacity would seem to demand fixed cost of this item, but the propor-

tionate value of the conveying apparatus is so large that when any change is made affecting the length of carry the total system cost will be raised or lowered, although not in direct ratio to such a change:

Change of Ratio: Suppose, in reconsidering the plant design, it is decided to cut in half the ratio of heating surface to grate surface by using double grates or stokers under boilers of the same rating while the plant output remains the same. A tabulation of the revised costs would be as follows:

	Per kw
Building (reduced 40 per cent)	$26.25
Boilers (reduced 50 per cent)	3.438
Stokers (remain same)	1.75
Piping (reduced 40 per cent)	3.735
Coal-handling apparatus (reduced 15 per cent)	1.955
Balance (remain same)	64.70
	$101.468

From the foregoing it is found that the plant first cost and fixed charges would each be reduced 19.6 per cent. Based on figures on this plant, furnished by H. G. Stott in his A. I. E. E. paper on "Power Plant Economics," Mr. Finlay estimates that the change to double grate operation would decrease maintenance and operating charges by 0.25 per cent.

The speaker presented also a set of figures on a plant cost of $150 per kw, for which he estimated a reduction in first cost and fixed charges of 20.8 per cent. The following summary of savings was then presented for the case of the $125 plant using double grates: First cost, 19.6 per cent saving; total plant charges varying from a saving of 5.64 per cent at 100 per cent load-factor, to 7.54 per cent at 50 per cent factor, to 9.65 per cent at 4.16 per cent factor (365 hours per year).

In the case of the $150 plant: First cost, 20.8 per cent saving; total plant charges vary from about 7.06 per cent saving at 100 per cent load-factor, to 9.26 per cent at 50 per cent factor, to 11.51 at 4.16 per cent factor.

STREET RAILWAYS DISCUSSED BY NATIONAL CIVIC FEDERATION

A meeting of the National Civic Federation was held at the Park Avenue Hotel, New York, on Dec. 16-17, and the annual banquet occurred at the Hotel Astor on the evening of Dec. 16. Tuesday afternoon was devoted largely to a discussion of trade agreements with labor organizations and was of interest particularly because of the account given by August Belmont of the experience of the Interborough Rapid Transit Company with labor unions. Mr. Belmont is president of the National Civic Federation, and said in part: "I am for the trade agreement in principle and in practice in connection with trade in general. But I have come to the conclusion that it is not the only and safe method in connection with public utilities. The convenience, comfort and safety of the public are too closely connected with the operation of these concerns to make any other course possible. A public utility company, in accepting a franchise, assumes certain duties and any man accepting employment from a transportation line should also be considered as entering into a contract with the public not to leave his post except on account of illness or after having given a reasonable notice of his intention to stop work—say two weeks or whatever time shall be agreed upon. The law cannot compel a man to engage in this work, but having done so, it should see that he performs his duties to the community as it does that the company is held to its contract. The Subway and elevated systems in this city were operated for some time under trade agreements with union organizations. Both were separate, but they passed under one management and there was a gradual merging of the unions of the two roads. The employees of one made an agreement with the other. The strike that followed was not because the employers wished to cut down wages or increase the hours of labor, and was in contravention of the agreements. Had the National organization been able to enforce the agreement there would have been no strike. But it could not—it has no way of doing so except to expel the local organization. The result in New York was that new men were hired in the strikers' places and the union was thrown out. The companies could take no risk and had to employ new men. It is impossible to operate a big transportation system in a city like this in any other way. A member of one of the labor committees asked me whether I would oppose a re-establishment of the union. I told him that it was impossible for a public utility corporation to operate its lines under a trade agreement as long as there was no way of forcing both parties to live up to their agreements. We could not take the risk of making another try. It is perfectly just for labor to demand consideration from the corporations, but the corporations have a right to demand the same consideration from the men. A man entering the employment of a public service corporation should consider that he is in the service of the public and give suitable notice of his intention of quitting work."

A. O. Crozier, of Wilmington, Del., then asked Mr. Belmont this question:

"If the humble employee in entering the service of a public service corporation at a modest wage thereby incurs an obligation as a servant of the public, should not the corporation which receives from the public a franchise free, a franchise which is not property but which is merchandise, also have an obligation to the public and be prevented from capitalizing that franchise for $100,000,000 and then charging the public high rates to earn dividends on it?"

The audience seemed inclined to laugh Mr. Crozier down, but Mr. Belmont replied: "That is a good question and I want to answer it. In the first place, you have stated your premise incorrectly in saying that the franchise is obtained free. The franchise tax is very heavy, and it is not operated free by any means. In the case of the subway the company leases the property from the city, so that the conditions there are somewhat unique, but with the surface lines the companies pay a very large amount of money for the use of the streets. I might say, therefore, that your premises being wrong, the question cannot be answered. Nevertheless, I will take up your question on capitalization. In the amalgamation of properties inducements have to be held out to the stockholders to get them together, and then the investor must be provided with the kind of security that he wants. If there is considerable risk there must be a corresponding possibility of considerable profit. The great difficulty with transportation in New York to-day is that the money cannot be obtained to give the service. A great deal of hostility has developed against the transportation systems, caused in large part by incorrect ideas, such as that the companies are using the streets free, as indicated by the first part of your question. Even if this hostility were just, as some of it may be, it makes it impossible for the corporation to obtain money for needed extensions and improvements. The only alternative is that the citizens must undertake what the corporations cannot or will not do. But because of this opposition by

certain parts of the press and public that has frightened the investor, the city will be hampered in its work. What is public money? There is no public money other than that which is obtained from taxation that is not furnished by the investor. In other words the municipality, to undertake any constructive work, has to go to the same source of money supply as the company, i. e., the investor. Because the corporation could not reach the investor, it has had to take out short-time notes, and after the lack of currency has passed, the lack of confidence will remain and will show up this fallacy as to the power of the public to do what the corporation cannot do."

Early on Tuesday afternoon Mr. Belmont announced that owing to his many business duties he would not be able to serve as president for another year. Ex-Mayor Seth Low was elected to succeed him.

CONFERENCE ON STANDARD CLASSIFICATION OF OPERATING ACCOUNTS

A conference on a standard classification of accounts of electric railway companies, between representatives of the American Street and Interurban Railway Association, the Interstate Commerce Commission and the National Association of Railway Commissioners, was held this week at the rooms of the Interstate Commerce Commission in Washington. Meetings were held on both Dec. 17 and 18, and among those present were:

Howard Abel, comptroller Brooklyn Rapid Transit Company, Brooklyn, N. Y.

C. Loomis Allen, vice-president and general manager Syracuse Rapid Transit Railway Company and Utica & Mohawk Valley Railway Company.

C. F. Balch, special examiner, Interstate Commerce Commission, Washington, D. C.

D. Dana Bartlett, general auditor, Massachusetts Electric Companies, Boston & Northern Street Railway Company and Old Colony Street Railway Company.

H. M. Beardsley, secretary, Elmira Water, Light & Railroad Company, Elmira, N. Y.

John I. Beggs, president, Milwaukee Electric Railway & Light Company and United Railways Company, of St. Louis.

E. S. Benson, consulting accountant, representing the Interborough-Metropolitan Company, of New York.

T. B. Bradley, of the Richmond Light & Railroad Company and Staten Island Midland Railway Company, of New York.

Arthur W. Brady, president, Indiana Union Traction Company, of Anderson, Ind.

W. B. Brockway, representing the United Railways Investment Company and American Cities Railways & Light Company, of New York.

J. F. Calderwood, vice-president and general manager, Brooklyn Rapid Transit Company, Brooklyn, N. Y.

J. F. Collins, secretary and auditor, Rochester Railway Company and Rochester & Eastern Rapid Railway Company, of Rochester, N. Y.

W. H. Davis, comptroller of the United Traction Company, of Albany, N. Y.

R .A. Dyer, Jr., of the Rochester, Syracuse & Eastern Railroad and Auburn & Syracuse Electric Railroad, of Syracuse, N. Y.

G. L. Estabrook, of Philadelphia, representing the Bangor Railway & Electric Company, Grand Rapids Railway Company, St. Joseph Railway, Light, Heat & Power Company, East St. Louis & Suburban Company, and other roads.

Frank R. Ford, of New York, representing United Railways Investment Company, American Cities Railway & Light Company, etc.

W. H. Forse, Jr., treasurer, Indiana Union Traction Company, Auderson, Ind.

W. F. Ham, comptroller, Washington Railway & Electric Company, Washington, D. C., representing American Street & Interurban Railway Accounting Association.

G. H. Harries, vice-president, Washington Railway & Electric Company.

J. Leslie Hess, president and general manager, Fonda, Johnstown & Gloversville Railroad.

Chas. O. Kruger, second vice-president and general manager, Philadelphia Rapid Transit Company.

Lewis Lillie, of Philadelphia, representing the Public Service Corporation of New Jersey.

Arthur L. Linn, Jr., general auditor, Mohawk Valley Company, N. Y., Utica & Mohawk Valley Company, and other roads.

Thos. N. McCarter, president, Public Service Corporation of New Jersey.

Geo. F. McCulloch, representing the Indiana Union Traction Company, of Anderson, Ind.

W. G. McDole, auditor, The Cleveland Electric Railway Company, of Cleveland, Ohio.

James Marwick, of New York, representing the Twin City Rapid Transit Company, Chicago City Railway Company and Duluth Street Railway Company.

W. J. Meyers, chief of division of statistics and accounts, Public Service Commission of the Second District, Albany, N. Y.

J. H. Pardee, operating manager, J. G. White & Co., of New York City, representing Eastern Pennsylvania Railways Company, Tri-City Railway Company, Davenport, Ia., and other roads.

C. A. Pearson, Jr., of Philadelphia, representing the Bangor Railway & Electric Company, Grand Rapids Railway Company, East St. Louis & Suburban Railway Company, and other roads.

E. F. Peck, general manager, Schenectady Railway Company, Schenectady, N. Y.

H. J. Pierce, president, International Railway Company, Buffalo, N. Y.

A. Stuart Pratt, of Boston, representing the properties managed by Stone & Webster.

C. Gordon Reel, vice-president and general manager, Kingston Consolidated Railroad Company, Kingston, N. Y.

Alex. Rennick, auditor, Philadelphia Rapid Transit Company, Philadelphia, Pa.

Charles S. Sergeant, vice-president, Boston Elevated Railway Company, Boston, Mass.

Wm. O. Seymour, Railroad Commission, Connecticut.

J. N. Shannahan, general manager, Washington, Baltimore & Annapolis Electric Railway.

F. E. Smith, auditor, Chicago Union Traction Company, Chicago, Ill.

Dana Stevens, vice-president and general manager, Cincinnati Traction Company, Ohio Traction Company, and other companies.

Bernard V. Swenson, secretary and treasurer, American Street & Interurban Railway Association, New York City.

C. L. S. Tingley, of Philadelphia, Pa., representing The American Railways Company and its many properties.

Robert I. Todd, representing the Indianapolis Traction & Terminal Company, the Terre Haute, Indianapolis & Eastern Traction Company, and allied roads.

A. F. Weber, chief statistician, New York Public Service Commission (First District), New York City.

Clinton White, Massachusetts Railroad Commission, Boston, Mass.

H. L. Wilson, comptroller, Boston Elevated Railway Company, Boston, Mass.

T. W. Wilson, general manager, International Railway Company, of Buffalo, N. Y.

Thos. Yapp, assistant secretary, Railroad & Warehouse Commission of Minnesota, St. Paul, Minn.

P. S. Young, comptroller, Public Service Railway Company, New Jersey.

The discussion centered about the report of the special committee which was appointed at the previous meeting, held Nov. 22, and which was unable to settle definitely upon any single tentative classification. In its report, this committee suggested one tentative classification of construction accounts, termed "Exhibit A," and two classifications of operating accounts termed "B" and "C" respectively. Classification "B" was preferred by the representatives of the national and state commissions on the committee and is published herewith. Classification "C" agreed substantially with the text of the tentative classification of

operating expenses drafted by the American Street and Interurban Railway Accountants' Association at its Atlantic City convention, and published in the Street Railway Journal for Nov. 16. The report of the committee also contained a comparison of the two classifications under the title "Exhibit D."

While different opinions were expressed on the relative merits of schedules "B" and "C," the discussion at the conference centered mainly upon the desirability of including in any classification of street railway accounts the subject of depreciation. Arguments were presented in favor of and against this course, the representatives of the Interstate Commerce Commission and State commissions, as a whole, favoring the inclusion of accounts bearing on this subject. Prof. Adams, statistician of the commission and the chairman of the conference, in this connection read a letter from Hon. Frank W. Stevens, chairman of the Public Service Commission of the Second District of New York State, stating that he hoped the subject of depreciation would be provided for in the classification, as it would strengthen the position of the New York Commission, which expected to include in its classification, accounts of this character. It was finally decided to adopt two classifications, one for the larger roads, the other for the smaller roads. The line of demarkation is yet to be determined, but the smaller roads will probably consist of those having gross receipts per annum less than some sum between $50,000 and $300,000, the larger roads being above the limit decided upon. These two classifications will be similar in principle but that for the smaller roads will have a very much smaller number of accounts.

