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Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905, to date, 237,350 copies, an average of 8184 copies per week.

Unpalatable Good Advice

The result of Mr. Dalrymple's trip from Glasgow to Chicago, at Mayor Dunne's invitation, to advise regarding municipal ownership of street railways, has followed exactly the programme laid down in our editorial of May 13 last on the "Loan of a Conscience." Mr. Dalrymple has returned to Glasgow, and has sent his report to Mayor Dunne, but at present writing the recipient has been scrupulously careful not to let that report get out of his pocket, although it is supposedly a public document. The conclusions as to what the report contained in the way of advice on municipal ownership in Chicago, in the light of all the circumstances, are too evident to need further statement.

But Mayor Dunne is not alone in his disillusion. A neighboring Mayor also had his experience, and has been left, we fear, in a mournful and chastened frame of mind as the result of Mr. Dalrymple's visit, and after attempting to utilize him as the herald of a political boom. The perverse and hard-headed Scot somehow was unable to see how graft and economy could be made to pull in double harness, and when Mayors Dunne and Johnson get together and compare notes on the advice they have received in his report, municipal ownership will hardly seem the land overflowing with milk and honey which their fervid imaginations have pictured. Mr. Dalrymple seems to have acquainted himself very fully and rapidly with the situation in Chicago, and now, after his brief visit to America, probably realizes the true inwardness of the municipal ownership movement here better than he could learn it by a year of reading on his side of the Atlantic. He knows from practical experience the small margin of profit on which street railways have to work, and he sees clearly that unless municipal tramways can be removed completely from control by and for the gang, they can show only sorry deficits in the result of operation. When one stops to think that more than half of each passenger's nickel goes to pay actual operating expenses, without including any proper allowance for general depreciation, the hopelessness of any 3-cent fare proposition is self-evident. Even granting the worst that has been claimed as to over-capitalization of street railway properties, there is no room left between operating expenses and 3 cents for a reasonable argument. And if a street railway gets into the clutches of a political machine, of however guaranteed respectability, its day in the state of solvency will be a very short one. If Mayor Dunne really wanted good advice, let him follow it.

Chicago's "Immediate Municipal Ownership"

While the whole country is waiting breathlessly for the "immediate municipal ownership" of street railways which was promised as a result of the city election of last April in Chicago, there seems to be a hitch in the proceedings, just as everyone knew there would be who had given any study to the complicated traction situation in Chicago. The hitch has certainly not been due to any failure of the traction interests to meet the city half way in the matter of acquiring the street railway lines. Negotiations were soon opened between the city and the companies, and then abruptly closed by Mayor Dunne. The Mayor then brought out several schemes for bringing about municipal ownership, the last of which bore a very strong resemblance to the extension ordinance proposed before his election for the Chicago City Railway Company, with the exceptions that it left out of account many important existing franchises, that it was not comprehensive and that it

did not by any means solve the whole problem for the entire city. It soon became evident that neither the public nor the City Council would stand for the building of 100 miles or 200 miles of municipal railway and leave the problem hanging over the balance of the city for several years. The latest reports are that the city and the companies are again about to talk business. It is the opinion of many street railway men over the country that it would have a most wholesome effect on the present fad for municipal ownership of street railways which is sweeping over the country if Chicago would at once proceed to try it. Even should it prove a moderate success in Chicago, which seems altogether unlikely, the fact that it would be sure not to be the great bonanza that many believe it to be would take off some of the glamor and put an end to the fad.

Just at the present time political conditions in Chicago are not by any means as corrupt as in years past, and are much better than generally supposed by those who have not been recently acquainted with them. Should these conditions continue and improve, the effect of politics in municipal operation would not be as immediately fatal as it would have been in years past, but the final result would undoubtedly be just as disastrous. The history of traction matters in Chicago for the few years during which Chicago has had the "honest majority" in its Council, indicates another very serious danger which exists in all municipal operations, namely, the danger of having too many managers. Not a move has been proposed in Chicago which really offers a solution of the traction problem on a sensible and reasonable basis that the cry of corruption has not been raised in some quarter. The "honest majority" in the Council, although successful in preventing corrupt legislation, appears so far to be unable to agree on good legislation. Thus far the City Council and the Mayor have proved successful as "obstructionists," but they have yet to make a record as successful "constructionists."

Lighting and Power from Railway Circuits

A topic of interest to electric railway companies is the supply of lighting and power from railway circuits. This is a subject which we have touched on recently in these columns and which has been considered in our Question Box, but a further discussion may prove of interest. It should properly be considered not as the mere operation of all classes of service from one system, but as dealing with light and power supply where the railway is the predominating factor in the distribution. In the good old times, before the underwriters set up their beneficent autocracy, motors and lights were run from trolley systems without much hindrance. Everything went, so to speak, and if the lights flickered it was charged up to the depredations of a vagrant ohm, popularly supposed to be a sort of Croton bug infesting electric wires. Now, however, the problem takes on a very different aspect, and practically implies operating an incidental lighting and power load not from the trolley wire, but from the power station and feeders, so as to give what may fairly be considered good, or, at least, tolerable service. All the testimony received on this question has been rather favorable, as was to be expected in the present state of electrical equipments. Granting that the fluctuations of a railway load are such as to forbid lighting directly from alternating feeder circuits, it is still easily possible to get good service by working motor generators on the lighting load. The motor generator, by the way, is just beginning to be appreciated in this country at somewhere nearly its real value. It was for some years pushed almost completely into the background by rotary converters, but however desirable these latter machines may be on certain classes of work, they are inferior to motor generators in preserving constant voltage at the generator end of the outfit. Well-designed motor generators, either d. c. to d. c., or a. c. to d. c., can be made to give excellent operative results, even when the voltage fluctuations of the source are rather severe. They are coming into larger use every year, and we see no reason why many electric railway systems should not make them a source of profitable additional business. Many a road now runs through a country that can hardly support an independent lighting circuit, but which would furnish considerable business if current could be supplied for it. In such cases a motor generator, perhaps merely in the form of a frequency changer, can give current cheaply and easily. It need not require a complicated plant to do the work. In fact, a motor generator of proper design can be made to give excellent service with very little attention of any kind. Every long railway system has scattered sub-stations requiring attendants, and by installing a small motor generator in one of these a very useful lighting service could be worked up. The stations that have tried such a scheme seem to report favorable results, and their experience should encourage others. In fact, in certain cases, the available lighting may well become no inconsiderable item in the gross receipts. The same is true of stationary motor service, which makes much less formidable demands in the matter of close voltage regulation, and is therefore easier to carry on. In this case a good deal of the business does not require motor generators at all, and the effect of the added load on the power station is beneficial.

Apropos of this subject, three very pertinent concrete questions came up to us the other day which, in the interest of railway men in general, deserve a somewhat extended answer. First: Can a railway circuit at 25 cycles give reasonably good service directly from its wires, assuming that the district does not furnish enough business to justify sub-station working? As regards the practicability of lighting from a 25-cycle circuit, there is some difference among authorities. It really depends upon what quality of light the consumer will be satisfied with. If really good lighting is intended, it is the opinion of most engineers who have studied the subject, that 25 cycles is just too low a periodicity for satisfactory service. Some persons fail to recognize the pulsation in the light, but a good many do notice it unpleasantly, and certainly with ordinary incandescent lamps of 16 cp and 110 volts, or thereabouts, it would be inadvisable to try lighting. With 50-volt lamps, particularly if of 20 cp or above, the fluctuations due to the periodicity would be far less troublesome, but those due to variation of voltage from the railway load would still remain, and we do not think the service could be made satisfactory to most consumers. To do commercially good work from such circuits it is necessary to do something to steady the voltage, and the particular thing selected depends somewhat on the nature of the service to be attempted. The main difficulty is that the variations of voltage and speed generally produce a cumulative effect.

Second: Which is preferable in trying lighting from a railway circuit, a motor-generator set with synchronous motor or one with induction motor? The answer depends upon the nature of the service to be attempted, and also upon the sort of fluctuations to be encountered in the supply current. The use of a synchronous motor averts all speed variations in the motor due to variations of voltage in the supply, while in either case the variations due to change of periodicity will remain. At the

end of a long feeder, where the drop is considerable, the former difference may be important. The synchronous motor requires a little the more attention, and has at times given trouble from "pumping." This latter difficulty can readily be avoided, however, and in large sub-stations the synchronous set is probably preferable, provided the frequency can be held reasonably uniform, as it generally can be in a large system. When, however, the amount of lighting to be provided is small and it is necessary to use a motor generator requiring the minimum of attention, the induction motor is altogether preferable. It can be made so as to have a relatively small drop in speed, with moderate variations in the supply voltage, and, as everybody knows, is extraordinarily reliable as a motive power. If it were not necessary to have direct current for the excitation of the generator fields, a motor-generator set with an induction motor could practically be left to itself, save for visits to start and to stop. With a location where current from the trolley wire is available, a generator could probably be given excitation from a storage battery or by special devices from the circuit, so as to be entirely self-acting so far as frequent attention is concerned.

This brings up the third question: Can voltage regulators on the fields of the generator of the motor-generator set be made to give good service in lighting when the frequency of the circuit varies 3 per cent to 5 per cent owing to fluctuating load? That depends on the character of the fluctuations. If they are rather rapid, as often happens on a railway system, no voltage regulator with which we are acquainted will hold the voltage steady. They will do good work, however, for fluctuations that are not too rapid. The trouble comes from the fact that when the speed of the motor falls from dropping frequency it falls sharply and takes down the field of the self-excited generator with it. The voltage regulator has to deal with the summed effect of these drops, and if the fluctuations are rapid the regulator cannot follow them. It serves as a palliative rather than a cure, but may make successful lighting possible in many instances that could hardly be attempted without it. We should certainly advise its use, without, however, guaranteeing a cure. In a station large enough to justify a regular attendant by the help of voltage regulators and judicious care, very good service can be given, even from a pretty badly fluctuating source. The main difficulty comes from working on so small a scale that the apparatus must be practically automatic. The problem of making a small motor generator that will give practically constant potential when supplied from a fluctuating source is one that has not yet been satisfactorily solved. It is an excellent thing for inventors to whet their wits upon, for it is badly needed and is surely within the range of possibility. Work on ordinary sub-station scale is easy enough, and should be tried oftener than it is.

The Size of Power Stations

One of the first questions to be determined in estimating the cost of a new electric road is the size of the power station which will be necessary for its proper operation. While such figures can most accurately be determined by an exhaustive study of the proposed profile and the weight, equipment and schedule of rolling stock suggested, in conjunction with speed-time-current curves derived from published motor characteristics, there is seldom time for such thorough work in the early stages of the game. Round numbers are wanted, instead of close detailed analyses.

Two rapid methods often used in getting the power station capacity needed are worth considering. One of these, and perhaps that which most readly suggests itself as a common-sense proceeding, is to compare the proposition in hand with others of similar design. Granted a close resemblance between the conditions, there could hardly be a better way in which to obtain rough figures of the amount of power required at the station to operate a given service. The trouble is, however, that the conditions seldom are as much alike as is assumed: the topography varies, the feeder system is entirely different in its arrangement, or the rolling stock equipment and the schedules do not agree in important particulars. All these possible variations call for the greatest care in exercising snap judgments based upon what another road is doing, but if such comparisons are made with due appreciation of where the conditions fail to parallel each other, much can be learned by the promoters of the new project from the experience of the older roads. In this connection, the collection of data showing the actual consumption of current at the power stations on many different roads operating various numbers and weights of cars at certain schedule speeds and stops per mile, cannot be begun too soon by those who desire to estimate along the lines just discussed.

The other method, which is certainly good as a check, if not equal to the demands of precise work, consists in estimating the average and maximum demand of current to be expected from a given number of motors of definite rating, assuming that the motors are worked to their full capacity as regards safe temperature rise. Thus, suppose a road is operating 20 cars, each equipped with four 40-hp motors, and that the motors are selected to work close up to the margin of their safe capacity—as motors ordinarily should be selected. It will not be far wrong to assume on this basis that at the cars there will be a continuous demand of about 300 hp, allowing for lighting and heating. Suppose a line and transforming efficiency of 60 per cent—which in many cases ought to be bettered—we need 500 hp constantly at the generators to properly keep the cars moving. Fluctuations must now be considered, and here the problem is most difficult, owing to the absence of exhaustive data upon the relation between the number of cars in service and the ratio between the average and maximum demand upon the power station, momentarily considered. If at any one time five of the cars are accelerating and the other fifteen taking an average amount of power, we shall have frequent momentary fluctuations running up to 750 kw, and sometimes 1000 kw, or even 1200 kw, when half the cars start at once. It would seem that in such a case the power station ought to provide at least 800 kw in normal machinery capacity, and considering the needs of the repair shop, and snow-plows in the winter season, if in a cold climate, 1000 kw would be safe to figure upon in preliminary specifications. It is much better to figure high in preliminaries than to revise during design and construction, and require the bankers to raise additional money.

Power stations are fortunately not often built in too large capacity for the demands of a live electric railway proposition, but the mistake is now and then made of trying to squeeze along with outworn, second-hand machinery for the sake of economy in first cost. Then, again, it is not uncommon to find roads, particularly where land is cheap, tying up too much money in building a larger power-station structure than is needed to house the existing machinery. These things should be figured carefully before vacant engine-room and boiler-house space is allowed to accumulate fixed charges upon the building proper.

NEW CAR SHOPS AND HOUSES FOR THE PUBLIC SERVICE CORPORATION OF NEW JERSEY

BY MARTIN SCHREIBER, M. E.

The officials of the Public Service Corporation of New Jersey have just completed the plans and specifications for one of the most complete and modern railways shop and car-house plants in the country. Work will be commenced immediately, and vigorously pushed to an early completion. The new plant will cost approximately $500,000.

The important repairs of the rolling equipment on this system are now taken care of at two principal points, the Plank Road shop at Newark, and the West Hoboken shop at West Hoboken, N. J., all the minor repairs being done at the individual operating car houses and yards.

The company operates upward of 1700 cars over about 550 miles of track. On account of the rapid growth and improvement of the road, it has become necessary to add more and complete facilities for maintenance and equipment, and it has been decided that in providing the new facilities all the important repair work will be carried out at the Plank Road shops at Newark.

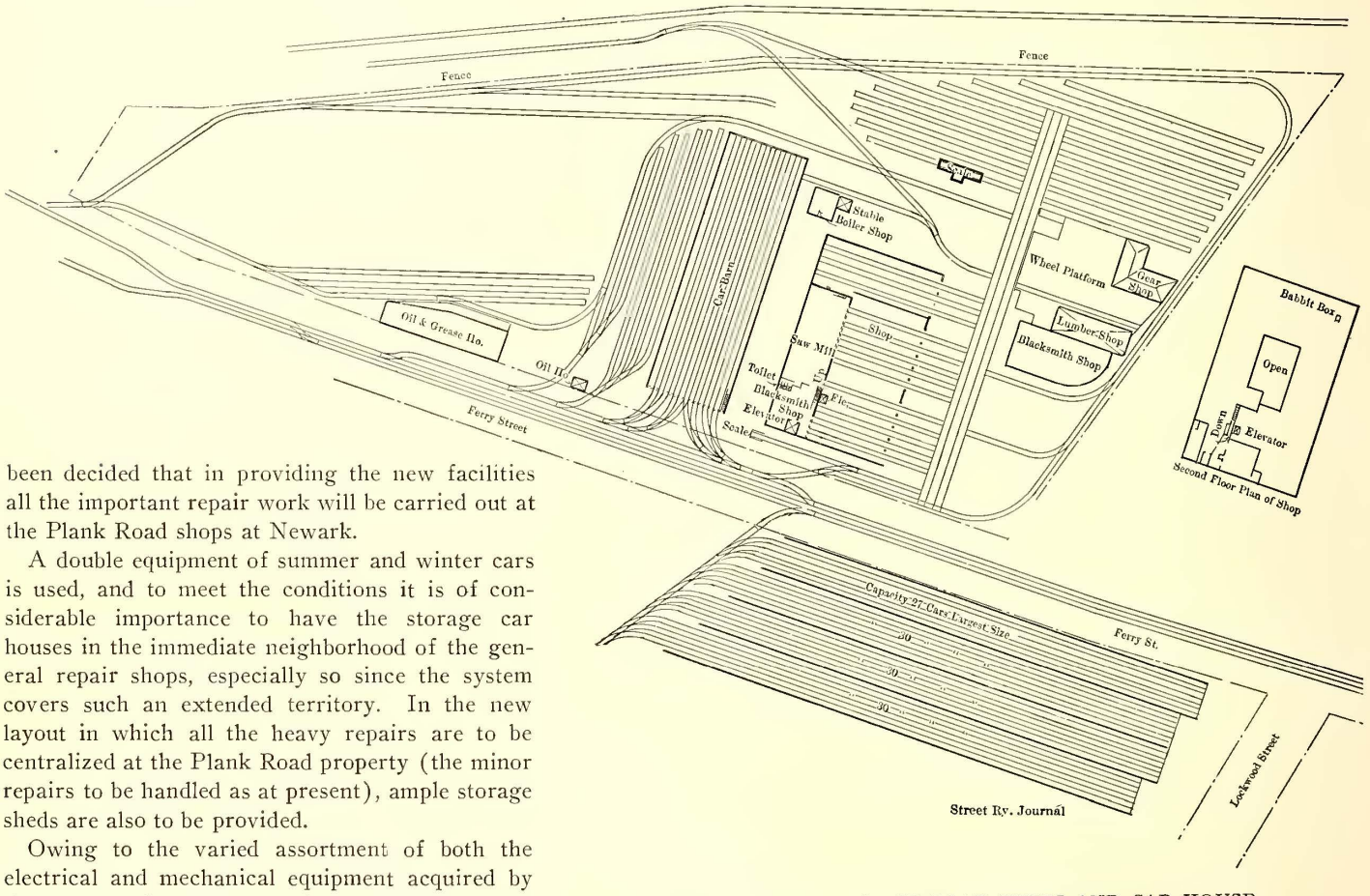
A double equipment of summer and winter cars is used, and to meet the conditions it is of considerable importance to have the storage car houses in the immediate neighborhood of the general repair shops, especially so since the system covers such an extended territory. In the new layout in which all the heavy repairs are to be centralized at the Plank Road property (the minor repairs to be handled as at present), ample storage sheds are also to be provided.

Owing to the varied assortment of both the electrical and mechanical equipment acquired by the merger of many companies, the present problem of the maintenance of the rolling equipment is a most trying one. However, it is intended to gradually standardize the entire apparatus as well as centralize the important repair work, so that a very marked operating saving and a betterment of service will undoubtedly follow.

One of the engravings represents the old property at the Plank Road as it exists, where 60 per cent of the heavy repairs of the rolling equipment is being done under considerable disadvantage. The main building consists of a brick two-story structure 190 ft. x 120 ft., the first floor of which is taken up with the truck shop and mill room, and the second floor used for a machine shop, winding room, etc. Part of the second floor is reserved for a general store room for the entire system, all of which is clearly indicated in the drawing. Then there is a blacksmith shop 90 ft. x 45 ft., a building that has been completed about a year, so that most of the equipment is new. The apparatus in this building consists of six Buffalo Forge down-draught forges, steam hammer, shears, etc. All the rebabbitting of bearings is also done in the blacksmith shop. Formerly the building marked "carpenter shop" was used as an operating car house for the Plank Road Line, which operates between Newark and Jersey City. It is a brick structure 80 ft. x 250 ft., and was recently converted into temporary quarters for the carpenter work.

On the south side of Ferry Street, which may also be seen in the drawing referred to, are new storage car houses that were completed last December. They are built of brick and consist of four bays, each bay containing three tracks 450 ft. long. All the walls are solid, and the roof is of mill construction with a 10-ft. x 10-ft. wire-glass skylight and a 48-in. ventilator every 32 ft. These storage car houses were described in the STREET RAILWAY JOURNAL for Februrary 2, 1905.

The accompanying large plan drawing of the grounds and buildings clearly brings out the new arrangement of the different shops with their separate departments; also the layout of the tracks, etc. This is the final scheme which was decided upon after very careful consideration and study of the existing conditions that were to be met.



OLD LAY-OUT OF PLANK ROAD SHOPS AND CAR HOUSE

It is noted that about 13 acres of additional property has been acquired for the project, this new land being principally intended for the additional storage facilities. It may be of importance to state that the Plank Road property was selected as the particular place of centralizing the shops for the reason that, first, the company already owned the property as shown in the old layout, and second, the location was desirable, as it was near the largest city the company covered and also centrally located for the remaining properties. Moreover, the adjoining property along the south side of the shop site is owned by the Pennsylvania Railroad, which has a spur running parallel to the property line. A connection to the Pennsylvania tracks makes it very convenient for bringing in sup-

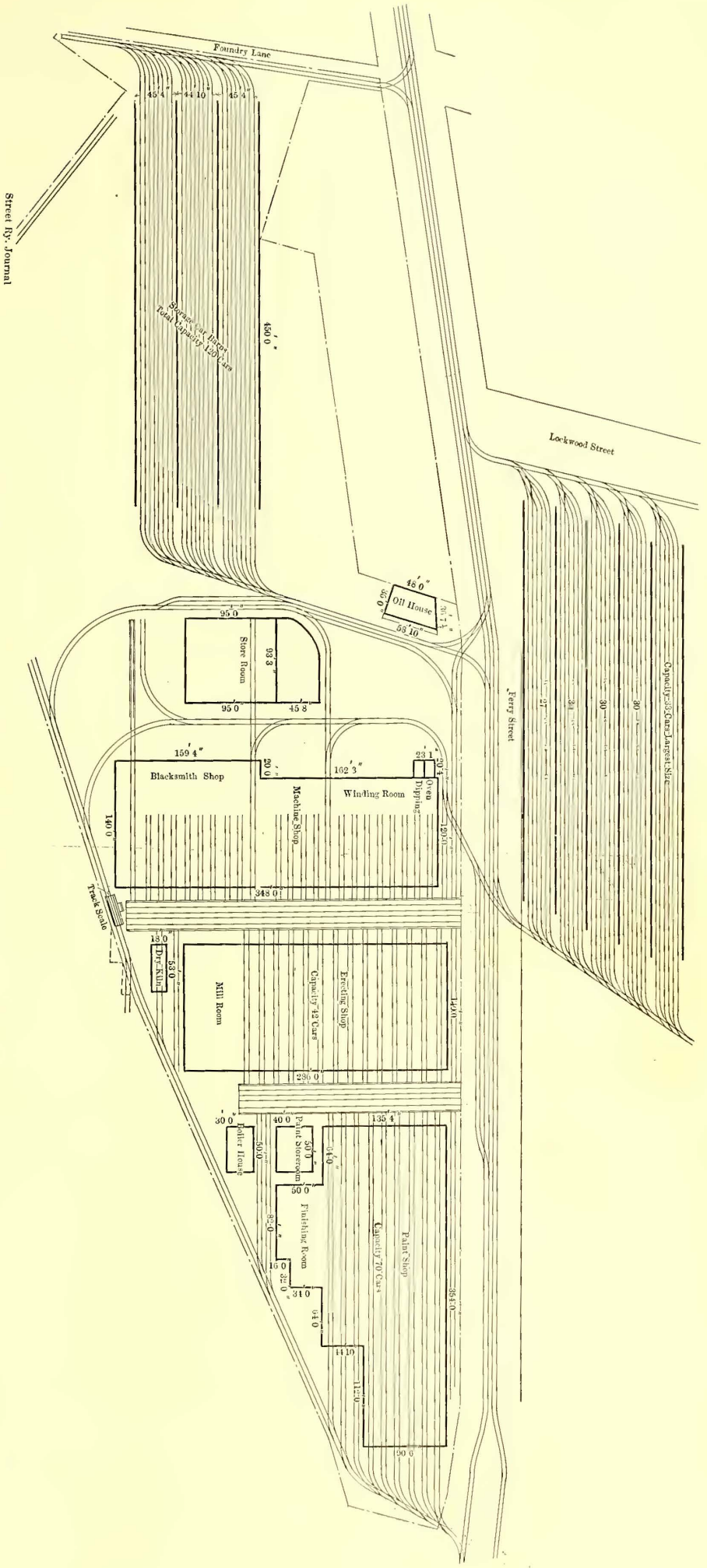
plies by rail, inasmuch as a freight car may be brought directly into the shop yards.

