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Heating Car Houses and Shops

The heating of large buildings, such as car houses and shops, is now generally done by what is known as indirect steam-heating. A fan blower at some central point forces the air through a bank of steam-heating coils. The hot air is then led in galvanized iron pipes to various parts of the building and discharged at outlets, the opening of which can be regulated by dampers. This system, when properly planned, gives excellent results, but certain mistakes are sometimes made in its application, which cause unkind remarks to be made about the installing engineer by the superintendent and workmen who use the shops daily. The theory that "hot air will rise anyway," and that therefore it might as well be discharged near the roof as near the floor from a heating system of this kind, looks plausible and attractive at first, but it does not work out well in practice. This is especially true after the temperature in a building has been lowered during the night and the attempt is made to warm the building quickly in the morning. The hot air discharge pipes from a heating system of this kind should be located near the floor. By near the floor we do not necessarily mean at the floor line, but they should be somewhere within 14 ft. of the floor, and if above the floor line should discharge downward. This creates a circulation and mixing of hot and cold air, which is much more satisfactory to the occupants of the building than a gradual warming of the air in the building by the discharge of hot air near the roof and the gradual withdrawal of cold air from the floor. The temptation is strong in an electric railway shop to place the hot air piping system very high and to discharge directly into the air from the main pipes, as this construction gives a clear head-room for the movement of cranes and travelers and avoids the expense of branches. Sometimes the most feasible place to locate heating pipes is below the floor level. We have in mind one well-heated shop of one story in which all the hot-air pipes and ducts are below the floor level. In this case the discharge pipes are taken up along side pillars, and are curved so as to discharge the hot air downward above the level of a man's head. In this way the headroom is left practically clear and the amount of floor space taken up is insignificant. In arranging these discharge pipes, however, care should be taken to have them high enough so as not to discharge directly upon the workmen. It is also the best practice to use a large quantity of air heated to a moderate temperature rather than a small volume at a high temperature.

The hot-air blast from such a heating system can be used with pleasant effect in the winter, when the cars are brought in for quick repairs, and motors and trucks are covered with snow and frozen mud. By letting such cars stand for a few minutes over a pit from which a hot-air blast is issuing, the snow is soon thawed off and the trucks and motors are dried at the same time.

Much Ado About Nothing

We confess to a feeling of amusement over the solemn reports in the daily papers of the speed tests of steam locomotives on the Zossen-Marienfelde line. We have heard from time to time of extraordinary engines there to be tested, and of the firm conviction of steam engineers that the supremacy of their honored client was about to be vindicated, as against the noisy pretense of upstart electric motors. Until recently there seems to have been a conspiracy of silence against the publication of reports from these epoch-making achievements, but at last the cat is out of the bag—and a very badly singed feline she proves to be. The trials of regular German express engines on the Zossen line appear to have led to nothing of particular interest, for the best speed they are reported as making even with a three-car train was less than 80 m. p. h., and with longer trains of six cars less than 70 m. p. h. This is good, comfortable speed, but nothing to awake the slightest interest when made on an experimental line in a speed trial. More recently an 85-ton special engine, using superheated steam, was put through a series of tests, and succeeded in touching 84½ m. p. h. with a three-car train and a little less than 80 with a six-car train.

Its economy is, perhaps wisely, not stated, but the fact that it consumed 22 per cent more lubricating oil than an ordinary engine does not encourage one in hoping for sensational efficiency. Another engine, weighing with its tender about 115 tons, is about to be tried, and we read with pleasure that there are great hopes of it. We cannot quite see what these trials prove, but we are glad the experimenters seem to be satisfied and are cheerful about the outlook.

Surely, even in Germany, a speed of 84½ m. p. h. on a short trial run cannot be considered extraordinary, and it is not for a moment comparable with the 130 m. p. h. made on the same line by the electric cars. For a locomotive to make the former speed no special efforts are required, and there is not the least reason for anybody to doubt so modest capabilities. We have known for a long time that a first-class steam locomotive could make much higher speed than this for short distances, even with a regular train of Pullmans. There are, if we remember correctly, no less than six American records for short runs of one to half a dozen miles at rates in excess of 100 m. p. h. There is one on the Burlington route of about 15 miles at a small fraction under 99 m. p. h. The trains between New York and Philadelphia almost daily run off miles at 80 m. p. h. to 85 m. p. h., and in 1897 the Lehigh Valley line scored a run of 44 miles between Alpine and Geneva Junction, N. Y., at a full 80 m. p. h. There is not the least doubt that locomotives are capable of short runs at these high speeds, but it is the ability to keep up the pace that locomotives lack. After a bit the fire gets out of condition, and steam and speed fall off together, or the train has to slow up a bit to scoop up water, or the fuel does not handle well, or some trifling thing goes wrong with the lubrication. The very fast runs common here are usually rather short, and are made on regular trains when a little behind time and trying to catch up with the schedule. There has been no flourish of trumpets about it, and the passengers generally have not realized the feat before the end of the trip. On a good track the difference between 60 m. p. h. and 80 m. p. h. is hardly noticeable, save to experienced railway men.

On the other hand, when it comes to the question of long runs, extremely fast running is very rare, so far as the total distance is concerned. We believe that the fastest recorded run for a distance greater than 100 miles was one made on the Atlantic Coast Line about a year ago. The distance covered was 172 miles, between Jacksonville, Fla., and Savannah, Ga., at the average speed of 70.7 m. p. h. In still longer runs the speed limit is lower, and the locomotive shows its limitations very plainly. It is a severe task to generate the power necessary for high speed and to keep steam steadily up in all kinds of weather. There are serious difficulties in the way of reliable work when the power station is on wheels, reduced as far as may be in weight, and constantly under the necessity of forcing the output to the highest possible point. It is in just these matters that the electric locomotive has a tremendous advantage. Its power station cannot only be worked at a fairly economical load but it can be kept up to its work all the time. There are enough boilers to ensure the working battery being in good condition, and there is grate surface enough to keep the fires burning at their best. On the locomotive itself there are relatively few moving parts, the motors are working at a known and definite efficiency, and if they must be overloaded a little the station has capacity enough to back them up. It will prove, therefore, much easier to secure maintained high speed with electric than with steam locomotives. The latter can, on a spurt, do better than a hundred miles an hour, but there is good reason for expecting the electric locomotive to maintain that speed for hours at a time, to say nothing of spurting at far higher speed, as was shown in the Zossen tests. What is most needed now is the actual application of high-speed electric traction on a line 500 miles or more in length, when there is space for a real saving in time. It is too late in the world's history to waste much time or effort on fruitless demonstrations of what nobody is disposed to deny.

Side Entrance Cars for Rapid Transit

The side entrance steel cars adopted for the Illinois Central Railroad's suburban service in Chicago, which are described elsewhere in this issue, cannot fail to be of great interest to all connected with elevated and underground electric railways, and any other rapid transit lines where quick loading and unloading is important, and where passengers can be delivered to platforms at the level of the car floor. Although the suburban service of the Illinois Central Railroad is at present operated with steam, it is of the same general character as rapid transit lines now so generally employing electricity, and the same principles of car construction apply.

Side entrance cars have been used in rapid transit service in other countries, but they are so different from the Illinois Central design as to belong to an entirely different class. The Illinois Central car has a side entrance opposite each section of seats; the aisle, instead of being down the middle of the car, according to the almost universal American practice, is along each side of the car; and the seats, which have a capacity of four persons, are located in the middle. That such an arrangement has advantages as regards quick loading and unloading of passengers is self-evident.

It is gratifying to learn that the experience of the Illinois Central with these cars in actual service, has not revealed certain objectionable features which were to be feared. For example, probably the first theoretical objection that would naturally be raised against this type of car would be the difficulty of heating, especially with such cold lake winds as sweep the Illinois Central's right-of-way along the lake front in Chicago. It would be thought that certainly the opening of so many side doors so close to the seated passengers at all important stations would make the cars very difficult to heat, and give rise to many objections from the passengers. Strange as it may seem, experience does not indicate that these objections exist. The cars are more easily heated than the regular center aisle cars which the company has heretofore used in this service. As to their comfort in this respect, we have taken pains to inquire among disinterested laymen who patronize these cars, and the verdict has invariably been that they are comfortably warm in winter. Of course, there is a certain inrush of air when a door is opened, but the circulation of air around the steam heating pipes under the seats is so free that this cold air is soon warmed. The explanation of the ease with which these cars are heated is undoubtedly in the free access of the air to the steam pipes. To make a side entrance car with numerous side entrances which would be at all feasible for rapid transit service, it was necessary to design an arrangement for closing all the doors simultaneously by an employee at one end of the car. As it was anticipated that this would take considerable power, compressed air apparatus for closing the doors was provided, but the actual results showed that the doors worked so easily that this was not necessary, although the feature has been retained on the new cars.

The car is practically a combination of the original American idea of an aisle car, with the original European idea of a side entrance car, and is somewhat similar to a type of car which is in quite extended use on the continent for limited trains, that is, it has side doors and a side aisle, but is longer; there are two

aisles instead of one, and the interior is not divided into compartments. The details of the Illinois Central car have been worked out with most commendable thoroughness. The control of the side doors was naturally a matter to which much attention was given, because as any experienced railroad man could see, the side doors would be practically the one danger point at which accidents to passengers would occur. To provide against any serious trouble from catching of fingers or clothing in the sliding doors, as they are closed by the employee at one end of the car, flexible connection between the door and the operating rod is employed, which will allow the door to yield sufficiently when it strikes such an obstruction, so that no damage is likely to be done. The electric signalling circuit in connection with the doors would appear to be an important time-saving feature, and one which might well be adopted on other rapid transit lines. Each door, when closed, makes an electric contact. All the door contacts on the train are in series, and the engineer's signal is in series with the contacts, so that he does not receive a signal until every door is closed.

As to carrying capacity, the car also makes an excellent showing as compared with the center-aisle type. The common objection to side entrance cars has been that passengers must find a vacant seat before they can enter the car from the platform, and will therefore delay the train by that much time. On the Illinois Central car they can enter the train at once at any side door and hunt for a seat after the train is in motion. The car is readily adaptable to service over portions of the route where there are no elevated platforms, since by raising the vestibule trap-door the ordinary steps are available. When the cars are used in this way there are no disadvantages connected with their use other than those found with the regular center-aisle car.

The Illinois Central has made a bold departure from established lines of car design for rapid transit service and deserves much credit for the progressive step it has taken. As everyone knows who has studied rapid transit schedules, the station stops take no small portion of schedule time for train terminals, and if this schedule time can be reduced by improvements in car design, it is certainly a matter of as much practical importance as loudly heralded advances in motive power and braking equipment, which permit a faster schedule.

Retribution for Chicago

The bill ordering the tunnels under the Chicago River removed as obstructions to navigation has passed Congress. This further complicates the traction situation in Chicago. Mayor Harrison opposed the bill, hoping to delay its passage until some bargain could be made with the Chicago Union Traction Company for franchise renewals and so throw the expense of lowering the tunnels on the company. As it is, the city will either have to bear the expense or close the tunnels. Chicago is paying the price of the delay of its officers in settling the traction question in more ways than one. By pursuing a procrastinating policy in regard to settling the franchise question it has subjected its citizens to an inferior street railway service, which is unworthy of the city, and which is monthly costing the people of Chicago a large amount of money in lost time. It has become hopelessly muddled in its municipal ownership proposition, and the authorities have become committed in a way to a plan in which few of them believe, and which is impossible of fulfillment. The tunnel problem is simply the latest straw added to the already heavy burden of the city authorities and citizens.

Steam Railroads as Electric Railway Managers

We have often discussed in these columns the effect of the acquisition and operation by steam railroad companies of interurban and other electric railway properties. A new phase of the matter appears in occasional complaints that such appurtenances have been found not to pay, at least in certain instances. Undoubtedly a certain proportion of electric railways are now being worked in a territory where the traffic is too light to furnish sufficient gross receipts at present. As a rule the electric roads worked by the trunk line railroads are very well constructed and equipped. They involve a very substantial investment, and are, perhaps, likely to carry larger charges for construction and depreciation than other electric roads. On the other hand, their fixed charges for capital invested are likely to be moderate, they are managed by men of large experience in the general handling of traffic, and they are not forced into cut-throat competition. In case they do not pay, the cause of failure should certainly prove worthy of study. The fundamental question is the relation of the electric line to steam lines of the same system. If the former is merely a feeder of the latter, the difficulty is due either to actual lack of possible traffic or to unskillful management. An interurban line requires careful handling to bring out all its possibilities of traffic, and if the feeder idea is too much in the manager's mind he may quite innocently fail in bringing the purely local traffic up to its reasonable possibilities.