It was decided tentatively to adopt for the amplified classification of accounts, or that for the large roads, the classification referred to in the report of the sub-committee as "Exhibit B," and published on pages 1177 to 1179, except that the subject of depreciation is to be referred to a committee representing the interests involved for further action. In other words, accounts Nos. 16, 25, 33, 46, 59, and 69 in the subjoined tentative classification, being those relating to depreciation, are to be omitted for the present. The classification is then to be printed and sent to all of the railway companies with the explanation that depreciation is not included owing to its being referred to the committee. All suggestions received from different companies will be compiled and submitted to a committee of fifteen, consisting of five members representing the American Street and Interurban Railway Association, five members representing the American Street and Interurban Railway Accountants' Association and five members representing the Interstate Commerce Commission and State commissions. There will be no formal adoption of any classification by the Interstate Commerce Commission until these suggestions have been compiled by the committee mentioned and submitted to the commission and passed upon by it. It was also proposed to include in the circular accompanying the printed reports of this tentative classification the latest steam railroad classification, so that the recipients can have an opportunity to compare the two, with the view of making the two harmonize as closely as possible.

The same plan will be followed in connection with the abbreviated schedule for the smaller roads, which will contain 21 accounts instead of the 116 accounts contained in tentative classification B. The following gentlemen were appointed to compose the committee of fifteen on the standard classification of accounts:

COMMITTEE ON THE STANDARD CLASSIFICATION OF ACCOUNTS.

Representing the American Street and Interurban Railway Association: Gen. G. H. Harries, of Washington, chairman; Arthur W. Brady, of Anderson, Ind.; C. Loomis Allen, of Utica, N. Y.; Frank R. Ford, of New York; W. B. McKinley, of Champaign, Ill.

Representing the American Street and Interurban Railway Accountants' Association: W. F. Ham, of Washington, chairman; F. E. Smith, of Chicago; W. G. McDole, of Cleveland, Ohio; H. L. Wilson, of Boston, Mass.; W. H. Forse, Jr., of Anderson, Ind.

Representing the Interstate Commerce Commission and National Association of Railway Commissioners: Prof. H. C. Adams, of the Interstate Commerce Commission, chairman; Clinton White, member of the Massachusetts Railroad Commission; Wm. O. Seymour, member of the Connecticut Railroad Commission; Thos. Yapp, member of the Minnesota Railroad Commission; Wm. J. Meyers, member of the Public Service Commission of the Second District, of New York.

COMMITTEE ON DEPRECIATION.

The following gentlemen were appointed members of the committee on depreciation of the American Street and Interurban Railway Association to take up the consideration of that subject as outlined above:

Gen. G. H. Harries, Washington, chairman; John I. Beggs, of Milwaukee; C. S. Sergeant, of Boston; Arthur W. Brady, of Anderson, Ind.; Frank R. Ford, of New York.

REPORT OF COMMITTEE ON CLASSIFICATION OF ACCOUNTS

This committee was appointed at the meeting in Washington on Nov. 22 to consider a standard classification of accounts and presented its report to Prof. Adams, Dec. 3. The report as stated in the previous article was accompanied by four exhibits, of which "A" and "B" are reprinted in this issue. "Exhibit C," as explained in the previous article, was practically the classification tentatively decided upon by the Accountants' Association at its Atlantic City convention, and "Exhibit D" was a comparison of classifications "B" and "C." The report of the committee follows:

Washington, D. C., Dec. 3, 1907.

Mr. Henry C. Adams,
In charge of Statistics and Accounts,
Interstate Commerce Commission,
Washington, D. C.

Dear Sir: The members of the committee of six appointed by yourself at the instance of a conference held at the office of the Interstate Commerce Commission on Nov. 22, for the purpose of considering a scheme of accounts to be prescribed by the Interstate Commerce commission for street and interurban railway companies within its jurisdiction, have to report that they met on Nov. 29 and have spent that and the following days to the present date in consideration of the matters intrusted to them. They find themselves unable to agree upon a complete scheme of accounts, nor have they been able to agree upon the importance of conformability to the system of accounts already promulgated by the Interstate Commerce Commission for steam railway carriers. They do, however, agree as follows:

That if it is necessary that the system of accounts to be prescribed for street and interurban railway companies shall conform closely to that prescribed for steam railway carriers, the classifications "Exhibit A" and "Exhibit B" are practicable and conform to the system of accounts prescribed for steam carriers as closely as the differing conditions of the two classes of carriers permit.

The members of the committee who are actively connected with the administration of street and interurban properties do not, however, believe that the Classification of Operating Expenses outlined in "Exhibit B" meets the needs of the managements of such properties to a sufficient degree, and therefore recommend in lieu thereof the classification herewith designated as "Exhibit C."

A comparison of these two classifications is submitted as "Exhibit D."

And the members of the committee connected with the Interstate Commerce Commission and State Commissions are of the opinion that, except for its lack of conformability to the scheme of accounts prescribed for the steam railway carriers, the scheme designated above as "Exhibit C" may be made by suitable subdivision and expansion to meet the requirements of the various Commissions.

The committee therefore recommend that the conference before which this report is to be laid on Dec. 17 shall consider both of these schemes of accounts, many of the individual accounts in both schemes being identical in name and character. It has not been thought necessary at this time to attempt a complete statement of the various classes of items to be comprehended in each particular account suggested, it being thought that when the system of accounts is settled upon by the Interstate Commerce Commission the details of the classes of items to be included in each separate account may be then readily worked out. This applies particularly to the Road and Equipment Expenditures Accounts ("Exhibit A"), the detailed items included in which the members of the committee that are connected with the operation of railways have not had time to examine carefully.

The committee recognize that various important elements of a complete system of accounts have not been completely provided for in "Exhibit C," the principal one among these being the matter of depreciation. The committee agree in recognizing the necessity of provision for depreciation in any complete scheme of operating expense accounts designed to show or to approximate the cost of operation. They are not, however, able to agree upon the practical method by which depreciation shall be accounted for, nor are the committee able to agree to what extent, if any, it is necessary to provide in the scheme of accounts for the matter of joint facilities, which is recognized in the system of accounts promulgated for steam railway carriers.

Of somewhat similar character to the matter of joint facilities is that of power produced in the power plant of a street or interurban carrier, but utilized outside the transportation operations of the carrier. The committee are not able to agree as to the proper method of accounting for the cost of production of such power and the revenue derived from the sale thereof.

Neither are the committee able to agree upon the best method of disposing of the matter of rents, nor upon the extent to which it is important and practicable to provide for the distinction between the elements of cost of production, interest, and profit in the amounts paid or received as compensation for the use of facilities owned by one corporation and furnished to another for a gross rent, or for products furnished for a gross sum.

Nor are the committee able to agree to what extent, if any, a scheme of amortization accounts should be provided through which to secure suitable disposition of extraordinary casualties, abandoned property, and expiring tangible assets, such as limited franchises, patent rights, and the like.

The foregoing is respectfully submitted.

(Signed) GEO. H. HARRIES, Chairman,
American Street and Interurban Railway Association.
WM. F. HAM,
American Street and Interurban Railway Accountants' Association.
C. LOOMIS ALLEN,
Street Railway Association of the State of New York.
WM J. MEYERS,
New York Public Service Commission (Second District).
WM O. SEYMOUR,
National Association of Railway Commissioners.
C. F. BALCH,
Interstate Commerce Commission.

EXHIBIT A.

TENTATIVE CLASSIFICATION OF EXPENDITURES FOR ROAD AND EQUIPMENT OF ELECTRIC RAILWAYS.
(Recommended by the special committee.)

GENERAL ACCOUNTS.

I. ROAD.
II. EQUIPMENT.
III. GENERAL EXPENDITURES.

PRIMARY ACCOUNTS.

I. ROAD.

Right of Way.
1. Engineering and Superintendence.
2. Right of Way.
3. Real Estate Other Than Right of Way.

Roadway.
4. Grading.
5. Ballast.
6. Ties.
7. Rails.
8. Track Fastenings and Other Material.
9. Frogs, Switches, and Special Work.
10. Paving.
11. Track Laying and Surfacing.
12. Roadway Tools.
13. Tunnels.
14. Bridges, Trestles, and Culverts.
15. Over and Under Grade Crossings.
16. Fencing Right of Way.
17. Grade Crossings, Cattle Guards, and Signs.
18. Interlocking and Other Signal Apparatus.
19. Telegraph and Telephone Lines.

Electric Line.
20. High-Tension Transmission Lines.
21. Overhead Feeders.
22. Track Bonding.
23. Underground Feeders.
24. Overhead Trolley Lines.
25. Third-Rail Conductors.
26. Conductor Rails.

Buildings and Structures.
27. Generating Plant Buildings.
28. Power Sub-station Buildings.
29. General Offices.
30. Stations, Waiting Rooms, and Other Buildings.
31. Docks and Wharves.

Permanent Equipment.
32. Generating Plant Equipment.
33. Sub-station Equipment.
34. Shop Machinery and Tools.
35. Cost of Road Purchased.

II. EQUIPMENT.

Revenue Equipment.
36. Passenger Cars.
37. Combination Cars.
38. Express Cars.
39. Mail Cars.
40. Freight Cars.
41. Locomotives.

Electric Equipment of Revenue Equipment.
42. Electric Equipment of Passenger Cars.
43. Electric Equipment of Combination Cars.
44. Electric Equipment of Express Cars.
45. Electric Equipment of Mail Cars.
46. Electric Equipment of Freight Cars.
47. Electric Equipment of Locomotives.

Service Equipment.
48. Work Cars.
49. Snow Equipment.
50. Electric Locomotives (Utility).
51. Miscellaneous Equipment.

Electric Equipment of Service Equipment.
52. Electric Equipment of Work Cars.
53. Electric Equipment of Snow Equipment.
54. Electric Equipment of Locomotives (Utility).

III. GENERAL EXPENDITURES.

55. Law Expenses.
56. Stationery and Printing.
57. Insurance.
58. Taxes.

59. Injuries to Persons.
60. Interest and Commissions.
61. Other Expenditures.

The text of this classification agrees substantially with the text of the Tentative Classification of Expenditures for Road and Equipment of Electric Railways.

EXHIBIT B.

Tentative Classification of Operating Expenses of Electric Railways.

(Prepared by the special committee and recommended for adoption, provided essential agreement with the steam railway accounts is necessary.)

I. Maintenance of Way and Structures.

Maintenance of Way.

1. Ballast.
2. Ties.
3. Rails.
4. Rail Fastenings.
5. Frogs, Switches, and Special Work.
6. Underground Construction.
7. Paving.
8. Roadway and Track (Labor and Expenses).
9. Tunnels.
10. Bridges and Culverts.
11. Over and Under Grade Crossings.
12. Grade Crossings, Fences, Cattle Guards, and Signs.
13. Signals and Interlocking Plants.
14. Telegraph and Telephone.
15. Other Maintenance of Way Expenses.
    - *a.* Superintendence.
    - *b.* Injuries to Persons.
    - *c.* Stationery and Printing.
    - *d.* Insurance.
    - *e.* Other Expenses.
16. Depreciation Estimate "Roadway."
    - *a.* Ties.
    - *b.* Rails.
    - *c.* Rail Fastenings and Other Material.
    - *d.* Frogs, Switches, and Special Work.
    - *e.* Underground Construction.
    - *f.* Paving.
    - *g.* Tunnels.
    - *h.* Bridges and Culverts.
    - *i.* Over and Under Grade Crossings.
    - *j.* Grade Crossings, Fences, Cattle Guards, and Signs.
    - *k.* Signals and Interlocking Plants.
    - *l.* Telegraph and Telephone.

Electric Line.

Transmission Lines—

17. High-Tension Transmission Lines.

Distribution System—

18. Overhead Feeders.
19. Underground Feeders.
20. Track Bonding.

Conductors—

21. Overhead Trolley Lines.
22. Third-Rail Conductors.
23. Conductor Rails.
24. Miscellaneous Electric Line Expenses.
    - *a.* Superintendence.
    - *b.* Injuries to Persons.
    - *c.* Stationery and Printing.
    - *d.* Insurance.
    - *e.* Other Expenses.
25. Depreciation Estimate "Electric Line."
    - *a.* High-Tension Power Transmission Lines.
    - *b.* Overhead Feeders.
    - *c.* Track Bonding.
    - *d.* Underground Feeders.
    - *e.* Overhead Trolley Lines.
    - *f.* Third-Rail Conductors.

Maintenance of Buildings and Structures.

26. Power Plants.
27. Power Sub-stations.
28. General Offices.
29. Carhouses and Shops.
30. Stations, Waiting Rooms, and Other Buildings.
31. Docks and Wharves.
32. Miscellaneous Buildings and Structures Expenses.
    - *a.* Superintendence.
    - *b.* Injuries to Persons.
    - *c.* Stationery and Printing.
    - *d.* Insurance.
    - *e.* Other Expenses.
33. Depreciation Estimate "Buildings and Structures."
    - *a.* Power Plants.
    - *b.* Power Sub-stations.
    - *c.* General Offices.
    - *d.* Car Houses and Shops.
    - *e.* Stations, Waiting Rooms, and Other Buildings.
    - *f.* Docks and Wharves.

Availability Maintenance Expenses.

34. Care of Track.
35. Removal of Snow and Ice.
36. Cleaning, Sprinkling, and Oiling Roadbed.
37. Injuries to Persons.
38. Other Miscellaneous Maintenance Expenses.
39. Other than Railway Operation—Cr.
40. Maintaining Joint Tracks, Yards, and Terminals—Dr.
41. Maintaining Joint Tracks, Yards, and Terminals—Cr.