Referring to the new plan, it is noted that the transfer table has been resorted to for shifting and handling the cars; this was considered the best arrangement that could be adopted. It has great advantage over the method of long lead tracks and extensive yard room. Short tracks laid parallel in the buildings render all the space at hand available, and every car is easy of access. Also with this layout a car can be moved without loss of time from one building to another as the various work on that particular body progresses. Moreover, with any other practical arrangement, the progress of the work is often limited by the speed of moving the cars about and not by the number of men at work or the space at hand. With the transfer table arrangement a number of tables may be put into commission, thus greatly reducing all interference with speedy transferring of cars. It is a well-known fact that the capacity of every shop must be overtaxed at times, and it is the facility of responding to this "overload" condition without an excessive cost per car that the transfer table makes a possibility.

For the present, two tables will be built for each transfer run, of which there are two, one between the erecting and machine shops, and one between the paint and erecting shops. The distance between buildings is 60 ft., this being deemed sufficient for handling the company's largest size cars. The transfer table itself is 32 ft. long, and the transfer pit is 32 ft. 1 in. wide.

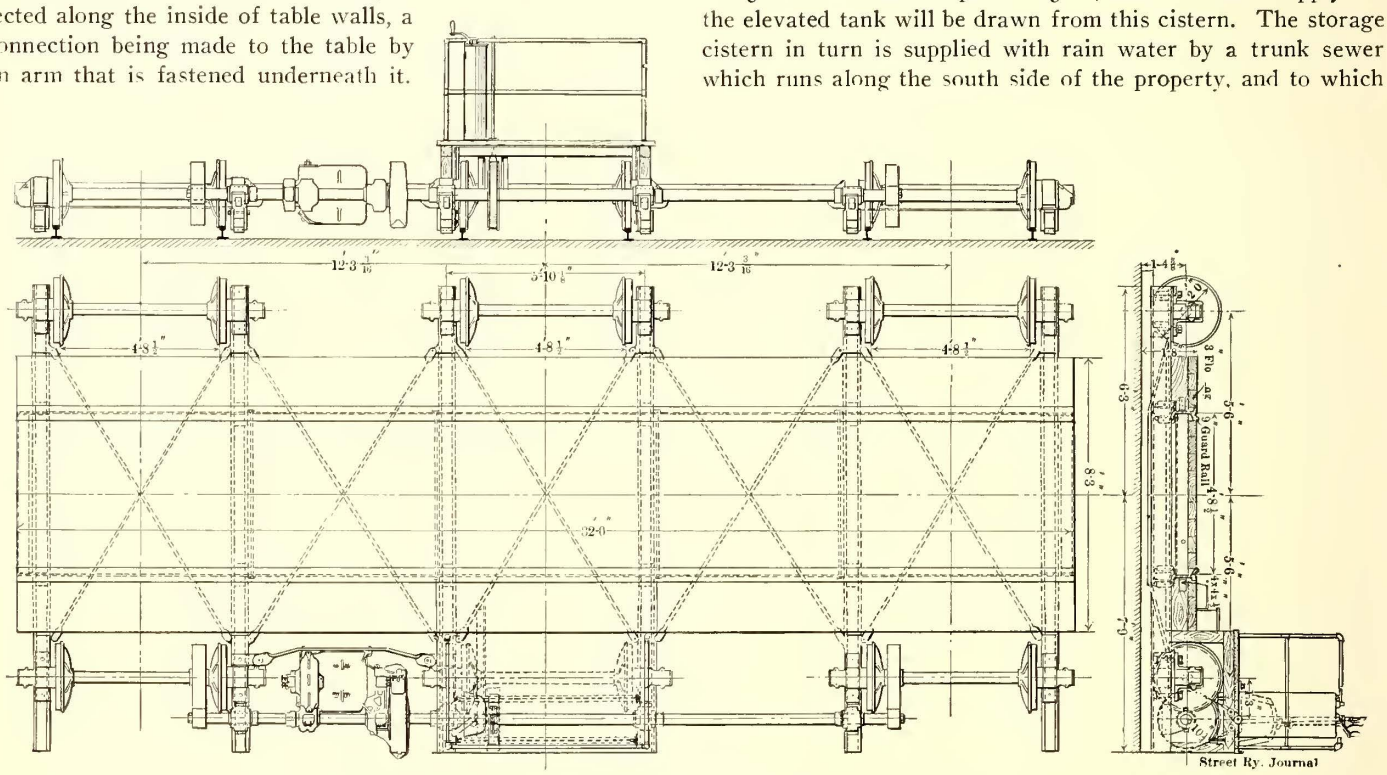
A transfer table of a substantial but very simple design has been devised and will be built at the company's own shop. From one of the accompanying drawings, showing the principal details of the new table, it will be seen that it is made up of six standard trucks, supporting six twin-bar girders, which carry two 9-in. guard rails. The table is stiffened in the horizontal plane by means of a set of 7/8-in. rods. Power is obtained from a General Electric 800 motor. Each table has a platform arranged for operating a K-10 controller and breaking lever, the brake lever being connected to a 6-in. x 1/8-in. steel band that grips a 21-in. cast-iron split pulley keyed fast to the driving shaft. The transfer table pits are enclosed with concrete walls 5 ft. deep, and the pit is 2 ft. 10 ins. from top of rail in the bottom to top of rail in the building. Three tracks on 12-ft. 3 3-16-in. centers and

PROPOSED NEW LAY-OUT OF PLANK ROAD SHOPS AND CAR HOUSES



of standard 4-ft. 8½-in. gage form the runs for the tables.

From the drawing showing the new layout it is plain that cars which are brought from any part of the system may enter the shops from Ferry Street connections and that there is a very elaborate track layout provided to readily accommodate this condition. The out-of-service cars may be placed in storage on the north or south side of Ferry Street. These out-of-season cars will only have to make one trip from any part of the entire system to the Plank Road property for overhauling and for storage, thereby eliminating a great deal of dead mileage now necessary by reason of repairing the cars at one point and storing them at the different operating and storage car houses. Inasmuch as many of the cars will go into the shop "dead," it is probable that no trolley wire will be provided for any of the buildings, but the cars will be moved by a cable on an electrically-operated drum placed at the end of the tracks and on transfer tables. Such a scheme would greatly reduce the fire risk and afford a very marked saving in the insurance rates. The transfer tables are not to be supplied with current from an overhead trolley but by a trolley wire stretched and protected along the inside of table walls, a connection being made to the table by an arm that is fastened underneath it.



DETAILS OF TRANSFER TABLE, PLANK ROAD CAR SHOPS

Now that the layout of the new shops has been discussed in a general way, it will be of interest to bring out some of the technical points of construction of the individual buildings.

On account of the commodious grounds reasonably available it was possible, through almost the entire work, to carry out the modern idea of shop construction, that is, single floors and few division walls. The advantages of this type over multiple-story buildings are, first, light is better; second, buildings are more easily and economically heated; third, ventilation is better; fourth, foundations of machinery are cheaper; fifth, floors cost less; sixth, supervision is easier; seventh, cost of construction is less, and eighth, there is less danger from damage due to fire. Moreover, it was constantly kept in mind in arranging the individual shops to avoid defects in design that would cause inconvenience in handling materials and interference with workmen.

PAINT SHOP

The general design of the paint shop is well shown in one of the drawings. The building proper is 354 ft. x 135 ft., and contains nine tracks capable of housing 70 average size cars operated by the company. The tracks are placed on 14-ft. centers except where the columns come, where the track spacing is increased to 16 ft. A finishing room 82 ft. x 50 ft. is provided on the south side, where small work stripped from the car bodies will be taken care of. Near the southwest corner of the main building is a fireproof paint store room, where all the mixing and storing of paints is to be carried out. At the west end of the building, just within the doors, is a wash stand for every track, so that a car entering the shop on any of the nine tracks may be first cleaned down and washed before proceeding further. On overhead trusses a drop connection to which a hose may be connected is provided over each track and is supplied with soft rain water, which is considered especially adapted for cleaning car bodies. The soft water supply is taken from an elevated tank on the south side of the building. This tank is built of steel and has a capacity of 25,000 gals. It is supported by a structural steel tower of sufficient height to give a water supply at a pressure of 40 lbs. The columns supporting the steel tank rest directly on the walls of a storage cistern built in the ground. This cistern has an inside diameter of 25 ft. and a clear depth of 15 ft., and the water supply for the elevated tank will be drawn from this cistern. The storage cistern in turn is supplied with rain water by a trunk sewer which runs along the south side of the property, and to which is connected all the leaders that carry off the water from the shop building roofs.

The paint shop, like all of the new buildings, is designed for complete steel framing. After the concrete foundations are completed the steel posts of roof trusses and purlins may be erected independent of the curtain walls. All foundations are to be of concrete and carried 6 ins. above the grade line where the brickwork commences. The first three courses of brick project over the foundation walls to form a water table. The roof trusses are placed on 16-ft. centers, and there are 20-in. x 2-ft. pilasters in the outside walls at this spacing, the intermediate or curtain walls being 12 ins. thick. There is 16 ft. clear height under the bottom chord of steel roof trusses and columns are placed between every third track, the columns consisting of four 3½-in. x 2½-in. x ¼-in. angles and a web plate 6 ins. x 5-16 in.

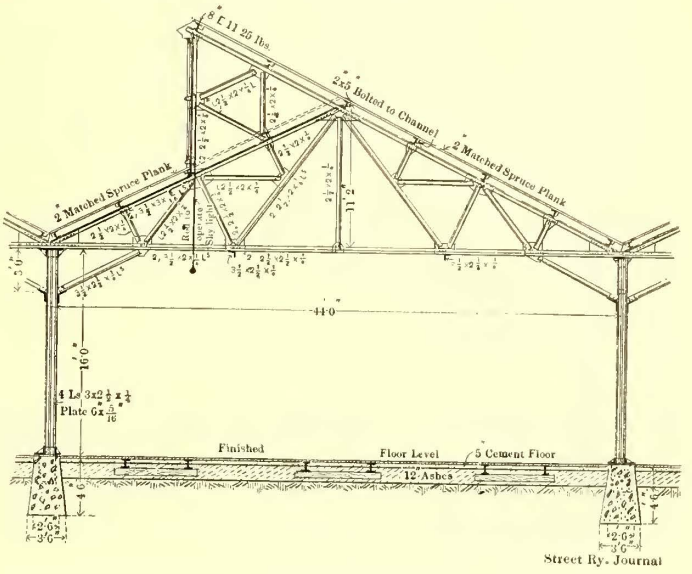
Special attention is to be given to the floor construction, as this is an important feature of a first-class job. First the inside of the building will be excavated to a depth of 17 ins., when the track, which is of 7-in. Trilby rail on wood ties of 2½-ft. centers, is to be placed, ballasted and surfaced to the grade.

The grade of floor line of building, as well as the entire yards, will be of the same level. After the track is placed, drainage provided for, steam ducts, etc., constructed, the floor of building will be filled with 12 ins. of steam ashes, watered and well tamped to a sound footing. Over the ashes 4 ins. of stone concrete is to be placed mixed in the proportion of five parts 1½-in. stone, three parts clean, sharp sand, and one part of Portland cement, and the concrete is to be cut in blocks to prevent cracking. The wearing surface is to be 1 in. thick, marked and colored a light gray. The ingredients of the top finish will consist of one part Portland cement and two parts of sea-washed grit, troweled with pure dry cement to a smooth finish.

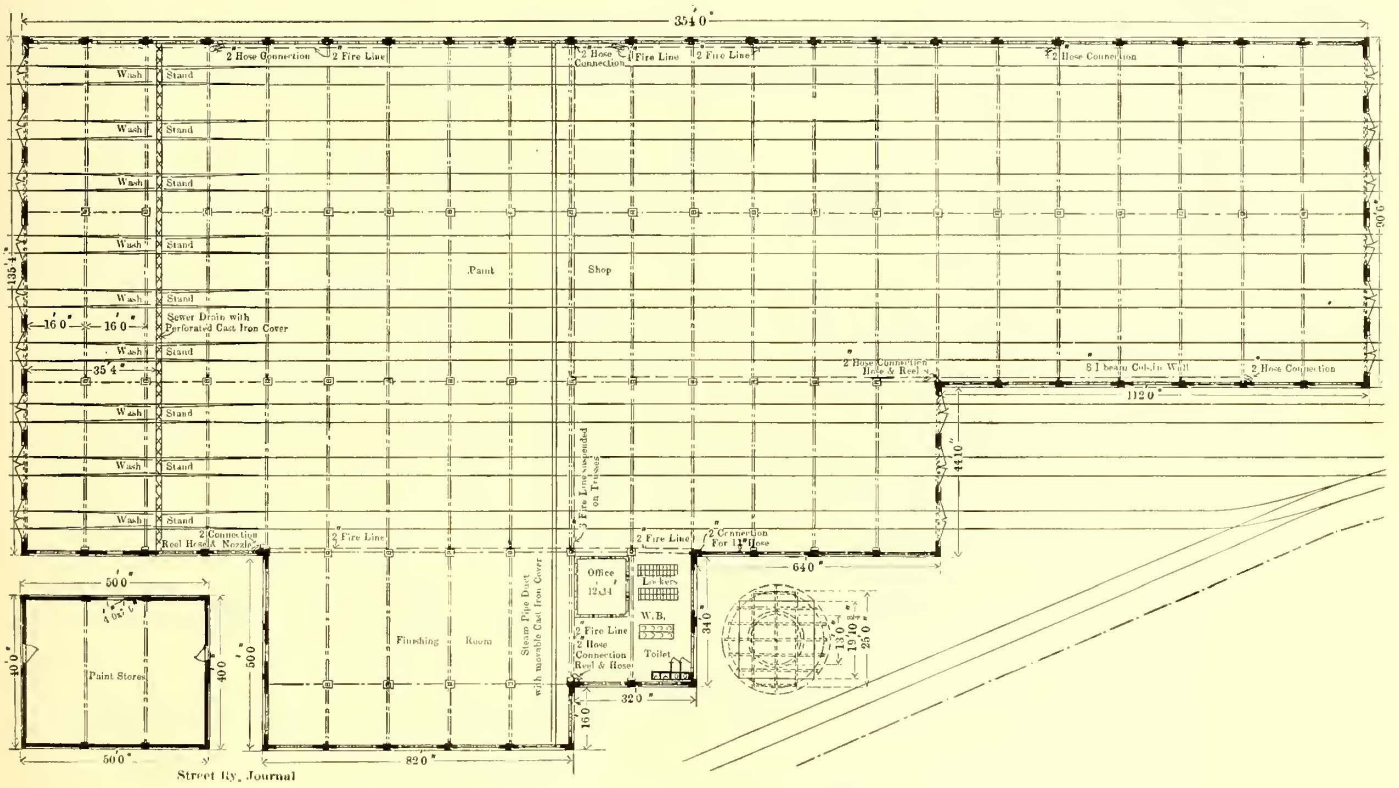
From the elevation drawing of this building it is seen that the outside walls are carried 3 ft. above the finished roof to form a fire wall, with roof gutters on the inside. All the roof leaders are carried down on the interior of the building, so that there will be no freezing or bursting of pipes in cold weather. All the windows on the Ferry Street elevation are constructed singly so that they may be finished with stone caps as well as stone sills. Neat stone coping 6 ins. x 14 ins. is arranged on top of walls on this elevation, the coping being broken into caps at the pilasters. This entire stone finish and brick corbeling develops into a very neat appearing and substantial design.

The south elevation, next to the Pennsylvania Railroad tracks, has double windows with wood mullions and steel lintels, and is finished plainly but substantially with a 12-in. salt-glazed tile coping. The east and west elevations contain the doors for the entrance tracks, the details for which, as well as the windows, are shown in the drawings. The doors are not to be equipped with frames, but are to fit snugly into the openings and are to swing out. When in the latter position there is a clear opening of 10 ft. It was possible to use a minimum size door opening, as all the tracks enter and leave the building practically on tangent alignment. The wooden doors are much to be preferred over steel rolling shutters, as they are more convenient and may be arranged with sash and glass.

Experience has proven that there is no part of the design of a shop building, and especially a paint shop, more important and as worthy of careful consideration as the quantity and quality of light. In deciding on a standard design for the shop buildings at hand a great deal of study was indulged in to select an economical, efficient and substantial roof, and numerous plans were discussed and considered. Of course a roof delivering a north light was desirable, but there is only one type that up to the present has been very much in vogue, and that is the familiar saw-tooth or weaving roof. This has several very serious defects. It is difficult to get a very satisfactory gutter construction in the common saw-tooth roof. The gutter is hard to keep tight, and in the winter months much annoyance is caused by ice and by snow drifting and banking up on the glass, so that the light is obstructed. The roof finally adopted is shown herewith. Advantage is taken of the north light as in the ordinary saw-tooth roof, and the plan may be termed a modified weaving roof. This design gives the advantage of using the well-known Fink type of truss and therefore the most economical distribution of metal may be obtained. Moreover, the scheme admits of the common and efficient valley gutter construction, and also of a well-protected skylight.

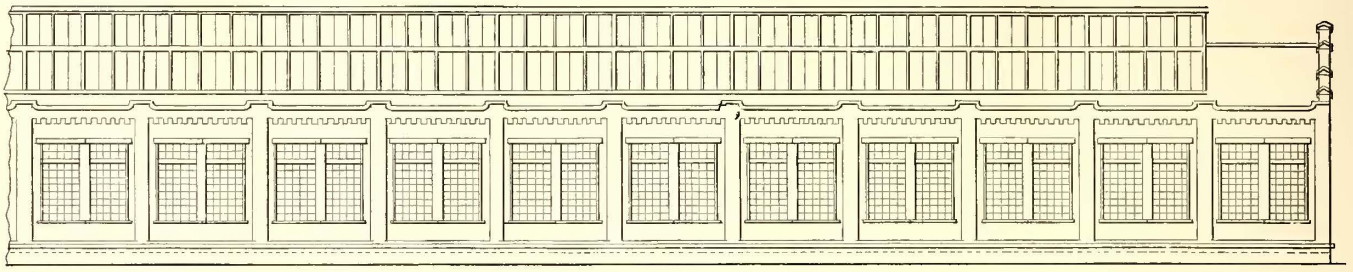


SECTION SHOWING MAIN TRUSSES IN NEW PAINT SHOP



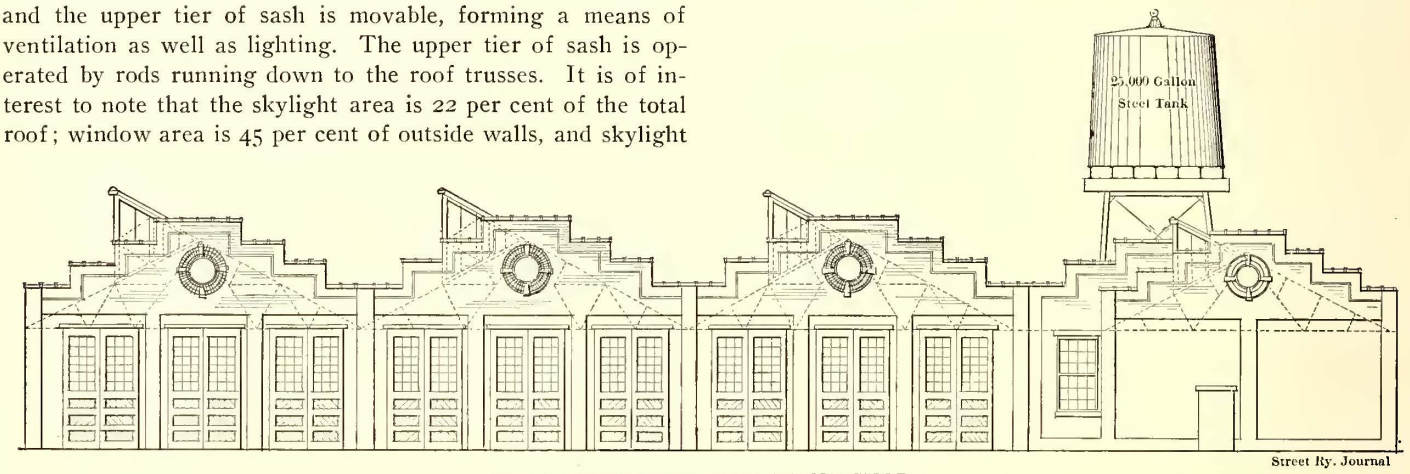
FLOOR PLAN OF NEW PAINT SHOP, PLANK ROAD PLANT

Condensation gutters may be very conveniently attached on the inside to take care of the skylight drip at the bottom of the vertical leg. The roof is constructed so that there are about 12 ft. of skylight in each span, the rise of the roof being equal to the height of the vertical leg of skylight.



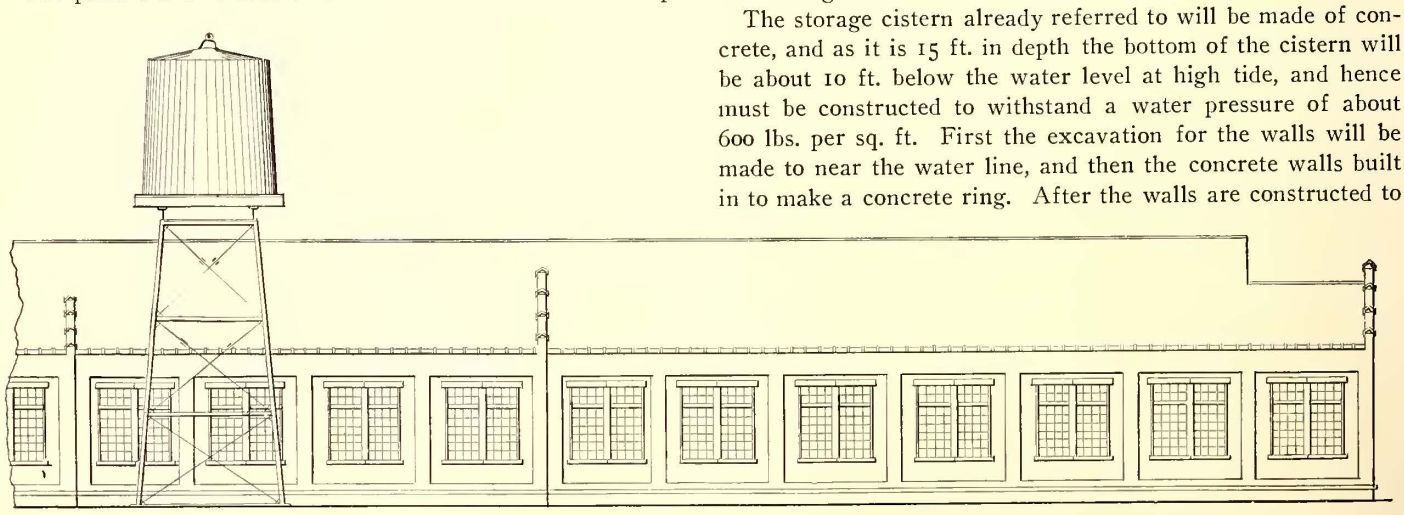
FERRY STREET ELEVATION, NEW PAINT SHOP

The skylight frames and moldings are made of No. 24 galvanized iron and all the sash bars are reinforced with steel rods. Sash are placed in two tiers so that the lower tier is stationary and the upper tier of sash is movable, forming a means of ventilation as well as lighting. The upper tier of sash is operated by rods running down to the roof trusses. It is of interest to note that the skylight area is 22 per cent of the total roof; window area is 45 per cent of outside walls, and skylight and window area is 29 per cent of the entire superficial area of the building property. The inside lighting will also be improved by finishing all the interior of buildings, including walls and roof, in white with two coats of cold water paint.