A still more complicated situation arises in the cases where the electric system has been acquired because it paralleled the railroad proper. In this case it is pertinent to inquire whether the line is operated to supplement the steam service or in part to replace it. If the latter, then an independent estimate of the earnings of the electric system is misleading. For expense on the steam section may have been lessened, while that on the electric section increased. A pair of parallel lines with whatever motive power may be so operated as to show gain or loss on either of them, and the net result is merely that money has been changed from pocket to pocket. The test of success is the joint result upon the two parallel sections. Even so, the question must naturally arise as to whether the electric section being used in part to relieve traffic on the steam section is being employed to the best advantage in building up traffic. It is very likely not to be used as effectively as it would be if worked by an independent corporation in competition with the railway which it parallels, not through inefficiency, but through the lack of the stimulus which comes from an active fight. If the electric line is used to supplement traffic, rather than to replace it, there is till more likely to be lack of determined effort, not from lack of interest, but from fear of interfering with the steam branch of the business. It is very difficult to determine the merits of the situation, for once a line is in the possession of a steam road, it stays there, and it is rather unusual for a steam road to buy out a line in active competition and fully developed, so that comparative results are difficult to reach. It seems to be pretty well established that an interurban line coming into direct competition with a steam line generally gets a very large share of the total traffic. In how far this is obtained by unsound processes of competition is quite another question. The railroad side of the story indicates that part of the traffic so obtained may be unprofitable. Meanwhile, the electric lines controlled by railroads will bear watching with an eye to the facts involved in this discussion, and we hope that more data will soon become available.

THE LOS ANGELES & REDONDO RAILWAY

An article descriptive of the interurban system of the Los Angeles & Redondo Railway Company must present several points of particular interest. Among them are: The fact that it was formerly a steam road, but has now been completely changed for electric traction, with resultant economy and efficiency; the large freight business it handles in connection with its electrically-equipped wharves, and the building of all its own cars in its own shops.

The company was organized fourteen years ago, at which time a narrow-gage steam road was built between Los Angeles

FIG. 2.—SCENE IN INGLEWOOD

and Redondo, a distance of 18 miles. Valuable water-right privileges were acquired at the seaboard and a terminal was secured in the southern part of Los Angeles about 3 miles from the center of the city. For about thirteen years the road was operated as a steam line in friendly competition with the Santa Fé, which owns a standard gage steam road between the cities named.

The Los Angeles & Redondo Railway passes through a fertile and attractive territory that has steadily been built up and improved in keeping with the general growth of all southern California. The local passenger and freight traffic has steadily increased, while a large tonnage is received from coast and foreign vessels. Some two years ago the owners of the road concluded that the conditions warranted and the times demanded up-to-date electric railway facilities. Accordingly, the old line which runs through Sunnyside, Summit, Gardena and Moneta was completely rebuilt, the grades being lessened

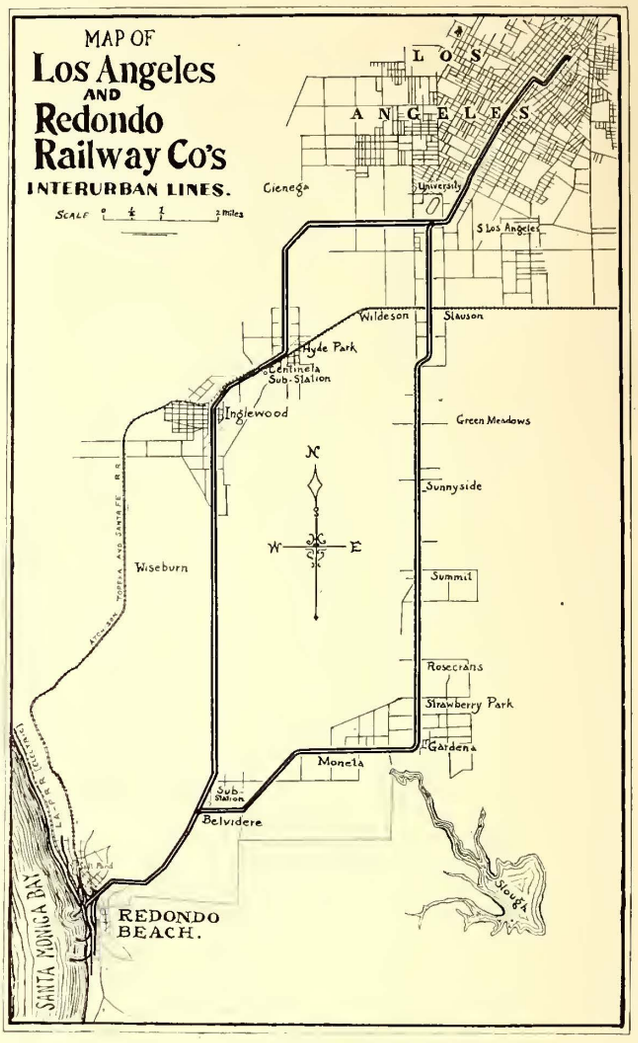


FIG. 1.—MAP OF LOS ANGELES & REDONDO RAILWAY

and curves eliminated wherever possible. In addition, another line was built about 3½ miles west of the old one through the town of Inglewood. This new line branches off from the older one just outside of the Los Angeles city limits and meets it again at Belvidere, a short distance from Redondo. It covers an equally attractive territory and reduces the distance be-

FIG. 3.—PASSENGER STATION AND OFFICE BUILDING AT REDONDO. HOTEL IN BACKGROUND

tween terminals by half a mile, as well as cutting down the maximum grade from 2¼ to 1½ per cent. Both routes are shown on the accompanying map, Fig. 1.

The choice of two routes to the sea has proved a popular feature with the public, and aside from serving two very productive districts, there are several advantages from an operating standpoint which will be mentioned later. The change to electric traction also enabled the company to abandon the passenger terminal in the southern part of the city and to operate its cars from Second and Spring Streets, in the center of the business district, over the Grand Avenue tracks of the Los Angeles Railway Company until its own private right of way is reached. This increased the passenger facilities to such an extent that, although one steam and another electric road reach Redondo, the Los Angeles & Redondo Railway Company gets practically all the passenger business. Fig. 4 is a view of the principal street in Redondo and Fig. 3 illustrates the passenger station and office building of the company, with the Hotel Redondo in the background. A scene in Inglewood on the new route is shown in Fig. 2.

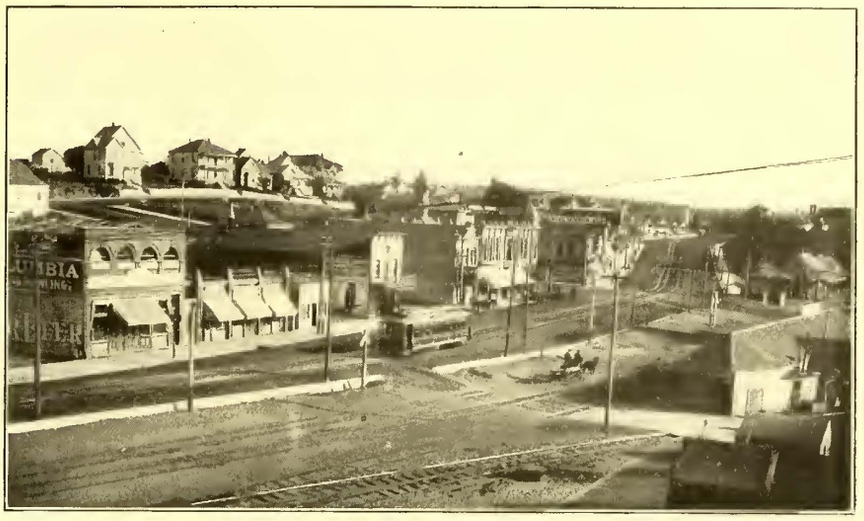


FIG. 4.—PRINCIPAL STREET IN REDONDO

TRACK AND OVERHEAD CONSTRUCTION

New 60-lb. A. S. C. E. section steel T-rails have been installed over both routes. These are laid with even suspended joints on 6 in. x 8 in. x 6 ft. ties. Fifteen ties are required for a 30-ft. rail length and at the joints the ties are spread 10 ins. apart. Standard 24-in. four-bolt angle-irons protect the Edison-Brown plastic bonds that are used throughout the system. The tracks are all of the 3-ft. 6-in. gage that is used on the local Los Angeles street systems.

Center pole overhead construction has been used throughout, with 15-ft. track centers. Thirty-five ft. round cedar poles with 8-in. minimum tops carry the bracket trolley supports and the high-tension, feed and telephone wires, the arrangement being as indicated in the accompanying sketch, Fig. 5. The company receives its power under contract from the Pacific Electric Railway Company, of Los Angeles, in the form of three-phase, 50-cycle, 15,000-volt alternating-current, at which potential it is distributed to the two sub-stations at Belvidere and Centinela. The high-tension wires are carried on No. 1 Provo glass insulators mounted on special pins 1¾ in. x 12 ins. The wires are arranged in the form of an equilateral triangle, with 36-in. sides. The top pin is inserted in the top of the pole and two lower ones are carried by a special 4 ft. x 5½ in. x 3¾ in. Oregon pine cross-arm secured to the pole in a 2¼-in gain by a ⅝ in. x 10 in. machine bolt. The insulator pins are fastened by ¼-in. maple dowel pins. The cross-arm carrying the 600,000 circ. mil feeder cable and the telephone wires is also of Oregon pine. It is 6 ft. x 5½ in. x 3¾ in., and in addition to a ⅝ in. x 12 in. machine bolt is supported by two 24 in. x 1¼ in. x ¼ in. iron braces. The details of the trolley wire bracket are self-explanatory.

As mentioned above there are several advantages from an operating standpoint in having two routes. The wiring system is so arranged that either one or both sub-stations can supply current over either route, thus enabling linemen to cut out either station or either high-tension line while the system is in operation for the purpose of making line repairs, and without interfering with traffic. In case of washouts or other local obstructions on one line, the reliability of service between terminals is assured by the other route. The same advantage applies to telephone service between terminals, as an independent return copper circuit follows each route. Telephones are used in despatching trains.

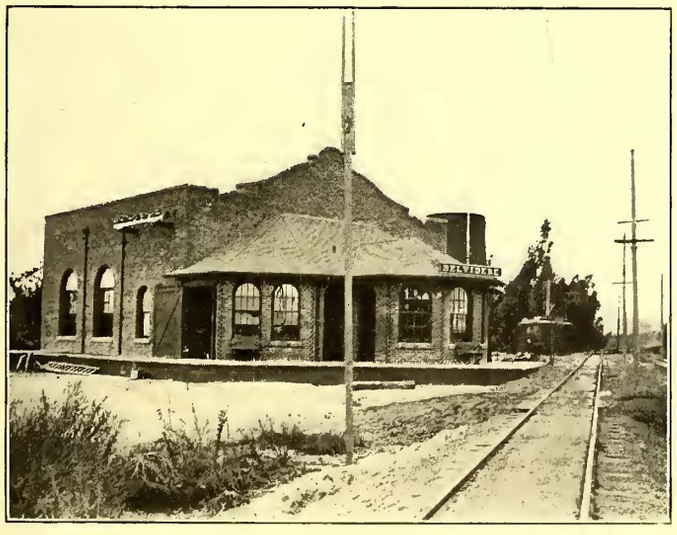


FIG. 6.—BELVIDERE SUB-STATION

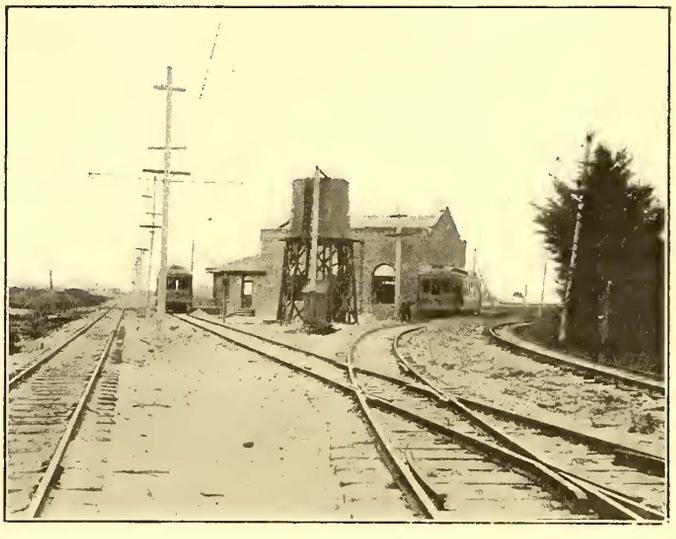


FIG. 7.—BELVIDERE SUB-STATION, SHOWING THE JUNCTION OF THE TWO ROUTES

SUB-STATION EQUIPMENT

As mentioned above there are two sub-stations for distributing direct-current to the system, one at Belvidere, about 3½ miles from Rodondo, the other at Centinela, about 6 miles from Los Angeles. The buildings are both of brick, with concrete floors, and were designed with the idea of being orna-

mental as well as useful. Figs. 6 and 7 are views of the Belvidere sub-station. Figs. 8 and 9 are respectively plan and cross-section of the building and Fig. 10 is an interior view of the station. On account of its cleanliness and fireproof qualities