Maintenance of Service Equipment.

42. Snow Equipment.
43. Work Cars.
44. Electric Locomotives (Utility).
45. Miscellaneous Service Equipment.
46. Depreciation Estimate "Service Equipment."
    - *a.* Snow Equipment.
    - *b.* Work Cars.
    - *c.* Electric Locomotives (Utility).
    - *d.* Miscellaneous Service Equipment.

II. Maintenance of Equipment.

Maintenance of Revenue Equipment.

47. Passenger Cars.
48. Combination Cars.
49. Express Cars.
50. Mail Cars.
51. Freight Cars.
52. Locomotives.

Maintenance of Electric Equipment of Revenue Equipment.

53. Electric Equipment of Passenger Cars.
54. Electric Equipment of Combination Cars.
55. Electric Equipment of Express Cars.
56. Electric Equipment of Mail Cars.
57. Electric Equipment of Freight Cars.
58. Electric Equipment of Locomotives.

II. Maintenance of Equipment—Continued.

Maintenance of Electric Equipment of Revenue Cars—Cont'd.

59. Depreciation Estimate "Revenue Equipment."
    - *a.* Passenger Cars.
    - *b.* Combination Cars.
    - *c.* Express Cars.
    - *d.* Mail Cars.
    - *e.* Freight Cars.
    - *f.* Locomotives.
    - *g.* Electric Equipment of Revenue Cars.

Miscellaneous Maintenance of Equipment Expenses.

60. Shop Machinery and Tools.
61. Power-Plant Equipment.
62. Sub-station Equipment.
63. Other Equipment Expenditures.
    - *a.* Superintendence.
    - *b.* Injuries to Persons.
    - *c.* Stationery and Printing.
    - *d.* Insurance.
    - *e.* Other Expenses.
64. Other than Railway Operations—Cr.
65. Maintaining Joint Equipment—Dr.
66. Maintaining Joint Equipment—Cr.

67. Equipment Borrowed—Dr.
68. Equipment Loaned—Cr.
69. Depreciation Estimate "Maintenance of Shop and Power Apparatus."
    a. Shop Machinery and Tools.
    b. Electric Power Plant Apparatus.
    c. Sub-station Apparatus.

III. TRAFFIC EXPENSES.

70. Soliciting and Administering.
71. Advertising and Attractions.
72. Traffic Supplies and Expenses.
    a. Stationery and Printing.
    b. Insurance.
    c. Miscellaneous Traffic Expenses.

IV. TRANSPORTATION EXPENSES.

Power.

73. Wages of Power Plant Employees.
74. Fuel for Power.
75. Water for Power.
76. Lubricants for Power.
77. Other Supplies and Expenses of Power Plants.
78. Operating Sub-stations.
79. Power Transferred—Cr.
80. Other than Railway Operations—Cr.
81. Purchased Power.

Operation of Cars.

82. Supervising.
83. Passenger Motormen.
84. Passenger Conductors.
85. Passenger Trainmen.
86. Freight, Express, and Other Motormen.
87. Freight, Express, and Other Conductors.
88. Freight, Express, and Other Trainmen.
89. Interlockers, Block, and Other Signals—Operation.
90. Telegraph and Telephone—Operation.
91. Stationery and Printing.
92. Clearing Wrecks.
93. Station Employees.
94. Station Supplies and Expenses.
95. Car Supplies and Expenses.
96. Carhouse Employees.
97. Carhouse Expenses.
98. Express Service.
99. Other Transportation Expenses.
    a. Switchmen, Crossing Flagmen, Watchmen, and Other Car Service Employees.
    b. Drawbridge Expenses.
    c. Other Expenses.
100. Insurance.
101. Loss and Damage.
    a. Passenger.
    b. Freight.
102. Damage to Property.
    a. Property.
    b. Stock on Right of Way.
103. Injuries to Persons.
104. Operating Joint Tracks, Yards, and Other Facilities—Dr.
105. Operating Joint Tracks, Yards, and Other Facilities—Cr.

V. GENERAL EXPENSES.

106. Salaries and Expenses of General Officers.
107. Salaries and Expenses of Clerks and Attendants.
108. General Office Supplies and Expenses.
109. Law Expenses.
110. Insurance.
111. Relief Department Expenses.
112. Pensions.
113. Stationery and Printing.
114. Other Expenses.
115. General Administration Joint Tracks, Yards, and Other Facilities—Dr.
116. General Administration Joint Tracks, Yards, and Other Facilities—Cr.

The text of this classification agrees substantially with the text of the Tentative Classification of Operating Expenses of Electric Railways, which harmonizes closely with the Classification of Operating Expenses of Steam Railways.

ADVERTISING A NEW TYPE OF CAR IN BOSTON

One of the latest ways in which the Boston Elevated Railway Company is making use of space in the newspapers at advertising rates is to make display announcements of changes or new features in its service. An example is the accompanying two-column announcement, making suggestions as to the novel features of the new semi-convertibles which it is introducing on suburban lines:

Boston Elevated Railway Company

Information Concerning the

NEW EASY ACCESS, SEMI-CONVERTIBLE CARS

Safety, Speed, Sanitation and Seats

The company is about to put in service 100 additional Easy Access, Semi-Convertible Surface Cars. As some of them will be operated over routes where this type of car has not been previously used, the following facts are stated for the guidance and information of passengers:

The new cars are 45 feet in length over all, have an unusually wide aisle, seat 52 passengers and weigh 28 tons. The cars generally used by the company are 35 feet in length over all, seat 34 passengers and weigh 12½ tons. The new cars are too heavy to be operated over certain bridges until these bridges are strengthened; and can be used only on routes where conditions are feasible.

The cars are equipped with four motors, with General Electric Automatic Control, Westinghouse Air Brakes and improved heating, lighting and ventilating apparatus. The seats and floors are especially designed for sanitation, and the floors are fireproof.

The cars have pneumatic sliding doors and folding lower steps that are closed and raised respectively when the car is in motion, so that passengers may not get on or off until the car has come to a stop, the door has been opened and the step dropped. A cab is provided for the motorman. The platform space is commodious, and the doors of such width that passengers may enter and leave the car by the same door at the same time.

Passengers, therefore, about to leave the car are requested to be near the door when the car approaches the desired stopping place, thus saving time for themselves and aiding the company to give rapid service and maintain its operating schedule for the benefit of all its patrons.

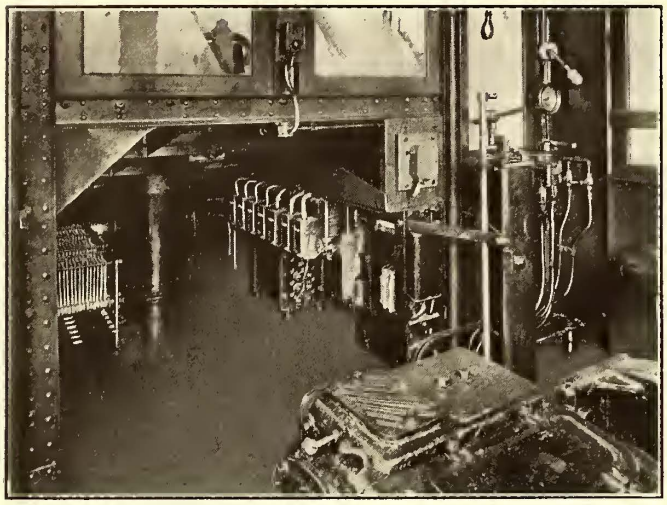
Boston Elevated Railway Company

These extra large cars have been used heretofore chiefly on the lines running under Boston Harbor in the East Boston Tunnel. Other lines are now to be equipped with them, however, and the fact that the first arrivals on this new order are this week being placed in service on the Brookline and Newton lines, where they are novelties, makes the advertisement worth while. Nothing similar to the folding step and double doorways of the new cars has heretofore been familiar to patrons on that side of the city.

In the second annual report of the Ohio Railroad Commission, which has been submitted to the Governor of the State, the Commission recommends that it be given jurisdiction over municipal railroad systems, where any portion of the system extends beyond the municipal corporation lines. The Commission expresses the belief that that is the intent of the present law, but the wording is so obscure it leaves a doubt. The wording is to the effect that the authority of the Commission shall not apply to street and electric railroads engaged solely in the transportation of passengers within the limits of cities, but does not mention the city systems, portions of whose lines extend beyond the city limits.

ELECTRIC LOCOMOTIVE FOR PORTLAND

Among recent electric locomotives the one illustrated and described below possesses some features of unusual interest. It is one of two 40-ton switching locomotives built for the Portland Railway, Light & Power Company, Portland, Ore., by the General Electric Company and American Locomotive Company at their Schenectady works. The classification of the locomotive, according to the standard rating of the manufacturers, is 404-E-80-4-GE-205-B.



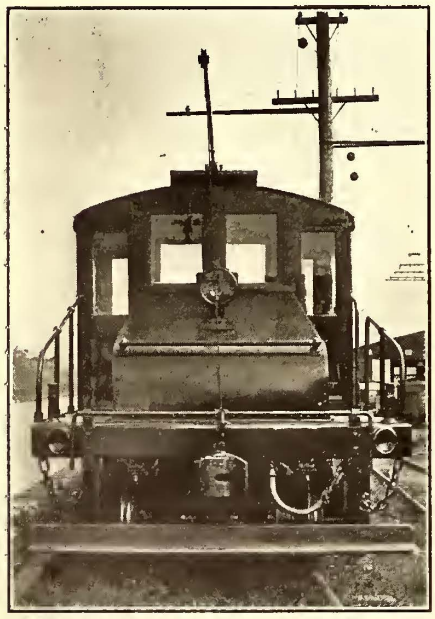
INTERIOR OF CAB OF PORTLAND LOCOMOTIVE

The motor equipment consists of four GE-205-B motors. This motor is one of the latest types with commutating poles developed by the manufacturers. The commutating pole motors are particularly desirable for locomotive service, as the maximum torque demanded of a locomotive, when starting on grades, is often four or five times that demanded under ordinary full speed running conditions, and in addition, a locomotive in switching service is often operated with power on the motors a very small proportion of the total time. The amount of time lost in coasting, making switches without power, waiting for couplings and other delays, under the conditions of some recent tests, amounted to well over 75 per cent of the time that the locomotive was engaged in a service that could fairly be called continuous. The equipment of the locomotive illustrated, on a one hour rating, will exert a tractive effort of 9200 lbs. at a speed of 16½ m. p. h. Under starting conditions the same equipment is easily capable of exerting a tractive effort of 20,000 to 25,000 lbs. without danger from commutator troubles.

The electric equipment of the locomotive aside from the motors consists of type M multiple unit control, with contactors and rheostats in the auxiliary cabs, and controllers located in diagonally opposite corners of the main cab. The locomotive is equipped with two trolleys to avoid turning the trolley and to provide additional carrying capacity when engaged in service so heavy as to call for the full overload capacity of the locomotive. In the center of the main cab is a CP-23 air compressor, having a capacity of 50 cu. ft. displacement when delivering air at 90 lbs. pressure.

Referring to the mechanical construction of the locomotive, the sloping end cabs are a separate frame work of angles and sheet iron, bolted to the platform and main cab so that they may be removed without disturbing any of the apparatus contained therein. The locomotive platform is built of four 10-in longitudinal channel irons securely fastened to the end frames or bumpers, which are of cast iron cored out to obtain the necessary weight with push bolt sockets cast in. The main cab is built of structural steel angles and sheets, with a platform of ⅜-in. sheet steel covered with ¾-in. hard wood. The two ends of the locomotive are equipped with four M. C. B. vertical plane couplers, having shank springs and follower plates, carried in a draw head casting attached to the main sills of the locomotive.

The truck is of the bar frame rigid bolster equalizer type, but, as shown in the side view, the weight of the side frames and bolster is transmitted to the equalizers through a heavy semi-elliptic spring on each side instead of through a series of double elliptic and helical springs as is customary on the so-called M. C. B. equalized truck for high speed service. The axles are 6 ins. in diameter, of hammered open hearth steel, with 33-in. Taylor fused



END VIEW OF LOCOMOTIVE

SIDE VIEW OF PORTLAND LOCOMOTIVE

steel tired wheels having the M. C. B. tread and flange.

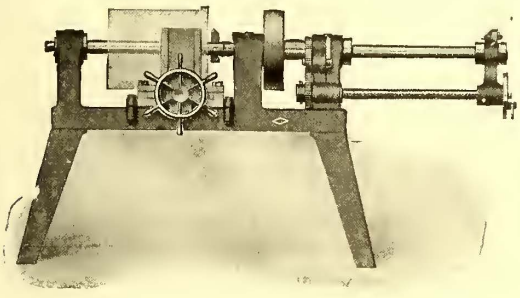
The locomotive is equipped with bell, whistle and headlights. The headlights are 32-cp incandescent, and 4-cp gage lamps are wired in each headlight circuit and controlled by the same switches.

The principal dimensions of the locomotives are as follows:

Length inside to inside of knuckles, 31 ft. 1 in.
Height over cab, 11 ft. 9 ins.
Length of rigid wheel base, 6 ft. 6 ins.
Width over all, 9 ft. 6 ins.
Track gage, 4 ft. 8½ ins.
Weight on drivers, 81,000 lbs.