WEST ELEVATION, NEW PAINT SHOP

The purlins are formed of 8-in. channel irons and are supported at the channel points of the trusses at about 6 ft. centers.



SOUTH ELEVATION, NEW PAINT SHOP

The roof proper is of 2-in. spruce plank, tongued and grooved and spiked to 2-in. x 5-in. sticks bolted on side of purlin irons. Over the sheathing a five-ply slag roof is to be placed and will be constructed as follows: First, a layer of dry felt is placed on sheathing, and over this four thicknesses of wool roofing felt, weighing 15 lbs. single thickness to every 100 ft. The felt is to be evenly and smoothly laid on, cemented together, the whole width of lap being not less than 9 ins. between each layer, with best refined tar, using 100 lbs. of tar to 100 ft. All joining along walls and around openings will be carefully made. The roof is then to be covered with a heavy coating of roofing tar and clean slag, there being not less than 1 cu. yd. of slag to every 600 sq. ft. of roof surface.

All the flashings of the entire roof are to be 16-oz. copper in sheets 4 ft. wide, and all the counter flashings will be 4-lb. sheet lead. It is estimated that the flashings for the entire shops will cost $3,000 in excess of the ordinary galvanized iron flashings, but it is believed that this amount will soon be saved in building maintenance with the former construction.

The storage cistern already referred to will be made of concrete, and as it is 15 ft. in depth the bottom of the cistern will be about 10 ft. below the water level at high tide, and hence must be constructed to withstand a water pressure of about 600 lbs. per sq. ft. First the excavation for the walls will be made to near the water line, and then the concrete walls built in to make a concrete ring. After the walls are constructed to the water line depth, the earth is to be taken out from under the ring, thus permitting the latter to settle down due to its own weight. As the concrete ring or wall settles more concrete is to be added on the top, and so this process will be continued until the walls are constructed to the required depth. The bottom cistern is to be constructed of concrete and reinforced with steel rods to stand the required pressure. The whole will

be made thoroughly waterproof with paper and tar, so that no salt water can possibly leak into the tank.

Steel I-beams are to be placed over the top of the storage cistern, with 4 ins. of reinforced concrete between the beams and top finished with 1½ ins. of cement. The steel tank is to be fed from the storage cistern by a Buffalo Forge vertical suction pump with a 5-in. discharge, and capable of delivering 940 gals. of water per minute against a 100-ft. head. The pump is to rest directly on the bottom of the cistern, and has the advantage over any other type inasmuch as it always is primed and ready for service. A 40-hp 500-volt vertical shaft, direct-connected Northern Electric d. c. motor operates the pump and is placed on the top of the cistern. Regulation is obtained by a float placed in the steel tank. When the water in the steel tank is at a low level, the copper float therein operates a chain that is electrically connected to a Cutler-Hammer starting device, so that the armature of a solenoid closes a switch, thus sending current into the motor which causes the pump to immediately discharge water into the steel tank. Again, when the water in the tank reaches the high point, the float operates the chain that causes the electrical solenoid to open the switch at the starting box, thus shutting off current and stopping the pump.

In case more rain water comes into the storage cistern than is used, a 12-in. overflow placed near the top will carry the water into the Ferry Street sewer, and the cistern acts as a catch basin in the trunk sewer line.

The foreman's office in the paint shop, like all the offices in the remaining buildings, is to be constructed entirely fireproof, the general design being ¾-in. steel channel studs placed on 12-in. centers and reinforced with rolled steel sections at angles and openings, the whole to be covered with metal lath. Over the lath on the outside a cement mortar is to be spread and on the inside a covering of gypsum mortar to make a 2-in. finished fireproof wall. The office roof is to be constructed of reinforced concrete slabs 2 ins. thick and supported by steel.

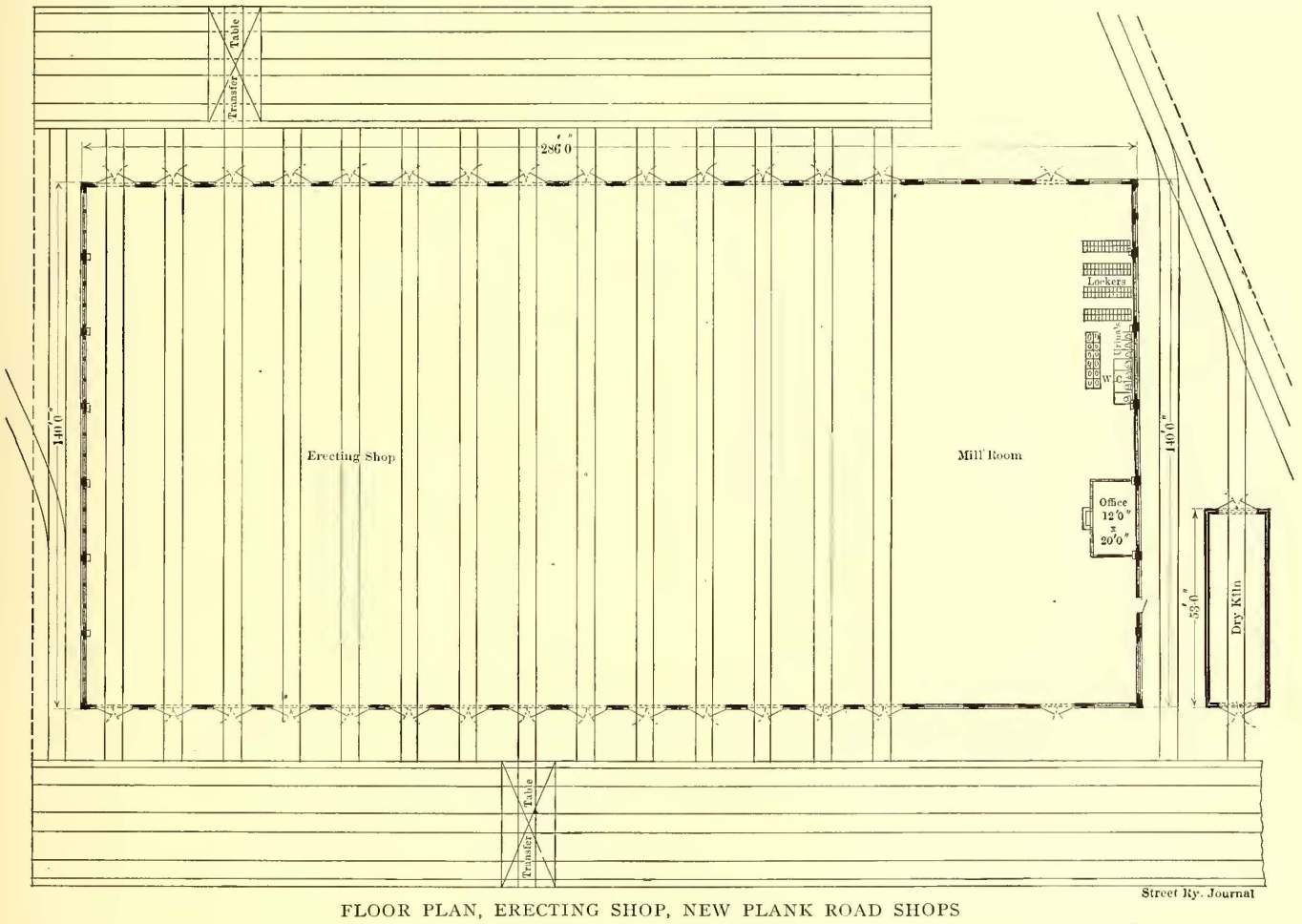
For fire protection a 4-in. fire line connection is effected from the city main in Ferry Street, and seven 2-in. hose valves, each equipped with 50 ft. of 1½-in. linen hose with rack and nozzle, are distributed throughout the building, allowing about 6000 sq. ft. of floor area for each connection. The fire lines will also be cross-connected with the elevated tank service, so that when the rain water is plentiful the fire lines may be supplied from the storage tank. One 3-gal. Underwriters chemical fire extinguisher is to be apportioned to every 2000 sq. ft. of floor area, and one fire pail distributed to every 1000 sq. ft. of floor space.

A thorough system of two-way standard 6-in. fire hydrants is to be installed around the exterior of buildings and grounds, so that any building may be covered with several independent lines of hose.

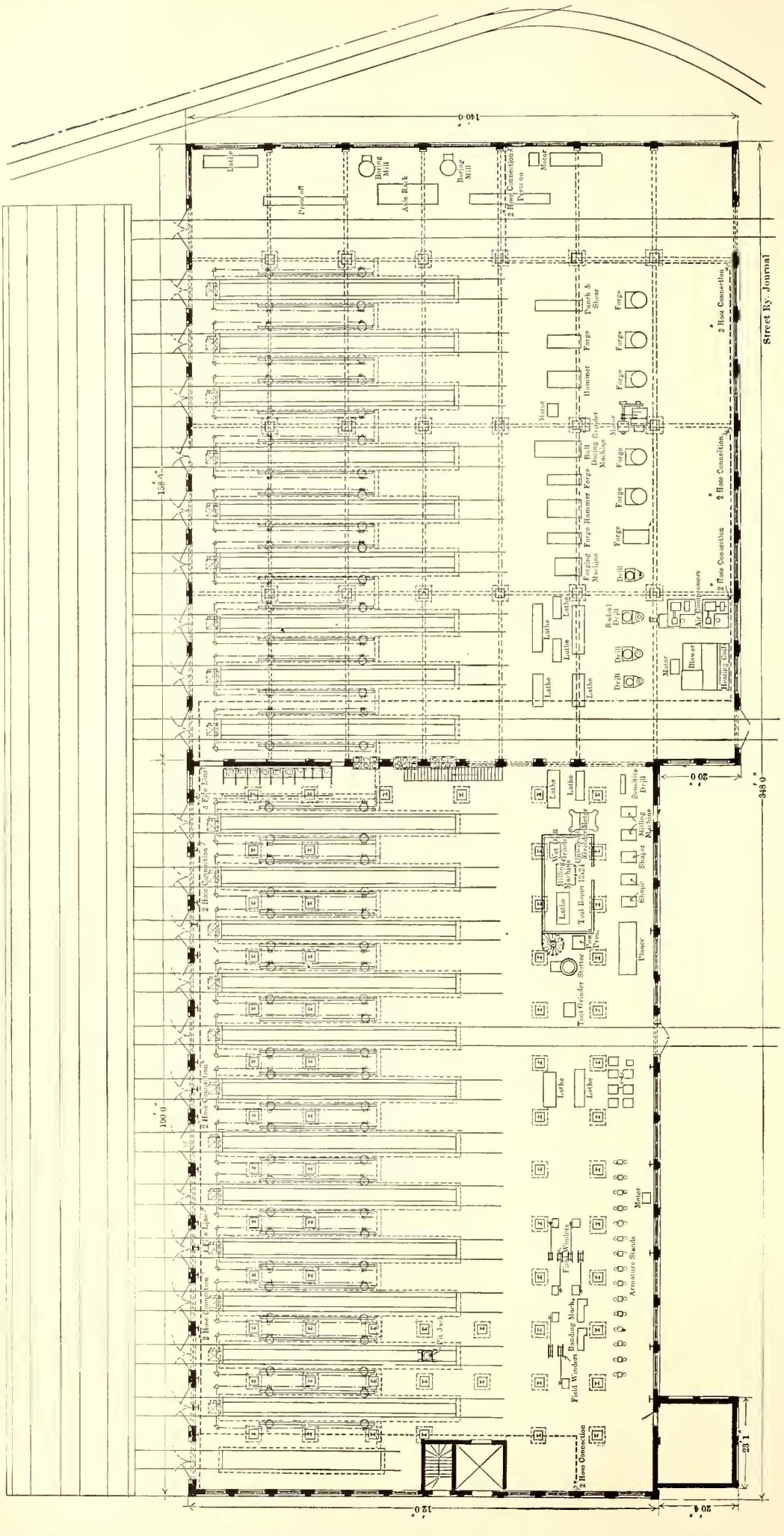
The old buildings are at present equipped with an auxiliary fire alarm system, which will be extended for the new shops. This arrangement is installed and maintained by the New York & New Jersey Fire Alarm Company, and operates as follows: Small fire alarm boxes are distributed in the buildings, one for about every 10,000 sq. ft. of floor area. The auxiliary boxes are electrically connected to main fire alarm box placed on a pole on Ferry Street. The main box in turn is wired up to the city's fire alarm circuit, and its location on record is similar to any city station. In case of fire, if any auxiliary box in the building is pulled, the effect is similar to that of turning the alarm in at any of the city's fire stations.

Two electric bells are to be situated in the office of the superintendent of rolling equipment, one sounding in case any auxiliary box is pulled and one will ring in case there is any defect in the entire auxiliary system. A sprinkling system is at present being considered and may be installed throughout the buildings later on.

The lighting of the paint shop and the entire plant and



FLOOR PLAN, ERECTING SHOP, NEW PLANK ROAD SHOPS



FLOOR PLAN OF MACHINE SHOP, NEW PLANK ROAD SHOPS

grounds is to be accomplished with 110-volt alternating current supplied by the lighting department of the Public Service Corporation. Both incandescent and arc lights will be used, and all wiring is to be done in iron conduit and according to the National Electric Code.

The paint shop is to be heated by direct steam heat. Wall radiators are to be placed under all the windows and 1¼-in. pipe coils are to be suspended under vertical skylight legs in roof trusses, there being 14,000 sq. ft. of radiating surface provided, or about 1 sq. ft. of radiating surface to each 85 ft. of cubical contents. It is estimated that this surface will heat the building to 80 degs. F. in zero weather. The main steam pipe is 10 ins. in diameter and the main return is 4 ins. in diameter.

Steam will be distributed from the central boiler house at high pressure and sent through a reducing valve at the building, reducing the pressure to about 5 lbs. The radiators and coils are to be equipped with special return valves, and a vacuum pump at the boiler house will bring back the air and water, delivering the same into a tank arranged with a vent to leave out the air. The boiler feed-pumps are to take the water from the supply tank and pump it back into the boilers.

This arrangement gives positive return of condensation water regardless of the position of radiators and coils in relation to the water line of the boilers.

ERECTING SHOP

In one of the engravings is illustrated the ground plan of the new erecting shop. This building covers an area of 286 ft. x 140 ft. There is also a dry kiln 53 ft. x 18 ft. In the erecting shop there are fourteen working tracks on 16-in. centers

and which accommodate 42 cars. The mill room is 65 ft. x 140 ft. and situated, as shown, in the south end of the building. Here will be placed the heavy machine tools for woodworking, the toilets, foreman's office, lockers, etc. It is the intention to install a tool equipment capable of taking care of machine work necessary to construct any part of a car body.

The general design of the erecting shop is very similar to that of the paint shop and needs no further description. However, it was decided to reduce the pitch of the roof to 1-5 of the span instead of ¼. The skylight area would be decreased so that the height would only be 9 ft. 6 ins. by this arrangement, but that amount of light is satisfactory for an erecting shop. Besides a 1-5 pitch roof is more desirable for slag than one of a greater angle.

The fan system is to be used to heat and ventilate the erecting shop. A 120-in. fan will be installed in the south end of the building with a bank of 8600 ft. of 1-in. steam coils, delivering hot air through galvanized iron pipes. The galvanized iron pipe is supported by the roof trusses and is to be placed out of the way above the bottom chords. The galvanized pipe delivering hot air is 74 ins. in diameter at the fan and divides into two branches running the entire length of the building and arranged with outlet branches every few feet. Steam will be supplied to coils similar to the system followed in the paint shop, that is, at high pressure from the main boiler house and then through a reducing valve in the building. The main steam supply pipe, after passing the reducing valve, is 6 ins. in diameter. The main return is to be 2½ ins. in diameter, and will also be brought to the boiler by vacuum and boiler feed pumps.

The heating arrangement will give a temperature in the building of 60 degs. F. in zero weather.

DRY KILN

The dry kiln is to be constructed to accommodate a flat car loaded with lumber, it being intended that the lumber remain on the car while the wood is being dried. The outside walls of the dry kiln are to be 20 ins. thick, consisting of two bricks and a 2-in. air space.

The roof is reinforced concrete supported by steel I-beams; 6-in. steel I-beams support the track over a pit 3 ft. deep inside of the kiln, and under the I-beams in the pit direct heating coils are to be placed so that the air inside may be heated to a temperature of 125 degs. F.

MACHINE SHOP

An extension is to be built to the old shop building, and the old shop will be reconstructed to conform with the new layout. The old building is 190 ft. x 120 ft., and the new addition is 153 ft. x 140 ft. The general design of the new work follows that already described. However, the new addition is 18 ft. in the clear under bottom of trusses, and the old building is 18 ft. in the clear under I-beams that support the balcony.

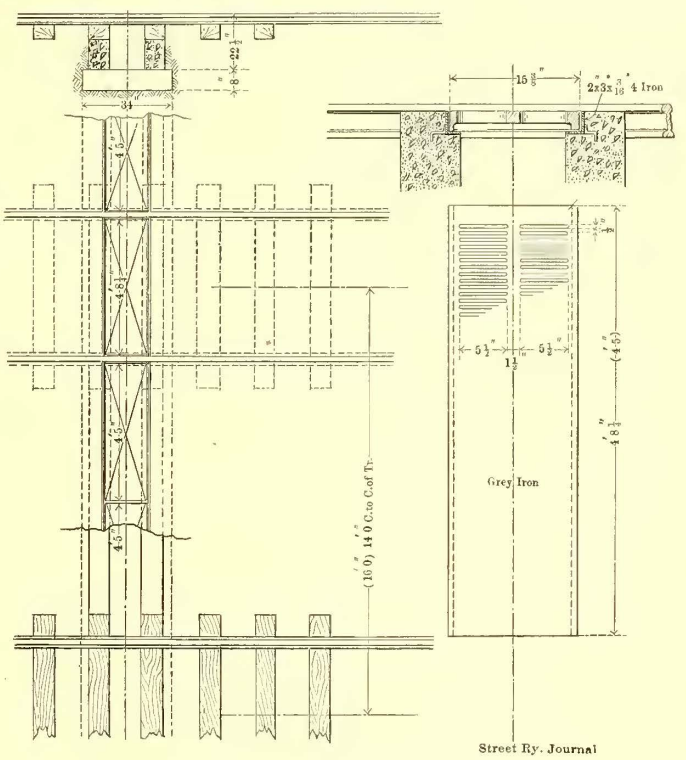
The balcony is 32 ft. wide on each side of the old building, and is built of steel and reinforced concrete designed for 300 lbs. per sq. ft. total dead and live load. Generally 18-in. 55-lb. I-beams are placed on 13-ft. 8-in. centers, and concrete beams on 4-ft. 6-in. centers are supported between the I-beams. Over the whole, as shown, a 5-in. reinforced concrete floor is installed and finished with a 1-in. cement wearing surface. Formerly the second floor of the old shop was of mill construction and was used for the winding department, machine shop and general store room. In the new layout the center of the old building will extend up to the roof, which will greatly aid in furnishing better light and ventilation.

It took considerable scheming to make the old building meet the new conditions. The old shop had already been changed from a power house to a repair shop, hence was of very irregular construction. For example, the steel columns supporting roof trusses on the west side of the house were not in alignment with the columns on the east side, so that in bringing the tracks in from the east side the columns came in the door openings. The track spacing was finally arranged so that only four of the eight columns have to be removed. The track spacing in the machine shop is 13 ft. 8 ins. This is not considered an ideal spacing, but is practical and the best, considering other difficulties to be overcome.

The office construction of the first and second floor in the old building is entirely fireproof and of cement and steel construction, as that described in the paint shop.

The heating of the new machine shop is accomplished as described for the erection shop. A 148-in. fan carries air through 16,000 ft. of 1-in. heating coils on the west side of building, distributing the same through galvanized iron pipes. The pipes are carried up into roof trusses in the new addition and under balcony floor in the old house.

The east side of the structure is reserved for the pit track.



DETAILS OF STAND FOR WASHING CARS

There are 23 tracks in all entering the building, three of which are through tracks, so that material may be taken in or out conveniently. The extreme north track is equipped with a pit arranged with a specially designed wheel-grinding apparatus. A car may be run in on this track, a flat wheel ground into shape and the car taken out again every 20 minutes. This method is considered greatly superior to that of removing the wheel and axle of a car to grind away flats. All the repair pits are also equipped with a specially designed car hoist and air jack, the details of which are shown on page 140.

The car hoist is composed of four screw jacks which are driven by a motor, as indicated, power being transferred to jacks by means of steel shafts and miter gears. This driving arrangement is believed to be superior to the chain drive, inasmuch as the pits are left perfectly clear and do not have to be crossed by the driving mechanism. Two 12-in. I-beams 30 ft. long rest on the screw columns and form the carrying support for each hoist. This arrangement is very reliable, positive and rapid, and is to be especially approved in a shop where the head room is not sufficient for an overhead hoist. The drawing also shows each pit arranged with an air jack. This jack may be moved in a longitudinal or transverse direction,

making it very efficient for handling motors and heavy parts suspended underneath the car.

Axle and wheels are to be attended to in the south end of new extension, and the space outside between the outside wall and track is to be reserved for a wheel platform. The west side of building is the shop proper, with electrical department on the north side. The machine tools are arranged in gangs and operated by an overhead shafting and belting, except the machines in isolated positions, which are to be independent and electrically driven. A dipping room and oven are provided for in a separate fireproof department that is independent of the main structure. The vacant space west of the forge shop will be used for brass foundry and an iron rack. For the present the heavy pieces will be taken in and out of the machine tools by means of chain hoists. But later a traveler system is to be installed. This will consist of I-beam runways suspended from the bottom of trusses in the new building and from second floor beams in the old structure. Upon the runs movable air and chain hoists may be propelled to any desirable position on the building.

The shop superintendent's office is situated directly over the tool room, and has sides almost taken up with windows, so that a good view may be had in any direction about the building. The side walls of the tool rooms are solid to a height of 3 ft. But the remainder of walls is covered with wire netting, the whole being of steel framing, cement floors and fireproof.