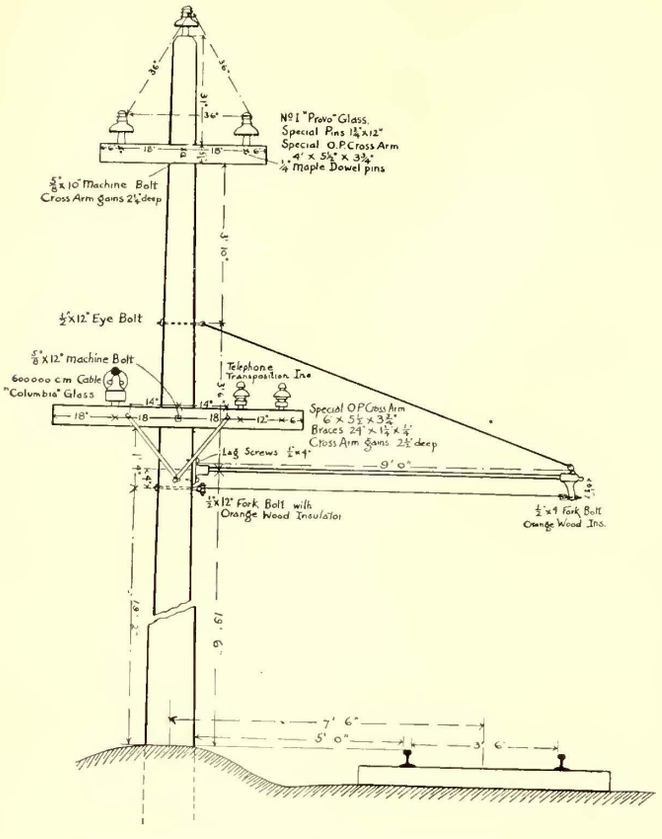


FIG. 5.—ARRANGEMENT OF OVERHEAD CONSTRUCTION

a concrete floor was decided upon. A 2-in. tongued and grooved wooden floor was first laid and this was covered with tar paper to prevent the moisture of the concrete from affecting the wood. A 3½ in. layer of concrete was then added with a ¾ in. wearing surface on the top. Owing to the disastrous results in case of fire, to stations having transformers located on wooden foundations, a brick wall on a concrete base was built to the floor line and the transformers were located on this pier in a row 6 ft. back on the switchboard.

The 15,000-volt transmission wires enter the sub-station building through 12-in. terra cotta tubes, near the outer ends of which are fastened circular glass windows, each containing a 1-in. hole at the center for the wire to pass through. The wires are covered with heavy rubber insulation for about a foot outside the building.

The transformers, seven in number, are of the oil-insulated, water-cooled, 50-cycle type, with 15,000-volt primaries. Each has a capacity of 100 kw and they are connected in delta in two banks, with one for emergency. Each transformer is provided with a 10-point switch in the secondary winding to vary the voltage from 2150 to 2350 volts.

The sub-station contains three motor-generator sets as follows: One 200-kw set, consisting of a 12-pole 215 kw (290 hp) 2250-volt synchronous motor direct-connected to a 6-pole 200-kw, 525 to 575-volt direct-current generator; one 150-kw set, consisting of a 12-pole, 165-kw (220 hp) 2250-volt synchronous motor, direct-connected to a 6-pole 150-hp direct-current generator; one 100-kw set, consisting of a 10-pole 150-kw (200 hp) 2250-volt induction motor, direct-connected to a 6-pole 100-kw direct-current generator. These sets are all of the four-bearing type. The synchronous motors have their exciters attached to extensions of the armature shafts and operate at 500 r. p. m.

Each machine is capable of being started from either the direct-current or alternating-current end, the synchronous motors being supplied with a partial squirrel-cage winding and the transformers with half-taps of 1075 volts for starting purposes. Despite the fact that synchronous motors are not in favor with a number of engineers, absolutely no trouble has been experienced by this company, their operation having been satisfactory in every respect. No synchronizing devices are used. In starting up, the motor is thrown directly on the half-taps and allowed to come up inductively. It is then thrown on full voltage, after which the field switch is closed. This requires but a few seconds and is perfectly safe, there being no danger of shutting down the power station by throwing on a

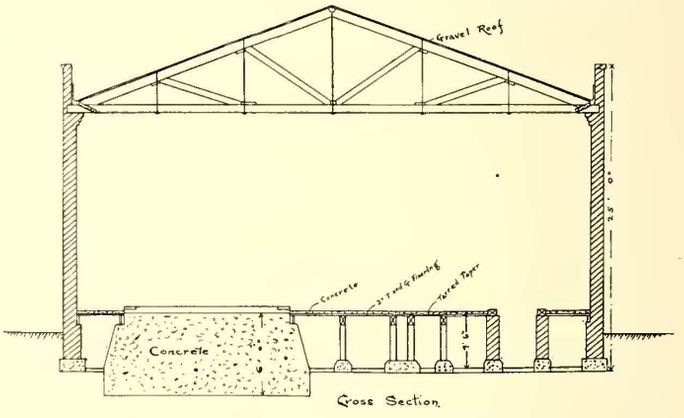


FIG. 9.—CROSS SECTION OF BELVIDERE SUB-STATION

machine out of synchronism as happens sometimes when synchronizing devices are used.

The switchboard is made up of eleven panels of blue Vermont marble as follows: Two high-tension panels, each containing three single-pole, single-throw 15,000-volt 300-amp. automatic oil switches operated by one handle and mounted in separate brick cells back of the switchboard; also a relay with current transformer for automatically tripping the switch in case of a heavy overload.

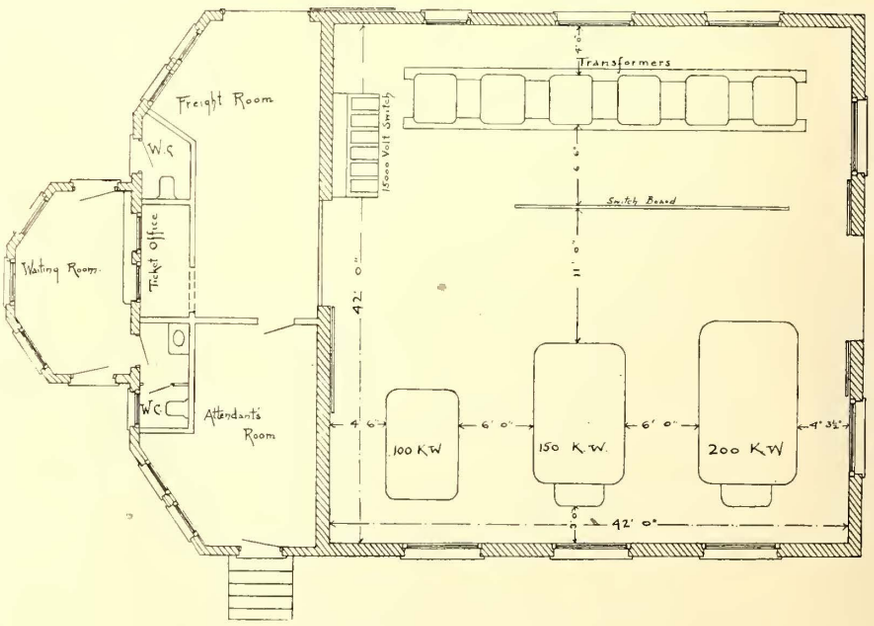


FIG. 8.—PLAN OF BELVIDERE SUB-STATION

One induction motor panel with ammeter and two 2500-volt

oil switches, one with overload relay, the other non-automatic and provided with an interlocking device to prevent both switches being thrown on the line at the same time. The non-automatic switch is connected to the half-taps of the transformers and is used only in starting up.

Two synchronous motor panels containing oil switches as above, alternating-current and direct-current ammeters and voltmeters, power-factor indicator, etc.

Three direct-current generator panels, with circuit breaker, switches, ammeter, rheostat and one four-point 200-amp. starting switch for starting machines from the direct-current end when desired.

Three 600-amp. feeder panels, with circuit breaker, ammeter and single-pole, quick-break switch. Two Weston voltmeters are hung on a swinging bracket at the end of the board and one 1200-amp. Thomson recording wattmeter is attached to a special panel back of the switchboard. The current and potential transformers are also placed on an iron rack 2 ft. back of the switchboard.

All wiring inside the station is rubber-covered; the 15,000-volt wires having an insulation 6-32 in. thick; the 2250 and 600-volt cables having an insulation 3-32 in. thick.

The high-tension wires are placed on No. 1 Provo glass insulators on locust pins, the whole being supported by seasoned wooden frame-work. The cables under the concrete floor are carried on Columbia glass insulators fastened to short cross-arms suspended from the floor joints.

The Centinela sub-station, Fig. 11, is practically the same as the one just described in so far as the generator room and the general arrangement are concerned. All the sub-station apparatus, including switchboards and high-tension switches were furnished by the General Electric Company.

CAR SERVICE

From a public standpoint the advantage of a comfortable and otherwise attractive trip to the sea and return, "where no scene is twice seen," coupled with a reliable and frequent car service, have brought a naturally attractive resort into special favor. The frequency of car service is governed by the season of the year. Last summer a twenty minute service was maintained daily from 6 a. m. to 7 p. m., then a forty minute service up to midnight. During the balance of the year a half-hour service is given from 6 a. m. to 6:30 p. m., then hourly to 11:30 p. m. Extra cars are run on Sundays and holidays both summer and winter to accommodate the additional travel.

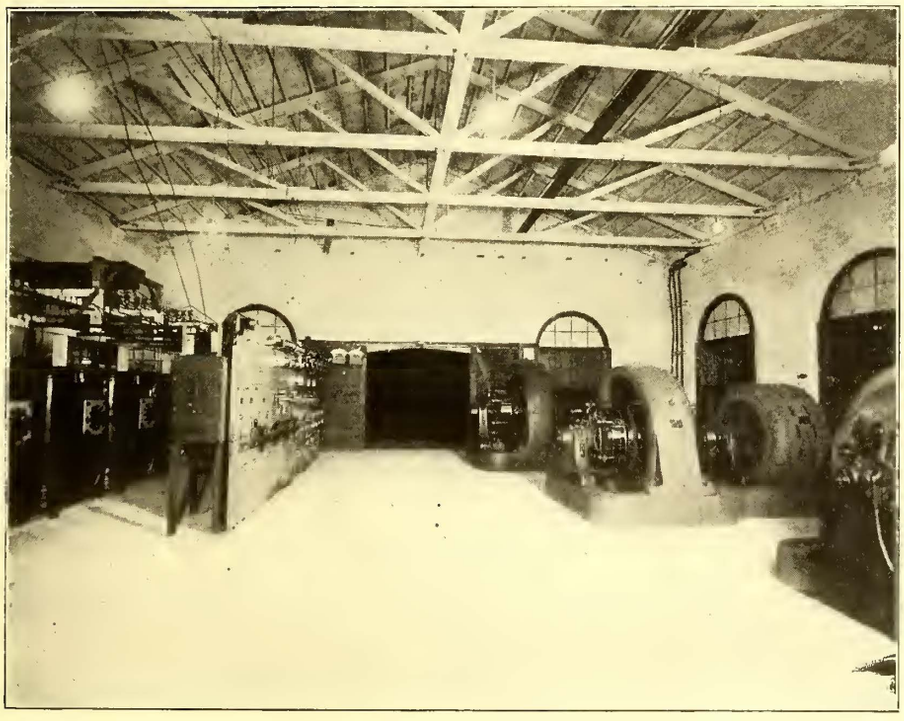


FIG. 10.—INTERIOR OF BELVIDERE SUB-STATION

PASSENGER CARS

It is interesting to note that the Los Angeles & Redondo Railway Company builds all its own rolling stock, including passenger and freight cars, in its own shops at Redondo. Its passenger cars, which are of the type illustrated in Fig. 12, are substantially built and are characterized by a well-proportioned and extremely pleasing design. They are 42 ft. long over all and weigh about 34,550 lbs. each, including brakes, motors and electrical equipment. They are finished in cherry and cedar, with the exception of the ceilings, which are either of plain or embossed sheet steel. The outside seats are of the Wheeler pattern, while those inside are of the Hale & Kilburn 98-A type, with oval pedestals and automatic foot rests. The inside seats are finished either in crimson plush or rattan, the latter giving better results in this section. Plain glass is used exclusively for windows and this adds materially to the richness of the car, aside from being stronger than ordinary glass. An unusual feature to be noticed in this connection is that the windows in the passenger compartment are stationary, the management having found that the doors and ventilators give sufficient ventilation, while it is freed from accidents occasioned by persons leaning far out of the windows and being struck by a trolley pole.