BORING ARMATURE BEARINGS

It is a well-known fact that the armature shaft wears more rapidly in the bearing at the pinion end than the other end of the shaft, on account of the thrust of the gearing, and that after the motor has been in use for some time the decrease in diameter is considerable. For this reason it is



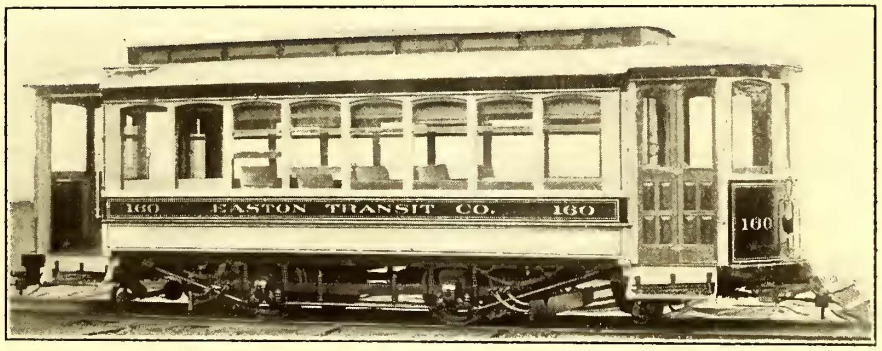
MACHINE FOR BORING ARMATURE BEARINGS

not practicable to keep bearings babbitted up to standard sizes, as even the bearings on the same shaft are different sizes and a bearing that is 1-32-in. loose is half worn out. It has also been shown by experience on various kinds of bearings moulded on mandrels that when the mandrel is of a lower temperature than the babbitt metal, as it usually is, the babbitt will have blow holes and shrinkage cracks after being moulded. That is, it will not have the wearing surface possessed by a bearing that has been bored out to fit the shaft revolving in it. Another objection to the mandrel method is that different sizes of mandrels must be kept on hand to fit the various journals. The shrinkage of the babbitt on the mandrel also is likely to make it difficult to drive the mandrel out, if the mandrel is made straight, as it should be. If the mandrel is made with a taper to release it easily from the bearing, the bearing, of course, has a taper, which with a straight shaft means a quickly worn bearing.

Mainly to overcome these objections the Black Diamond Engineering Company, of Monongahela, Pa., has designed the machine illustrated herewith, which is built to bore bearings up to 12-in. O.D. and 18-in. long. The chuck is two-jawed, self centering and is operated by means of the hand wheel. It will firmly hold round, square or hexagonal bearings, either split or solid, up to 12-in. diameter. The boring bar is of 2-in. cold drawn steel, and can be slid in the long sleeve, which revolves in the bearings. The driving pulley and feed gear are keyed to the sleeve, the boring bar being revolved by means of the key. The boring bar is fed through the work by means of a feed screw parallel with it and driven by the gearing from the sleeve. On the outer end of the boring bar is a split nut through which the boring bar revolves. The collars on the boring bar keep it in place. The split nut is opened from gripping the feed screw by means of a casting on the end. When the handle is raised this casting holds the split nut open and prevents it from coming in contact with the feed screw. Returning it is locked in either position. The intermediate gear, on an eccentric stud, by means of the handle, can be thrown out of gear with the driving pinion on the sleeve. By locking the feed nut on the feed screw the bearing can be faced off at either end, while the tool can be advanced by turning the large gear on the hand screw. The boring bar is fitted with a No. 4 Morse taper socket, but the bar can be taken apart and a drill or reamer placed in the socket and the work drilled or reamed, making practically a drill press. The machine also makes it possible to bore bearings with one end closed. It can be fitted with a crank handle so as to operate it by hand, and the manufacturers can supply a boring bar extension for journals smaller than 2-in. The machine may be driven direct by a motor or by a belt.

MORE SEMI-CONVERTIBLE CARS FOR EASTON, PA.

Early this year, seven 20-ft. closed cars, built by the John Stephenson Company, were purchased by the Easton Transit Company; then eight 10-bench open cars, built by The J. G. Brill Company, were purchased, and these were followed by a lot of six 30-ft. 8-in. semi-convertible cars, illustrated in the STREET RAILWAY JOURNAL of June 29, and now operating on the new Easton & South Bethlehem division. The equipment just delivered consists of six 20-ft 8-in. cars, also of the Brill semi-convertible type, one of which is illustrated. These cars contain all the features of the double-truck, semi-convertible type, and are equipped throughout with the same specialties manufactured by the builders, namely, seats, gongs, bells, angle-iron bumpers, ratchet brake handles, etc. The principal dimensions of the



EXTERIOR OF CAR FOR EASTON

new single-truck cars are as follows: Length over end panels, 20 ft. 8 in.; over crown pieces, 30 ft. 1 in.; width over sills, including panels, 7 ft. 10-½ in.; height from rail over trolley board, 11 ft. 1 in.; size of side sills, 5 in x 3⅜ in.; end sills, 3½ in. x 6⅝ in. The trucks are the builders' No. 21-E type with 7 ft. 6 in. wheel base.

The associates of the late Superintendent E. J. Wilcoxen, of the Rochester Railway Company, are preparing two memorial books. One contains all the messages of condolence received and the other is made up of expressions of appreciation from his associates. The books will be presented to Mrs. Wilcoxen.

FINANCIAL INTELLIGENCE

Wall Street, Dec. 18, 1907.

The Money Market

There was no material change in the local money situation during the past week. The demand for call money for stock market purposes was somewhat more active as a result of the calling of loans by the local institutions and rates for day to day money have ranged between 17 and 6 per cent, the bulk of the business being transacted at above 10 per cent. In the time money market business was practically at a standstill, the only money coming upon the market consisting of small amounts put out by out of town institutions. Loans of sixty-day funds were reported at 10 and 12 per cent and 10 per cent was bid for accommodation for that period. For the longer periods, four to six months, 8 per cent was quoted, although no transactions were reported at that figure. The demand for money from the West and South continues, although upon a somewhat smaller scale. The currency market has been considerably less active than heretofore, but the demand from certain sections of the West continued rather persistent, which has been sufficient to maintain the premium around 1 per cent. The foreign exchange market has ruled decidedly firmer, notwithstanding the increased offerings of bills against cotton and grain shipments, the strength in this department being attributed to the purchases in connection with the end of the year settlements abroad, and also to cover gold imports. Additional engagements of the yellow metal have been made during the week, bringing the total amount on this movement up to about $100,000,000. Of this amount about $85,000,000 has been laid down on this side. A feature of the week was the large increase in cash made by the New York City banks which resulted in a material reduction in the deficit of the Clearing House institutions. Further strengthening of bank reserves is expected from now on, as in some instances the banks have notified their borrowing customers that their loans must be reduced to the greatest extent possible between now and Jan. 1. At the close of the week there was nothing in the situation to warrant the expectation of a decidedly easier market in the near future. Preparations must soon be made for meeting the Jan. 1 interest and dividend disbursements, which this year amounted to upward of $180,000,000. The disbursements on Jan. 1 next are not likely to be as heavy owing to the fact that many corporations have passed their dividends, while many others have materially reduced their distribution or have deferred payments on their stocks. It is expected, however, that shortly after the first of the year the market will work easier. Usually at this time of the year the country banks begin to send their unemployed funds into New York for loaning purposes, but so far the offerings of the country banks have been extremely small, owing to the stringency existing all over the country. After the first of the year the supply from that source is likely to be much freer. It is also pointed out that much relief will be afforded by the reaction in practically all branches of business, which, of course, will greatly reduce requirements.

The bank statement published on last Saturday was extremely favorable. Loans decreased $11,367,700, while deposits decreased $7,985,500. Cash increased $4,112,800, and as the reserve required was $1,996,375 less than in the preceding week, the deficit was reduced by $6,109,175. The total deficit now stands at $40,101,175, as compared with a deficit of $1,699,050 in the corresponding week a year ago and with a surplus of $3,961,075 in the corresponding week two years ago. Another feature of the statement was an increase in circulation of $3,339,800.

The Stock Market

The stock market continues to display reactionary tendencies and prices have during the greater part of the past week declined still further from the substantial recovery made from the recent price level. Speculation, however, becomes more and more professional, as well as narrower and duller, which may in a measure be explained by the close approach of the holiday season, although a more potent reason is the absence of any pronounced selling pressure from any quarter other than the professional traders. In consideration of the main factors underlying the market, it is perfectly natural that prices should recede. To begin with, money, both on call and on time, continues stiff, with every prospect that it will become even more so between now and the beginning of the new year, because of the preparations necessary to meet the enormous dividend and interest payments then due. Then, again, the flow of money to the interior keeps up, despite the fact that many of the banks outside this city now have reserves largely in excess of anything in their history; currency here still commands a premium, whereas it had been the general expectation that this would have long since disappeared, and while the Clearing House banks are gradually restoring their surplus reserves, the process is a slow one and they still show a deficit beneath the legal requirements of some $40,000,000. With such a condition of affairs prevailing, to say nothing of the tendency on the part of railway and industrial managements to husband their resources through the medium of either reduced or deferred dividends, it is little wonder that prices for stocks show a drooping disposition.

There have of late been a few encouraging features in the situation, but these have for the time being been without avail in so far as arresting the decline in prices is concerned. The Bank of England in its last weekly statement made a very strong showing, further considerable amounts of gold were secured abroad for shipment to the United States, our Government gave out a very encouraging report on the cotton crop, estimating this year's yield at 11,678,000 bales and finally the bond market exhibited much greater strength and activity than that for stocks, which is one of the most encouraging signs of the times, especially as the demand for bonds has been virtually dead for over a year. This growing faith in railway mortgages, which in numerous instances yield at current prices unprecedented returns on the investment, is conclusive evidence that while for the moment capital is a bit chary about buying into stocks, even those of the gilt-edged class, the belief of the average investor in the ultimate prosperity of this country is unshaken and there is absolutely no fear of anything like defaults in meeting interest payments, otherwise there would be no such inquiry for railway mortgages as that now in evidence and which in all probability will continue to grow with the approach of the January interest and dividend payments. Sooner or later this demand will spread to the stock market, but for the present the tendency is in an opposite direction, with the industrials the particularly weak spots. The copper shares have been especially depressed by reason of unsatisfactory trade conditions and either actual or anticipated suspension or passing of dividends.

While moving more or less in unison with the balance of the market, the local traction shares have shown relatively greater firmness than the general run of stocks and a continuance of the quiet buying of them that has been going on for some little time, and which is based on the present and prospective large earnings of all these companies. An additional incentive in the case of Brooklyn Rapid Transit is found in the fact that the investigation into the company's affairs failed to disclose anything detrimental to its interests.

Philadelphia

There was a material falling off in the transactions in the local traction issues during the past week, and prices, while displaying considerable irregularity, tended downward. In the early dealings Philadelphia Rapid Transit dropped nearly a point on comparatively light trading, but later there was a sharp recovery to 17⅝. The advance, however, was only temporary, and at the close of the week there was another reaction to 17¼, or ¼ below last week's closing figure. Union Traction was also under pressure during the greater part of the week, the stock sustaining a sharp loss to 46¾. Philadelphia Traction also was weak, and closed at 82, which represents a loss of 2 points for the week. Philadelphia Company common ran off

1⅛ to 35⅞, and American Railways declined to 44. Consolidated Traction of New Jersey sold at 60, and United Companies of New Jersey at 226. Frankfort & Southwark Passenger sold again at 385, unchanged.

Chicago

Considerable progress has been made in clearing up the Chicago traction situation, and it is now believed that the whole matter will be amicably settled in the near future. The proposed plan it is thought will go through as it is understood there will be no opposition by certain interests which have held out against the plan for some time.

Trading in the local traction issues has been limited and prices generally show no material change. Metropolitan Elevated common sold at 17, and South Side Elevated at 63½ and 62. Chicago Railway 5's sold at 95, Northwestern Elevator 4's at 87.

Other Traction Securities

Trading in the Baltimore market was extremely light during the week and prices generally suffered fractional losses. United Railway incomes were exceptionally weak, the bonds declining more than two points on limited transactions. The 4 per cent bonds lost ½ from 82 to 81½, and the refunding 5's lost a point to 71. Baltimore Traction 5's sold at 106, and Macon Railway & Light 5's at 90. The Boston market was unusually quiet and devoid of special feature. Transactions included Massachusetts Electric preferred at 27, Boston Elevated at 125½, Boston & Worcester preferred at 55½, West End common at 81½ @ 81, and West End preferred at 98½.