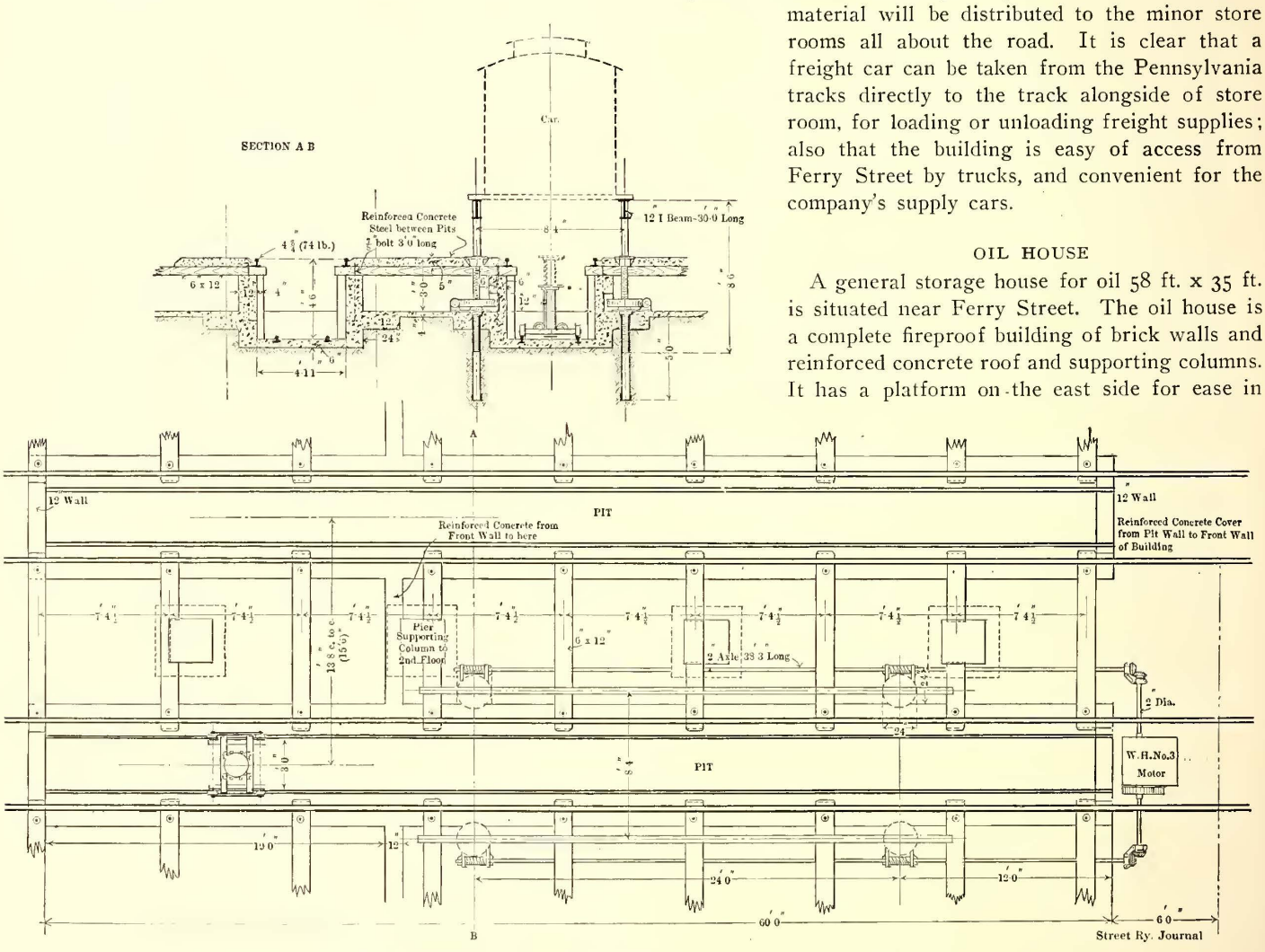
An insulating room for taping armature and field coils is located on the balcony. The intention is to employ girls to do this work, and the latter may come and go independent of the remainder of the shop, as there are fireproof stairways to the Ferry Street side. The small elevator in the northwest corner forms the mode of conveying material to and from the electrical department below. The shop office, which will be the headquarters of the superintendent of rolling equipment, is also on this floor, besides a reading room for the employees, and a space reserved for repairing registers and controllers. Later it is probable that a kitchen and dining room will be constructed on the second floor. The remainder of space on the balcony is to be taken up by light shop stores, which are to be brought up and down on the large elevator at the north end of the building.

STORE ROOM

The new store room is to occupy the present blacksmith shop, which will be removed to new quarters in the machine shop building. An addition will be built to the old blacksmith shop, so that the new store room is to occupy a space 140 ft. x 95 ft. The new addition to conform with part of the store room will be of brick with a mill construction roof. Here are to be kept the general stores for the complete system, and from this point material will be distributed to the minor store rooms all about the road. It is clear that a freight car can be taken from the Pennsylvania tracks directly to the track alongside of store room, for loading or unloading freight supplies; also that the building is easy of access from Ferry Street by trucks, and convenient for the company's supply cars.

OIL HOUSE

A general storage house for oil 58 ft. x 35 ft. is situated near Ferry Street. The oil house is a complete fireproof building of brick walls and reinforced concrete roof and supporting columns. It has a platform on the east side for ease in loading and unloading barrels of oil. The building floor is 6 ins. below the platform landing, so that any waste oil will always be retained inside. The oil house is designed to hold two car loads of oil, and here will be stored the oil ready to be apportioned in barrel lots to the general shop or any auxiliary repair points about the road.

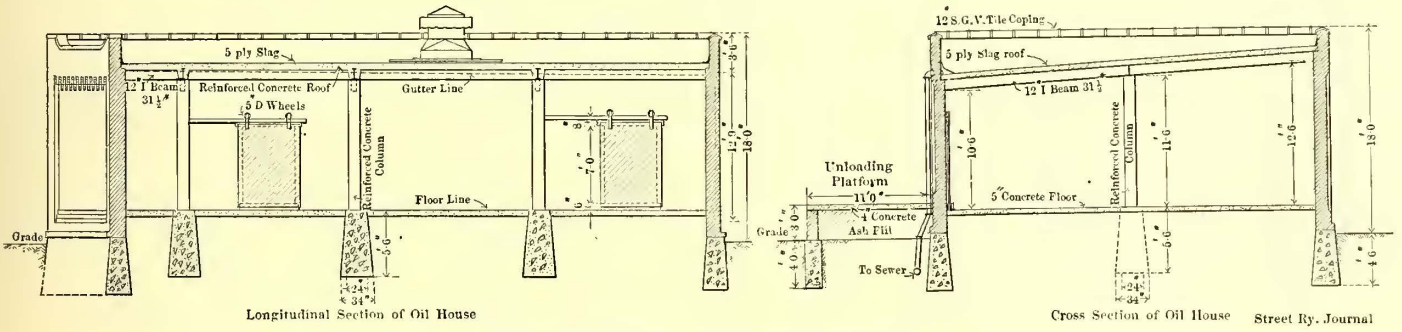


DETAILS OF PIT AND CAR HOIST FOR NEW MACHINE SHOP

STORAGE HOUSES

On the north side of Ferry Street are the present storage barns that hold 130 cars. One more bay capable of housing 30 more cars will be added to the present building, making the total storage 150 cars on the north side of Ferry Street. New storage houses are to be built on the south side of Ferry Street and west of new store room, as seen in the general layout.

The new storage houses are to be built in three bays, each bay containing four tracks covering an area of 450 ft. x 44 ft., and capable of storing 120 cars. This will make the total storage capacity for the present amount to 270 cars, which will take care of the system for the time being. The details of construction for the new storage houses have not been entirely decided upon, but probably the building will be made of concrete and steel, the roof to consist of reinforced concrete girders, 1 ft. thick and 4 ft. high, the girders being placed at intervals of 6 ft. Smaller reinforced concrete steel beams will be installed on 8-ft. centers between the large girders, and then the whole will be covered with a reinforced concrete roof 4 ins. thick. The column supporting the large girders will be reinforced concrete steel and 20 ins. thick x 2 ft. wide. The curtain walls between the supporting columns are also to be composed of steel bonding rod and concrete. These will be only 6 ins. thick and carried by the columns, so that the curtain wall will extend only 6 ins. below the grade line. Under the curtain wall there are to be placed 12 ins. of steam ashes to protect the same in freezing weather. It is estimated that a considerable saving will be made by adopting the concrete construction, and surely it is more desirable from an insurance standpoint than the brick and wood. The ends of the storage barns are to be equipped with four overlapping sliding doors instead of steel shutters. By this arrangement three-quarters



NEW OIL HOUSE, PLANK ROAD PLANT

of the storage barns may be open at any one time, and this is deemed satisfactory. The sliding doors are considered far superior to the rolling shutters.

BOILER HOUSE

All the steam for the different heating systems will be generated and supplied from a central boiler house, the location of which is shown in the general layout. This is to be a brick building 40 ft. x 40 ft., with iron trusses and a monitor roof. Equipment will consist of four 125-hp Weatherhill tubular boilers, each boiler being 16 ft. long, 5 ft. in diameter, and fitted with forty-four 4-in. tubes. These boilers are old equipment to be obtained from the lighting department of the corporation. There is also to be a duplicate set of boiler feed and vacuum pumps.

Steam will be delivered to each of the particular buildings at about 100 lbs. pressure, and reduced to 5 lbs. pressure by Foster reducing valves before entering the various heating apparatus. By using high-pressure steam from the boiler house, the piping to the individual buildings may be smaller than with the use of low pressure, owing to the higher velocity of steam. In addition, the reducing valves at the heating apparatus in the different buildings may be adjusted in accordance with severe variations in the temperature of the outside air, while the boilers can be maintained at a constant pressure. Also, high pressure at boilers gives better conditions for operating the pumps.

The draft for the boilers will be furnished by a self-supporting steel stock 60 ins. in diameter and 100 ft. high.

The entire layout for the new shop and storage plant, as outlined in the foregoing article, was designed and laid out by the corporation's own engineering staff, under the direction of Col. Charles A. Sterling, vice-president of the Public Service Corporation, and Albert H. Stanley, superintendent of the railway department. Charles E. Remelius is superintendent of rolling equipment, and has charge of all repair shops on the system.

PROGRAMME OF THE MECHANICAL ASSOCIATION

The tentative programme of the Philadelphia convention of the American Railway Mechanical and Electrical Association has just been announced by the secretary, and includes reports of committees on the following subjects:

"Controlling Apparatus," J. S. Doyle, master mechanic of the Interborough Rapid Transit Company, New York, chairman. This report consists of two papers, one by Hugh Hazelton, of the Hudson Companies of New York, on "Multiple-Unit Systems of Train Control;" the other by W. A. Pearson, electrical engineer of the New York City Railway Company, on "Series-Parallel Railway Control."

"Way Matters," F. G. Simmons, superintendent of construction and maintenance of way of the Milwaukee Electric Railway & Light Company, chairman. The report of this committee is composed of the following papers on the welding of rail joints: "Thermit Rail Welding," by George E. Pellissier, civil engineer of the Holyoke Street Railway Company; "Zinc Welding," by H. B. Nichols, engineer of way of the Philadelphia Rapid Transit Company, and by C. B. Voynow, assistant engineer of the same company; "Electrical Welding," by T. W. Wilson, general manager of the International Railway Company, Buffalo, and one from the "Iron Age;" "Cast Welding," by F. G. Simmons, chairman of the committee. Mr. Simmons has also prepared a fitting introduction and summing up of the complete subject.

"Brakes," D. F. Carver, superintendent of the Rochester Railway Company, chairman. F. F. Bodler, master mechanic of the United Railroads of San Francisco, will contribute a paper on "Track Brakes," which forms a part of this report. Other papers on this subject will be announced later.

"Maintenance and Inspection of Electrical Equipment," Wm. Pestell, of J. G. White & Company, chairman. The papers forming this report will be announced later.

"Wheels," G. J. Smith, master mechanic of the Metropolitan Street Railway Company, of Kansas City, chairman. The papers forming this report will be announced later.

In addition to the foregoing reports of committees, the association is to have papers on the following subjects: "Power Distribution," by C. H. Hile, superintendent of wires, Boston Elevated Railway Company; "The Power Load Factor as a Factor in the Cost of Operation," by L. P. Crecelius, chief electrician, United Railways Company of St. Louis, Mo.; "Power Houses," by Fred Bushnell, chief engineer, the Rhode Island Company, Providence, R. I.

The Question Box will also form a prominent feature this year.

NEW ENGLAND RAILWAYS' ADVERTISING OF PARKS AND OTHER ATTRACTIONS

The Boston & Northern and Old Colony Street Railways, who own and operate nearly 900 miles of track north and south of Boston, have five pleasure parks where entertainments are given every afternoon and evening during the summer months for a period of about ten weeks. Contractors and workmen have been busily engaged at the parks for several months past renovating and thoroughly going over them, cleaning them up and making numerous and extensive alterations, additions and improvements. Many amusement enterprises, such as roller-skating rinks, boxball bowling, merry-go-rounds, as well as a collection of monkeys, have been added this year, while swings and rustic benches abound among the trees. In four of these parks boating may be enjoyed.

PREPARING TO TRANSPORT 140,000 FOLDERS

The official opening day for these resorts for the season of 1905 was set for Monday, June 26. On this day the theaters were opened, each with a different play, together with a band concert and a grand display of fireworks in the evening. The theaters have been enlarged so as to seat more people than ever before, and the auditoriums have been covered to protect the public from the sun as well as the rain. Such well-known plays as "The Girl from Paris," "The Telephone Girl," "Boys and Girls," "1492," "When Reuben Comes to Town," etc., will be given at these theaters. There will be two weeks of vaudeville during the entire season.

RACK USED FOR DISTRIBUTING FOLDERS, BOSTON & NORTHERN STREET RAILWAY COMPANY, PASSENGER DEPARTMENT

THE BOSTON & NORTHERN AND OLD COLONY STREET RAILWAY COMPANIES' ADVERTISING CAR IN FRONT OF THE PRINTER'S OFFICE

Such an extensive entertainment outlay as this, added to the companies' other pleasure trips, requires an advertising campaign which must be carried out on a large scale. This fact is made clear in graphic fashion in two of the accompanying views, one of which shows the advertising car leaving the printer's office, and the other the car's interior containing 140,000 folders in bundles. The third illustration shows the type of folder case distributed at a number of points over the two systems.

All of this work is in the care of Robert H. Derrah, who prepares the newspaper advertisements about the different theatrical attractions, the illustrated folders covering various trolley trips, press notices, etc. He has been very successful in the latter form of advertising as a result of the several trolley trips on which he has chaperoned members of the New England press.

THE JACKSON & BATTLE CREEK TRACTION COMPANY'S DESPATCHING SYSTEM

During the past two years the Jackson & Battle Creek Traction Company has been using with great success the telephone despatching system, of which details are presented in this article by the courtesy of E. S. Loomis, superintendent of the company.

Owing to the proximity of the high-tension transmission wires, it was considered advisable to install the telephone system with a complete metallic circuit. The telephone wires are also attached to the transmission wire poles, and are transposed at every fifth pole to neutralize the effects of induction. In the despatcher's office at the Albion shops, which are located about the middle of the railway, the telephone line is divided into two sections—a call from the west being indicated by a bell signal, and one from the east by a buzzer. Therefore, the line is normally cut at the despatcher's office so that if an outsider wishes a through telephone connection, the despatcher is requested to insert the necessary plug in the box shown in the accompanying illustration of the despatcher's table.

A train despatcher is always on duty when any cars are on

INTERIOR OF THE DESPATCHER'S OFFICE AT THE ALBION SHOPS

the road, and no cars are allowed to run over any portion of the line without his instructions. Before starting out, the conductors report for orders at one of the terminals. Should there be no orders for them the agent gives them in duplicate the clearance card, form T.7, reproduced herewith. If the despatcher desires to give out a train order, he calls up the agent and gives him the necessary instructions as per the accompanying form T.6½. Upon receiving this order, the agent repeats it to the despatcher, gives his name, and thereafter must not give a clearance card to the train specified. Upon receiving either his clearance card or other train order, the conductor calls up the despatcher, repeats the instructions, gives his name and starts upon receiving the despatcher's approval.

All stations, aside from the terminals, are equipped with the regulation train order signal, which is used to hold trains when-

LIMITED TRAINS
JACKSON & BATTLE CREEK TRACTION COMPANY
THIRD RAIL SYSTEM

Form T.7

CLEARANCE CARD.

....190

To Conductor and Motorman No.....

I have No Orders for your Train.

....Operator.

Time..... m.

CLEARANCE CARD GIVEN TO TRAIN CREW BY STATION AGENT

TRAIN ORDER.

LIMITED TRAINS
JACKSON & BATTLE CREEK TRACTION COMPANY
THIRD RAIL SYSTEM

Form T.6½

Albion Shops ..... 190....

To Agent.....

Complete at.....m. Signed .....

TRAIN ORDER TRANSMITTED THROUGH STATION AGENT

Train Order.

LIMITED TRAINS
JACKSON & BATTLE CREEK TRACTION COMPANY
THIRD RAIL SYSTEM

Form T.6

Albion Shops 190

To Conductor and Motorman .....

at.....

Complete at.....m. Signed .....Conductor.

DESPATCHER'S TRAIN ORDER FORM TO CONDUCTOR AND MOTORMAN DIRECT

LIMITED TRAINS
JACKSON & BATTLE CREEK TRACTION COMPANY
THIRD RAIL SYSTEM

....190 ....

TRAIN NO.	CAR NO.	ARRIVED	DEPARTED
		M.	M.

AGENTS FILE ON SPINDLE

.. ..Conductor.

TRAIN CARD GIVEN TO STATION AGENT BY CONDUCTOR

ever necessary. For this purpose copies of the form T.6½ are handed to every conductor. Then if his train is held he reports at once to the despatcher for further orders before proceeding. Each conductor is supplied with a pad of form T.6 blanks, together with a carbon sheet for making duplicates,

Form T. 2

LIMITED TRAINS
JACKSON & BATTLE CREEK TRACTION COMPANY
THIRD RAIL SYSTEM

DELAY REPORT.

..................190....

Train No.......................Delayed as Follows:

Hrs.	Min.	

Depart .... m.

Arrive .... m. ....Conductor.

CONDUCTOR'S DELAY REPORT

one copy being given by the conductor to his motorman, who must read back the instructions aloud before proceeding, as no verbal orders are permitted.

The forty-six miles of line operated by this company has fifteen sidings, all of which are equipped with standard split switches locked for the main track. They are furnished with the regulation banners and lamps which, like the signal lamps, are lighted by current from the third rail. At each siding there is a telephone booth 3 ft. 6 in. x 3 ft. 6 in. x 7 ft. high, lighted in connection with the railway switches. All booth telephones are provided with a switch and are cut out when not in use. All trains have the right of track to meeting points as scheduled.

LOCAL Form 2¼

Jackson and Battle Creek Traction Co.
DAILY TIME REPORT.

.... 190

.... No.. Motorman

Car No..........

EAST		WEST	
Train No.	Miles	Train No.	Miles

Miles Run..........
TIME
Began .... o'clock m
Ended .... o'clock m

(repeated twice more: Car No. / EAST / WEST / Train No. / Miles / Miles Run / TIME / Began o'clock m / Ended o'clock m)

TOTAL TIME FOR DAY
.... Hours .... Minutes

LOCAL Form 2½

Jackson and Battle Creek Traction Co.
DAILY TIME REPORT.

.... 190

.... No.. Conductor.

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Total Time for Day: ..... Hrs. ..... Min.

TRAIN CREW'S REPORTS FOR LOCAL TRAINS

LIMITED Form 2

Jackson and Battle Creek Traction Co.
DAILY TIME REPORT.

.... 190 ..

.... No.. Motorman

Car No.

EAST		WEST	
Train No.	Miles	Train No.	Miles

Miles Run..........
TIME
Began .... o'clock m
Ended .... o'clock m

(repeated twice more: Car No. / EAST / WEST / Train No. / Miles / Miles Run / TIME / Began o'clock m / Ended o'clock m)

TOTAL TIME FOR DAY
.... Hours .... Minutes

LIMITED Form 3

Jackson and Battle Creek Traction Co.
DAILY TIME REPORT.

..................190......

.... No. .... Conductor.

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Train No. { Lv. .... m / Ar. .... m (six lines)
Car No. TIME Began o'clock m Ended o'clock m

Total Time for Day: ..... Hrs. ..... Min.

TRAIN CREW'S REPORTS FOR LIMITED TRAINS

Among the other forms used in connection with the despatching system, as illustrated herewith, are the following: Form T.2, delay report made out by the conductor, giving the train number, the cause for losing time and the amount of same, as well as the time of departure and arrival; the form shown at the bottom of page 143 is signed by the conductor and given to the station agent for filing; forms 3 and 2 are respectively the daily time reports made out by the motorman and conductor of a limited train, while forms 2¼ and 2½ are used by the trainmen of the locals.

THE TECHNICAL PERIODICAL

R. A. Hadfield, the well-known manufacturer of special work of Sheffield, England, and one of the greatest living authorities on steel, has recently been elected president of the Iron and Steel Institute of Great Britain. In his presidential address to the Iron and Steel Institute, he paid a tribute to the technical press in the following words:

I take this opportunity of expressing our great indebtedness to the technical press for the wonderful work they do in keeping us supplied with the most recent information. There are, I believe, now published about 103 important technical journals, many of them issued weekly. Two-thirds of these papers are published in English, being equally divided between this country and America. Germany follows with about one-sixth of the total. It is not, of course, multiplicity that is of chief value in technical literature; a higher consideration is the quality of the information, and next to that comes the number of readers. On this point England and America can safely be said to hold their own. We often wonder at the marvels of daily journalism, but to me they do not seem to compare with the work done by the technical press, where the matter must be correct and exact. The daily press, however essential to our well-being, does work of a more or less ephemeral nature, that of the technical papers is of a lasting description.

SOME PHASES OF THE FEED-WATER HEATER PROBLEM

BY WALTER E. HARRINGTON

In a recent editorial which appeared in the STREET RAILWAY JOURNAL, attention was called to the fact that too little consideration is given to the very important subject of boiler room economies. From the tendency of certain phases of power plant design recently exhibited, it is evident that this important field, which has great possibilities for improvement, is being neglected and needless wastes are resulting where pronounced savings should be the rule. It is true that careful consideration is now being given to the subject of greater economy in power generation by the use of the steam turbine and other refinements which are being entered into for this purpose. But in the majority of power plants the possibilities for economy through the proper use of the boiler auxiliaries are many times greater than those which can be obtained through discrimination between designs of boilers, engines, turbines, generators, etc.

There can be no doubt that large and important savings will result from intelligent and careful use of stokers, damper regulators and many other valuable auxiliaries. But it is safe to say that no one type of boiler auxiliaries occupies a position of so great importance as the feed-water heater. The feed-water heater indeed bears the same relation to the boiler which the condensing equipment bears to the engine. It not only increases the efficiency, and hence the capacity of the boiler, but it also performs the important function of reducing the incalculable strains and irregularities by heating the feed-water before it enters the boiler.

It is a well-known fact that for every 10 degs. added to the temperature of the feed-water before it enters the boiler about 1 per cent of the total fuel otherwise required will be saved. The theoretical saving is slightly less than 1 per cent; the actual saving, as demonstrated by numerous tests, ranges as high as 1.4, with 1.2 as a fair average; this means that if a feed-water heater is raising the temperature of the feed-water from 50 degs. F. to 160 degs. F., or an increase of 110 degs., a saving of about 13 per cent is effected in the fuel bill. If, however, the feed-water heater is capable of raising the temperature to 210 degs. F., an increase of 160 degs., the saving of fuel would be about 19 per cent. It will therefore be seen that it is not only important to make use of a feed-water heater, but that it is of the greatest importance that the power plant manager should select that type of heater which will enable him to obtain the maximum increase of temperature in the feed-water.

There still exists to some extent a difference of opinion as to the relative desirability of using the open or closed type of feed-water heater, but the degree of perfection which the open heaters has attained has eliminated formerly objectionable features and has enabled open heaters to make for themselves records which cannot be approached with closed heaters. It is doubtful whether the advantages of the open heater are fully recognized and appreciated by steam users in general. The chief objection which attended the early use of the open heater, namely, that the oil from the exhaust steam was carried into the boiler, did much to discourage its more general adoption. While it is true that trouble was formerly experienced in this direction, it is also true that this objection does not hold good against the better designs of open heaters now on the market, and that it is entirely possible to exclude the oil from contact with the feed-water. There are thousands of installations in which the open heater is now being used where no difficulty is experienced from the contamination of the feed-water by oil. The perfection of oil separators for use in the exhaust steam connection to the heater has rendered this possible.