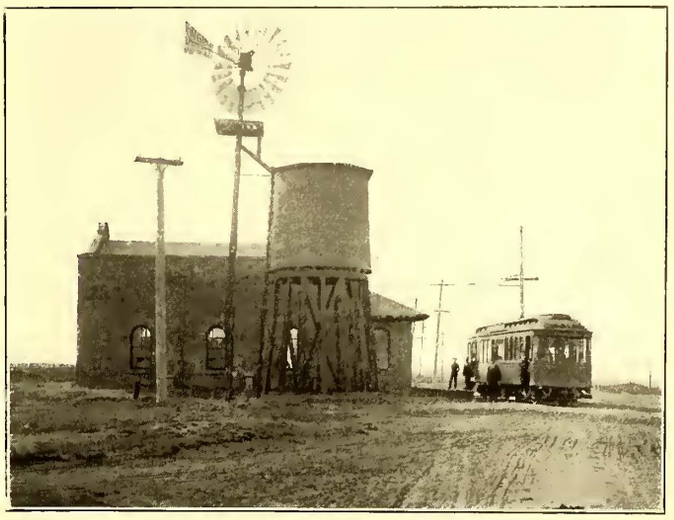


FIG. 11.—CENTINELA SUB-STATION

The trucks are of the 37-A McGuire type, with 6 ft. wheel base and are equipped with two 38-B Westinghouse motors and K-11 controllers. For the air brakes Christensen AA-1 independent motor compressors are used, the air controller being set at 50 lbs. pressure. Vertical ratchet wheel, hand emergency brakes are also provided. Mosher arc headlights, supplied by the Dayton Manufacturing Company, are operated in series with the incandescent lights used inside the car. These lights are wired in multiple series, so that the burning out of one lamp does not throw out the others. Round-dial New Haven fare registers are used to record all five-cent fares and each car is equipped with New Haven trolley catchers.

The strength of one of these cars was well demonstrated in a recent collision on the road, caused by a freight car on

another line which crossed the Redondo road hitting the passenger car at right angles, the cause of the accident being the failure of the brakes on the freight car. Both cars were running at about 10 miles an hour and the Redondo car was lurched off the track, but was only slightly damaged and only part of the glass was broken.

POWER CONSUMPTION OF CARS

The company has equipped each of its cars with a permanent

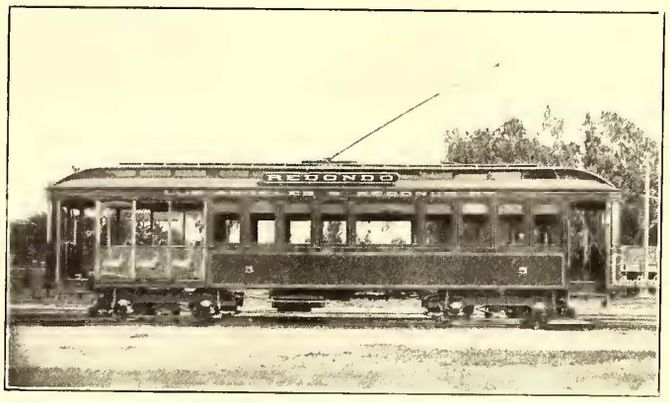


FIG. 12.—STANDARD PASSENGER CAR

Thomson recording wattmeter, the instrument being mounted over one door as shown in Fig. 13. By means of these meters a careful record is kept of the power consumed by each car on every trip. Once a month the chief electrician of the company posts a report which shows the standing of each motorman, the man who shows the smallest kilowatt consumption per car mile ranking first. As a result the motormen soon learn how to handle their cars with the minimum expenditure of current and the posting of the record is an incentive for them to make the best showing possible with a consequent saving to the company. The result is a valuable check on the power consumption, an item of no small importance, especially where the power is rented, but one which seems to have been more or less disregarded by the average electric railway. From these records it has been found that the average consumption of passenger cars per car mile with the regular gear ratio of 18:64 is 1.25 kw. On a higher geared car with 14:58 ratio there was about one-third more power consumption per car mile.

FREIGHT CARS

The company has in service freight motor cars that were also constructed in its own shops. They are about 46 ft. long over all and weigh about 25 tons each. The equipment consists of four 38-B Westinghouse motors mounted on 37-A McGuire trucks, with K-17 controllers and D-2 Westinghouse automatic air compressors. The motors have a gear ratio of 14:68. Each of these cars handles from three to five loaded freight cars besides furnishing space itself that is equivalent to one box car. Fig. 14 shows one of the motor cars unloading milk at the Los Angeles freight terminal and Fig. 15 is a view of another motor car with a train of seven box cars at the same point.

These cars are also furnished with recording wattmeters from which readings are taken to show the power consumed each trip. The controllers on these cars are located at the right side of the vestibule and a hinged platform extension over the steps on the controller side enables the motorman to stand where he can conveniently observe signals, as shown in Fig. 15. For shunting cars on side tracks a lever is fastened to the coupling pin and projects through the dash of the

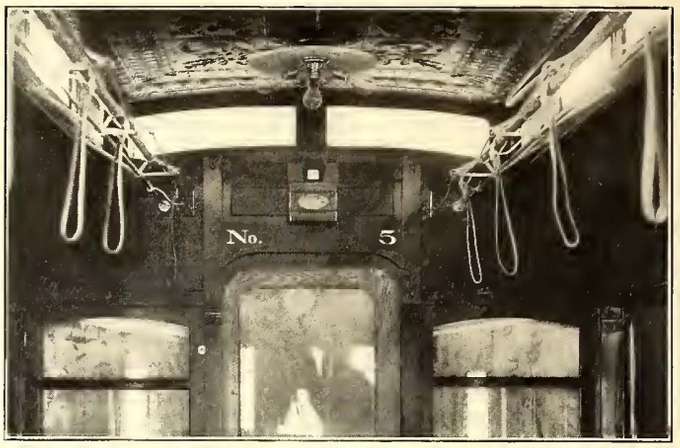


FIG. 13.—RECORDING WATTMETER MOUNTED IN PASSENGER CAR

car so that the motorman can cut his train loose by simply pressing on the lever with his foot.

SWITCHING LOCOMOTIVE

As will be mentioned more in detail later, the company owns three shipping wharves at Redondo, all equipped for trolley operation. Steam locomotives were used there for switching purposes up till recently, when the electric locomotive illustrated in Fig. 16 was put into service. This switching car was designed by the company's electrical engineer, L. B. Pemberton, and was built in the company's shops under his direc-

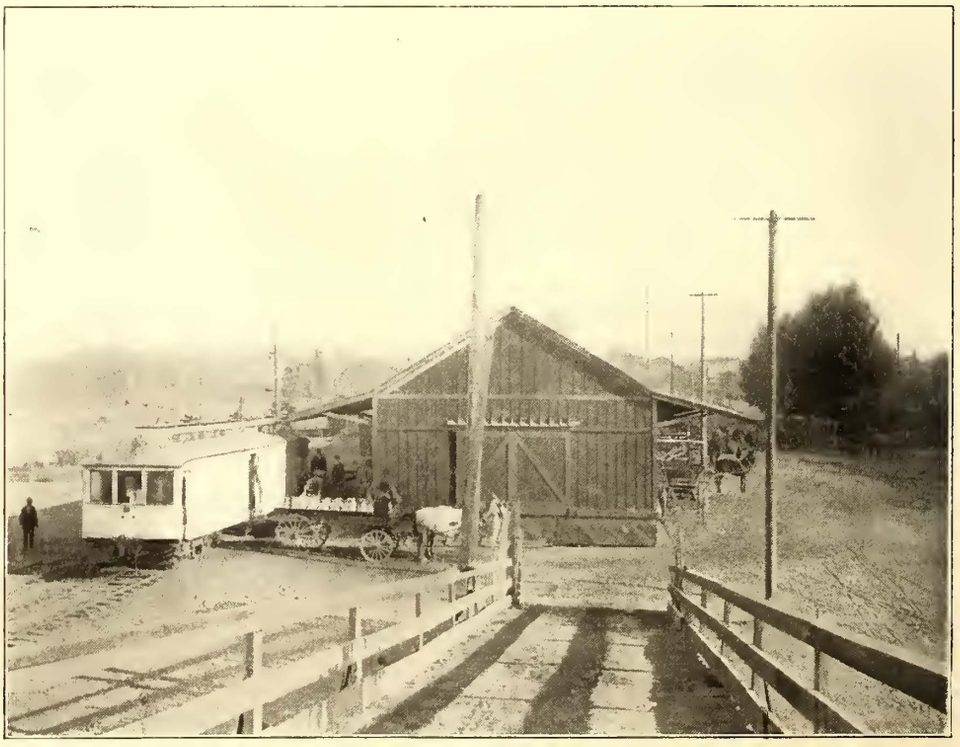


FIG. 14.—FREIGHT MOTOR CAR UNLOADING MILK AT LOS ANGELES TERMINAL

tion. This car possesses many novel and distinct advantages that merit special consideration. Fig. 17 is an elevation of the car and Fig. 18 is a floor plan showing the location of the equipment. The locomotive is 17 ft. 6 in. long over the drawbars and 8 ft. wide. Its total height is 12 ft. 2½ in. and its weight, 13 tons. The floor, which is 3 ft. 8 in. above the

rail, is built of four longitudinal 7 in. x 16 in. wooden sills, with space in the center under the car for trap doors. The space between these sills is fitted with old rails laid in concrete so as to give the car enough ballast for efficient traction effort. The cab is 7 ft. 2 in. long, with projecting roof and extends the full width of the car. A 37-A McGuire truck with 6 ft.

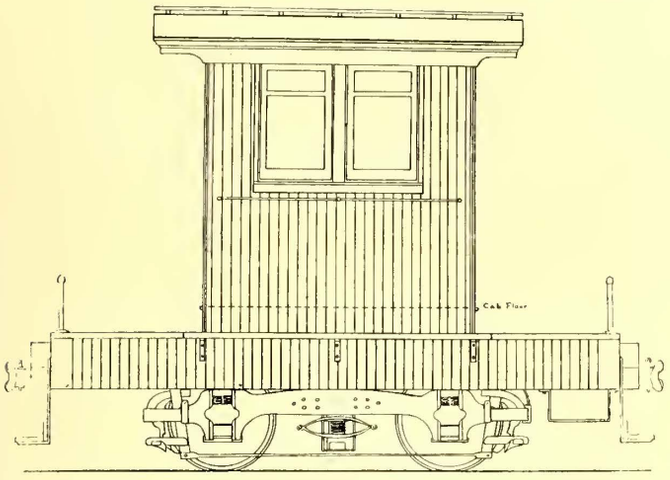


FIG. 17.—SWITCHING LOCOMOTIVE ELEVATION

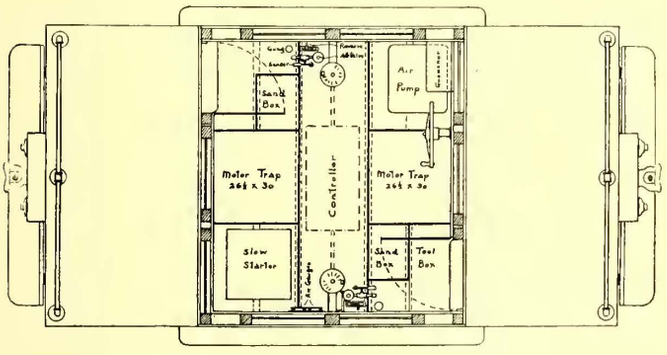


FIG. 18.—PLAN OF SWITCH ENGINE

wheel base and equipped with two 38-B Westinghouse motor propels the car. An ingenious arrangement was made so that but one controller is necessary. A false floor was built in the cab 10 ins. above the main floor and the controller was placed horizontally in the center between the two floors. The controller rod was then extended to both sides and connected by means of bevel gears to vertical rods which are operated by means of the ordinary controller handles. This arrangement permits the motorman to operate the car from either side and, besides dispensing with one controller, gives more room in the cab.