Cleveland Electric securities were very quiet on the Cleveland Stock Exchange the past week. A few small lots of stock sold at 37, but for the most part the asking price was several points above this and the takers were few. Aurora, Elgin & Chicago was in fair demand both for the common and preferred. Several lots of common changed hands at 27, and the preferred 68, with a few 5 per cent bonds at 94½. The asked price of the preferred advanced to 70. Northern Ohio Traction & Light sold at 19½, with 20 asked at the close. Western Ohio preferred was quoted at 55, but there was little trading in it. Small lots of Forest City changed hands at 100, with 101¼ asked at the close.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Dec. 11.	Dec. 18.
American Railways	45	43⅞
Boston Elevated	124	123½
Brooklyn Rapid Transit	38⅜	37½
Chicago City	a150	a150
Cleveland Electric	36	37
Consolidated Traction of New Jersey	59	59½
Detroit United	35	34
Interborough-Metropolitan	7	6½
Interborough-Metropolitan (preferred)	19	17
International Traction (common)	30	35
International Traction (preferred) 4s	61½	59¼
Manhattan Railway	115	114
Massachusetts Elec. Cos. (common)	9¼	9
Massachusetts Elec. Cos. (preferred)	38	37
Metropolitan Elevated, Chicago (common)	21	a17
Metropolitan Elevated, Chicago (preferred)	46	44
Metropolitan Street	—	21
North American	43	41¾
North Jersey Street Railway	25	25
Philadelphia Company (common)	36½	35½
Philadelphia Rapid Transit	16½	17¾
Philadelphia Traction	82	83
Public Service Corporation certificates	54	54
Public Service Corporation 5 per cent notes	85	85
South Side Elevated (Chicago)	62	62
Third Avenue	25	22
Twin City, Minneapolis (common)	81	83
Union Traction (Philadelphia)	47	46⅝

a Asked.

Metals

According to the "Iron Age" new business is light, and in the finished trades does not probably amount to more than one-third of the total capacity. What developments there have been in the leading distributing markets for merchant pig iron are rather adverse since lower figures have been made. Coke continues weak.

The copper metal market continues quiet but steady at 13@13¼c. for Lake, 12¾@13c. for electrolytic, and 12½@12¾c. for castings. Export business continues large, and present indications point to record breaking exports of the metal for December.

THE PROPOSED IOWA CENTRAL RAILWAY—PLANS FOR BUILDING BEING MADE

The construction of the Central Railway Company's proposed interurban line to connect Clinton, Ia., with Dubuque, is practically assured, according to T. J. Wilcox, of Clinton, who was the promoter of the Iowa & Illinois Interurban Railway, now in operation between Clinton and Davenport. Mr. Wilcox states that the construction and equipment of the line will cost approximately $2,500,000. His plan is to operate by the third-rail system between the two cities, but to install the trolley in cities and towns through which the line will pass. The line from Clinton to Dubuque will be about 80 miles in length and will run through a rich agricultural region. It is not to be an air line. Instead of constructing the road due northwest from Clinton to Dubuque, it is the intention to build west and north to Maquoketa and thence north to Dubuque. It will be remembered that there has been under consideration the construction of two lines to Dubuque, one from Clinton in a northwesterly direction to Dubuque and the other from Maquoketa due north to Dubuque. It is the intention to make one line take the place of the two above mentioned, and to unite into one company all the parties interested in the above mentioned projects. The route has been surveyed as far as Maquoketa and several routes from Maquoketa to Dubuque have been mapped out for the surveyors to follow.

IMPORTANT DECISION ON STREET RAILWAYS IN NEW YORK

An important decision as to what sort of construction must be actually begun by the holders of a certificate of convenience and necessity for street surface roads to secure them from the possibility of a revocation of their certificate under section 99-a of the Railroad Law has been announced by the Public Service Commission of the Second District. Before entering into the merits of the application for the annulment of the certificate of the Rockland Railroad the commission announced at a hearing given on the subject that as the law provided that when the holders of a certificate of convenience and necessity fail to begin construction within two years the Public Service Commission may, at its discretion, annul the permission, the power of the commission in this matter depended upon whether or not the Rockland Company had begun construction as meant by the statute.

In the opinion of the commission, as written by Chairman Stevens, it has such power, and the decision lays down the general rule that the construction required by the law is actual physical construction, that attempts to obtain local franchises are not a beginning of construction, but merely attempts to obtain the right to begin construction and that surveys and engineering work before the granting of the certificate of convenience which are necessary in order to procure such a certificate are not a beginning of construction, which is prohibited by section 59, until after the certificate is granted.

This decision affects some 40 street surface railroad corporations which have not begun construction within the time limits. Some 20 or more steam railroad corporations in a similar position are not affected owing to the law passed in 1895, extending the time for all steam railroads for three years from date. Chairman Stevens rules in his decision that this law does not apply to street surface railroads.

REPORT OF THE RECEIVERS OF THE NEW YORK CITY RAILWAY COMPANY

The receivers for the Metropolitan Street Railway Company and New York City Railway Company have applied to Judge Lacombe, in the United States Circuit Court, for instructions regarding the operation of the Third Avenue Railway Company, which the court recently ordered them to abandon. The application was in the form of a petition, which included a report of the lines since taken charge of by Adrian H. Joline and Douglas Robinson.

The report states that the Third Avenue Railroad was leased April 13, 1900, to the Metropolitan Company for a term of 999 years. The latter corporation was thereby obliged to pay a quarterly dividend upon the road's capital stock of 6 per cent from 1906 to 1910. The quarterly dividend due October, 1907, amounting to $239,937, was, by order of Judge Lacombe, defaulted. The lease also stated that the Third Avenue had executed, or was about to execute to the Morton Trust Company, as trustee, a "first consolidated mortgage" to secure payment of bonds amounting to $35,000,000, and that the Metropolitan Company guaranteed the prompt payment of interest and principal.

The receivers say there is now outstanding $37,560,000 of the bonds referred to, with a semi-annual interest at the rate of 4 per cent and that on Jan. 1 the sum of $751,200 will be due. Having no money to pay such interest, the receivers ask the court for instructions. There is also outstanding a prior issue of bonds by the Third Avenue, amounting to $5,000,000, bearing 5 per cent interest, which constitutes a prior lien upon the property to the first consolidated mortgage, the petition says.

Continuing, it is alleged that there is now outstanding of the Third Avenue Company's capital stock $15,995,800, par value. Of this amount, it is stated that $5,970,000 was formerly owned by the New York City Railway Company, but on May 22, 1907, it was transferred to the Metropolitan Securities Company. The balance of the issue $10,025,800, is in the hands of the public.

Before making the lease the Third Avenue Railroad Company purchased the control of the stock of the following roads:

	Total.	Owned by Third Avenue R. R.
42d St., Manhattanville & St. Nicholas Ave	$2,500,000	$1,671,100
Dry Dock, East Broadway & Battery	1,200,000	1,128,700
Kingsbridge	8,600	8,600
Union Railway	2,000,000	2,000,000
		Owned by Union Ry.
Southern Boulevard	$250,000	$248,000
Westchester Electric Railroad	500,000	500,000
Yonkers Railroad	1,000,000	992,500
Tarrytown, White Plains & Mamaroneck	300,000	300,000

All of the stock given in the second column is now owned by the New York City Railway Company, as the lessee of the Metropolitan Company. All of this property is pledged under the first consolidated mortgage.

The question of the supply of power is a mixed one, the receivers say, citing the fact that the Third Avenue gets its power from its own plant at 216th Street, and the Ninety-Sixth Street power house of the Metropolitan. On the other hand, the power house at 216th Street supplies certain lines of the Metropolitan. The Third Avenue owns more cars than are operated on its lines, whereas none of the controlled lines, excepting the Union Railway System, owns as many cars as are operated on their respective lines.

At present the operation of the Third Avenue Railroad costs for operation about $1,300,000 more than its receipts from all sources, as shown by the following table. In this table the column headed "Direct" includes income and expenditures which arise directly from the operation of the Third Avenue Railroad Company, and which can be ascertained separately. The column "Apportioned" includes the proportionate share of the income and expenditures in respect to the Third Avenue Railroad Company's property, and other property owned by the New York City Railway Company, and which is properly applicable to the leasehold operations of the Third Avenue Railroad Company:

New York City Railway Company: Statement of approximate results of operations under lease of the Third Avenue Railroad Company for the year ending June 30, 1907:

	Direct.	Apportioned.	Total.
Gross earnings from operation of car lines:			
Cash fares	$1,983,573.74	.....	$1,983,573.74
Ticket fares	88,970.52	.....	88,970.52
Mail	2,587.57	.....	2,587.57
Express	.....	$7,573.96	7,573.96
Advertising	.....	16,000.00	16,000.00
Total	$2,075,131.83	$23,573.96	$2,098,705.79
Operating expenses:			
Maintenance of way	.....	$101,677.33	$101,677.33
Maintenance of power plant	.....	12,906.11	12,906.11
Maintenance of other bldgs	.....	8,076.33	8,076.33
Maintenance of equipment	.....	158,409.02	158,409.02
Operation of cars	$396,810.75	106,306.08	503,116.83
Operation of power plant	.....	116,587.14	116,587.14
Injuries and damages	221,813.58	77,554.62	299,368.20
General expenses	.....	79,484.58	79,484.58
Total	$618,624.33	$661,001.21	$1,279,625.54
Net earnings from operation of lines	.....	.....	$819,080.25
Gross profit on sales of power	.....	$229,401.45	229,401.45
Rental of land and bldgs	.....	31,000.00	31,000.00
Rental of tracks and terminals	$2,850.00	18,000.00	20,850.00
Rentals of equipment	.....	28,195.00	28,195.00
Interest realized on advances to other companies	217,195.44	.....	217,195.44
Total	$220,045.44	$306,596.45	$1,345,722.14
Taxes, excluding franchise tax	$83,027.36	.....	$83,027.36
Int. on first mortgage bonds	250,000.00	.....	250,000.00
Total	$333,027.36	.....	$333,027.36
Balance of income available for special franchise tax or interest on refunding mortgage bonds	.....	.....	$1,012,694.78

The receivers think that there is no reason to expect an increase in the gross earnings of the Third Avenue system sufficient to offset the increase in operating expenses which may reasonably be anticipated, and operating expenses are likely to increase rather than diminish, owing to the tendency toward higher prices for material and labor and the increased cost of operating cars due to the greater congestion of traffic at various points. The gross earnings have decreased between 1896 and 1907, as shown by the following table:

1896	$2,628,628
1897	2,590,473
1898	2,519,360
1899	2,176,910
1900	2,139,834
1901	2,222,489
1902	2,275,176
1903	2,212,652
1904	2,217,417
1905	2,251,057
1906	2,259,036
1907	2,098,705

This reduction, the petition says, is due partly to the loss of traffic to the subway and elevated, but principally to the increase in the percentage of transfers. While it appears that the total number of passengers carried in 1906 on the Third Avenue almost equals the number of passengers carried in 1897, the percentage of transfers to paying passengers has increased from 19.144 in 1897 to 38.144 in 1907.

The New York railroad law requires a street surface railway which has contracted with any other such company for the use of its road or any portion thereof to give a transfer without extra charge entitling the passengers to a continuous trip over any portion of any such railroad embraced in any such contract. The report says that it is difficult to prevent the fraudulent use of such transfers, and the loss on this account is steadily increasing. It may very well be that with the operation of the Third Avenue Railroad as under a separate system, and the consequent elimination of the burden of these transfers, the earnings would show a substantial gain.

The receivers also point out that no provision has been made for depreciation of the properties, and that to keep them up large sums must be expended from time to time. Except for the year 1900, no special franchise tax has been paid by the Third Avenue, the taxes for subsequent years being in litigation, but the receivers estimate them at approximately $70,000 annually. They also say that car license fees and paving claims of the city of New York against the Third Avenue Railway are now under litigation and it is impossible to estimate the amount ultimately payable thereunder. Notes of the Third Avenue Railway Company have been given to the Metropolitan Street Railway Company for advances made by the latter for construction on the Third Avenue lines and those of the so-called controlled companies. Interest on these notes amounts to approximately $268,000 per annum.

The receivers say that, irrespective of any question as to whether or not it is possible for them to operate the Third Avenue Railroad Company to advantage as a part of the New York City Railway system, there is a practical obstacle in the way of their so doing in the fact that they are wholly without means to pay the rental and interest aforesaid. Their receipts from all sources from the date of their appointment to the 30th day of November, 1907, aggregate $4,253,460.35. Their operating

expenses, including payrolls, payments for taxes and necessary material supplies have aggregated $2,420,266.54, and the interest and rentals for subsidiary lines paid as directed by the court aggregate $1,157,011.89. For equipment and construction work that was absolutely indispensable and for miscellaneous requirements they have expended $418,994.02, leaving cash on hand Nov. 30, 1907, $257,187.90.

This amount and such additional sums as may be derived from current earnings will barely suffice to meet the indispensable requirements for the month of December, especially in view of the fact that with the advance of the winter season the daily earnings show material diminution.

THE CLEVELAND SITUATION

At a meeting of the Council committee of the whole, Monday forenoon, the committee appointed to value the buildings of the Cleveland Electric Railway Company reported an agreement on $842,987. This includes all the buildings, with the exception of the power houses and the four battery houses which will be valued by Messrs. Andrews and DuPont, in connection with the machinery and power house equipment.

The committee on land valuations also filed its report. The land in use was valued at $921,155.96, while that not in use was valued at $213,318, making a total valuation of $1,134,473.96. A year ago the land was valued at $1,084,204. Members of the committee said that they had reduced some values and increased others, as they thought right, but that the result was a larger total than before. A. S. Taylor acted for the company and C. D. Moore for the city. Mr. Taylor made the valuation a year ago. The valuations were made by the square foot.

It was reported that the committee on track valuation would probably disagree, as the members could not arrive at a basis for estimation. In that case, two reports will be submitted to the Council and Mr. Goff. The committee consists of City Engineer Hoffman and C. H. Clark.