The open or direct-contact type of heater differs from the closed heater, primarily in that the water is heated in it by direct and actual contact with the steam, whereas with the closed heater the heat from the exhaust must be transmitted from the water through intervening metal surfaces, such as tubes or coils. It cannot be questioned that a greater heating efficiency is possible where the steam is brought into direct contact with the water. The tubes used in the best designs of closed heaters are fairly good transmitters of heat when new and clean, but the heating efficiency is quickly and materially impaired by the coatings of impurities which form on both sides of the tubes. Scale is sure to form on one side and cylinder oil to accumulate on the other, and between the two the heat conductivity is greatly reduced. Moreover, as the closed heater is operated under boiler pressure, it is not unusual for tubes to collapse, burst, leak or otherwise give trouble. This is, of course, obviated in the open heater, which is never operated at a pressure higher than that which prevails in the exhaust steam main—generally a matter of a few ounces only.

This cardinal difference between the open and closed heaters —i. e., that in the open heater the steam and water are brought into actual contact, whereas in the closed heater they are separated by intervening metal—enables the open heater to make some important savings over a heater of the closed type. For example, in the open heater, as the heat from the exhaust steam is transmitted to the feed-water the resulting condensation of the steam mixes with and forms a part of the feed-water. The advantage of saving and utilizing this condensation is four-fold.

First—It means saving the heat in the condensation itself.

Second—As a result of the first advantage less exhaust steam is required to heat the water. Under average conditions the open heater will heat the water to a given temperature with about one-seventh less exhaust steam than the closed heater requires. Or, conversely, given a limited quantity of exhaust steam, the open heater will heat the water to a higher temperature than will the closed heater.

Third—Less fresh water is required to be furnished and heated, since the condensation of the exhaust steam (which has a temperature of 212 degs. at the moment when the steam is condensed at atmospheric pressure) displaces an equal amount of cold water, this amount averaging about one-seventh of all the water that would have to be supplied to the closed heater. This is of exceedingly great importance where city water has to be purchased, or where water is scarce or costly, or where it contains considerable scale-forming matter.

Fourth—Since this condensed steam is perfectly pure—being nothing more nor less than distilled water—the quality of the whole feed supply is materially improved. A simple illustration will make this plain. Suppose that of two batteries of boilers one was fed continuously (seven days in the week) with impure water. And suppose that the other battery was fed with the same kind of water six days in the week, but that on the seventh day it was supplied with perfectly pure water. Certainly at the end of a year, or of six months, or of one month, this second battery of boilers would be in a better condition than the first, and this essentially is the advantage which is gained by saving the condensation of the steam used in heating the feed-water in an open heater.

Important as is the saving of this condensation in improving the quality of the feed-water, it is not the only way in which purification is obtained in an open feed-water heater. It is a well-known fact that some of the most troublesome and prevalent scale-forming impurities found in feed-waters are carbonates of lime and magnesia. These are held in solution in the water in the form of bicarbonates. By heating the water to the temperature of 200 degs. or over, as is readily done in an open feed-water heater, the extra measure of carbonic acid gas in the bicarbonates is driven off, the open heater being freely vented to the atmosphere. The remaining mono-car-

bonates of lime and magnesia are precipitated in the heater in the form of insoluble, flaky particles, which can be mechanically removed from the water by settlement and filtration, and thus be prevented from entering the boilers, where they would form scale.

The action of the heat also liberates other gases and the air which are in the water, and which, if they entered the boilers—as they would if no heater, or if a closed heater, were used—would cause severe pitting and corrosion, since they are very active in attacking moist iron. Again, in an open heater the feed-water can be relieved of mud and other solids to a very considerable extent by filtration, while the lighter impurities which rise to the top of the water in the settling chamber can be carried off by flotation.

Thus it will be seen that in an open feed-water heater purification of the water is obtained by saving and utilizing the condensation of the steam used in heating the water, and by precipitation, deposit, settlement, filtration and flotation.

Against this vitally important function of the open heater, the closed heater gives practically no purification, and it presents no offsetting advantages. Whatever degree of purification is obtained in the closed heater must be slight, and is at the cost of impaired heating efficiency, as already explained.

The capacity of the open heater is not limited by any consideration of heating surface or of the condition of this surface, inasmuch as the direct contact of the steam with the water effects the heating by condensation, the capacity for heating the water being limited only by the amount of water and steam that can be brought together. Large quantities of the steam are condensed and become a part of the feed-water. In the act of heating, the only requisite in thus using the exhaust steam is that the steam be freed from such impurities as entrained cylinder oil before coming in contact with the water. As already mentioned, this is easily taken care of by the oil separator, which has now been brought to a state of perfection which enables it to be operated with the utmost certainty as to results. In the open heater it is steam to water and water to steam all the time, with no intervening metal surface to become scaled and no question as to the number of square feet of heating surface in relation to the rated horse-power, as is the case with the closed heater. The maximum heating capacity of the open heater is maintained just as long as the steam and water can be brought together in the heater—that is, the heating continues just the same whether the trays are clean or whether they are covered with a large quantity of scale. The only consideration which governs the size of the open heater is that of providing for the separation and settling of the impurities which are thrown out of the feed-water by the purifying effect of the heating; this is amply provided for by the trays over which the water is passed for the deposit of precipitated matter.

Furthermore, by thus bringing the steam into actual and direct contact with the water to be heated, it is always possible to obtain the full temperature of the steam for that pressure. The "actual contact" method of transmitting heat involved in the open heater is ideal. If it were only possible to generate high-pressure steam in a boiler by bringing the water into direct contact with the products of combustion without the intervening surfaces of sheets and tubes, one of the greatest desideratums in power practice would be gained. An equivalent result is here accomplished, however, at atmospheric pressure with equally favorable results. There can be no deterioration in the heating efficiency or capacity in an open heater—no matter how long it has been in use or whether it is clean or not. Inasmuch as the open heater is operated under atmospheric pressure, the construction is simplified, the use of cast iron, copper and brass being permissible for all parts subject to deterioration, which would be impracticable if the heater were operated under pressure.

In connection with the matter of purification comes the question of provision made for cleaning heaters, and at this point also the comparison is decidedly favorable to the open heater. Every reasonable provision can be made in the open heater for easy and rapid cleaning. Large doors can be provided for removing and cleaning the distributing trays and filter bed. No inaccessible internal compartments need be used, so that a man can enter the heater for the purpose of cleaning the interior. In all of the work of cleaning the open heater no pipe connections are disturbed.

On the other hand, it is practically impossible to clean more than one side of the tubes or coils in the closed heater. In some cases it is impracticable to clean either side. For even such scant cleaning as can be accomplished in the closed heater it is frequently necessary to disconnect the piping.

It is a well-established fact that the amount of steam required for the operation of the boiler auxiliaries is about one-tenth of all the steam generated. Furthermore, practice shows that the exhaust steam from the auxiliaries is sufficient in quantity to heat the feed-water for the boilers if the open heater is used. It is evident from these two facts that the steam from the auxiliary engines can be used to good advantage for heating the feed-water. By this method it does not matter if the auxiliaries are of low economy, inasmuch as all of the heat in the steam not actually utilized in mechanically operating them is returned by means of the open heater to the boilers. Thus duplex pumps may be used with the assurance of the highest economy of operation, regardless of other conditions. If the exhaust from the auxiliaries were passed through the condensers, more than 85 per cent of the heat of the steam would be entirely wasted, but by operating the auxiliaries non-condensing and utilizing the exhaust in an open heater, the heat in this exhaust is saved, and, moreover, the pure water of condensation is added to the feed-water to the amount of over 12 per cent of the total supply, and a considerable portion of the scale-forming impurities is kept out. This mode of operation is particularly valuable where water is scarce or impure.

The crying need of many boiler plants is for extra boiler capacity, not only as a reserve so that repairs and cleanings can be given to the others, but also to give the extra steam required at periods of heavy load, and to save some of the coal that is wasted in forcing the boilers beyond their capacity. The simplest solution of this problem, which is applicable to the majority of power plants, is to feed the boilers with water at the highest possible temperature—not water at 150 degs. or 160 degs., but at the temperature of the exhaust steam, or nearly so—and also to purify the feed-water, and thus reduce the amount of scale-forming impurities entering the boilers. A case may be cited where in a power plant the maximum capacity of eight boilers with the heaviest load on, feeding water through a closed heater, was about 1000 hp. By replacing the closed heater with an open heater of an approved type, the operators at this plant were enabled to deliver comparatively pure water to the boilers at a temperature of 210 degs., in consequence of which, with the same boilers, they are now enabled to easily carry 1200 hp, while the normal load which formerly required every one of the eight boilers can now be carried with ease by seven boilers. Another result of the installation of the open heater was that the old scale came off the boiler tubes in great quantities. In addition to all this, it was found that after the installation of the open heater the fuel consumption was materially reduced. This is but one of many instances that may be cited where power plants have been daily throwing away large quantities of perfectly pure hot water and feeding into the boilers water containing many impurities that make scale, whereas by the adoption of the open heaters this pure, hot water could be saved and utilized with correspondingly beneficial results in the way of economy and efficiency.

THE QUESTION BOX

The regular Question Box department of the STREET RAILWAY JOURNAL is herewith resumed. Occasion is taken to again invite all the readers of this paper to participate in this department by sending suggestions or statements of experience relative to any of the questions pertaining to any phase of practical electric railway work.

A.—GENERAL

A 1a.—What means of advertising have you found most effective?

Some of the means employed by the Railways Company General in advertising the different railways that it controls are folders containing maps, time cards, engravings of different scenes along the roads and booklets giving general and historical information regarding points of special interest. We also have time-tables printed in the newspapers in the different towns, and also have special reading notices inserted in the papers regarding changes of schedule, and special schedules on holidays, or notices about special events that would be of interest to the public. We also have billboard posters advertising the resorts and attractions, and small posters for shop windows, and display cards for the inside of the cars. We also make a practice of having small dodgers printed, to be hung inside the cars, telling of any special excursions and giving the weekly attractions at the parks. These dodgers are attached to a string, so that they can be pulled off and read. They are also hung up in the waiting rooms along the line of the roads and distributed in the towns. We attach display boards to the company's side poles, on which the attractions are advertised. We also hang display banners on the front and rear dashers and vestibules of the cars for advertising any special events. For one of the lines of this company, where there is a large summer resort, we have a very finely engraved booklet, in which are described different resorts along the lake, and also the location of the hotels and boarding houses, giving prices and capacity of each house. The booklet also gives general information as to how the different points on the lake may be reached from the terminal of the electric railway. The most effective advertising means we have found is by the newspapers, especially for interurban lines, where the through travel is from traveling men and tourists, who invariably look in the newspapers for time-tables of the interurban lines, just as they do for the steam railroad schedules. As the railroads publish their schedules in the newspapers, if the interurban roads wish to compete with them in traffic between the same points, they must also publish their time-tables and schedules in the local newspapers, for traveling people, as a rule, always look in the newspapers for such information. Next to this manner of advertising, we have found that the small dodger is the most effective for reaching the general public, when the distribution is carefully looked after. D. A. HEGARTY, Gen. Supt., Railways Company General, New York City.

A 3.—How much money can be spent profitably by an electric railway company for advertising?

The amount of money spent profitably by an electric railway for advertising depends a great deal upon the kind of a railway advertised. The class of patrons riding on an interurban road are different from those patronizing a city line. The interurbans are used more for pleasure riding, and, consequently, they are the roads that require the most advertising. There is a general practice of giving transportation in exchange for newspaper advertising, which I think is a fair exchange, and a source of revenue to both parties to a certain extent, as the newspaper advertisements bring riders to the roads, and the fact of the schedules being advertised in the newspapers induces people to buy the papers.

D. A. HEGARTY, Gen. Supt., Railways Company General, New York City.

A 17.—At one time the use of trail cars was quite general on electric railways throughout the country. Then came a period when the running of trailers was looked upon with more or less disfavor. There seems to be a decided tendency at the present time to go back to trailers. Please give your ideas and experience relative to trailers. Under what conditions do trail cars properly find a place in the operation of a modern electric railway? Do trail cars cause a greater number of accidents? If they do, what can be done to make them safer? What is the economy in running trailers?

We have two city lines in Western cities where there is a resort to which large crowds of people go between the hours of 2 in the afternoon and 12 at night. On the division running to these resorts we use motor cars with two trailers attached to each motor car. There are times, on Sundays and holidays, when we have to attach three trailers to a motor car. To operate trailers, it only takes a conductor for each trailer, thereby doing away with a motorman for every trailer operated. By having the power contained in one car it materially lightens the load that would otherwise have to be carried on the trailers. The saving in the operation of trailers comes not only from the fact that you save just half the wages per trailer on account of using only one man, but you also save the first cost of the investment, by not having any electrical equipment under the trailers. A trail car is no more liable to cause accidents than a motor car of the same style of construction. All cars opening on the sides are more likely to cause accidents than center-aisle open cars, with the sides barred off, and these cars the conductor has only the back platform to watch when passengers are getting on or off, whereas, in the case of the other cars the conductor must watch as many places as there are openings in the side of the car. Therefore, I prefer the center-aisle open cars for the prevention of accidents.

D. A. HEGARTY, Gen. Supt., Railways Company General, New York City.

Trail cars are of great value to those roads that are subject to a heavy intermittent service that calls for a large number of cars on special occasions, the frequency of which are insufficient to justify an investment necessary for complete equipments. Unless extra precautions are observed the elements of danger are considerable. For the smaller cities where the passengers are less active and observant, an employee should be stationed on the rear platform of the motor car, or where there are heavy grades, on the front of the trail car at the brake, and the duties of this extra man should be to watch the passengers in getting on and off, and to give all signals to the motorman. By this arrangement the conductor is enabled to give his entire attention to the fares of both cars.

F. H. BROOKS, Supt., Lincoln (Neb.) Tract. Co.

The topography of the lines, in the writer's opinion, is the deciding factor with respect to the use of trailers. The fact that lines are hilly does not necessarily preclude the use of trailers, but a combination of hills and curves makes the running of trailers undesirable. In Wheeling we have reached the stage where the carrying capacity on certain lines must be increased, and we are meeting the situation by substituting for our 18-ft. and 20-ft. single-truck cars a light type of 40-ft. double-truck car. These double-truck cars will take care of our traffic for some time to come. As some of our lines are single-track, we will meet any fututre demand for increased carrying capacity on these lines by double-tracking. In our city trailers will come as a last resort. GEO. O. NAGLE, Gen. Mgr., Wheeling Tract. Co., Wheeling, W. Va.

B.—EMPLOYEES

B 1.—What are the requirements demanded of applicants for conductors and motormen on your road? The editor will appreciate receiving copies of all the blanks used in your employment department.

Applicants for positions as conductors or motormen must be over 21 and under 40 years of age, not less than 5 ft. 6 ins. in height, and weigh at least 150 lbs., physically sound with perfect eyesight.

ALBERT EASTMAN, Supt. of Employment, Public Service Corporation of New Jersey.

Before employing motormen and conductors we require that they produce three letters of introduction from responsible business men, no letters from politicians, lawyers or salaried men being accepted. In oral interview we determine if the applicant smokes cigarettes, drinks, owes any debts or belongs to any labor organization. If his investigation is satisfactory, and he has a watch and enough money for badges, he is allowed to fill out application blank, a copy of which he is instructed to keep.

L. M. LEVINSON, Mgr., Shreveport (La.) Tract. Co.

B 3.—For conductors and motormen do you prefer married or single men and country bred or city men? Please give your reasons for your answer.

Married men, regardless of whether they are country or city bred. Married men usually take more interest in their work, as the loss of their positions means more to them than it does to a single man.

ALBERT EASTMAN, Supt. of Employment, Public Service Corporation of New Jersey.

We prefer country bred men, but have no preference as to married or single.

L. M. Levinson, Mgr., Shreveport (La.) Tract. Co.

B 4.—Do you employ men who have had previous experience on other electric roads? Why?

We accept inexperienced in preference to experienced men.

Albert Eastman, Supt. of Employment,
Public Service Corporation of New Jersey.

B 6.—Do you consider it a good idea to make applicants swear to the statements in their application blanks? Why?

I consider it a good idea to make applicants swear to the statements in their application blanks. The adoption of this would prevent the filing of a large number of "fake" applications.

Albert Eastman, Supt. of Employment,
Public Service Corporation of New Jersey.

C.—PARKS AND PLEASURE RESORTS

C 1.—Give suggestions, based on your experience, as to the best method of handling park travel.

Our baseball park and our summer theater and dancing pavilion are located on a 5-mile belt line, with cars running in both directions, trailers being used behind each motor car. If the attraction is a good one, we run these trains in sections, tying up the extras on a long spur track for that purpose while the entertainment is on, and running them out when it is over.

L. M. Levinson, Mgr., Shreveport (La.) Tract. Co.

C 3.—Is it better for the railway company to operate a park and its attractions or to induce outsiders to operate them on a percentage basis?

We lease our parks and furnish all necessary lights. Our revenue is limited to car fares.

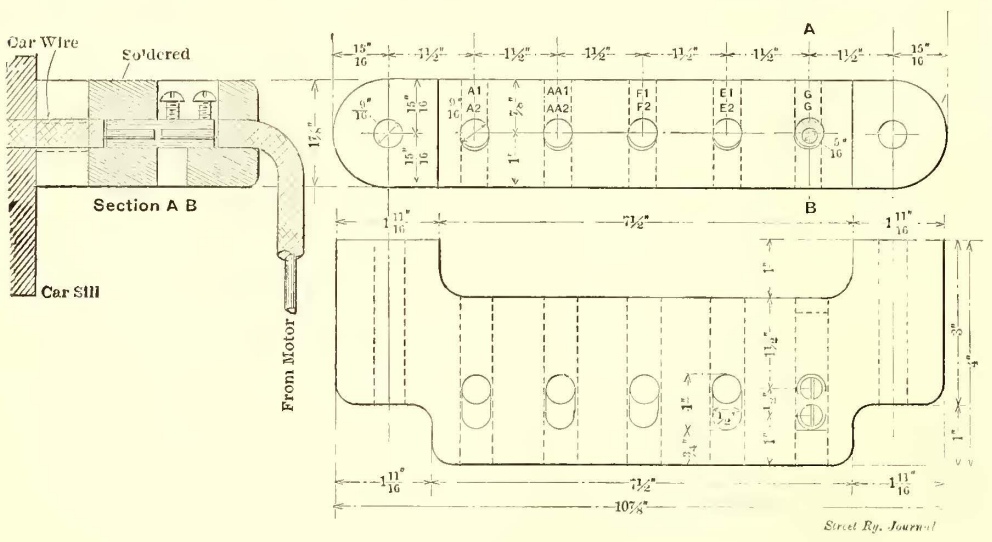
L. M. Levinson, Mgr., Shreveport (La.) Tract. Co.

E.—MASTER MECHANICS' DEPARTMENT

E 11.—What can the master mechanic of the average surface road do to render his cars more nearly fireproof?

The drawing shows a railway motor connecting board as used on the cars of the West Penn Railways Company. The board consists of a plain wooden board, sawed out on band saw and drilled on a post borer or by hand. There are five standard two-way connectors, and two ½-in. bolts for fastening board to car timber immediately over the motor leads. The board is thoroughly soaked in insulating compound and baked before using. The connectors for this board are purchased with only two holes tapped, as the car cables are soldered in one end. Two standard ¼-in. machine screws are used in the other end of the connector, and the board is so proportioned that it is impossible for any metallic substance falling on its top to short circuit the wiring. The connector fits snugly the hole that is bored for it, and is definitely located by being soldered to car wire and by the screws. The connector is set back from the face of board, and hole leading to it is made of such size as to fit the car wire right up to connector face; the strain from the motor leads is thus largely removed from the connector screws, and the chances of the leads being pulled out are largely lessened. The outlines of the board are such as to keep water used in scrubbing cars from collecting on it. The boards are stamped uniformly, A1, AA1, F1, E1, G, and this has proved of great assistance in quickly connecting up an equipment that has been removed from a car body, as it does away with reference to wiring diagrams and the ringing out of wires. The board installed is strong enough to support the weight of a man. The uniformity of car wiring, secured by the use of the board, is a help to the men, and the small space that the board occupies, 4 ins. x 11 ins., is an advantage. No tape is required, and this effects considerable economy. Quite a saving is also made in time necessary to disconnect and connect up equipments over some other methods.

J. W. Bridge, M. M., West Penn Railways, Connellsville, Pa.



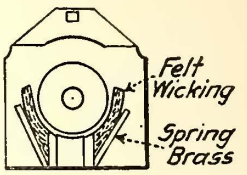
RAILWAY MOTOR CONNECTING BOARD, WEST PENN RAILWAYS

Use fireproof material and electric or hot water for heating purpoces. Supersede for wood iron panels, ribs and angle-iron sills and bumpers. R. H. Young, M. M., Lincoln (Neb.) Tract. Co.

E 47.—Give description, with sketch, of journal box suitable for using oil for motor lubrication.

The journal most suitable for oil is one that has a felt wicking, either at the side or bottom, which feeds the oil to the journal. (See sketch.)

R. H. Young, M. M.,
Lincoln (Neb.) Tract. Co.



JOURNAL WITH FELT WICKING

E 76.—Many of the steam roads dry-wipe their cars without the use of any water. Do you think this method is applicable to electric cars?

The accumulation of dirt on a steam car is of a different nature to that gathered up by an electric car, and each requires a separate treatment to remove, and I do not think a system of cleaning could be worked out which would prove satisfactory to both. A steam car does not become dirty while in active service from an accumulation of ordinary dust, but it is rendered dirty by a peculiar greasy slime intermingled with certain fine particles of coal and ash, given out by the locomotive. This foreign matter comes in contact with the surface of the varnish, and the speed at which the train is traveling forces this hot greasy matter to hold on to the surface, and on some roads where a constant war is not carried on to erase it this slimy matter becomes like a scale, or blight, over the whole surface, so much so that on railroads using soft coal, the coating of greasy stuff becomes so thick as to obliterate the color, striping and lettering of the car. Clear water has no effect on this unless a little friction is applied to remove it, and this is the reason we have so many patent articles on the market claiming to remove this dirt without injury to the surface of the varnish.

Most of the Eastern roads overcome this smoke nuisance by a constant fight carried on by means of the "Dry-Wipe" system, which the writer thinks is about the best thing to do, giving the cars a thorough soap and water and elbow-grease washing every two or three months. The above conditions are not encountered in the operation of an electric railroad, there being no smoke, and whatever dust is taken up is from the roadbed, and is of an ordinary character, and this, together with the dust settling on the car when it is housed for the night, is made to hold on to the varnish by occasional rain and sun baths; but this dirt is far more easy to clean off than the steam car "smudge," and should not be allowed to stay on so long a time between washings as to enable it to become fixed into the varnish. The electric car is somewhat at a disadvantage in having to withstand a constant spattering of mud in going through the crowded and, sometimes, dirty streets of a great city; if this filth is allowed to remain on the varnish any length of time it is a great enemy to your bright and clear surface; I should advocate a constant system of regular washing with clean water—a merely superficial cleaning, which would serve to keep the varnish free from an accumulation of dust and dirt, this to be followed by a monthly soap and water cleaning.

A few years ago the writer had a contract to wash and keep clean the cars of a street railway operated by horses, and the manner in which this work was performed may suggest a like method for washing electric cars. Of course, it will be understood that the description refers to washing a closed or winter car. Open cars require quite a different treatment for many reasons.