It is well known that there is a source of danger in switching and coupling with electric motor cars on account of the quick start of the car when the motors are thrown on the first notch. To overcome this difficulty Mr. Pemberton devised a soapstone resistance which is connected to the first notch of the controller. This cuts down the current so that the car can be started up very gradually without any sudden jump. The resistance is located in one corner of the cab, as indicated in Fig. 18. The rest of the engine's equipment comprises an air

FIG. 16.—SWITCHING LOCOMOTIVE

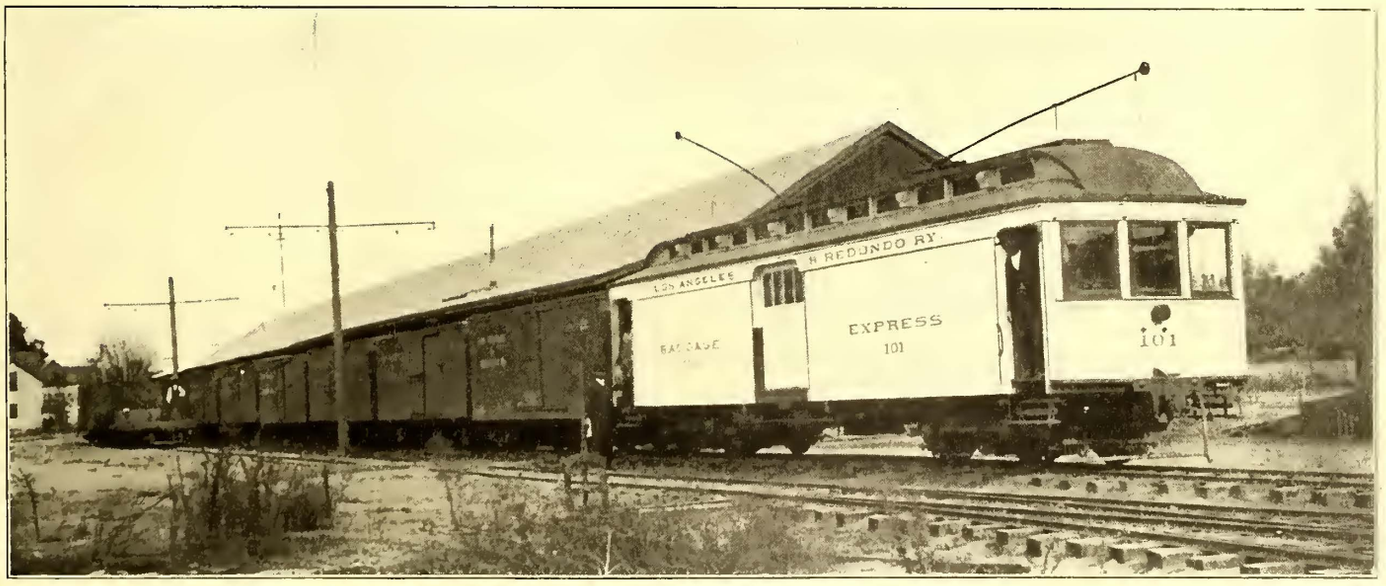


FIG. 15.—FREIGHT MOTOR CAR WITH TRAIN OF CARS

compressor and governor, sand boxes, tool box, air whistle and vertical wheel hand brake. An ordinary trolley arm is used at present, but it is planned to equip the locomotive with a diamond or bow-shaped trolley, so that it will not have to be turned every time the car is reversed.

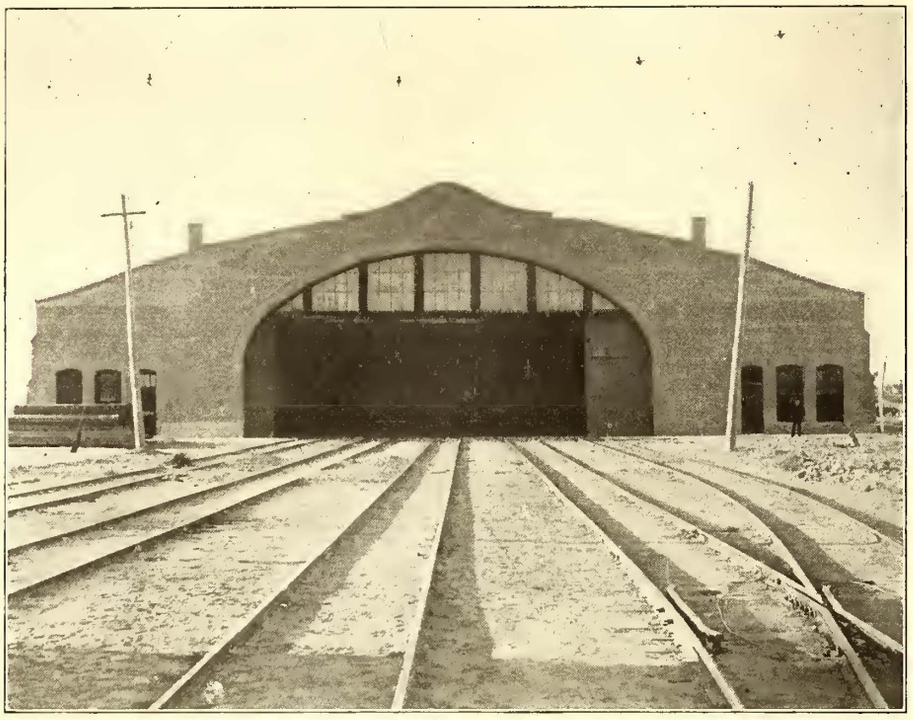


FIG. 19.—SHOP AND CAR HOUSE BUILDING AT REDONDO

This switching engine has proved to be a very useful part of the company's equipment, as it takes the place of steam engines and is much easier and cheaper to handle. It easily hauls five loaded box cars up a heavy grade in Redondo, where the steam locomotive could only haul three cars.

SHOPS AND CAR HOUSE

The car house and shops are united under one roof and Fig. 19 shows the general design of the building, which is of brick, 120 ft. wide x 160 ft. long. The arch at the entrance has a 65-ft. span and is said to be the largest brick arch in the State. Five tracks with capacity for sixteen cars run the length of the building and the shops are located at the sides. The three center tracks are over one large concrete pit, thus giving ample room and light for working under the cars. The rear wall of the building is of temporary construction, so that the building can be easily extended.

On the south side of the building are located the armature-winding room and carpenter shop, a view of the latter being shown in Fig. 20. On the opposite side are the blacksmith shop, Fig. 21; the machine shop, Fig. 22, and the storeroom, Fig. 23. The tools, which are electrically driven, are of the best and include all the machines necessary for building cars and for general repair work. The paint shop is located in a separate building.

It has been the aim of the management to standardize every detail used in the construction of the road or its equipment, so that any part needed in passenger or freight car service or for track or overhead repairs can be furnished by the storeroom without any question as to type or pattern required or any complications that so frequently arise from lack of uniformity.

ELECTRIC FREIGHT SERVICE

This company has been something of a pioneer on the Pacific Coast in the handling of carload freight by electricity and the success it has met with will doubtless be of interest to suburban electric roads generally. For the handling of local freight, baggage and express packages and perishable commodities where regularity of service rather than extreme heavy tonnage is the rule, it goes without saying that experience proves the efficiency of electric traction from every point of view. This company has proven that it can handle carload freight, however, with its electric locomotives, at a less outlay in power consumption than it had previously experienced with steam locomotives, and, aside from this, there is the material advantage of saving in labor account, as two men can handle the trains in lieu of four and the services of a high-priced locomotive engineer are dispensed with.

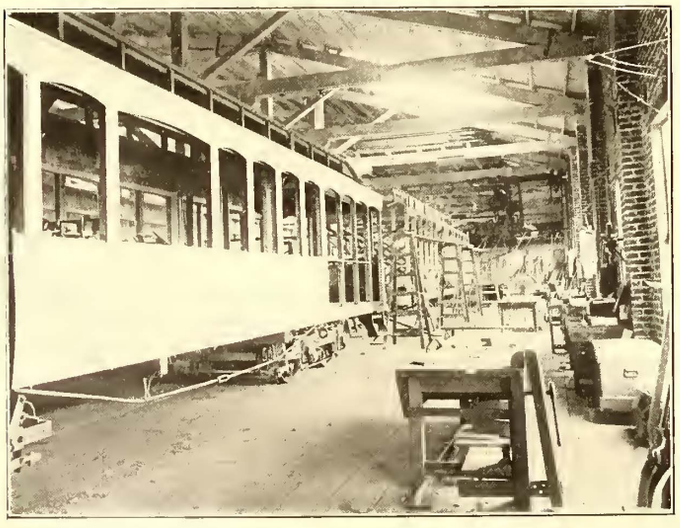


FIG. 20.—CARPENTER SHOP

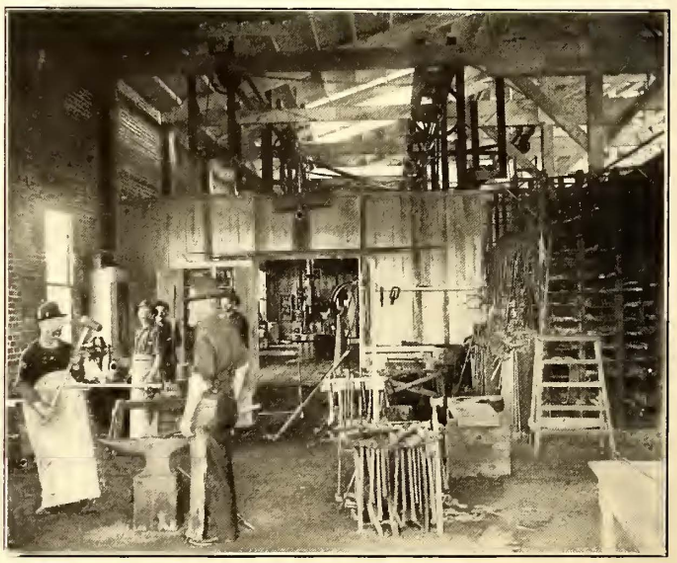


FIG. 21.—BLACKSMITH SHOP

WHARF TERMINALS AT REDONDO

The accompanying view, Fig. 24, shows a shipping scene at Redondo, with vessels discharging lumber and merchandise over the company's wharves. On each dock three rails are laid to accommodate the 3 ft. 6 in. electric gage and the Santa Fé standard gage tracks. The Santa Fé Company,

owing to its interior connections, brings a large tonnage that is valuable to the wharf owners and in turn receives privileges on the wharves that are correspondingly valuable to it, as

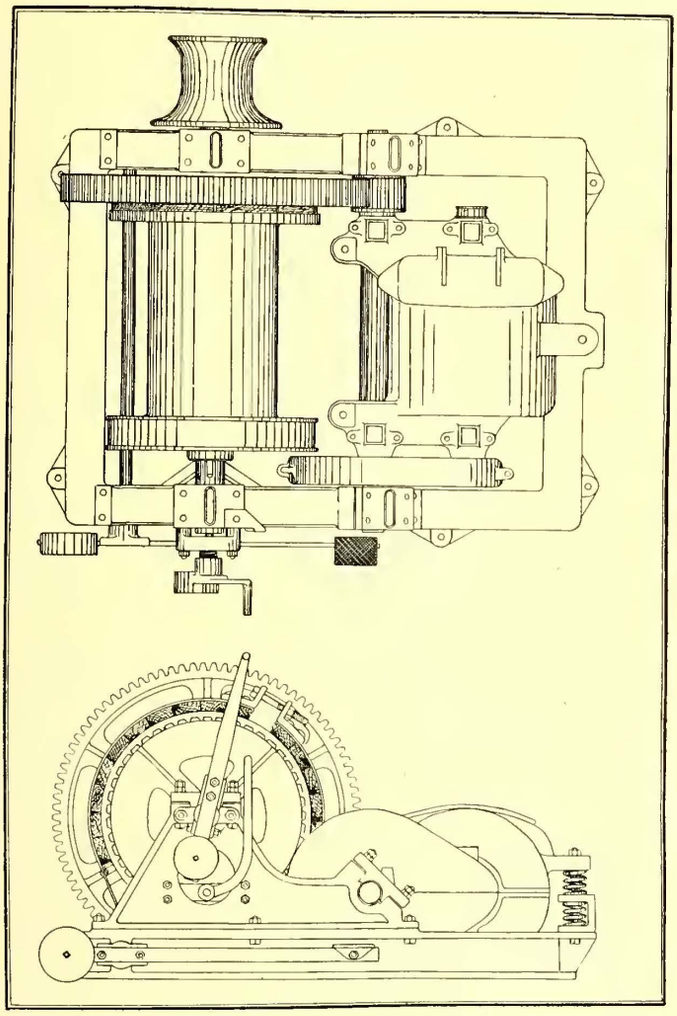


FIG. 27.—PLAN AND ELEVATION OF ELECTRIC HOIST

Redondo is the only coast terminal for Santa Fé tracks between San Francisco and San Diego.