N. T. Cook, acting as the city's representative on the committee on car valuations, states that he and J. J. Stanley, acting for the company, will probably bring in two reports also. Mr. Cook said he had reached a valuation of $2,672,663 on passenger cars, but had not yet gotten to the other rolling stock. Messrs. Andrews and DuPont, committee on overhead construction, said they were not ready to make a report. Charles Cook, of Buffalo, formerly chief engineer of the Cleveland Electric, will aid in this work, and he has not yet been able to reach the city. H. J. Davies, secretary of the company, is having an inventory of the stores made, and as soon as this is completed the committee will endeavor to place a value upon them.

In speaking to the Council Monday morning, F. H. Goff, representing the Cleveland Electric, said that in both addresses made by Mayor Johnson at the former meeting, he had stated that there would be considerable depreciation in the pavement assets, and that he had begun to doubt whether this property should have any value in arranging the leasing plan. The paving, he said, is a part of the roadway. The city, in granting franchises, requires certain top dressing for the streets and this is pavement. In this way it becomes a part of the roadbed cost. The question is, "How is it to be treated in these negotiations?" Mr. Goff said he did not believe that any company could charge this cost up to expenses; that the profits on operation would not stand such an expense. Some provision must be made for the valuation of this portion of the assets.

Mr. Goff said that he was pleased that the Mayor had coincided with him in recommending a consolidation of the companies, if the leasing plan is to be followed out. He said further that he believed the Mayor's idea of the plan of consolidation was more mature than his own suggestion. If this is to be done, however, the capital accounts of the companies must be entered upon the same basis. If the pavement is a part of the capital account of one company, it must be of the other. If the engineering expenses, the interest charges and other things of this kind are to be capitalized by one company, they must be with the other.

The earnings of the company were larger in 1906 than at any former time in the history of the road. Mr. Goff said that the properties were valued by Mr. Andrews and Mr. DuPont, but they differed materially. For the purpose of getting at the franchise value, however, he said he was willing to take Mr. DuPont's figures, $14,000,000. Allowing 6 per cent on this, a fair profit, he said that the earnings were sufficient to pay $60,000 a month on something else. This, then, must be on the franchise value, both inside and outside the city. But the depreciation of the values at the rate of $2 per share a month means $468,000 a month. This, the Mayor said, is because one-third of the franchises expire in February of next year. President Andrews stated, when asked, that the gross earnings this year have been greater than last, but that the operation of the lines at seven tickets for a quarter and some other expenses might make a difference in the dividends that are paid. Mr. Goff said that, reasoning along the line of counting everything down to the lowest ebb, it would probably be impossible to get together on an agreement. He will insist upon fairness.

Speaking of the franchises to be given the old company, Mr. Goff said he would not take a stand on six tickets for a quarter as an ultimatum, but that he would insist upon adequate security in the leasing plan. The Municipal Traction Company, he said, is irresponsible, and it is not the desire that the lease should be forfeited or that the operating company should fail in the accomplishment of its plans. There should be something to secure the return of the property to the company at the expiration of the franchise and this must be something more than faith. Mr. Goff said that, although he did not believe in it himself, he wanted to help on the Mayor's hobby. There has been such a trend toward municipal ownership of street railway companies that it should be well tried out some place.

The speaker said that it is his notion that, with a fair valuation of the assets and franchises, the holding company should be allowed to operate at any fare the grants may name. It is desirable that the city grant the old company a franchise, and the new one as well, that will allow making loans, as it may be that the city will be bonded up to the full limit when rapid transit lines, subways or something else entailing great expense is needed. It is better that the franchise be sufficiently liberal that the companies may take care of themselves in this respect.

The Cleveland Electric Railway Company has secured the aid of William Barclay Parsons, of New York, in fixing the franchise values, and Mr. Parsons was in the Council chamber during the meeting. Mr. Goff insisted upon an expert being employed to inform him on this subject. On nearly every line on which the franchises are claimed to expire in February a portion of it, lying outside the city limits, has several years to run. Although the Mayor has claimed a great reduction in the value of the franchises within the city, he has counted the outlying franchises as worth no more. In fact, Mr. Goff read from one of his addresses an extract where he said that the outlying franchises should be valued at half what those inside the city are worth and that, taking the average time inside and out, franchises on all the lines would expire in 1912.

Mayor Johnson said that the Doan Street franchise was granted on terms that would require the company to carry people at the regular fare and transfer them to any part of the city for seventeen years after the franchises on most other lines have expired. He said he did not know how the company was going to live up to its obligations, and make any money from a business of this kind, if it allows its franchises to expire and does not take up the leasing plan. He intimated that the company would have to live up to its agreement on this street and transfer to the lines of any company that may build them and pay the full fare that company might charge. It is possible, however, that these conditions contemplated that the company transfer to its own lines. That being true, there are some pretty big meshes in the net, although the Mayor talked as if the company had a big load on its shoulders in that time which it built to accommodate people who wanted a cross-town line. The company makes no money from the business it originates.

Mayor Johnson agrees that the security franchise should be broad, but seemingly he could see no necessity of guaranteeing the restoration of the property to the original owners at the expiration of the grant. He says the city can not obligate itself to do that, but that it can make conditions such that the property shall be sold to any company that may receive franchises at the end of that time and that the value shall be arrived at by arbitration. This provision has been made in the franchise of the new companies and the Mayor intimated that it would be insisted upon in the franchise to be granted the Cleveland Electric. He said he would be willing to make the franchise term twenty-five years, and that he would make it

fifty years if that term were legal. Any franchise should allow the company fifteen years to operate after any possible lapse of the lease.

The value of the pavement, he said, is in doubt. The grants require that when the tracks are taken up the company must leave the pavements in good condition. For this reason he doubted whether the company has any real ownership in them. Yet, he said, in the negotiations the cost of pavements have always been considered.

Another meeting Tuesday morning to hear a report or two.

From the standpoint of discussion the street railway meeting Tuesday was interesting. Mayor Johnson, among other things, agreed to accept William Barclay Parsons as an expert to represent Mr. Goff in the franchise question and in other matters that come up from time to time. He did not name a man to represent himself.

City Solicitor Baker said that the Cleveland Electric attorneys have filed with himself and Mr. Tolles, as a committee on franchise expirations, the claims of the company, and he is now engaged in reducing the city's claims to writing. The Mayor suggested that the hearing be open, with himself and Mr. Goff present.

Mayor Johnson and C. H. Clark, representing the Cleveland Electric on the track and pavement valuation committee, had several little tilts over the manner of doing the work. The Mayor accused Mr. Clark at guessing at valuations, especially when he said that the cost per mile of laying track is $2,112, while City Engineer Hoffman, the other member of the committee, said that the cost is $800. He asked Mr. Hoffman to produce his figures. On the other hand, he told Mr. Hoffman that he should increase his price of foundation under the tracks, when he said he had not allowed anything for excavating concrete. Mr. Hoffman had figured the cost at 60 cents a square yard, while Mr. Clark had placed it at a dollar. Mr. Clark also said he had counted the track on the viaduct, to which the Mayor objected, although he admitted that the company had placed the track there in the first place. Mr. Goff suggested that the members of the committee get together and educate each other. Neither of them had a complete report that they had submitted to each other. On the suggestion of Mr. Goff, the Mayor dictated rules which they shall follow in their work.

Mr. Goff again referred to the Mayor's method of valuing franchises in 1905, when he estimated that the outlying franchises were worth half as much as those inside, and that the average date of expiration would be January, 1912. He said he would be willing to negotiate with the Mayor on that basis now, if the directors of the company cannot show why the valuations should not be made in that way. The Mayor said he would not be willing to make a settlement on that basis at this time, because the people expect him to use his best judgment at the very least in this matter. He said that several things have occurred since then to change his views, and that he must now take them as they are. The Mayor said, however, that the outlying lines have a value to the inside lines, since they contribute business to them, which could not be gotten without the extensions outside the city. This is one of the few suggestions of this kind the Mayor has made, but he has spoken of a few that will have a bearish tendency in the settlement.

ITHACA BRANCH MEETING A. I. E. E.

The regular meeting of the Cornell University branch of the A. I. E. E. was held in Sibley College on Friday evening, Dec. 6. An enthusiastic audience of 273 greeted the speaker, W. N. Smith, electric traction engineer of Westinghouse, Church, Kerr & Company. Mr. Smith's paper was the first formal Institute paper presented before the Cornell University branch, and it was entitled "Practical Aspects of Steam Railway Electrification." The speaker dwelt particularly upon the necessity of a study of electrification from all points of view. In the discussion Prof. H. W. Hibbard, head of the railway mechanical engineering department of Cornell University, expressed his appreciation of this kind of treatment of the problem. Professor Hibbard felt that to a certain extent the steam railroad man has been ignored in the electrification problem. He emphasized that there is no antagonism to electrification on the part of steam railroad men, where the conditions seem to warrant its introduction. He did not feel, however, that electrification should be forced upon steam railroads, but rather that it should be adopted as necessary when conditions fully warrant such adoption. The steam railroad man is first and foremost a transportation engineer, regardless of the source of motive power.

Prof. V. Karapetoff discussed the problem from the standpoint of power supply, comparing the steam locomotive to a "power plant on wheels." He also drew attention to the gasoline-electric car as having a bearing upon the subject of the evening. The informal smoker after the meeting was an important feature of the occasion, and was largely attended. Simple refreshments were served by the entertainment committee, and music was supplied by local talent.

NORTH AMERICAN COMPANY EXTENDS ITS FOREIGN HOLDINGS

By the acquisition of the Laclede Power Company and the Edison Electric Illuminating Company, of St. Louis, the North American Company of New York is now in control of all the lighting and power companies and the street railways of St. Louis. The North American Company secured the properties through the Union Electric Light & Power Company, one of its subsidiary concerns. In order to acquire the property the latter company increased its capital stock from $10,000,000 to $18,000,000. At the same time $8,000,000 of new bonds were authorized, bringing the bonded indebtedness of the company from $10,000,000 up to $18,000,000. A director of the North American Company is quoted as stating that the large amount of stocks and bonds of the Union Electric Light & Power Company remaining after the purchases of the newly acquired properties had been provided to take care of future developments. The plants of the Laclede Company will be operated as a branch of the Union Company's business, with E. V. Matlack, president of the Laclede Company, as manager. The Laclede had a franchise, obtained in 1891, which has 30 years to run. It also owned an old franchise of the Edison Illuminating Company, of Carondelet. Under these it maintained a valuable conduit system in the business district, as well as overhead wires. It is said that the contracts of the Laclede with consumers will be carried out by the Union until expiration, when they will be supplanted by contracts on the new Union schedule.

FREIGHT RIGHTS TO THE OLD COLONY

By the action of the Massachusetts Railroad Commission, in granting freight rights to the Old Colony Street Railway in Fall River and the town of West Bridgewater, the company is set free from that check on its trolley freight expansion which these two communities have been able to continue for a period of about two years. In each it was admitted that the new service was desirable, but in each the local authorities chose to impose conditions as to limitations of franchise, restrictions on service and rates, requirements as to rolling stock, which were absurd as compared with those generally applied to this and other companies operating similar service elsewhere in the state. The company now gets its rights through the obstructing communities under the so-called "missing link" law, which allowed it to appeal direct to the railroad commission in case of failure of the local authorities to make a grant within sixty days of the filing of a new petition.

The opening of West Bridgewater will make it possible to start a direct freight service from Brockton to Bridgewater, Middleboro and New Bedford, whereas the company has recently been forced to put this business over a roundabout route via Taunton, involving something approaching a ten-mile detour. Brockton manufacturers and business men supported the company splendidly in presenting this case before the railroad commission, giving testimony indicating that a surprising amount of goods were being shipped out of Brockton through the agency of the new service, and showing that even in a district where railroads form a network, the trolleys can develop new opportunities for local trade.

The company is not yet ready to state what it will do in developing freight routes to and through Fall River, or in negotiating for possible steamboat connections to New York; but since it is already operating trolley freight cars in Brockton, Middleboro, New Bedford, Taunton, and the intervening towns, with connections to Plymouth and Providence, R. I., its entrance into Fall River, the largest manufacturing center in southeastern Massachusetts, and a seaport, is practically the final step in developing its territory outside of Boston. Its rights now cover practically all through routes between important centers, including access to the Boston Elevated trackage at the Boston-Milton boundary.

ACCIDENT RECORD IN NEW YORK

Figures compiled from the reports filed with the Public Service Commission by the street railway and railroad companies show that within the last three months the street cars, elevated, steam and subway trains in the City of New York have killed 155 persons and have seriously injured 500 more. The exact figures compiled from the reports would indicate that there have been between 600 and 700 persons killed every year, and that at least 2000 people have been maimed annually. The figures for November were given out at the offices of the Public Service Commission Wednesday, Dec. 18. The table of serious accidents for the month was as follows:

Killed	45
Fractured skulls	12
Amputated limbs	4
Broken limbs	47
Other serious accidents	135
Total	243

The total record for the month compares unfavorably with that for the two months preceding. The record by months is as follows:

KILLED.

September	63
October	47
November	45
Total	155

FRACTURED SKULLS.

September	11
October	15
November	12
Total	38

AMPUTATED LIMBS.

September	8
October	9
November	4
Total	21

BROKEN LIMBS.

September	39
October	40
November	47
Total	126

OTHER SERIOUS ACCIDENTS.