The conditions of the road in question called for a nightly wash of all the horse cars on a line operating 300 cars. The night men commenced to wash cars at 6 p. m., when the cars began to run in for the night. The time between cars coming in was irregular. First a batch at 10-minute headway, then a rest until about 8 o'clock, then a rush of fifty cars came in at a 2-minute headway. Then the hustling began, for it was the rule that the driver of each team had to bring his car on to the washing platform, wait until it was washed, and hitch on his team again and switch his car to its proper place for the night, before he could take his team to its proper place and then go home. It will be easily realized how necessary it was for the washers to hurry, and I hope it will be equally understood that we did not attempt to wash a car completely in two minutes. What we did was to split up the operation into sections.

First, it was necessary to have the water-washing done in one place on a properly constructed cement floor, arranged to slope down under the car and drawn off into the sewer. This place was called the "wash-stand." The writer had electric lights arranged so as to cast a powerful light on both sides and ends of the car; also lights casting rays from above and lights placed in a glass cover near the ground, casting rays upward. By this means no part of the car was in shadow, and the dirt was easily distinguished on the car. There was "no groping in semi-darkness."

The writer invented a special broomhead having a place in the stock to receive the end of a brass elbow screwed in and clamped for strength. This elbow was screwed into a water-pipe handle attached to a rubber hose, so that a continuous stream of water passed through the broomstick and through the broomhead and on to the car. All the man had to do was to move the broom quickly over the surface and the dirt was quickly gone. These cars were 17-ft. bodies, 28 ft. over all. A man was placed on each side of the car and a man at each end, four men in all outside. Each outside man had a water-broom. Two men were placed inside the car for sweeping, dusting and cleaning inside of the windows. This operation was done in 2 minutes as far as the outside was concerned. The driver then hitched on his team and put his car in its proper place, where another gang of washers went at it with chamois, wiping the panels and windows, while others cleaned the handles. It will be noticed that the main object was to get the "sloppy" work done in one place and to do it quickly.

The finishing of the job was done more leisurely. It was also necessary to keep the incoming track clear of cars so as to avoid a blocking of cars on track in the street and to switch each car to its proper berth for the night.

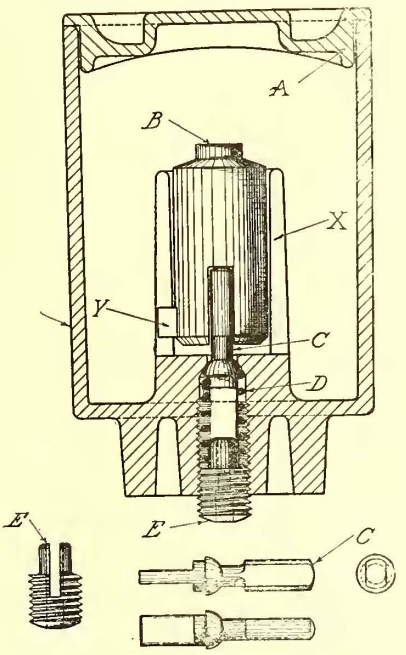
By following this mode of car cleaning, the writer was able to keep the whole equipment clean at a very economical cost, considering the amount of work accomplished, and to further aid in keeping the brilliancy of the painting at its best possible appearance and the cars as a whole clean and sweet, I introduced what I called a special "clean up," which consisted of a gang of men working by daylight; and by giving these men a certain number of cars a day to "clean up," the whole equipment went through this thorough cleansing process in such a way that each car received its treatment in regular consecutive order. The only difficulty lay in the trouble in so handling the men as to enable them to get at the cars and do this work while the cars were on their "daily swing;" but with the co-operation of all concerned we were enabled to overcome all obstacles.

The writer is fully aware that in the foregoing there are many features peculiar to the "horse car age," yet, notwithstanding, I do think that a modified form of the "special clean up" method could be adapted to electric equipment. I wish, however, to advise that, whatever system is adopted in order to clean and properly wash the cars, all the sloppy wet work be done in one part of the depot, for having the washing done all over the flooring of the building gives rise to many evils. The writer was ever ready to give a fair trial to any patented article which came along, but in the end found the "old reliable" laundry soap, water and plenty of energy to be the best car cleaner, when intelligently applied; for good soap is beneficial to the varnish when used at proper intervals of time. To sum up the whole situation, the writer is of the opinion that a proper regard to the handling of an electric railway car equipment, in reference to car washing, is absolutely necessary, and should receive careful attention by the management as to the best way to go at work so as to get the best results for the amount of money available for the purpose. It will be found that the item of car cleaning is a serious one, and a large amount of money can be expended without a satisfactory result, unless it is accomplished in a systematic way and not in the fast and loose manner too frequently followed.

JOHN C. WEAVER, Bound Brook, N. J.

E 47.—Give description, with sketch, of journal box suitable for using oil for motor lubrication.

The accompanying sketch illustrates a novel form of lubricator that has been in use on motors of the Rhode Island Company (Providence) since last August, with very satisfactory results. In service the weight "B," which fits loosely in the vertical tube "X," responds to the jar caused by the motion of the car, and is free to rise and fall, thus striking a hammer blow on the end of valve stem "C." This action disturbs the valve so as to allow a very small quantity of oil to pass through. The oil is then free to flow down through the adjusting screw "E," and, forming a drop on the end of same, passes onto the journal that is to be lubricated. This lubricator has the advantage of employing no felt or wicking of any description which is liable to clog at any time from sediment, dirt and impurities.



OIL CUP, RHODE ISLAND COMPANY

The lubricator can be adjusted to meet any conditions, and this is a very necessary feature, in order to properly regulate the flow of oil to the amount needed for proper lubrication, and at the same time do away with any waste or excess of oil being used over and above what is actually needed. After the lubricator has been properly adjusted to suit the working conditions it requires no more attention, excepting that of an occasional filling, and good lubrication is assured.

To adjust tension of spring "D" under valve "C," the weight "B" is removed and a small wrench applied to end of valve "C." The other end of valve engages adjusting screw "E," and it will be seen that by the turning of the wrench on this valve the adjusting screw may be moved in or out of the casting, thus regulating tension on the spring, which controls the feed of oil. Tube "X" has three vertical slots running its full length, and lug "Y" on weight "B" must be in one of these three slots. This keeps the weight from turning, and the weight holds the valve and adjusting screw from turning, thus holding the adjustment of valve at any desired point.

These lubricators are made to be placed inside the regular grease cup of motor. The device is covered by patents and is soon to be placed on the market.

EDITORS.

E 71.—What pressure do you maintain on the springs in trolley bases?

The pressure on trolley spring should be sufficient to hold a trolley wheel up against the wire with a pressure of 15 lbs. at the end of a 13-ft. pole.

MASTER MECHANIC.

There should be between 20 lbs. and 25 lbs. pressure against the trolley wire. Never more, as it would cause an excess of wear on all parts of trolley wheel and wire. If there is much less than 20 lbs. pressure the wheel is apt to leave the wire at switches, etc.

J. L. SULLIVAN, Foreman,
Motor & Truck Dept., United Rys. Co., St. Louis.

From 18 to 20 lbs.

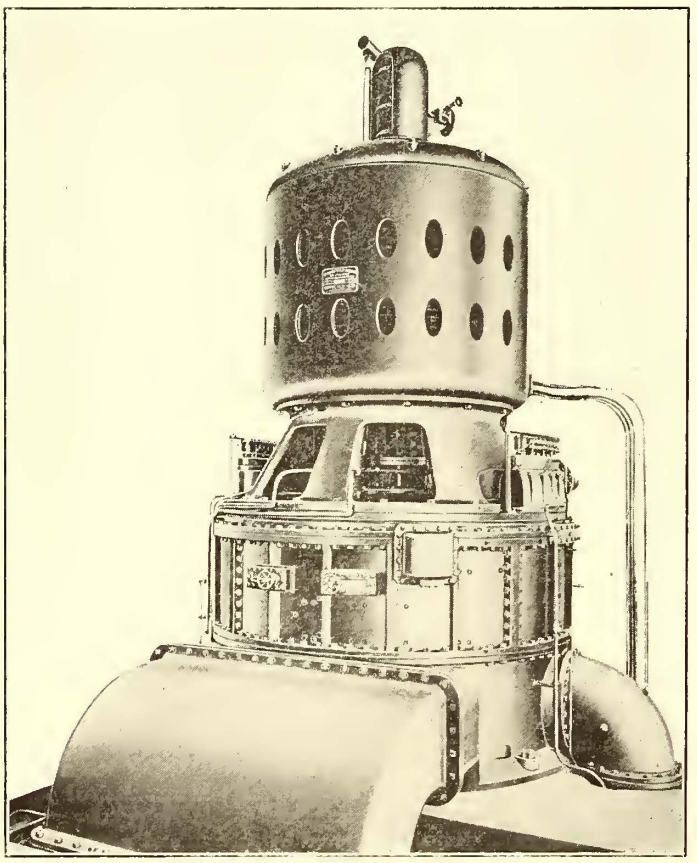
J. CHAS. ROSS, Gen. Mgr.,
Steubenville (Ohio) Tract. & Lt. Co.

Depends on the alignment and general condition of trolley wire. With wire in first-class shape, 20 lbs. tension upwards at the wheel is sufficient. It may have to be increased to 30 lbs. if the line is in bad shape. A lighter tension is also possible with a ball-bearing trolley base than with the old-style pin bearing.

FRANCIS G. DANIELL, New York City.

REPORT ON THE TEST OF A 2000-KW CURTIS TURBINE

The accompanying report gives the results of a test recently made by Frederick Sargent, of Sargent & Lundy, the well-known engineers of Chicago, and Louis A. Ferguson, vice-president of the Commonwealth Electric Company, of Chicago, on a 2000-kw, 900-r. p. m. Curtis steam turbine generating unit. The turbine is a four-stage machine, designed in 1903, and recently changed in a few particulars as a result of experiments conducted during the past year. The machine, as tested, conforms as nearly as possible to the standard four-stage machines now being produced by the General Electric Company, but is less efficient, since the changes made have been confined to the buckets, while several other important changes, which the company knows to be desirable, could not be made in this case without entirely rebuilding the machine. The results reported were determined by the most accurate methods, and have been verified by repeated tests, in addition to those conducted by Messrs.



THE 2000-KW CURTIS FOUR-STAGE TURBINE RECENTLY TESTED AT SCHENECTADY

Sargent and Ferguson, duly considering the steam pressure, vacuum and superheat.

The report of Messrs. Sargent and Ferguson to E. W. Rice, Jr., third vice-president of the General Electric Company, reads as follows:

We sent our assistants, Messrs. Clark and Eastman, to Schenectady to prepare the apparatus for making these tests, and they made several preliminary trials before our arrival, and the results of each of the trials very closely approximated the results of the official tests herein mentioned. We had all the instruments carefully tested and standardized during the trials, the electrical instruments being tested by the New York Testing Laboratory in the presence of Mr. Eastman. The surface condenser showed practically no leakage. We took every precaution to satisfy ourselves that the tests were reliable and accurate, and we beg to certify that the results obtained were as follows:

FULL-LOAD TEST

Duration of test	1.25 hour
Steam pressure (gage)	166.3 lbs.
Back pressure (absolute)	1.49 ins. of mercury
Superheat	207 degs. F.
Load in kilowatts	2023.7
Steam consumption per kw-hour	15.02 lbs.

HALF-LOAD TEST

Duration of test	0.916 hour
Steam pressure (gage)	170.2 lbs.
Back pressure (absolute)	1.40 ins. of mercury
Superheat	120 degs. F.
Load in kilowatts	1066.7
Steam consumption per kw-hour	16.31 lbs.

QUARTER-LOAD TEST

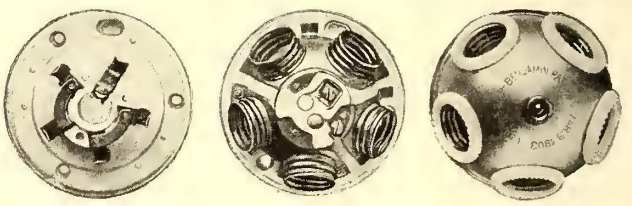
Duration of test	1 hour
Steam pressure (gage)	155.5 lbs.
Back pressure (absolute)	1.45 ins. of mercury
Superheat	204 degs. F.
Load in kilowatts	555
Steam consumption per kw-hour	18.09 lbs.

ZERO LOAD

Duration of test	1.33 hour
Steam pressure	154.5 lbs.
Back pressure (absolute)	1.85 ins. of mercury
Superheat	156 degs. F.
Steam consumption per hour	1510.5 lbs.

IMPROVED WIRELESS CAR-LIGHTING CLUSTERS

The Benjamin wireless clusters which are in extensive use on electric cars throughout the United States because of their simplicity and substantial construction have been recently still further improved. These car clusters are made in two sizes: One with a 3-in. diameter base is made for two or three lights; the larger size with a 4-in. diameter base is made to accommodate two, three, four or five lights. These clusters can be used either with or without reflectors. The 450 cars purchased by the St. Louis Transit Company just previous to the Exposition were equipped with two-light clusters having no reflectors. When the ordinary opal reflector is desired, the clusters are



VIEWS SHOWING CONSTRUCTION OF WIRELESS CLUSTERS

furnished with a sub-base by which the usual flat opal reflector can be adapted to car lighting, by being held between the base of the cluster and the sub-base between two rubber rings. Reflectors of white enameled tin or of polished aluminum are furnished to fit directly between the base of the cluster and the ceiling without a sub-base. These latter reflectors are 14 ins. and 16 ins. in diameter.

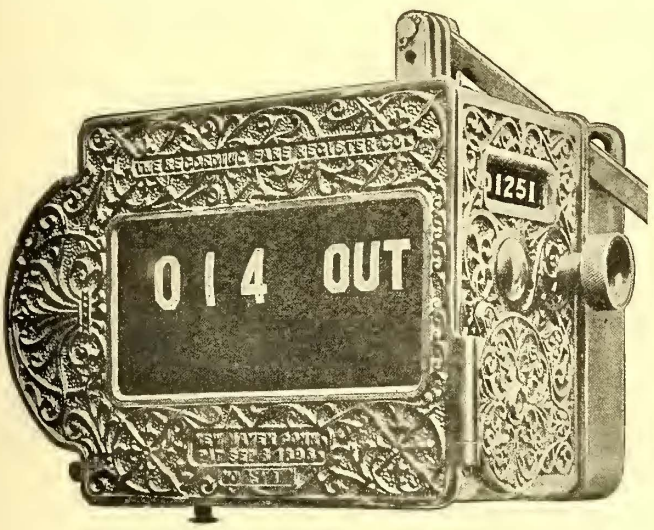
The interior construction of these wireless clusters is very simple and substantial. The contacts are all made a part of the mechanical construction of the cluster, so that the only connections the wiremen must make are at the two binding screws, where the wires lead in. Lamps are connected together in series by overlapping contacts. Between the terminals are porcelain partitions. All insulation is of porcelain, and the various parts are bolted firmly to a single porcelain block which forms the entire insulation and support of the cluster. The distance between parts of different potential is greater than in an ordinary lamp socket. In no place are parts having appreciable difference of potential less than 3-16 in. apart. In this respect the clusters are claimed to be superior to ordinary sockets. The center contacts against which the lamp bases are screwed are phosphor bronze springs with about 1/8-in. movement. This is to prevent lamps shaking loose in car service. The shell near the binding screws is fibre lined. The clusters are adapted to outdoor purposes by attaching a

flange which will screw onto a ½-in. iron pipe or conduit, the reflector holder being fastened directly onto the conduit. For outdoor use a porcelain enameled steel shade is furnished. Outdoor clusters are supplied with aluminum shells in the place of polished brass, better to withstand the action of the weather. The outdoor clusters can be used either with goose-neck bracket of iron pipe or with a suspension fitting. The latter consists of a short length of iron pipe with a cap at the top containing an eye for the attachment of the suspension cable, and means for taking out the wires by means of drip loops to prevent water from getting inside the pipe.

Among the large companies using these clusters are the New York City Railway Company, the Interborough Rapid Transit Company, United Railways of St. Louis, Detroit United Railways and the Los Angeles companies.

A NEW FARE REGISTER

In the accompanying illustration is shown the new type-E fare register, made by the Recording Fare Register Company, of New Haven, Conn., and first exhibited at the Lake George convention, where it received very favorable comment. This



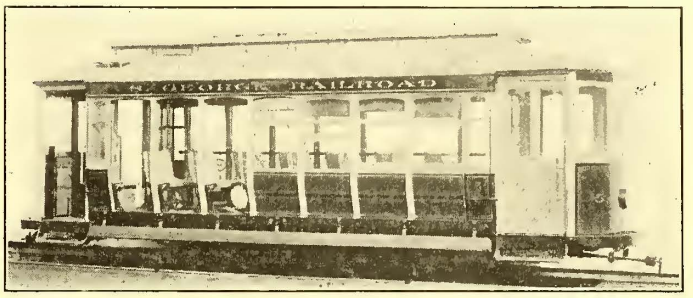
NEW TYPE OF SIMPLE RECORDING REGISTER

register was designed for the purpose of giving the electric railways a first-class, simple register at the lowest cost consistent with accurate work. In general appearance it is the same as the various types of recording registers made by this company, but does not contain the recording feature. The principal points of advantage claimed are the remarkable simplicity of the mechanism and its absolute accuracy and durability. All parts are of steel and strong enough to stand the most severe use.

CONVERTIBLE CARS FOR WEST VIRGINIA

The J. G. Brill Company has recently completed for the S. George Railroad Company, Wellsburg, W. Va., the convertible type of car shown. The builder's well-known arrangement of the panels and sashes sliding into roof pockets has become widely used during the last seven years, as conversion or semi-conversion may be effected quickly and easily, and the cars, when opened or closed, are practically the same as the standard types. The car illustrated is mounted on the No. 21-E single-truck, which carries the car body 2 ins. lower than any other single truck. Brackets connect the back of the seats with the posts, thus forming convenient handles, which encourage passengers to face in the right direction when leaving the car. Twenty-eight passengers may be comfortably seated, the seats being of spring cane. Ash in natural color and decorated birch ceilings constitute the interior finish. The vestibule sashes are composed of single lights and are arranged to drop into pockets.

The general dimensions are: Length over the end panels, 20 ft. 7 ins., and over the crown pieces and vestibules, 30 ft.; the panel over crown piece, 4 ft. 8½ ins.; width over the sills and the panels, 7 ft. 2¼ ins.; width over the posts at the belt, 8 ft.; sweep of the posts, 5 ins. The side sills are 5¼ ins. x 7 ins.; the sub-sills, 3¼ ins. x 4⅝ ins., supported by 3¼-in. x 5-in. x ⅜-in. Z-iron. The thickness of the corner posts is 3⅝



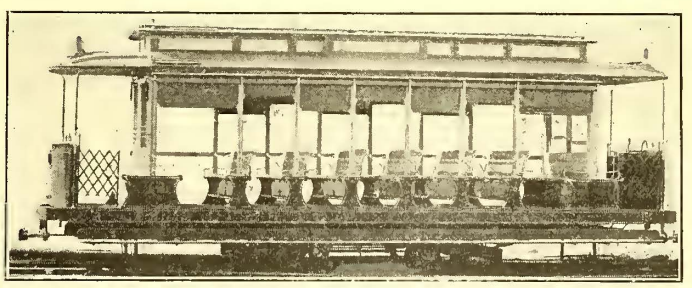
APPEARANCE OF CONVERTIBLE CAR WHEN PARTLY OPEN

ins., and of the side posts, 3⅜ ins. The No. 21-E trucks have 33-in. wheels and 4-in. axles. Among the Brill specialties are angle-iron bumpers, radial draw-bars, "Dedenda" gongs, ratchet brake handles and folding gates.

OPEN CARS FOR THE KNOXVILLE TRACTION COMPANY

Six ten-bench open cars, built by the G. C. Kuhlman Car Company, have lately been placed on the lines of the Knoxville Traction Company. The new cars will be used in the city and suburbs of Knoxville, where the company operates about sixty-five cars on 30 miles of trackage. The lines of the company reach Chilhowee Park (for whites) and Magnolia Park (for colored), which bring a large amount of extra business during the summer months.

Fifty passengers may be comfortably seated, the seats being reversible, with the exception of the two at each end. The sashes in the bulkheads are arranged to drop into pockets between the seats. Three-bar guard rails extend across the window spaces. The curtains may be drawn to the floor. The interiors are finished in ash, with three-ply birch ceilings. In-



TEN-BENCH OPEN CAR USED BY THE KNOXVILLE TRACTION COMPANY

cluded in the equipment are Brill vertical bevel gear brake handles, "Dedenda" gongs, "Retriever" signal bells, angle-iron bumpers, etc.

The cars are 21 ft. 8½ ins. over the corner posts and 7 ft. 1½ ins. over the sills. They are 30 ft. 4 ins. over the crown pieces, and from the panel over the crown piece, 4 ft. 3¾ ins. The width over the posts at the belt is 7 ft. 6 ins., and the sweep of the posts is 2½ ins. The distance between the centers of the posts is 3 ft. 9 ins. The side sills are 5 ins. x 8 ins., and the end sills are 5 ins. x 7⅛ ins. The thickness of the corner posts is 3⅝ ins., and of the side posts, 2¾ ins.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION CONVENTION

The annual convention of the Colorado Electric Light, Power and Railway Association will be held at Glenwood Springs, Col., Sept. 18, 19 and 20, 1905. George B. Tripp, of Colorado Springs, is secretary.

REPORT OF THE LONDON TRAFFIC COMMISSION

The Royal Commission on London Traffic, which was appointed by Parliament in February, 1903, to inquire into the means of locomotion and transport in London, and which visited this country during the fall of the same year, has issued its report. While in this country the committee visited several Eastern cities and interviewed a number of the leading street railway managers on the subject of American transportation facilities. The report declares that everybody knows that the existing means of transit in London are seriously defective. It adds that improvement is imperatively necessary in the interests of both public health and convenience, for the prompt transaction of business and to render decent housing possible.

The narrowness of the streets in London lies at the root of the problem of surface locomotion in that city. The commissioners recommend the widening of many important thoroughfares, and what is more important, the construction of two great avenues, one running east and west, 4¾ miles long, and the other running north and south, 4¼ miles long. Each avenue would be 140 ft. wide, with four tramway tracks on the surface and four electric railway tracks underground. The commissioners estimate the cost at from £25,000,000 to £30,000,000. Nevertheless, they strongly urge this plan if it is found to be financially practicable.

In dealing with tramways, the report remarks that the existing tramway mileage in London is quite insufficient, and is conspicuously inferior to that of American, European and provincial English cities. It recommends a large extension and the linking of various systems. More underground railways also are needed, and they should be, if necessary, aided by the local authorities. Shallow subways are regarded as preferable to deep laid tubes, although the former in some cases are admitted to be impracticable. The opinion is expressed that motor omnibuses will never take the place of tramways.

As can be seen, the construction of the two avenues and the carrying out of the commission's other recommendations would be enormously expensive. The commissioners recognize that this will prevent the adoption of an ideal scheme, but in view of the apparent fact that the population of London will reach 11,000,000 in the near future, they declare that the utmost possible ought to be done, and they urge the creation of a permanent body to deal with the question.

The system of paying cash fares on the cars came to an end on the Indiana Union Traction Company's line July 14.