The peculiar and advantageous formation of the water front at Redondo is partly illustrated in Fig. 24. The deep gorge heading at Redondo not only relieves this port almost wholly from the usual undertow but enables vessels of deepest draught to approach near the shore line, thus obviating the necessity for very long wharves and correspondingly reducing maintenance expenses. The depth of water at these wharves varies from 25 ft. to 70 ft. and the length of the docks vary from 600 ft. to

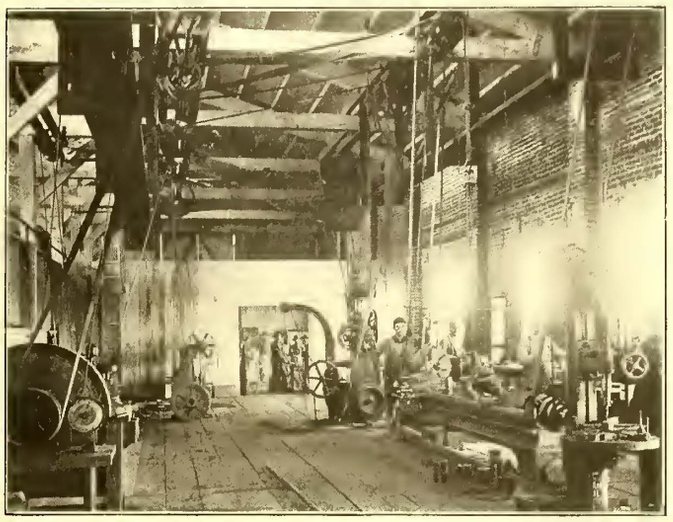


FIG. 22.—MACHINE SHOP

FIG. 23.—STOREROOM

1200 ft. It is interesting to compare this harbor with Port Los Angeles, near Santa Monica, about 16 miles north of Redondo, where the Southern Pacific Company has had to build a wharf

FIG. 24.—SHIPPING SCENE AT REDONDO, SHOWING RAILWAY COMPANY'S THREE WHARVES

about 1 mile long in order to reach deep enough water for its shipping.

The motive power used in hoisting on the Redondo wharves has been steam up to a recent date, when electric hoists, Fig. 25, were installed on the new wharf. The results of tests have shown a saving of more than one-third in power consumption in favor of electric motor as against steam, to say nothing of the labor saved in steaming up. It is the company's purpose ultimately to install electric hoists on all the wharves, as the cost of operation and maintenance is not only less but they are always ready for immedite use in emergencies and there is no power wasted when they are not in use.

FIG. 28.—HOTEL REDONDO

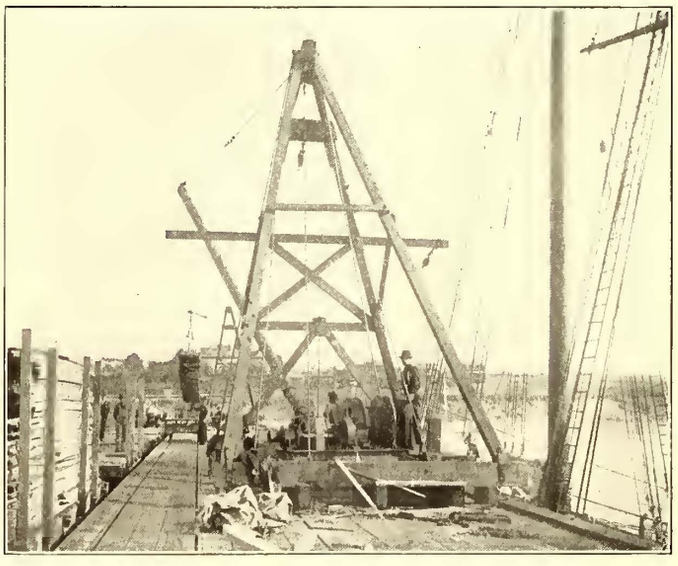


FIG. 25.—ELECTRIC HOIST ON REDONDO WHARF

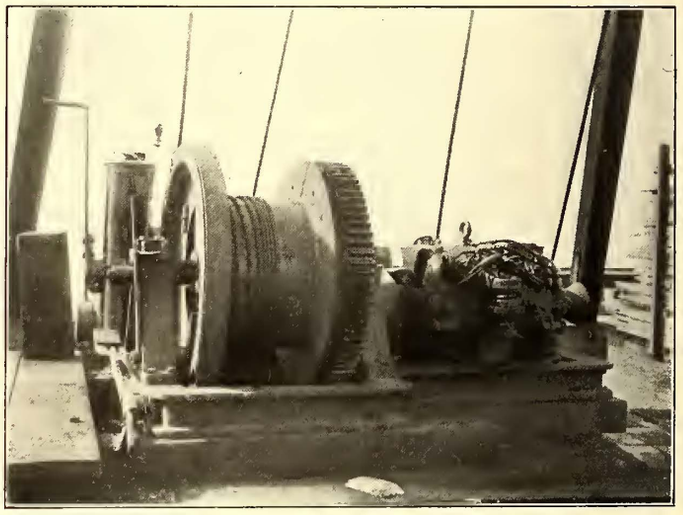


FIG. 26.—DETAIL OF ELECTRIC HOIST

The electric hoist illustrated in Fig. 25, and in detail in Fig. 26, was designed by the company's chief electrician and built by the Fulton Engine Works, of Los Angeles. Fig. 27 shows a similar but more compact design adopted for the other hoists. A 25-hp 12-A motor is geared to a drum 30 ins. in diameter, and gives the hoist a speed of 200 ft. per minute. An ordinary K-17 controller is used and a friction band is provided by which the drum is thrown into or out of connection with the motor. A band friction brake is operated by the foot.

EFFECT OF ELECTRIC SERVICE ON REALTY HOLDINGS

Primarily, the object in giving good railroad facilities to Redondo was the expected beneficial effect on the realty holdings and the benefits that have resulted to the real estate controlled by a subsidiary company, the Redondo Improvement Company, amply justified the improved service even if the move had not been justified as a railroad measure.

One of the special charms of Redondo lies in its rolling contour, every knoll affording an attractive site for a home, with views in all directions that are fascinating. A great deal has been done and is being done by those interested to develop the natural advantages. The hotel, Fig. 28, costing a quarter of a million dollars, one of the handsomest and most attractive on the Southern Coast, is surrounded on the water front by several acres of tropical trees and overlooks the water at an elevation of about 30 ft., with excellent views north and south of the highlands that bound the horseshoe bay from which Redondo (round) derives its name. The usual amusements common to resorts of this character are in evidence and liberally indulged in, especially during summer months. An attraction which has probably done more than all the advertising to bring Redondo into notice is its famous carnation fields. Several acres of these flowers bloom the year round and furnish flowers for shipment to all parts of the United States. An abundance of artesian water and a good distributing system, besides gas, electricity and an excellent climate, all com-

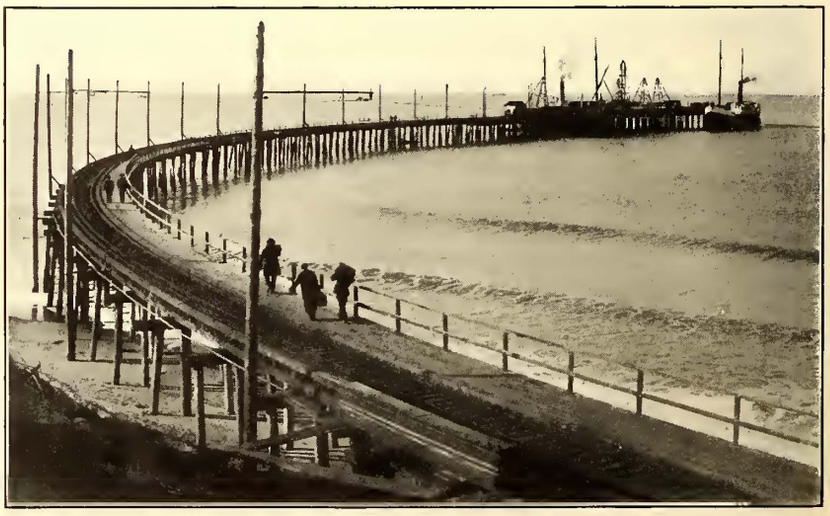


FIG. 29.—WHARF NO. 3 AT REDONDO

bine with nature to make this resort popular. The Los Angelos & Redondo Railway Company is a close corporation, being virtually owned by two people. It has the following named officers: President, L. T. Garney, Los Angeles; vice-president, Percy T. Morgan, San Francisco; secretary-treasurer, purchasing agent and manager, H. B. Ainsworth, Redondo; superintendent, L. J. Perry, Redondo; electrical engineer and general foreman, L. B. Pemberton, Redondo. The construction and improvements noted in the above description have been effected under the personal supervision of the energetic manager, Mr. Ainsworth, who has been ably assisted in the design and construction of the mechanical and electrical features by Mr. Pemberton, the electrical engineer.

THE POWER PLANT AND ELECTRIC RAILWAY OWNED BY THE STATE OF NORTH DAKOTA

The State Capitol Building at Bismarck, North Dakota, is a trifle over 1 mile from the city hotels and depots, and the transportation of the members of the Legislature to and from the Capitol Building has always been accomplished with some difficulty and inconvenience as well as expense to the members, as hacks and other conveyances charged 25 cents for a trip in either direction. This, with a lack of room at the Capitol, led to the renting of many committee rooms down town, which has proved an expensive though convenient arrangement.

During last winter's session a bill was passed authorizing the building of another wing to the Capitol. This permitted plenty of room at the Capitol for committee rooms, but did not solve the transportation problem. Hence a bill was passed later making an appropriation for the building of a trolley line from Bismarck to the Capitol Building.

The heating plant in the present building had been in continuous operation for nineteen years, and was in need of a general overhauling, nor was it large enough to furnish heat for the new wing. The lighting of the building had never been entirely satisfactory, as it was too far from the city plant for good service, the voltage being 220 direct-current, and

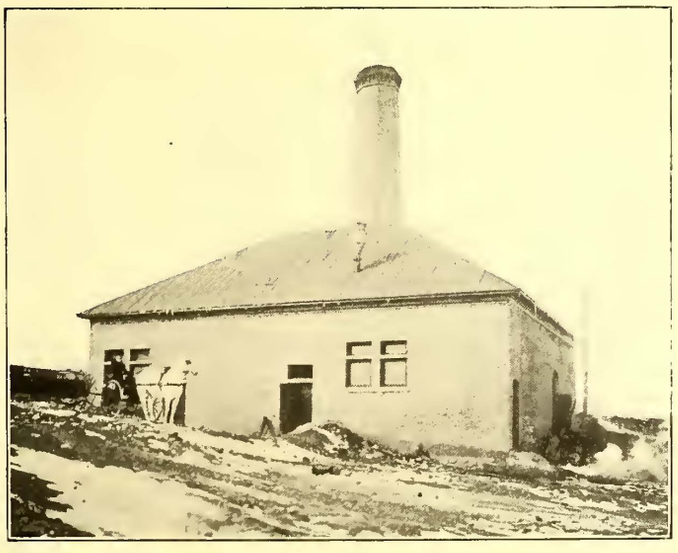


FIG. 1.—EXTERIOR OF POWER STATION

the distance over 1 mile. The Board of Capitol Commissioners decided to remodel the heating plant and build a lighting plant in connection with the power plant for the electric railway. It appointed Charles Foster to prepare suitable plans and specifications for the remodeling of the heating plant, for the installing of the lighting and power plant for the Capitol Building and the railway, and to superintend the construction of the entire installation.