September	95
October	80
November	135
Total	310

The grand total for each month of all serious accidents is as follows:

September	216
October	191
November	243
Total	650

The total number of accidents reported for the last two months is as follows:

	October.	November.
Collisions	221	160
Struck by cars	791	977
Injured boarding	510	438
Injured alighting	593	465
Employees injured	603	150
Contact with electricity	...	27
Other accidents	1,794	1,820
Total	4,866	4,037

The decrease in the number of persons injured in boarding cars and alighting from them is credited to the change from open to closed cars on the surface lines.

THE SITUATION IN NEW YORK

Chairman Wilcox held a hearing Dec. 12 on the proposal to put the automatic safety devices used on the subway express tracks on the local tracks as well. General Manager Hedley, of the Interborough, was examined. He declared that the installation of the "tripper" on the local tracks would necessitate the cutting down of the service, as trains could not be run so close together as they are at present. He declared, too, that with the automatic devices, motormen would rely too much on outside interference, and would not pay strict enough attention to the rear lights of the train ahead.

The Public Service Commission in the First District has reported to the State Civil Service Commission the appointment of twenty-seven transit inspectors at an annual salary of $1,200.

Gov. Hughes had the members of the Public Service Commissions of both districts compare notes and confer with each other Wednesday afternoon, Dec. 18, and at a dinner at the Executive Mansion in the evening heard the result of the deliberations and made suggestions. While the members of the boards were in session in the afternoon, the Governor was closeted with Theodore P. Shonts, president of the Interborough-Metropolitan Railway Company, for a long conference. Mr. Shonts came, it is believed, at the request of the Governor to give him the corporation's side of the railway problem in New York, and to point out a way to remedy certain abuses which are impossible under the present law. The dinner was over shortly after 10 o'clock, but the Governor held the commissioners at the Executive Mansion until past midnight, talking over the proposed amendments to the law, the application of the statute, and the thrashing out of various complaints and rumors about the application of the law by the two boards.

DISCHARGE IN CASE OF CENTRAL'S ELECTRIC ACCIDENT

The trial of Alfred H. Smith, vice-president and general manager of the New York Central Railroad, for manslaughter in the third degree in connection with the wreck at Woodlawn, on the Harlem division of the railroad, in February last, came to an abrupt end on Dec. 18, when Justice Kellogg announced that there was not enough evidence against the vice-president to warrant sending the case to the jury and directed that body to return a verdict of "not guilty." Justice Kellogg said that the prosecution had failed to show personal negligence by the defendant. The latter had control of 50,000 men, 7000 miles of track and 1500 miles of curve. Of necessity the most that he could do was to provide a general scheme for traffic and the safety of passengers. Justice Kellogg spoke of the frequency with which railroad accidents occur, and advised Mr. Smith to go back to the Central and add to the railroad's present precautions all that he could devise for the protection of the people.

The train which met with the accident was one drawn by the new electric locomotives of the company. A feature of the hearing was the statement of the witnesses who were passengers which placed the speed of the train at anywhere from 60 to 90 miles per hour. Much expert testimony was offered by the company in rebuttal.

AMERICAN MUSEUM OF SAFETY DEVICES

A friend of the American Museum of Safety Devices and Industrial Hygiene has offered a prize of $100 for the best essay on the Economic Waste of Accidents. The committee of award consists of Richard Watson Gilder, George Gilmour and W. H. Tolman.

Prof. F. R. Hutton, past president of the American Society of Mechanical Engineers, is the chairman of the Committee on Admission of Exhibits for the museum, which occupies the entire fifth floor at 231 West Thirty-ninth Street, New York. The museum desires exhibits of devices and processes for safeguarding life and limb in connection with wood-working machinery, railway and marine transportation, mining, agriculture and manufacturing of all kinds. One exhibit already consists of specimens of fifty different kinds of dusts illustrating the occupational diseases; accompanying each is the photograph, a microscopic section of the lungs showing the effect on the worker of coal, iron, brass, steel, wood and other dusts. There are also wax models of lungs and hands illustrating those occupational diseases which attack the bones and skin.

All exhibits accepted by the committee on exhibits will be eligible for the gold medal offered by the "Scientific American" for the best device, exhibited at the museum, for safeguarding life and limb.

THE WESTINGHOUSE AFFAIRS

It is said that within a few days plans will be announced for the rehabilitation of the Westinghouse Electric & Manufacturing Company, which went into the hands of receivers in October. One of the features of the plans of rehabilitation is the proposal for putting the affairs of the company more directly in the hands of the board of directors. The present board of directors is made up as follows: A. N. Brady, G. W. Hebard, E. M. Herr, Brayton Ives, H. H. Westinghouse, George C. Smith, F. H. Taylor, George Westinghouse, T. W. Simeon, W.

D. Uptegraff and W. W. Bumstead. On the financial side the plan is understood to contemplate the issuance of new bonds to the extent of from $25,000,000 to $30,000,000 at an interest rate which will probably be 5 per cent. In addition to this the stockholders will be invited to subscribe to new stock to the extent of some $7,000,000. Of the new bonds a sufficient amount will be reserved to provide for the retirement of the outstanding 5 per cent. debenture certificates, now amounting to over $2,200,000 and due in 1913.

STREET RAILWAY PATENTS

UNITED STATES PATENTS, ISSUED DEC. 3, 1907.

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

872,329. Controller; Arthur T. Crocker, Schenectady, N. Y. App. filed March 3, 1906. Means for effectually locking a reversing controller in such a way that it is unnecessary for the motorman to remove the handle or any other bulky part.

872,369. Brake Cylinder; William K. Rankin, Philadelphia, Pa. App. filed Feb. 11, 1907. The cylinder has an intermediate ported connection member, cross-head guides formed at their outer and opposite ends, and cross-heads thereon having means for brake lever connections.

872,473. Railroad Frog; James B. Strong, Hillburn, N. Y. App. filed March 18, 1907. Relates to the construction of the frog block.

872,477. Rail Joint; William P. Thomson, Philadelphia, Pa. App. filed Feb. 6, 1907. The splice bar has a portion depending below the base of the rail and designed to fit on one side of two adjoining rails and having each half of its length unsymmetrical with reference to a vertical plane equi-distant from the ends of the bar and at right angles to the bar.

872,514. Automatic Train Pipe Coupling; Phillip Hien, Chicago, Ill. App. filed Feb. 26, 1906. Provides an automatic train pipe coupling which will protect from injury the terminal gaskets of the pipes in coupling and uncoupling.

872,515. Automatic Motor Control Apparatus; George H. Hill, Schenectady, N. Y. App. filed May 21, 1906. Means whereby the governing device for controlling the automatic operation of the controller is made flexible so as to automatically adjust itself to meet the requirements of different conditions of load.

872,532. Rail Joint; Andrew Morrison, Pittsburg, Pa. App. filed March 13, 1907. One fish-plate has a depending, hook-shaped portion to engage the free end of the base plate of the other fish-plate.

872,537. Fare Register; John F. Ohmer & Elmer H. Bridenbaugh, Dayton, Ohio. App. filed Aug. 27, 1906. The object of this invention is to dispense with the use of springs in the manufacture of such apparatus.

872,540. Slack-Adjuster for Car Brakes; William G. Price, New Castle, Pa. App. filed Aug. 18, 1906. The invention comprises an automatic turn-buckle located preferably in the bottom brake rod.

872,541. Brake Shoe Hanger; William G. Price, New Castle, Pa. App. filed Aug. 20, 1906. Consists in making the brake hanger bracket adjustable in a horizontal plane, so that it can be adjusted in position both in a direction lengthwise of the axle so as to bring the central line of the hanger in exact line with the center of the brake shoe, no matter what the width of the wheel and the shoe may be, and also adjustable in a direction transversely of the axle so as to compensate for wear on the wheel and preserve the angle of the hanger.

872,563. Control System; George H. Hill, Schenectady, N. Y. App. filed Nov. 27, 1905. Provides means whereby when one or more motors of a system is eliminated from a circuit, the control system shall be changed so as to give the most advantageous operation of the remaining motors.

872,570. Railway Switching and Signaling Apparatus; William Macomber, Buffalo, N. Y. App. filed March 15, 1904. Relates to mechanism of the type adapted to cause alternate actuation of a part by successive closures of a circuit.

872,613. Railway Signaling Apparatus; Frank L. Dodgson & Winthrop K. Howe, Buffalo, N. Y. App. filed Nov. 27, 1905. A train stop device for applying air brakes when an engineer passes a danger signal, or in case of any brake-down in the mechanism, or the cessation of line current.

872,631. Audible Warning-Signal for Railway Crossings; Charles D. Anderson & Ashby G. Stout, Louisville, Ky. App. filed May 27, 1907. Special track plates adjacent to the track rails and engaged by a depending brush carried by the motor trucks.

872,661. Brake Leverage System; George Macloskie, Schenectady, N. Y. App. filed April 25, 1907. Applicable to combined hand and air brakes. Has an equalizing leverage system and operative connections between the piston and shoes independent of the equalizing system.

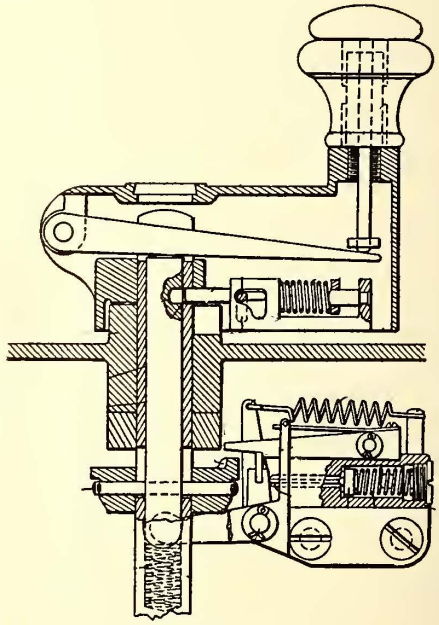
872,674. Safety Guide for Trolley Wheels; Frank J. Nolan, Buffalo, N. Y. App. filed Nov. 26, 1906. An inverted V-shaped hood is mounted over the trolley wire, so that in case the wheel leaves the wire, it may take current from the hood.

872,707. Automatic Connector for Train Pipes; Peter Beahm, Altoona, Pa. App. filed June 29, 1907. Details of an improved coupling device for air-brake, signal and steam pipes.

872,713. Signaling System; Clarence W. Coleman, Westfield, N. J. App. filed June 22, 1906. The signals are actuated by liquified gas. Means for preventing the leakage of the gas to thus increase the number of operations of the signal that can be obtained from a given stored supply of gas.

872,720. Controller Operating Mechanism; Carl Fleming, Norwood, Ohio. App. filed Jan. 31, 1907. A controller for electric motors comprising fixed and movable contacts, means which, when released, tend to move the movable contact to "off" position and two locking devices for said means.

872,798. Signaling System; Clarence W. Coleman, Westfield, N. J. App. filed May 1, 1906. See patent 872,713.



PATENT NO. 872,329

872,802. Trolley; Gustav Ehmann, Canton, Ohio. App filed June 19, 1906. The trolley harp is swiveled on a vertical axis on the pole by a ball-bearing connection.

872,898. Trolley Harp; James L. Chase, Ayer, Mass. App. filed July 18, 1907. The trolley wheel has two peripheral grooves for the reception of the wire. Automatic lubricating means.

872,938. System of Control; George H. Hill, Schenectady, N. Y. App. filed Oct. 31, 1904. A system of motor control adapted for systems embodying a plurality of motors arranged to be grouped in various relations. Means whereby the entire number of motors of the system may be grouped in series and in different ways so as to avoid supplementary resistanct.

872,939. System of Motor Control; George H. Hill, Schenectady, N. Y. App. filed April 7, 1906. Relates to modifications of the above.

872,990. Control Apparatus; Arthur T. Crocker, Schenectady, N. Y. App. filed March 21, 1907. Provides an improved mechanism for operating the emergency air-brake valve and the emergency circuit-breaker when the controller handle is released by the motorman.

872,991. Control Apparatus; Arthur T. Vrocker, Schenectady, N. Y. App. filed Sept. 18, 1907. Provides means for limiting and checking the movement of the controller drum in accordance with circuit requirements by means of electrically operated ratchets and depending devices acting thereon.

STREET RAILWAY PATENTS, ISSUED DEC. 10, 1907.

873,017. Trolley Wire Ear; William G. Carey, Schenectady, N. Y. App. filed Feb. 21, 1907. The trolley wire has a grooved upper edge which is engaged by a pair of depending jaws pinched thereon by a nut.

873,091. Automatic Uncoupling Handle for Vestibule Curtains; Henry M. Robertson, St. Paul, Minn. App. filed Sept. 13, 1907. Relates to guard curtains for use on the vestibules of coaches and provides an automatic uncoupling handle therefor.

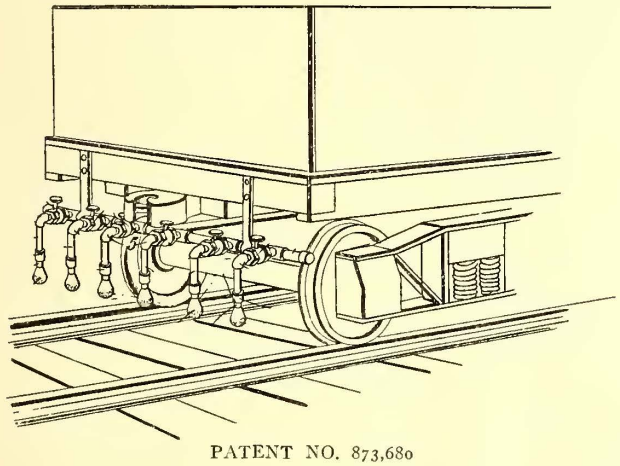
873,101. Regenerative System for Braking; Walter I. Slichter, Schenectady, N. Y. App. filed June 11, 1906. The method of braking electrically in systems embodying a plurality of motors adapted to drive a common load, which consists in operating a portion of the motors as separately excited generators driven by the load and operating other of said motors as generators driven by the load and excited by current generated in the first-named portion of the motors.