GUY ANCHORS

The accompanying illustrations show the method of installing Stombaugh guy anchors made by W. N. Matthews & Brother, of St. Louis. The smaller sizes of these anchors are supplied without rods and are installed as shown in Fig. 1. A piece of galvanized-iron cable or wire, 7 ft. or 8 ft. long, is attached to the eye of a rodless anchor and is then passed through the hollow pipe of the installing wrench, shown in the illustration. The anchor is then keyed to the wrench and the wire drawn tight, after which a clamp is set flush with the cross-bar of the wrench, as illustrated in Fig. 1. The anchor is then screwed into the ground, care being taken to insert them so that the connecting cable will be at exactly the angles in which the guy wire is to run. When as deep as the conditions of the ground permit, the wrench is disconnected and withdrawn, and the guy wire is attached.

The rodless anchors are only made in 5-in. and 6-in. sizes. Larger sizes are made with a permanent rod, and are installed as shown in Fig. 2. The rod is slipped through the hollow wrench, after which a metal or wooden wedge is driven firmly into the eye, as shown in the engraving. The wedge prevents the wrench from slipping off the key from the torsional strain while the anchor is being set. When the proper depth is reached, the wrench is pulled out and the guy cable from the pole is attached to the eye of the anchor left projecting from the ground.

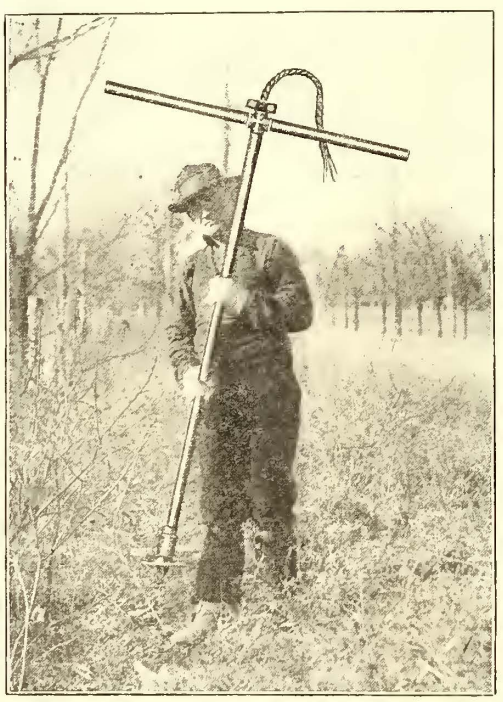


Fig. 1

Fig. 2

METHOD OF INSTALLING GUY ANCHORS

A new feature of these anchors is that the pipe of the wrench is now being made longer than formerly, and allows about 1½ ins. to 2 ins. of the eye to project beyond the cross-bar.

The fate of the Ware & Gilbertville Transportation Company, an enterprise which carried passengers by automobile, is interesting. It was started when the Hampshire & Worcester Street Railway was temporarily suspended, having gone into the hands of a receiver. A short time ago the street railway resumed operations, and now the manufacturers of automobiles are seeking to get their money for the machines. Automobile transportation could not stand the competition of the street railway.

FINANCIAL INTELLIGENCE

WALL STREET, July 19, 1905.

The Money Market

The money market continued firm this week despite the heavy gain in cash by the local institutions, which more than offset the payment of $11,500,000 into the national treasury by the depository banks. The demand for funds was fairly brisk throughout, especially for fixed periods, but there was no disposition on the part of lenders to offer with much freedom, in view of the heavy demands soon to be made upon the banks for crop moving purposes which promise to be fully as heavy as in former years. Money on call was in abundant supply at rates ranging from 3 to 2 per cent, with most of the business transacted at 2 to 2¼ per cent. Time money was in much better demand, and several large transactions were reported at current rates. Early in the week local and out-of-town institutions offered moderately at 4 per cent for six months and experienced little difficulty in placing their funds. Toward the close the demand for over the year maturities slackened materially, but a better inquiry developed for the shorter periods, especially for four months contracts, which commanded 3¾ and 3½ per cent. Sixty-day contracts were obtainable at 3 per cent, while ninety-day money was in good supply at 3¼ per cent. Mercantile paper continued in good demand, but the supply was extremely small considering the reported activity in mercantile lines throughout the country. Sterling exchange was weak, at a further decline of 20 points to 4.86.55 for prime demand bills, which eliminates all possibility of gold exports for the time being. A feature of the market was the unusually good showing made by the clearing house banks on last Saturday. The gain in cash amounted to $11,743,700, which was considerably in excess of the preliminary estimates. The increase in this item was due largely to the arrival of subscriptions to the new Japanese Government 4½ per cent loan, and to the transfer of funds from San Francisco to New York. Loans decreased $9,150,400, owing to the liquidation in the stock market. Surplus reserve increased $11,565,425 to $19,523,250, which compares with a surplus of $44,563,350 in the corresponding week of last year, and $13,278,475 in the corresponding week two years ago. United States deposits amounted to $11,398,800, as against $11,977,600 in the preceding week. The European markets remained easy and practically unchanged. The discount rates at the principal European centers were as follows: London, 1¾ per cent, decline ⅛ per cent; Berlin, 2⅛ per cent, unchanged; Paris, 1¾ per cent, decline 1-16 per cent.

The Stock Market

There was a material falling off in the dealings on the Stock Exchange this week, and although prices displayed considerable irregularity the general tone was firm. In the early dealings trading was fairly active, and prices continued to advance under the lead of the Northern Securities group, all of which rose sharply, but in the subsequent dealings the market developed extreme dullness, and there was a general disposition on the part of the professional elements to take profits. The market was well supported, however, and the reactions in most instances were confined to comparatively narrow limits. Commission house business fell off materially, and the transactions for London accounts were very moderate. Northern Pacific was the strong feature in the early dealings, the stock scoring an advance of 11 points, to the highest price on record. Great Northern advanced 5 points, and Northern Securities, on the curb, rose sharply in sympathy. In other parts of the list great strength was displayed, especially in St. Paul, which was lifted several points. No confirmation of the Northern Pacific rumor was obtainable, however, and prices ran off rather sharply on that account. Northern Pacific dropped 5 points, while the declines in other parts of the list amounted to 1 per cent and upwards. In the subsequent dealings prices scored substantial recoveries on a very small volume of business. St. Paul was conspiciously strong, and Reading was bought in large amounts. Southern Pacific and Union Pacific also held strong. Illinois Central enjoyed a sharp advance on buying, said to be for the account of a new pool. The steel stocks declined early in the week on rather heavy selling, but subsequently recovered part of the loss. Tennessee Coal & Iron also lost heavily at the beginning, but regained most of the loss at the close. In the specialties the overshadowing feature was the sharp break in Pittsburg Coal, on the passage of the preferred stock dividend, to near 48, which compares with a price of 80 last spring. The bond market was dull, but generally strong, about the only feature being the new Japanese 4½s, which sold at a premium of 1¼ per cent above the subscription price, and held most of the gain. The closing was extremely dull but steady.

The local traction issues were moderately active and strong, the features being Metropolitan Street Railway and Brooklyn Rapid Transit, both of which ruled around top prices on reports of large increases in earnings.

Philadelphia

There was a further falling off in the dealings in the local traction stocks this week, and although prices displayed irregularity at times the general tone of the market was firm. Interest again centered in Philadelphia Rapid Transit, of which upwards of 3000 shares were dealt in at from 28⅛ to 27½, and back to 28 at the close. Philadelphia Traction opened down ¼ at 99¾, but later recovered to 100. Philadelphia Company common was quiet but strong, several hundred shares changing hands at from 43¼ to 43½, while the preferred sold at 47¾ to 48 for small amounts. Union Passenger Railway dropped a point to 2¾ on the sale of 100 shares, and United Gas & Improvement sustained a similar loss, about 1000 shares selling at prices ranging from 95 to 94. Union Traction held steady at 60, and Consolidated Traction of New Jersey was firm at 82. Other transactions included American Railways at 51; United Traction, of Pittsburg, preferred at 50½, Railways General at 2⅝ to 3, and United Railway Investment preferred at 87.

Chicago

Trading in the traction stocks continued upon an extremely small scale this week, and apart from the sale of ten shares of Chicago Union Traction preferred at 26, the lowest point attained thus far this year, the market was absolutely without feature. Chicago & Oak Park stocks ruled firm, the common selling at 5, while several hundred shares of the preferred brought 18. Metropolitan Elevated sold at 24, and Northwestern Elevated changed hands at 21½. South Side Elevated continued to display strength, the price holding at 95. North Chicago Street Railway sold at 58 for fifty shares.

Other Traction Securities

Trading in the Baltimore market was quiet and prices generally held firm. United Railway 4s were fairly active, upwards of $30,000 changing hands at 94 to 93¾. The income bonds were less active, $14,000 of the free bonds selling at 59¾, and $10,000 certificates of deposit selling at 58½. Some activity developed in Toledo Traction 5s, $16,000 being dealt in at 100½ to 100¾. Other transactions included 100 United Railway stock at 13¼, $7,000 Norfolk Railway & Light 5s at 93¼ to 93, $2,000 Central Railway 5s at 117¼, City and Suburban 5s at 113⅜, Richmond Traction 5s at 105⅛, and Macon Railway & Light 5s at 97¾. In the Boston market dealings were upon a comparatively small scale, but prices showed only slight changes from those prevailing at the close of last week. Boston & Worcester preferred was rather more active, about 1000 shares changing hands at from 76½ to 75½, and back to 76. The common was practically neglected, ten shares selling at 31. Boston Elevated held firm, all transactions reported taking place at 157¾. Boston & Suburban sold at 69. Massachusetts Electric issues were inactive. The common sold at 18 to 18½ for about 200 shares, while the preferred broke from 63¾ to 63, but subsequently there was a full recovery. West End common sold at 97 to 97½, and the preferred at 114. The New York curb market was quiet. Interborough Rapid Transit developed moderate activity, upwards of 2000 shares being traded in at from 201 to 203¾. New Orleans common sold at from 34½ to 27½, while the preferred sold down to 70. Washington Railway & Electric preferred brought 90½ for 300 shares.

Tractions were inactive at Cincinnati. The new Ohio Traction preferred made its appearance at 106 to 106¼; this is the controlling company which holds the majority of the securities of the so-called Widener-Elkins properties around Cincinnati. Cincinnati, Newport & Covington common made a gain to 33¼; the preferred sold at 92¾. Other sales were as follows: Cincinnati Street Railway, 147¼; Toledo Railway & Light, 34½ to 35½; Cincinnati, Dayton & Toledo at 23. Several large blocks of the 5s of this com-

pany sold at 95. At Toledo, Toledo & Western stock made an advance from 13½ to 15. Toledo & Indiana sold at 14. This has come up from 9 in the past few weeks. Northern Ohio Traction & Light was particularly active in Cleveland, and reached a new high mark of 24½ on reports of improved earnings. Aurora, Elgin & Chicago common also was very active, about a thousand shares selling with a high mark on this movement of 19¼, due to the report that the company has secured a grant enabling it to operate freight and express into the center of Chicago. The preferred came into prominence with a range of from 70 to 73½. Over $100,000 worth of A. E. & C. 5 per cent bonds sold at 93 and 94. Northern Texas Traction made another upward movement from 66 to 69. Lake Shore Electric common came into prominence on reports of fine showing made by the company. The common stock will not stand a show of dividends for a long time, but it is being bought on speculation quite freely. It had a range from 10 to 11⅛. Western Ohio receipts also had an upward trend, selling at 15. The 5 per cent bonds of this company were a trifle lower, 79⅞. Cleveland Electric sold at 78.

Security Quotations

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

	July 12	July 19
American Railways	50	51
Boston Elevated	157	157
Brooklyn Rapid Transit	69½	69½
Chicago City	a190	—
Chicago Union Traction (common)	7⅛	7⅛
Chicago Union Traction (preferred)	32	33
Cleveland Electric	78	78
Consolidated Traction of New Jersey	82	82
Consolidated Traction of New Jersey 5s	108½	108½
Detroit United	93	92⅝
Interborough Rapid Transit	200⅜	203½
International Traction (common)	—	26
International Traction (preferred) 4s	—	64
Manhattan Railway	164	165
Massachusetts Electric Cos. (common)	a19	18
Massachusetts Electric Cos. (preferred)	63	63
Metropolitan Elevated, Chicago (common)	23⅞	23⅞
Metropolitan Elevated, Chicago (preferred)	65	65
Metropolitan Street	125¾	127¼
Metropolitan Securities	81¾	82½
New Orleans Railways (common), W. I.	37	31½
New Orleans Railways (preferred), W. I.	79¼	73⅛
New Orleans Railways 4½s	90	90
North American	98⅝	98⅛
North Jersey Street Railway	25	25
Philadelphia Company (common)	43	43
Philadelphia Rapid Transit	28	27½
Philadelphia Traction	100	100
Public Service Corporation 5 per cent notes	97	97
Public Service Corporation certificates	69	68½
South Side Elevated (Chicago)	95	94½
Third Avenue	127	127
Twin City, Minneapolis (common)	113⅜	112½
Union Traction (Philadelphia)	59½	60
West End (common)	97	97
West End (preferred)	*114	114

a Asked. W. I., when issued. * Ex-dividend.

Iron and Steel

The "Iron Age" says that orders from the general foundry trade have been in fair volume, and have been well distributed. Much of the business was done at low price—at $11 and under in Birmingham; but now $11.85 for early delivery has become scarce, and the leading makers ask $11.50 and upward for delivery during the balance of the year. So far as can be learned, consumers have only partially covered requirements for the balance of the year. Cleveland reports that a buying pool has been formed in that important foundry center among the buyers of pig iron. Business in the heavy lines, steel rails, plates and shapes continues very satisfactory. In the lighter lines there is a notable movement in the steel bar trade, and a better feeling prevails in sheets. Export trade is very satisfactory. The export tonnage of the United States Steel Corporation during the first six months of this year was only 46,000 tons below the shipment of the corresponding period of last year, when export work was sought so vigorously and effectively.

FIGURES OF SUBWAY TEMPERATURE

General Manager Hedley, of the Interborough Rapid Transit Company, issued a statement Wednesday night showing the figures of subway air which had been reported to him by his employees. The test at City Hall station, made at 3 o'clock in the afternoon, showed a temperature of 90 degs., whereas on the street surface the mercury was at 100. At Thirty-Third Street at the same time the subway station thermometer registered 87 degs., as against 97 degs. on the surface; Columbus Circle showed 90 degs. in the subway and 100 degs. on the surface at 3 o'clock, while Sixty-Sixth Street showed 87 degs. in the station, against 99 degs. on the surface. The greatest difference was shown at the Ninety-First Street station, where at noon the thermometer was 86 degs. in the subway and 104 degs. on the surface, a difference of 18 degs. At noon the thermometer in the Seventy-Second Street station registered 89 degs., as against 97 degs. on the surface. The Ninety-First Street station registered 84 degs. at 9 o'clock in the morning, as against 98 degs. in the street above.

Throughout the hot period, according to General Manager Hedley, the temperature in the subway has averaged from 5 degs. to 14 degs. cooler than it has been on the surface.

To make a personal test of the atmospheric conditions in the subway, President August Belmont, of the company, hit upon the idea Wednesday of holding a directors' meeting in the tunnel. At the same time a general inspection was made of the tunnel route. Instead of transacting business in a board room, the directors, at Mr. Belmont's suggestion, went to the Bowling Green station, and there took a special car, and while on the trip uptown discussed and acted upon various matters affecting the road.

TRIAL ELECTRIC TRAINS ON THE LONG ISLAND

The first electric train on the Long Island Railroad was run Tuesday, July 18, from Woodhaven Junction to Flatbush Avenue and back. Two round-trips were made for the purpose of testing the clearances of the contact shoes. On Wednesday a train of five cars made a trial trip to Rockaway Beach, and it is expected that by the first of next week electricity will take the place of steam on the whole Rockaway Beach division. General Superintendent C. L. Addison and Electric Superintendent L. S. Wells were in charge of Tuesday's trial run. A speed of 35 m.p.h. to 40 m.p.h. was maintained without difficulty on the elevated portions of the track.

JUNE REPORT OF NEW YORK CITY RAILWAY COMPANY SHOWS NEW YORKERS FAVOR SURFACE CARS DURING SUMMER MONTHS

Despite the competition from the subway, as well as the elevated roads, the June gross earnings of the New York City Railway Company were the largest for any June in its history, aggregating $1,887,834. The earnings for June, 1904, were $1,865,065, or about $22,000 less than last month's; for June, 1903, $1,764,798. The figures for last month thus represent an increase of about $123,000 over the corresponding month two years ago. The record month of the Metropolitan system was May, 1903, when the gross earnings were $1,948,795. If June were not a short month and the average daily receipts had been maintained for the additional day, the record made in May, 1903, would have been surpassed last month.

In the months immediately following the opening of the subway, late last October, the New York City Railway's earnings fell off sharply. The company's statement for the three months ended March 31, which was the first covering a full quarter's operation of the system in competition with both the subway and elevated lines of the Interborough system, showed gross earnings of only $3,639,468, representing a considerable falling off in receipts, which was due to two causes—diversion of traffic from the surface roads to the underground lines and exceptionally severe weather in the winter months covered by the statement. The record showing for June also is doubtless due to two causes, the normal growth of traffic and the abandonment of the subway by many thousands of persons unable to endure the heat and the atmosphere of the underground lines.

IOWA INTERURBAN EARNINGS IN 1904

Every year the interurban railway companies of Iowa are required by law to file sworn statements with the Executive Council of the State, giving their gross earnings, operating expenses, net earnings and other information, for the use of the said Executive Council in determining the values at which to assess these properties for taxation. The statements cover the year ending December 31. The following is a brief summary of facts as shown by such statements for the year 1904:

The Interurban Railway Company, of Des Moines, reported 28.87 miles of road, same as in 1903; total gross earnings, $139,554; gross earnings per mile, $4,833; total operating expenses, $73,233; operating expenses per mile, $2,536; total net earnings, $66,321; net earnings per mile, $2,297; total value of road, including buildings, lands, power plants and equipment, $328,164; value per mile, $11,361. After making deductions for taxes it is found that the company earned more than 19½ per cent on this valuation. The gross earnings are $13,605 greater, the operating expenses are $5,548 and the net earnings are $8,058 greater for the year 1904 than they were for 1903. The company earned nearly 19 per cent on a valuation of $293,000 in 1903.

The Cedar Rapids & Marion City Railway Company reported 14.21 miles of road, as against 12.06 miles in 1903; total gross earnings, $123,974; gross earnings per mile, $8,724; total operating expenses, $96,775; operating expenses per mile, $6,810; total net earnings, $27,199; net earnings per mile, $1,914; total value of road, including buildings, lands, power plants and equipment, $180,031. After deducting taxes the company earned more than 15 per cent on this valuation. The gross earnings are $10,231 greater, the operating expenses are $6,889 greater and the net earnings are $3,342 greater for 1904 than in 1903. The company earned 11½ per cent on a valuation of $188,000 in 1903.

The Waterloo & Cedar Falls & Northern reported 74.73 miles of road, an increase of 20 miles over the amount reported for 1903; total gross earnings, $135,148; gross earnings per mile, $1,808; total operating expenses, $80,083; operating expenses per mile, $1,071; total net earnings, $55,065; net earnings per mile, $737; total value of road, including buildings, lands, power plants and equipment, $575,800. After deducting taxes the company earned over 9 per cent on this valuation. The 20 miles of additional road for the year 1904 is a road leased from the Great Western. The gross earnings are $44,376 greater, the operating expenses $32,698, and the net earnings $11,671 greater for the year 1904 than in 1903. The company earned more than 8 per cent on a valuation of $547,300 in 1903.

The Mason City & Clear Lake Traction Company reported a mileage of 14.62, same as in 1903; total gross earnings, $37,547; gross earnings per mile $2,568; total operating expenses, $28,928; operating expenses per mile, $1,979; total net earnings, $8,619; net earnings per mile, $589; total value of road, including buildings, lands, power plants and equipment, $45,200. After deducting taxes the company earned over 13 per cent on this valuation. The gross earnings are $4,439 less, the operating expenses $9,098 less, and the net earnings $4,559 greater during the year 1904 than during the year 1903. The company earned less than one-half of 1 per cent on a valuation of $52,632 in 1903.

The Tama & Toledo Electric Railway Company reports 2.75 miles of road, same as in 1903; total gross earnings, $10,771; gross earnings per mile, $3917; total operating expenses, $9,007; operating expenses per mile, $3,275; total net earnings, $1,764; net earnings per mile, $642; total value of the property of the company, $28,370. After making deduction of taxes the company earned about 5 per cent on this valuation. The gross earnings were $123 less, the operating expenses $663 greater and the net earnings $783 less during the year 1904 than during the year 1903. The company earned more than 12 per cent on a valuation of $19,996 in 1903.

The Cedar Rapids & Iowa City Railway & Light Company, which commenced operation Aug. 13, 1904, reports figures as follows for the four and one-half months of operation in 1904: Mileage, 27.63; total gross earnings, $34,281; gross earnings per mile, $1,240; total operating expenses, $17,108; operating expenses per mile, $619; total net earnings, $17,173; net earnings per mile, $621. Estimated value of the property of the company $350,000. So in four and one-half months operation the company earned about 5 per cent on this valuation.

The Boone Suburban Railway Company reports 4.7 miles of road, the same as in 1903; total gross earnings, $7,127; gross earnings per mile, $1,516; total operating expenses, $6,990; operating expenses per mile, $1,487; total net earnings, $137; net earnings per mile, $29; total value of the property of the company $17,600. The net earnings did not quite pay the taxes in 1904. The gross earnings were $899 less, the operating expenses $1,850 greater, and the net earnings $476 less in 1904 than in 1903. The company earned 14 per cent on a valuation of $18,800 in 1903.

The Iowa & Illinois Railway Company, which operated 2 miles of its line the entire year and all of its line for a little over a month in 1904, reports 36.012 miles of road; total gross earnings of $12,761; gross earnings per mile, $358; total operating expenses, $12,919; operating expenses per mile, $358; total net loss, $158; total valuation of road, including buildings, lands, power plants and equipment, $1,042,343.

The total gross earnings of the eight companies in the State for 1904 were $501,168; the average gross earnings per mile were $2,499; the total operating expenses were $325,046; the average operating expenses per mile were $1,621; the total net earnings were $176,122; the average net earnings per mile were 878. The gross earnings for 1904 were $109,801 greater than for 1903; the operating expenses were $68,575 greater and the net earnings were $41,225 greater. Four of the companies, which reported in 1903, show an increase in per cent of earnings based on actual value of the property for the year 1904, while the remaining two show a decrease, these two being the smallest two companies in the State. The two new companies which reported operation for a part of 1904 have not been in operation long enough to tell just what they will be able to do. The Cedar Rapids-Iowa City line made a good showing for the four and one-half months it was in operation, while, on the other hand, the Iowa & Illinois shows up a net loss for the month the entire line was in operation. The reports indicate, however, that the Iowa interurban companies will earn more than 10 per cent on the actual value of the property. Some of them will double this amount and a few of the smaller ones will no doubt go below it.

NIAGARA POWER CONTRACT REPORT

It is announced that the so-called Vanderbilt-Andrews syndicate has signed a contract with the Niagara, Lockport & Ontario Power Company to take power from that company for the trolley lines controlled, and to be controlled, by the syndicate. The Niagara, Lockport & Ontario Power Company, which will not have a plant of its own for several years yet, has contracted with the Ontario Power Company to take the first 60,000 hp it generates, and the Lockport Company will, for the present, by a transmitting company, supply this power to the trolley lines. The Ontario Company now has two 10,000-hp units in operation, and is assembling a third. It has put its bonds on the market for public sale. The Lockport Company, through the Archbold-Brady Company, of Syracuse, has constructed a large part of its transmission line from the Canadian shore of the Niagara River towards Rochester. It is predicted that the line will reach Syracuse next year.