The power house, which is shown in Fig. 1, is 53 ft. 4 ins. x 56 ft. 4 ins., and is built of brick, with cut stone trimmings and Bodine fireproof roofing. The smokestack is of brick, has an internal diameter of 4 ft, and is 60 ft. high above foundation. The core is built separate from the outer shell and extends to within 4 ft. of the top. A suitable air space is carried up from the foundation to the top of the stack,

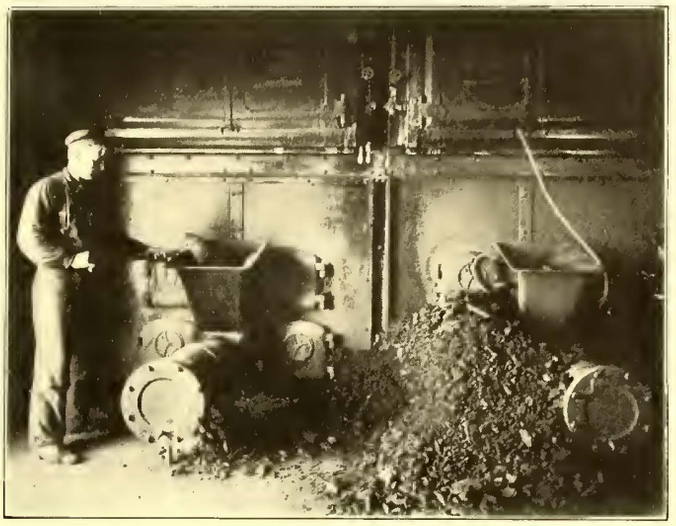


FIG. 2.—FIRING FURNACES IN POWER STATION.

and at no point do the core and outer shell touch. The building is finished very plainly on the inside. The walls in the engine room and storeroom are painted with asbestine cold water paint. The two rooms mentioned have a steel ceiling. All floors are of cement tile, except the coal room, which is 3-in. plank. All transom windows have suitable lifts, so that the building is easily ventilated.

The boiler room is on the east side of the building, and contains the boilers, blower, pumps, heater, return tank and all auxiliary apparatus, such as traps and oil separator. The boiler plant consists of two Heine boilers, rated at 150 hp each, and built for 160 lbs. working pressure. As shown in Fig. 2, these boilers are equipped with Jones' stokers, automatically controlled by the Cole automatic controller. Air is supplied by a Sturtevant 54-in. fan, directly connected to a double 4-in. x 3-in. Sturtevant engine. The controller is belted to the fan shaft, and the engine is regulated by a Foster fan engine regulator. This arrangement is found to work very satisfactorily with but little variation in the steam pressure, as the air and coal are delivered in the right proportions for complete combustion. The coal used is North Dakota lignite screenings. It will evaporate about 4 lbs. of water per 1 lb. of coal, and burns very freely leaving some clinker.

There are two 6-in. x 4-in. Blake duplex boiler feeders and one 1½-in. Penberthy injector, both of which can be used to feed the boilers and the pumps. These feeders are so piped that either may be used to pump into either boiler, that is, both may be in use, one pumping into one boiler, and the other pumping into the other boiler; one may be pumping hot water and the other pumping cold water, but by manipulating the valves, the pumps may be reversed, and the first feeder be made to pump into the second boiler, and vice versa. A hose valve is connected to the pump discharge, and a 100-ft. hose reel attached to the wall in a convenient place, so that in case of fire in the plant, direct pressure can be had almost instantly.

The heating plant in the Capitol was partly a one-pipe system and partly a two-pipe system, but has been remodeled to a certain extent and the Paul vacuum system installed. The exhaust steam from all engines, pumps, etc., passes through a Triumph oil separator, which removes the oil and then passes into the heating system. It has not been found necessary to

carry any pressure on the heating main, as with a vacuum 12 ins. to 18 ins. on the air line, the vacuum on the steam line will be from zero in coldest weather to 5 ins. or 6 ins. in mild weather. This is of great advantage when using exhaust steam. When the exhaust steam is not sufficient for heating, live steam can be furnished through a Davis 3½-in. reducing valve. The exhaust steam from the exhauster is used to heat the engine room of the plant. The returns from the building, as well as from all other sources except the oil separator, flow into a tank under the boiler room floor, and from there are pumped to the boilers.

The engines are both Ideal engines, built by A. L. Ide & Sons, Springfield, Ill. The generators were built by the Commercial Electric Company. The lighting unit consists of a 12-in. x 12-in. engine direct-connected to a 50-kw 125-volt generator, running at 290 r. p. m. The railway unit consists of a 14-in. x 14-in. engine, directly connected to a 100-kw 550-volt generator, running at 275 r. p. m.

Both generators are attached to the engine shafts by flange couplings, this arrangement allowing the removal of the armature for repairs without disturbing the engine. The foundation is made up of one solid block of concrete 24 ft. long, 16 ft. wide and 3 ft. deep.

The switchboard consists of two panels of white marble, one panel for each machine. The recording instruments are of Weston manufacture; the switches are Crouse-Hinds, and the circuit breaker I-T-E.

It is proposed to install a storage battery to take care of night lights for the watchman and for vault lighting for daylight use. The switchboard for this will be installed beside the other board, thus making a three-panel board. Above the switchboard is a gage board, having mounted on it a clock, two gages for the heating system and one for the boiler pressure. On the wall of the engine room is also mounted a recording gage which records the boiler pressure.

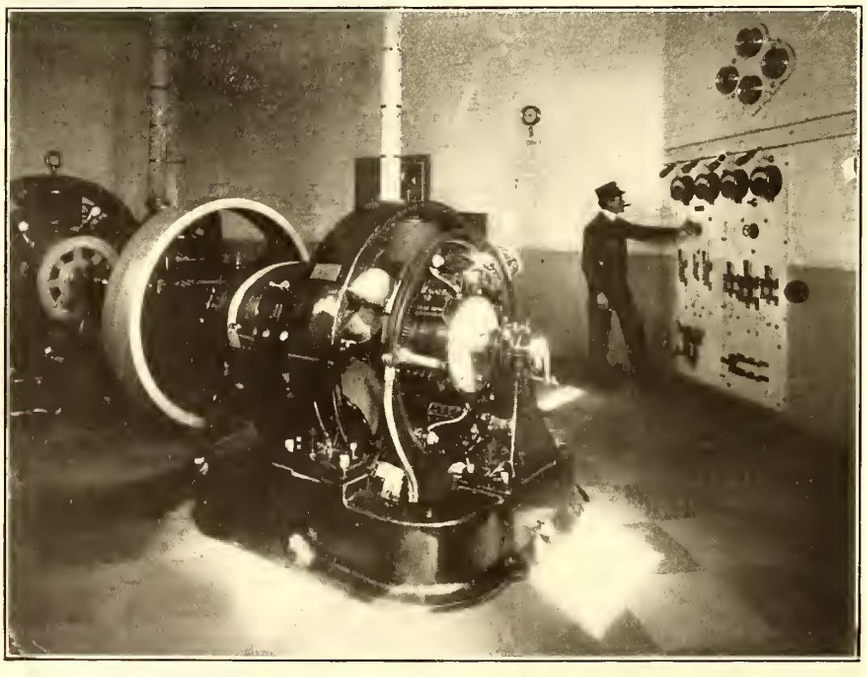


FIG. 3.—GENERATING SETS AND SWITCHBOARD IN POWER STATION

The railway is of standard gage, using 45-lb. T-rails bonded with the General Electric Company's ribbon bond. About two-thirds of the line is through the city and on the city streets, and the other third through what is known as the Capitol Park Addition. Inside the city proper the grade of the road was carried to the established grade of the streets, but on that part of the line running through the Capitol Park Addition, a cut of 4 ft. was made for about 300 ft., a fill varying from 0 ft. to 8 ft. for over 600 ft. long, and another fill varying from 0 ft. to 6 ft. about 400 ft. long.

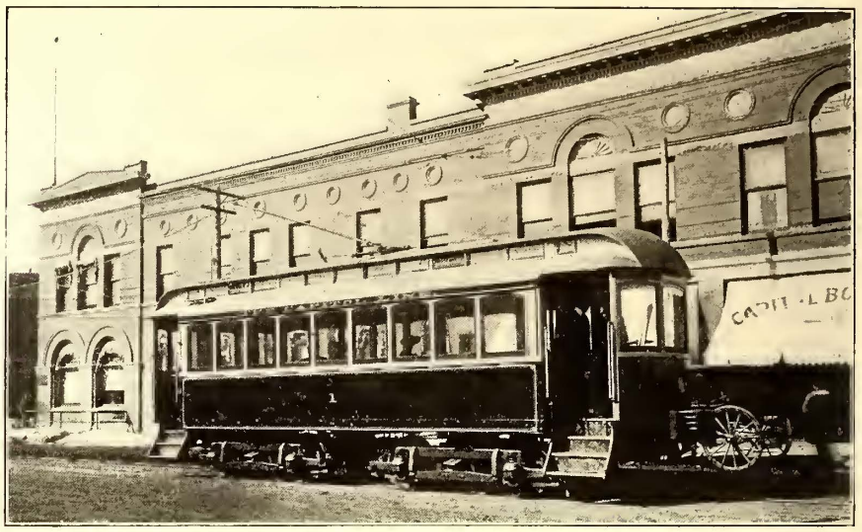


FIG. 4.—CAR USED ON THE CAPITOL LINE

The overhead material was furnished by the General Electric Company. The poles are made of cedar and are 30 ft. long.

Only one car is in use at present. It was built by the American Car Company, of St. Louis, Mo., and described in the Street Railway Journal of Feb. 27. It is 34 ft. 6 ins. over end sheathing, and has fourteen reversible rattan seats and four stationary ones. The electrical equipment is Westinghouse, and consists of four 12-A 30-hp motors and two controllers. The air brake equipment is of the Christensen type.

The car is equipped with standard Jenny couplers, as it is expected to have two or three special hopper cars built for hauling coal to the power house. The mines from which the coal is secured are about 25 miles from Bismarck. Track connection will be made with the steam road running to the mines, and the special cars sent to be loaded, then switched to the electric line and hauled to the Capitol, where the power house is located.

All the engineering work was done by Mr. Foster. This installation is, perhaps, one of the most complete small plants that can be found in the West, or outside of large isolated plants in the larger cities. No contracts were entered into, except the changing of the piping for the heating plant and the power house, all other apparatus being purchased and installed under the direction of the consulting engineer. From a financial standpoint it cannot be said that the car line is a complete success, but under the existing conditions it cannot be said to be a failure, as during the winter months all the exhaust steam is used for heating, and the difference in efficiency between the new manner of heating and the old will do much toward making up the cost of coal for the summer months. The problem of transporting the members of the Legislature is solved effectively, as it takes but a few minutes to transport the whole body.

SIDE-DOOR STEEL SUBURBAN CARS FOR THE ILLINOIS CENTRAL RAILROAD

In view of the interest in the rapid and safe transportation of a dense passenger traffic in elevated, suburban and similar rapid transit service, a detailed description is given herewith of what is really an epoch-making step in car design for such service.