873,134. Switch; Milton B. McConnell, Tampa, Fla. App. filed Aug. 9, 1907. Consists of an oscillating member secured to and extending laterally from the pivoted end of the switch point, and means operable by a passing car for actuating said member to effect the movement of the switch point.

873,177. System of Motor Control; William F. Schneider, Norwood, Ohio. App. filed March 25, 1907. Means whereby the same operations of the main controlling switch produce different results at different times. Adapted for use in train service where different speeds must be observed.

873,197. Fender for Street Cars; Morris Wilenski, Chicago, Ill. App. filed Feb. 14, 1907. Consists of jointed side pieces pivotally secured at their rear ends to the car body and provided at their forward ends with a scoop, and means through the platform of the car for lowering the scoop.

873,284. Control System for Electric Motors; Louis M. Adpinwall, Wilkinsburg, Pa. App. filed April 4, 1906. Means dependent upon a predetermined value of electric current flowing



PATENT NO. 873,680

in the motor circuit for retarding the accelerating action. Comprises a single limit switch and may be adjusted at the will of the operator.

873,200. Electric Apparatus; Howard L. Beach, Wilkinsburg, Pa. App. filed March 3, 1906. Produces a step by step movement of an operating device, and automatically returns the aforesaid device to its initial position upon the interruption of a predetermined circuit.

873,298. Electric Motor Control; William Cooper, Wilkinsburg, Pa. App. filed March 3, 1906. Relates to modifications of patent 873,284.

873,377. Blocking and Derailing Device; William J. C. Kenyon and Winfred S. King, Omaha, Neb. App. filed Dec. 7, 1906. A derailing device comprising an inclined part in line with the track, a flange inclined transversely to the track, said flange sloping downward to the track at the end opposite said inclined part, and an inclined ear at the side of said flange.

873,368. Automatic Switch; Francis M. Hall, Potomac, Ill. App. filed Aug. 31, 1907. The switch is closed through the medium of a spring under tension. Means for releasing the spring from an approaching car or train.

873,419. Trolley and Harp Therefor; Samuel F. Estell, Los Angeles, Cal., and Frederick W. G. Phillips, Wilmitte, Ill. App. filed Aug. 8, 1907. The trolley wheel is mounted on its axle by a ball and socket joint so as to be capable of deviating from the normal plane of its rotation.

873,468. Automatic Block Signaling System for Electric Railways; Fitzhugh Townsend, New York, N. Y. App. filed June 29, 1906. A block signal system for electric railways in which a track current is impressed upon each block section and utilized to control translating devices covering the action of the signals.

873,492. Insulating Rail Joint; James H. Brothers, Newark, N. J. App. filed March 22, 1907. Provides a construction serving to increase the bearing area for the insulating material, and decrease the fiber strain, thus enabling the material to better withstand the load imposed.

873,522. Third Rail; Ralph K. Eddowes, Philadelphia, Pa. App. filed Dec. 7, 1906. Consists of an outer body portion supporting the conducting member or members, face downward, and insulated therefrom.

873,570. Amusement Apparatus; William F. Mangels and Charles N. Brewster, New York, N. Y. App. filed July 27, 1907. Comprises an inclined surface having a circuitous route laid out thereon from the upper end of the said inclined surface to the bottom thereof; and a car adapted to travel down the said surface and confined in its travel along the route.

873,587. Rail Magnetic Brake; Victor L. Ochoa, New York, N. Y. App. filed Feb. 23, 1907. A rectangular casing depends from the truck frame and is magnetically wound so as to produce a magnetic pole face adjacent to the track rail.

873,622. Derailer; Martin C. Sloderbeck, Marion, Ind. App. filed Aug. 23, 1907. Comprises a pivoted block having a curved bearing face at its end beyond the pivot thereof, and a bearing block having an oppositely curved face disposed to contact with the bearing face.

873,662. Trolley Head; Gardner P. Copp, Los Angeles, Cal. App. filed March 12, 1906. The harp is pivotally connected to the pole so that it may turn angularly when the car is on a curve.

873,668. Electric Trolley; Albert S. Janin, New York, N. Y. App. filed Aug. 14, 1905. Consists of a toggle lever frame carrying a long roller in place of the usual grooved trolley wheel.

873,680. Spraying Apparatus; John V. Pearse, Owensboro, Ky. App. filed March 13, 1907. Apparatus for spraying plants upon railroad roadbeds with a liquid adapted to destroy the plants.

PERSONAL MENTION

MR. H. S. HOLT, the only Candian director of the Detroit United Railways, has resigned owing to his inability to attend board meetings in Detroit and New York.

MR. C. N. WILSON has resigned as president, general manager and director of the American Engineering Company, of Indianapolis, Ind., his resignation to take effect Jan. 1.

MR. THOMAS J. HURLEY, of Brooklyn, N. Y., is dead, aged sixty years. Mr. Hurley was identified with the development of the Southwest and installed electric street railways in Texas and Arizona.

MR JOHN BLAIR MACAFEE, of Philadelphia, Pa., has been elected vice-president of the Lexington & Interurban Railways Company, of Lexington, Ky., succeeding Mr. Louis des Cognets, who has resigned to devote himself to private business matters. Mr. des Cognets will continue as a director, however.

MR. GEORGE BULLOCK, retired last week as vice-president of the Worcester Consolidated Street Railway, and Mr. L. S. Storrs, of the New England Investment Company, which holds the street railways in Massachusetts controlled by the New York, New Haven & Hartford, succeeds.

MR. WILLIAM SELFRIDGE has been elected president of William Wharton, Jr., & Company, Inc., to succeed the late Mr. William Wharton, Jr. Mr. Selfridge has been connected with the company for many years as director and assistant treasurer, and in the past has given the greater part of his attention to the finances of the company.

MR. FRANK T. SLOANE, who has been connected with the Brooklyn Rapid Transit Company for two years as insurance engineer, has resigned from the company to become connected with the R. M. Bowser Company, of Ft. Wayne, Ind., as special representative. Before becoming connected with the Brooklyn Rapid Transit Company, Mr. Sloane was insurance inspector for the United States Steel Corporation.

MR. GEORGE F. FABER, of Ringold, Ill., has been chosen superintendent of the lines of the Western Ohio Railway Company, to succeed Mr. James K. Gray, who accepted a similar position on the Mansfield-Bucyrus lines of the Cleveland, Southwestern & Columbus some time ago. Mr. Faber has for some time been with the Aurora, Elgin & Chicago and has had an extended and favorable experience in electric railway affairs.

MR. C. N. RYAN has been appointed assistant secretary and assistant treasurer of the Eastern Pennsylvania Railways Company, and its subsidiary railway and lighting companies, with offices at Pottsville, Pa., to succeed Mr. F. B. Lasher, resigned. Mr. Ryan was for three years auditor of the Michigan United Railways Company, and during the past year, has been traveling operating auditor with J. G. White & Company, of New York.

MR. ARTHUR WILLIAMS, general inspector of the New York Edison Company, recently received from the French Government the decoration of "Officier de l'Instruction Publique," for his work in the field of electric lighting and industrial hygiene. In recognition of this honor his colleagues on the board of the American Museum of Safety Devices and other friends entertained him as a guest at a luncheon at the Engineers' Club, of New York, Dec. 18, at which time the insignia was presented by Dr. W. H. Tolman, director of the Museum. Mr. T. Commerford Martin, president of the club, presided, and among the speakers were Dr. Josiah Strong, Dr. W. Tolman, of the Museum of Safety Devices and Industrial Hygiene, and Mr. John W. Lieb, Jr., assistant general manager of the New York Edison Company.

MR. WALTER PERLEY HALL, of Fitchburg, Mass., assistant attorney-general of Massachusetts, has been appointed chairman of the Board of railroad commissioners by Governor Guild, to succeed Hon. James F. Jackson, resigned. The selection of a railroad commissioner has been perhaps the most difficult appointment problem which the Governor has had to solve during his career as chief executive, alike because of the record of Mr. Jackson and the importance of the office. Mr. Hall is about forty years of age, and is a native of Manchester, N. H. He was educated at Brown University and the Harvard Law School. Since January, 1906, he has been assistant attorney-general, and has represented the state in all grade crossing matters, besides being generally familiar with the general railroad situation in the commonwealth. Mr. Hall is not expected to assume his new duties much before Jan. 1. Under the law, the appointment went over until this week for confirmation. Moreover, Mr. Hall's position as assistant attorney-general involved matters from which he could not hastily withdraw without considerable embarrassment to Attorney-General Malone, it is understood. As the matters heretofore pending before the railroad commission will practically all be disposed of by Commissioners White and Bishop, before the issuance of the annual report, at the opening of the year, the intervening time will afford the new chairman an oportunity of attending to matters claiming his personal attention, and he will be able to enter the new work with his older coadjutors at the beginning of the new year.

MR. H. W. CLAPP, of the General Electric Company, has recently resigned from that company to accept a position with the electrical engineering department of the Southern Pacific Railroad Company, and will shortly remove to San Francisco. On Saturday, Dec. 14, a number of his friends in New York tendered him an informal luncheon at the Engineers' Club to express their regret at his departure from this city and to wish him success in his new field. Among those present were Messrs. W. J. Clark, manager of the traction department, General Electric Company; T. Beran, manager New York office, General Electric Company; J. G. Barry, manager railway department, General Electric Company; W. B. Potter, engineer, railway department, General Electric Company; A. R. Whaley, general superintendent, electric zone, New York Central & Hudson River Railroad Company; C. L. Bardo, superintendent, electric zone, New York Central & Hudson River Railroad Company; J. S. Doyle, superintendent car equipment, Interborough Rapid Transit Company; H. N. Latey and F. R. Slater, of Latey & Slater Company; W. H. Sawyer, engineer, Ford, Bacon & Davis; J. R. C. Armstrong, electrical engineer, New York City Railway; Alexander McIver, superintendent equipment, New York City Railway; W. C. Campbell, assistant superintendent equipment, New York City Railway; F. V. Greene, Westinghouse Air Brake Company; A. H. Sisson, St. Louis Car Company; J. G. Buehler, president and treasurer, Columbia Machine Works, New York City; C. S. Hawley, Consolidated Car Heating Company. During the five and a half years he has spent in and about New York, Mr. Clapp has been engaged in some of the most important electric railway propositions as sepcial representative of the railway engineering and construction departments of the General Electric Company. He has given particular attention to the installation and operation of the rolling equipment used in the electrification of the New York Central Railroad and to the cars for the Interborough Rapid Transit Company's system. He also equipped the cars for the West Jersey & Seashore Railroad, which it will be remembered was an installation of peculiar interest, because of the short time in which the contract was executed. Mr. Clapp is a son of Mr. F. Boardman Clapp, managing director of the Melbourne (Australia) Tramway & Omnibus Company, and before coming to America he was for four years superintendent of motive power of the Brisbane Tramways Company, Brisbane, Australia.

WILLIAM THOMSON, Lord Kelvin, died at his home in Glasgow, Scotland, Tuesday evening, Dec. 17. For some months his health had been slowly failing and his friends realized that the end was approaching. He was born in June, 1824, at Belfast, Ireland, and was the son of Dr. James Thomson, a man of remarkable ability and a great mathematician of his day. Lord Kelvin will in the history of science take place with Newton, Liebnitz, Laplace and Helmholtz. In an age of specialists, he was the greatest specialist in innumerable branches of science, but nevertheless his towering intellect escaped the fetters which science in its modern development and exacting specialization imposes upon its devotees. The activities of Lord Kelvin were so great that a mere enumeration of his more important work is only practicable. As a mathematical physicist, he was one of the founders of the science of thermodynamics and the mathematical theory of electricity, and to him more than any other is due the modern development of the ether theory. For the past half century, no great question has arisen in science to which Lord Kelvin did not give heed, and often the world waited upon his opinion as that of a final arbiter. While his fame ages hence will rest upon his purely intellectual achievements, he was perhaps best known to the world at large for his work on the transatlantic cable and the long line of apparatus he devised for scientific and industrial purposes. It was William Thomson's studies showing the scientific practicability of submarine telegraphy that brought the project of laying a transatlantic cable to a commercial stage; and it was his invention of the mirror galvanometer and the syphon recorder that placed the operation of submarine lines on a parity with land lines with respect to practical operation. Lord Kelvin also was chairman of the international committee of engineers appointed to consider the subject of electrical development at Niagara Falls in connection with the Cataract Power Company's plans. Merely to catalogue in part other inventions, we have from him besides laboratory instruments for the absolute measurement of electrical quantities, the line of instruments of laboratory accuracy for industrial use; the ship's binnacle, which in a short time replaced all other forms of the mariner's compass on the ships of the world; the types of sounding apparatus for the assistance of navigation near shore and for sounding the greater depths of the ocean, and the seismograph.

LORD KELVIN.