PROGRESS IN SUBWAY VENTILATION

The puzzling question of properly ventilating the New York Subway has been taken up in earnest. Two powerful rotary fans have been put to work at the Brooklyn Bridge station, where they draw out hot air at the rate of 40,000 cu. ft. a minute, thereby changing the subway air at that point every five minutes. Just north of the Fourteenth Street station another large blower has been installed. Next week other big fans will be installed at the various express stations along the line of the subway. Each of the fans measures 9 ft. in diameter. At Seventy-Second Street a new ventilating shaft will be opened up from the subway to the center of Broadway. There the shaft will be 9 ft. x 12 ft., and a ventilating fan, or blower, will be put in use there, too. In addition to the big fans which will be installed, plans have been adopted for sending a current of pure air through the subway from one station to the other. Just what these plans are Mr. Hedley would not say.

At Ninety-Sixth Street three large ventilating shafts are being constructed right over the station. They will open from the top of the subway to the atmosphere. The shafts will be 7 ft. wide x 15 ft. long. At 140th Street and Broadway a large ventilating shaft opening is being made, and a large blower, driven by electricity, will be installed there. This one will remove 60,000 cu. ft. of air per minute. There are other plans now being worked out, and as fast as they are completed new devices will be installed, so as to make subway conditions as comfortable as possible in the summer months.

General Manager Hedley said that thousands of small rotary fans operated by electricity would be added to those already in the subway, to keep the air moving. It is also understood that windows of express trains will be opened from the bottom as well as from the top. To prevent accidents, wire screens will be placed across the lower part of the windows.

CINCINNATI & MIAMI CANAL RUMOR

It is announced by the Central City Improvement Association, of Cincinnati, an independent civic organization, that a company is being formed with a view to utilizing the porton of the Miami & Erie Canal within the city limits of Cincinnati for electric railway purposes. The thing has been taked of for years, but this is the first public announcement of the plans. It is announced that the Cincinnati Northern Traction Company—which means the Widener-Elkins syndicate—is interested in the project together with other Cincinnati parties, the plan being to utilize the canal banks and bed for trackage, giving the Cincinnati Northern a much desired entrance to the heart of the city. The line would be used extensively for freight, and freight yards would be located near the Mitchell Avenue aqueduct, which would be the head of the canal if the city portion was abandoned. Here the road would have track connection with nearly all the steam trunk lines entering the city. The canal bed would be deepened and bridges raised. In a number of places curves would have to be straightened, otherwise it would give a practically level private right of way to the very heart of the city. It is announced that it would cost $3,000,000 to complete the work aside from rentals that would have to be paid to the State. The civic organization mentioned, together with many prominent business men, who desire to see the useless waterway utilized, will combine in an effort to induce the State Legislature to make the desired lease of the canal.

CLEVELAND AS A CENTER FOR INTERURBAN RAILWAY FINANCING

Cleveland is regaining its old-time prestige as a center for the promotion of traction lines. Three or four years ago the city was one of the greatest, if not the greatest, financing centers in the country in this particular line, but the embarrassment of the Everett-Moore syndicate not only stopped the operations of this great group of promoters, but laid out nearly all new traction propositions for the time being. Within the last six months conditions have changed, and Cleveland capital is now building roads in all parts of the country, and many more are in a preliminary stage. Some of these might be mentioned:

The Bishop-Sherwin syndicate is pushing work on the Washington, Baltimore & Annapolis, which promises to be one of the finest properties in the country.

The Andrews-Stanley syndicate is engaged in important extensions in Central New York, in connection with the New York Central Railroad.

Denison, Prior & Company and others in Cleveland are preparing to build a line connecting Kansas City and St. Joseph, Mo.

The Pomeroy syndicate has succeeded in financing the Cleveland, Ashland & Mansfield Railway, which will practically complete a through line from Cleveland to Columbus and Cincinnati.

Cleveland people are constructing and have partly in operation the Sandusky, Norwalk & Mansfield Railway, from Norwalk to Mansfield, Ohio.

The Mandelbaum syndicate is completing the Lima to Findlay extension of the Western Ohio Railway, which has been in the air for several years. This is without exception the most important line being built in the country to-day, as it will connect up two great systems of lines in Ohio, Michigan and Indiana, making it possible to travel continuously on electric lines over some 3200 miles of track.

Barney Mahler, of the Everett-Moore syndicate, has secured the last franchises for a long line in the valleys of Utah, with Salt Lake City as a center, and he claims to have completed arrangements for financing it.

The Holcomb-Latimer syndicate has financed and is now pushing work on the Buffalo, Dunkirk & Western Railway. This is another important connecting link, as it will give a continuous chain of lines from Central New York State clear across Northern Pennsylvania, Ohio and Michigan.

J. B. Hanna and associates are engaged in promoting the Chicago Air Line, a proposed line from East Chicago to South Bend, Ind.

Luther Allen, Judge C. M. Stone and his associates have financed the Toledo & Chicago Railway Company, which proposes to extend the Toledo & Western to Fort Wayne and to South Bend. The two last-mentioned roads will complete a chain of lines from Toledo to Chicago, and with the other project mentioned above, will complete a chain from Buffalo to Chicago.

Will Christy, Will Davis and others are building the Marion, Kokomo & Western, an important connecting link in the Indiana system.

The Muncie, Hartford & Fort Wayne Traction Company, a Cleveland-owned proposition, has arranged for financing an extension from Bluffton to Fort Wayne, completing a very direct route from Fort Wayne to Indianapolis.

There are many other projects in the air in Cleveland, and unless signs fail, the end of this year will see a tremendous amount of new construction to the credit of Cleveland people.

FRANCHISE MATTERS CONSIDERED IN NEW YORK

On the application of Assistant Corporation Counsel Burr, Justice Gildersleeve, in the Supreme Court, modified on July 14 the order made by Justice Truax which prevented the Board of Estimate from acting on the subway plans submitted by the Rapid Transit Commission. As soon as a copy of the modified order was received by the board it approved the spur of the present subway from Manhattan Street to Fort Lee Ferry, and also the extension from 230th Street to Van Cortlandt Park. These may be built at once under the original contract with the Belmont syndicate, although the other routes approved by the board on July 14 will be held up by the Truax order until the Appellate Division passes on the legislative act which took away the franchise-granting power from the New York Board of Aldermen.

Lawyer L. L. Kellogg, who obtained the Truax order, said that the modification would not permit the Board of Estimate to sign any contracts at present, and, even if they went ahead adopting the plans, all this might be upset if the higher courts held the new law to be unconstitutional. However, the board went ahead and approved all the subway extension plans.

When the Lexington, Third, Seventh and Eighth Avenue plans were taken up, President Littleton, of Brooklyn, moved that they be sent back to the Rapid Transit Commission, because they were only alternate routes. He said that the commission had sent them as the routes that contractors deemed most available. The law, he added, directed that the commission lay out definite routes which it considers best for the city, and the law should be obeyed.

The Brooklyn routes approved were Fourth Avenue, over the Manhattan Bridge, to Eastern Parkway, and from Fourteenth Street and University Place through Brooklyn and to Jamaica. Contracts cannot be signed for these routes until the litigation brought on by the Aldermen is settled.

The Board of Estimate of New York last week considered the franchise applications before it in so far as pending litigation permitted, but a dispute as to how the value of the franchises should be appraised prevented any action. The board voted favorably on the franchises it had inherited from the Board of Aldermen, and ordered the bridge department to go ahead with Mr. Ahearn's plan for an underground terminal for the Williamsburg Bridge.

Work on the routes approved cannot begin till the Appellate Division has passed on the law removing the franchise power from the Aldermen. The modified order of Justice Gildersleeve permits the board to approve the routes set by the Rapid Transit Commission and to consent to the construction of the roads, but does not permit it to make any contracts or to issue bonds.

When the board first took up the consideration of franchises on the passage of the Elsberg law a formal resolution was drawn referring each franchise application to the finance department to fix the value of the privileges. Borough President Littleton held that the president of the borough affected should be included with the Controller, and his opposition, sustained by the other borough presidents, prevented the adoption of the resolution. In the same way Mr. Littleton stopped action on other applications. Mr. Grout refused to accede in his amendment to the formal motion, and neither side could muster the twelve votes necessary to take action. Mr. Grout declared his office was equipped to do the work. It always had done the work, and there was no need for any assistance. No matter what report the Controller or a committee should make, the board could not act on it until after the litigation has been ended.

Orders for steel rails received recently by the United States Steel Corporation, it was learned Wednesday, are sufficient to keep the mills busy up to the beginning of next year. The fact that the rail mills are sold ahead for such a long period promises a big increase in this year's production of rails over last year's output, 2,284,000 tons. The record production was in 1903, when 2,992,000 tons of rails were manufactured. The meetings of steel manufacturers held in New York Wednesday, resulted in no change in the official schedules. As a matter of fact, premiums have been charged on a number of lines for early delivery, and the present status of the market points to an increase rather than to a decline in these premiums.

SAN FRANCISCO'S MUNICIPAL LINE

The Board of Supervisors, of San Francisco, has taken definite steps toward the inauguration of the actual work of transforming the Geary Street Railway for the city as a municipal line. At the instance of the chairman of the public utilities committee a resolution has been adopted calling on the city engineer to prepare at once the specific plans needed in order that bids may be advertised for the actual work of construction. A second resolution directs the city attorney to open negotiations with the owners of property suitable for the site of the new car house, that such a structure may be begun with as little delay as possible. To simplify matters for the city attorney and save him time, the resolution submits to him a number of available sites, among which he may make his choice. Both the resolutions were adopted by unanimous vote.

LACKAWANNA SAID TO HAVE SECURED TROLLEY LINE

The Elmira & Seneca Lake Railroad, the electric line 16 miles in length, connecting Seneca Lake, Watkins and Watkins Glen with Horseheads, the northern terminus of the lines of the Elmira Water, Light & Railroad Company, has been purchased by the Lackawanna Railroad Company, so it is said, and will be operated by that company. The Watkins line, according to report, will remain an electric line, but will be fully equipped with all modern appliances in every department. The principal object of the Lackawanna in the matter is to gain an entrance into the grape country, and by a line of modern freight and passenger boats which will be established on Seneca Lake to gain access to Northern New York and the freight and passenger business of that section.

NEW TUNNEL BEGUN FROM NEW YORK TO LONG ISLAND CITY

The Belmont tunnel to connect Long Island City with Manhattan Borough, New York, is under way. Work was started July 12 at the Long Island end, and is to be pushed rapidly. Operations began on a plot of land running from Fourth to Fifth Streets and between Front Street and West Avenue, Long Island City. The property is just across the street from the big power house of the Pennsylvania Railroad Company. The tunnel is to be built under the old Steinway franchise, which provided for the construction of a tunnel from Fourth Street and Jackson Avenue, Long Island City, under Forty-Second Street as far west as Eleventh Avenue, Manhattan. That tunnel was started in 1892. A shaft was sunk in Fourth Street, Long Island City, and in December, 1892, an explosion of dynamite at the mouth of the shaft killed six persons, injured fifty and destroyed several buildings. The tunnel work stopped, and was never resumed. The Belmont interests secured the franchise and paid off the obligations of the old company, resulting from suits for damages caused by the explosion.

The tunnel is to be much like that of the Pennsylvania Railroad, and will be in the form of two steel tubes. It will run under the Long Island Railroad freight yard, and have a passenger station in Fourth Street, between Jackson and Vernon Avenues, which is at a point directly opposite the viaduct entrance to the new bridge over Newtown Creek. There will be two branches to the Long Island City end of the tunnel. One will go under Newtown Creek and make an important connection, probably with a subway through Greenpoint, a part of Brooklyn, and the other will branch off toward the Queens County Court House, where the tunnel will come to the surface and make connections with the tracks of the New York & Queens County Railway Company.

A STAY FOR NEW BRITAIN THIRD-RAIL

The question of the removal by the New York, New Haven & Hartford Railroad of the third rail from its line between Hartford and New Britain will come before the Legislature at its next session, this being decided upon by the Legislators a few days ago. Thus the company will be given ample time in which to perfect plans for service over the branch. According to President Mellen, of the company, it is likely that before the body convenes again the overhead trolley will have been substituted. In the early weeks of the present session of the General Assembly, as previously noted in the STREET RAILWAY JOURNAL, a bill was introduced requiring the company further to protect the third rail. When the bill was called for a hearing, President Mellen, who was present, replied that the company had determined to remove the rail before July 1, when there would be no need for the proposed legislation. The company has always claimed that life was sufficiently protected, so far as the road is concerned, if the public would itself exercise ordinary care in keeping off company property; that since the disposition was to do otherwise, and in addition to hold the company legally responsible for the carelessness and recklessness of individuals, it had concluded to solve the problem by removing the cause of danger. When the time arrived for carrying into execution the radical plan forced upon the company by the public, a protest was raised against the action that has resulted in the armistice noted herein.

TRAFFIC CIRCULAR OF THE PUGET SOUND ELECTRIC RAILWAY

An elaborate railway folder has just been issued by the Puget Sound Electric Railway Company, containing sixteen pages of time-tables and views taken along the company's lines. The cover is in red and green, with a view of Mount Tacoma in the center. There are seventeen half-tones in the folder, six of which are views of Tacoma, while the others show views of Seattle and typical scenes along the route.

Maps of Tacoma and Seattle are shown, as is also a map of the territory over which the electric railway runs. Points of interest in the two cities are described, and time-tables are given of the railways with which the electric cars connect.

TWO IMMENSE TURBINES FOR THE NEW YORK EDISON COMPANY

With the successful closing of recent negotiations for two 7500-kw Westinghouse turbine-type generating units, the New York Edison Company has inaugurated an important epoch in the history of metropolitan electric lighting in this country by adopting generating units of such unprecedented size. The importance of this step is enhanced by the fact that these turbine units will be installed in the finest and largest of American central stations, Waterside Station No. 2, that ultimately will contain ten units of the same size. Waterside Station No. 1, it will be remembered, is equipped with Westinghouse vertical three-cylinder compound reciprocating engines, which, although installed only a few years ago, as then representing the highest type of large engine construction, have so soon been outclassed through the rapid advance of the steam turbine system. No less than eleven of these large engine type units are now in service in this station, each rated at about 6500-hp capacity and direct connected to a 3500-kw generator. The next step in the acquisition of larger units resulted in the installation of 5000-kw turbine units of the Curtis type.

The extreme compactness of the new generating unit is evidenced by the small space it requires in the new power station arrangement. Its overall dimensions are approximately: Length, 50 ft.; width, 17 ft.; height, 15 ft.; floor space, 850 sq. ft. per unit net, or .113 sq. ft. per kilowatt capacity. This is less than one-half the space occupied by the engine-type units, which are the most compact type yet built for central station work. A condenser of the surface type will be located beneath the turbine in the foundations proper.

The new turbines will operate under 175 lbs. steam pressure, approximately 28-in. vacuum and 100 degs. superheat, the normal speed of the unit being 750 r.p.m. Under these conditions the economy of the complete unit will be in the neighborhood of 16 lbs. per kw-hour at full rated load. Each unit will have an overload capacity of at least 50 per cent, or will be capable of developing full-rated load without the use of a condenser. The turbine gives its best economy around full-rated load, although a large overload capacity is at all times instantly available when required without material sacrifice of efficiency. At this maximum load each turbine will be developing over 15,000 hp at the shaft, which is by far the greatest amount of power ever developed in a single prime mover in stationary service.

The direct-connected turbo-generators will be of standard Westinghouse construction, delivering 6600-volt, three-phase current to the high-tension network at a frequency of 25 cycles per second. The generators will embody the new enclosed construction which constitutes an important advantage in the entire elimination of the hum peculiar to high-speed turbine generators. They will have an efficiency approximating 97½ per cent at full-rated load. Each generator will be able to sustain for several hours an overload of 50 per cent within reasonable temperature rise.

It is of interest in connection with this important installation that almost simultaneously three Westinghouse turbine units of the same size have been adopted by two large Brooklyn power stations, one for railway and the other for lighting service, making a total of over 50,000 hp in turbine machinery of this size. Two units will go to the Brooklyn Heights Railroad Company and the third to the Brooklyn Edison Company.

CIRCULAR ON EXHIBITS AT PHILADELPHIA

George Keegan, of 13-21 Park Row, New York, secretary of the American Street Railway Manufacturers' Association, has issued a circular to all members, outlining some of the features of the exhibit to be held in connection with the meeting of the American Street Railway Association at Philadelphia, Sept. 25-30. As already stated, the exhibits will be held in the south pavilion of the Philadelphia Museums and in an adjoining building. These buildings have about 75,000 sq. ft. of floor space, are well lighted and ventilated, and being located on Thirty-Fourth Street, near South Street, within fifteen minutes of the City Hall, are easily accessible. They also afford excellent facilities from a shipping standpoint, having a switch track (Pennsylvania Railroad) which enters the buildings, and 500 ft. of track under cover. There is also ample room outside the buildings for outdoor exhibits, with two railroad tracks, one 600 ft. long and the other 400 ft. long. Arrangements can be made for purchase of such electric power as may be necessary for exhibits.

The reservation of space for exhibition purposes is restricted to members of the association, the membership fee in which is $35 per year. This includes the privilege of floor space and four badges, each entitling holder and lady to all the privileges of the convention and to such entertainments as may be provided by this association. Application for space for exhibit purposes must be forwarded not later than Aug. 1, to the secretary, by whom any further information desired will be gladly furnished.

THE CENTRAL PASSENGER ASSOCIATION MEETING

At a meeting of the Central Passenger Association (steam) at Chicago last week, the question of interline steam and interurban tickets, which has been up for discussion at nearly all of the meetings for the past six months, was laid on the shelf for an indefinite period. General Passenger Agent Ross, of the Clover Leaf, against whom most of the complaints had been directed, informed the members that they might just as well call off the discussion as his road would not yield an inch unless all the roads in the association would agree to discontinue all relations with electric lines. The only difference between the Clover Leaf and the majority of the other lines is that the Clover Leaf made no bones about interlining with all the electric lines with which it could make alliances, and it has greatly increased its business thereby, whereas the other steam roads have been making such alliances, but have denied them in public.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JULY 11, 1905

794,269. Automatic Electric Railway Switch; W. D. Woolley, Normandy, Mo. App. filed Aug. 3, 1904. A track switch in which a pair of insulated sleeves are placed upon the trolley wire and have connections to a pair of solenoids for moving the switch point in the usual way. The sleeves are preferably of iron, bent around and clamped by bolts upon the trolley wire.

794,277. Car Wheel and Process of Making Same; William B. Brayton, Cleveland, Ohio. App. filed Sept. 27, 1904. A car wheel consisting of a body having a rib on its outer periphery and a metal tire surrounding the body, and having a groove on its inner periphery receiving the rib, the groove being of greater depth than the rib.

794,404. Brake Beam; John Green, St. Louis, Mo. App. filed Nov. 19, 1904. Consists of a pair of channel-beams each having its web slit longitudinally intermediate of its ends and spread to form truss chords, and a strut interposed between the chords, the channer-beams being arranged so that the flanges of one beam oppose the flanges of the other beam.

784,508. Fare Register; William G. Kirchhoff, St. Louis, Mo. App. filed Nov. 29, 1901. Registers different classes of fares and indicates on one dial by means of separate indicator hands the total number of fares of each class registered for each trip.

794,509. Fare Register; William G. Kirchhoff, St. Louis, Mo. App. filed Sept. 27, 1902. This invention relates to the means for perpetuating a record of the number of fares of a single class, or of all classes indicated by a fare register, and has special reference to the devices used in printing or marking such record.

794,660. Third Rail; Edward R. Brodton, Atlanta, Ga. App. filed Sept. 3, 1904. Comprises three sections insulated from each other, and pairs of contact plates arranged between the sections and insulated therefrom.

MR. DALRYMPLE VOICES HIS OPINIONS IN A LETTER

The following extracts from a letter from James Dalrymple, general manager of the Glasgow municipal street railways, to Horace Andrews, of the Cleveland Electric Railway Company, is of interest. It will be remembered that Mr. Dalrymple was in this country as an advisor to Mayor Dunne, of Chicago, on the subject of municipally-owned street car lines, and that his opinions were a disappointment to municipal ownership advocates. In part he writes: "I enjoyed my visit to your country exceedingly, and gained a great deal of useful information. A considerable interest is apparently being taken in Cleveland regarding fares on street railways. From my observations I consider that the average ride in the United States is much longer than in this country. In Glasgow our average ride is about a mile and a quarter, while I believe in your cities it is much longer.

"I am also convinced that it would be a great mistake for your companies to attempt to lower your fare under five cents if you are going to give universal transfers. A five-cent fare with a transfer yields about the same revenue as a graded fare without a transfer.

"If you adopted our system of graded fares I think you would earn more money than you earn at present. I am afraid, however, that your people are wedded to the one-fare with the transfer."

PERSONAL MENTION

MR. HENRY A. EVERETT, of Cleveland, and his family are spending a two months' vacation in Alaska.

MR. A. B. DUPONT, of Detroit, has been employed by Mayor Dunne, of Chicago, as personal expert to advise with him regarding street railway matters in connection with his plans for the building of municipal street railway lines.

MR. DAVID C. MACWATTERS, general passenger and ticket agent of the Colorado Springs & Cripple Creek District Railway, has been appointed general passenger agent of the Cripple Creek Central Railway lines, comprising four roads with a total mileage of 130 miles. He succeeds Mr. Joseph B. Wiggenborn, resigned.

MR. WILLIAM P. BAILEY has been appointed auditor of the Indianapolis & Northwestern Traction Company to succeed Mr. R. M. Boykin, of Philadelphia, who returns to the East to become auditor of another Tucker-Anthony property. Mr. Bailey has been with the Indiana Company since it has been in operation. Beginning as a conductor, he advanced to train despatcher, and then to chief clerk. Subsequently he was made auditor.

MR. S. I. WAILES has been appointed manager of the sales department of the National Electric Company. Mr. Wailes is a graduate of the Clarkson School of Technology, Potsdam, N. Y., and entered the employ of the Electric Traction Company, of Philadelphia, in 1895, resigning in 1898 to accept a position as superintendent of electrical equipment of the Thousand Islands Navigation Company, which owned a fleet of seven steamers. In July, 1901, he was employed by the Brooklyn Rapid Transit Company as assistant to the engineer of equipment and line, and resigned in October, 1902, to accept a position with the National Electric Company as traveling engineer, covering territory in the Southwestern States. In July, 1903, he was appointed manager of the Cincinnati sales office. Following this he became the Pacific Coast sales agent, with headquarters at San Francisco, and in March, 1905, was appointed assistant sales manager of the air-brake department.

MR. E. G. CONNETTE, general manager of the Syracuse Rapid Transit Railway Company, was pleasantly surprised on the night of July 13 by the employees of the company, who presented him with a $500 diamond as a token of their esteem and their gratification that he is to remain in Syracuse. When it was first reported that Mr. Connette was likely to go to Worcester, Mass., as general manager of the Consolidated Street Railway, of that city, the men determined to give him a handsome remembrance. When it was finally decided that Mr. Connette would remain in Syracuse, the employees went right ahead with the plan, and the presentation was made accordingly. The affair took place in the club rooms of the Employees' Mutual Benefit Association. Mr. Connette was summoned from his home in Borden Avenue, and upon his arrival was greeted by about 200 of the men. Superintendent John E. Duffy in behalf of the men made the presentation speech, expressing the gratitude of the men for what Mr. Connette had done for them and their joy that he was to remain at the head of the system. Mr. Connette responded feelingly in a short speech. An orchestra was present, and when it struck up "For He's a Jolly Good Fellow," everybody joined in. The function concluded with a pleasant social hour, during which there were music and refreshments.