The Illinois Central side-door steel suburban cars were briefly described in the STREET RAILWAY JOURNAL of July 4, 1903, page 21, at the time their construction was about to begin. Of the different plans then presented, the one illustrated herewith was chosen as being the most flexible for all conditions of service. Although the plan shown in the previous article as having doors on one side only, and seats in groups of ten extending to the opposite side of the car, was preferred because trains could be run with the doors on the west side of the cars, thus avoiding exposure to the lake winds, this plan was rejected finally at a sacrifice of twenty seats because of the excessive cost of remodeling masonry and bridges

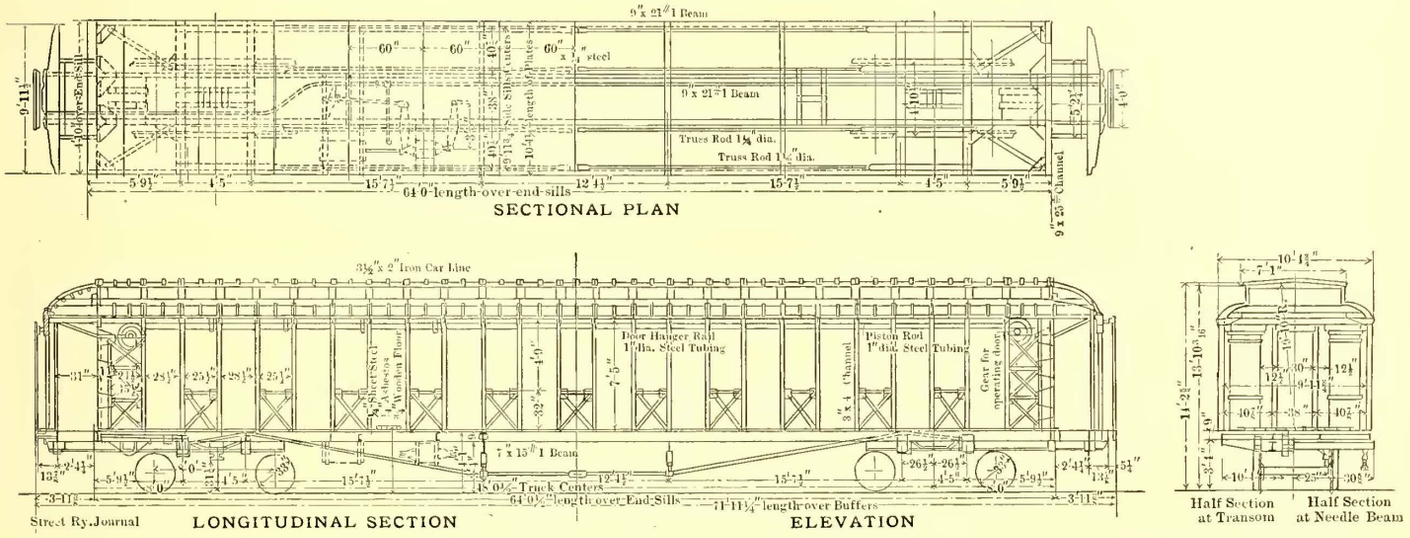


FIG. 1.—DETAILS OF STEEL-FRAME, SIDE-DOOR PASSENGER CAR CONSTRUCTED BY THE ILLINOIS CENTRAL RAILROAD

along the line incident to moving the platforms to the west side of the track at all stations.

An order for additional cars, now being carried out, embodies the changes found necessary by the severe seven months' service test to which the first lot was subjected. These changes, together with the reasons therefor, are given below, through the courtesy of A. W. Sullivan, assistant second vice-president, and of William Renshaw, superintendent of machinery of the Illinois Central Railroad, who have designed the many original features set forth in the following mechanical description:

DETAILS OF CONSTRUCTION

The under framing of the car has four 9-in. 21-lb. steel I-beams for sills, 64 ft. long and spaced nearly equal distances apart. The end sills are 9 ins., 25-lb. channels, riveted to the sills with double angle-plate reinforced by gussets. There are four body bolsters arranged in pairs on 4½-ft. centers, and built of 7-in. x 1-in steel bars. These are bolted to the lower flanges of the sills and carry a heavy truss, which, in turn, carries the center plate. The truss rods proper are solid, passing over the inner body bolster and anchored to the outer, and are adjusted by eight vertical screw queen posts, bearing at the bottom on the rod and at the top on the 7-in. and 15-lb. I-beam which extends entirely across the car underneath the sill, forming an additional cross-brace. The underframe is additionally stiffened by 6-in and 12¼-lb. I-beams placed between the longitudinal sills over the body bolsters and needle beams.

Upon the metal sills a steel floor of ¼-in. plate 60 ins. in width, is laid with planed butt joints and double riveted to the upper flanges of the sills.

The butt joints are held rigidly together by 1¾-in. x 3-16 in. T-irons riveted underneath, extending across the car between I-beams. This gives a continuous metal surface extending the entire length and width of the car, insuring perfect rigidity and complete fire protection from underneath.

The upper frame work is built up of 3-in. and 4-lb. steel channels, with solid forged ends, which are riveted to the upper flanges of the side sills, and at the top are covered by a ½-in. iron plate 4½ ins. wide, which extends in one piece throughout the length of the car and vestibules. These channels are so spaced as to form the window and door posts, being set back to back 2 ins. apart so as to form hollow side walls, within which the doors slide when opened. By reference to the drawings, a very stiff girth and diagonal bracing with gusset connections will be noticed below the windows and in the end panels of the car. The corner posts are two 4-ins. x 5¼-lb. channels, set transversely on the side sills and spaced 11 ins. apart. The corner posts are very firmly tied together across the car, and also braced with a 4-in. and 5¼-lb. channel to the corner posts of the vestibule located on the car platform end sill. The carlines are 2 ins. x ⅜ in. iron and are so located that each rests directly on the side plate over the door posts, all the carline plate and door posts being riveted together. The framing of the car body is thus continuously connected in a very stiff manner throughout the entire body, giving great resistance and stability.

The cars are finished outside in poplar, inside in mahogany panels inlaid with a border design. This finish is secured to the frame by a very unique method; strips of hard maple 1½ ins. thick were fitted neatly to the inside of the channels for the door posts. The channel and maple filling were then placed in a chuck upon the bed of a planer, the channel below. Then with a specially designed tool, the upper edges of the channel flanges were split down to 3-16 in. deep, and the inner portion of this edge rolled down and turned over upon the filler cold compressing and firmly enclosing it within the channel walls, thus making the maple filler an integral part of the channel without the use of any screws or bolts whatsoever. This is clearly shown in the horizontal section through the door and window posts in Fig. 2.

Horizontal nailing strips of oak 1½ ins. x 3¼ ins. are tightly fitted and bolted to the metal frame between the channel posts, and on top of the metal plate above the doors hard pine, 4 ins. x 1½ ins. is tightly fitted between the metal carlines and bolted to the plate. This greatly increases the re-

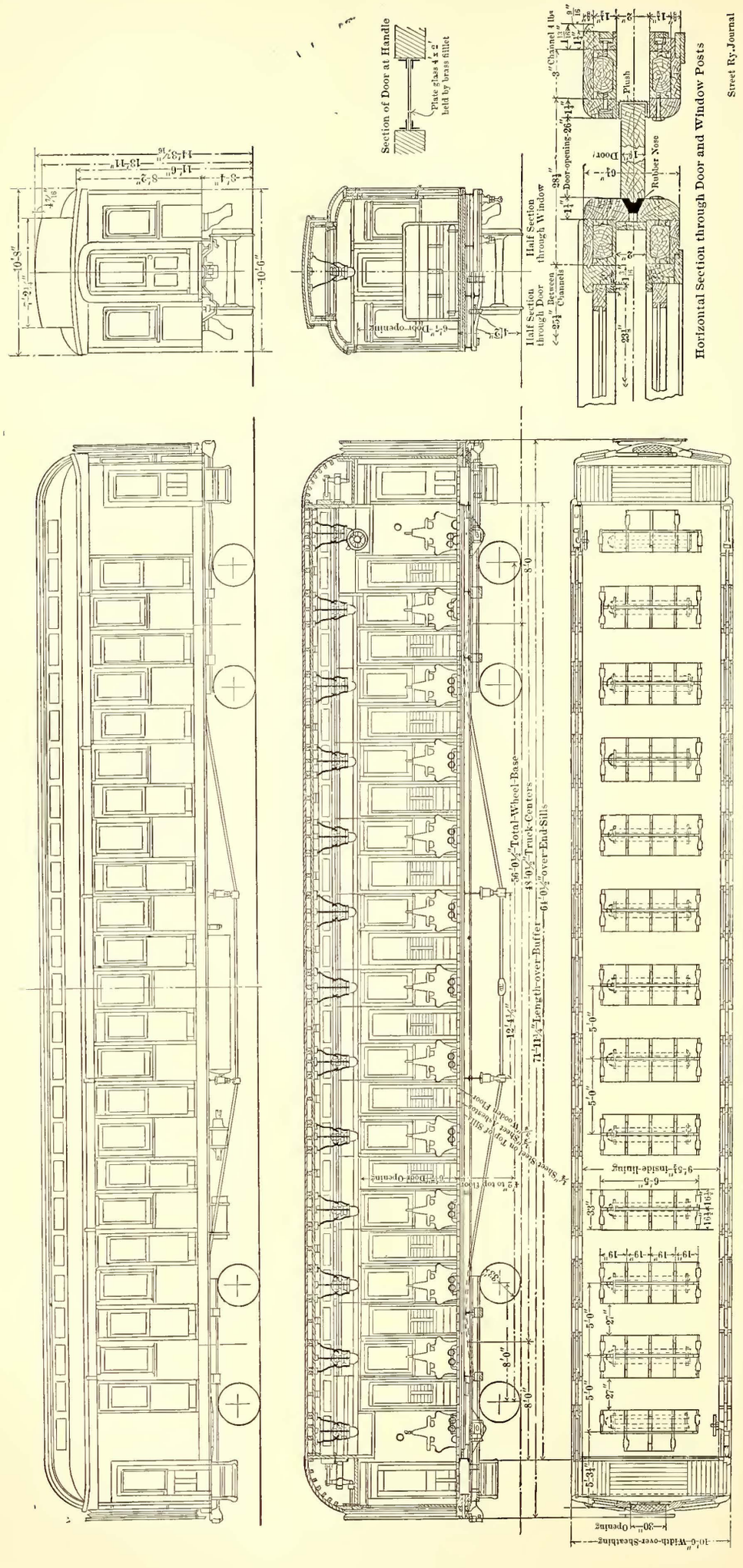


FIG. 2.—SIDE AND END ELEVATIONS, SEATING PLAN, CROSS SECTIONS AND CONSTRUCTION DETAILS OF ILLINOIS CENTRAL RAILROAD SUBURBAN CAR

sistance of the car in addition to forming an entirely adequate foundation for attachment of the sheathing in the usual manner. The carlines have poplar nailing strips bolted to each side, and the roof, which is of 13-16-in. poplar, is nailed to these strips in the usual manner. Upon the steel plate bed of the floor ¼-in. asbestos is laid, and upon this the maple flooring is placed cross-wise in matched strips 2¼ ins. x ¾ ins.

The problem of securely fastening this flooring to the steel bed plate was solved by glueing up the flooring on the bench in sections 12. ins wide, then by heavy clamps, glueing and forcing these sections one by one into position. Underneath both ends of the seats, also the center of the car floor, brass strips 1 in. wide were gained into the flooring the entire length of the car, to which the seats and heating coils were fastened, and which were in turn fastened to the bed plate by 5-16 in. screws having a wide countersunk head. This affords better access than any bolt arrangement, and also gives instant signal of loose condition. A special air machine had to be devised for drilling, tapping, reversing and backing out of these holes automatically. The nailing strips at the side are on top of the flooring, and thus hold its ends down very securely.

ARRANGEMENT

The interior of car is open throughout its entire length to the end platform sills of the vestibule, the flooring being continuous, thus permitting the steps of the vestibules to be utilized as a part of the interior of the car. The platform trap doors over the steps open against the ends of the car, and the vestibule side doors swing across the ends of the side aisles to prevent passengers walking into the opening of the steps. The seating arrangement provides a passage around these side doors and an aisle along both sides of the car. The vestibules are also provided with swinging end doors to close the ends of the cars and to allow of access through the vestibule to adjoining cars. The seats are of an entirely new design of mahogany throughout, with no upholstering whatsoever.

By reference to the floor plan it will be seen that there are sliding side doors opposite each section of seats. These doors are carried on ball-bearing rollers and work be-

tween the walls of the car. They are connected by a mechanism within the wall, which is so arranged that all of the doors on one side may be opened, closed, locked or unlocked simultaneously. This mechanism has duplicate control, one for air, with a cylinder 2½ ins. in diameter, and the other with a hand wheel about 30 ins. in diameter. In practice the doors are unlocked

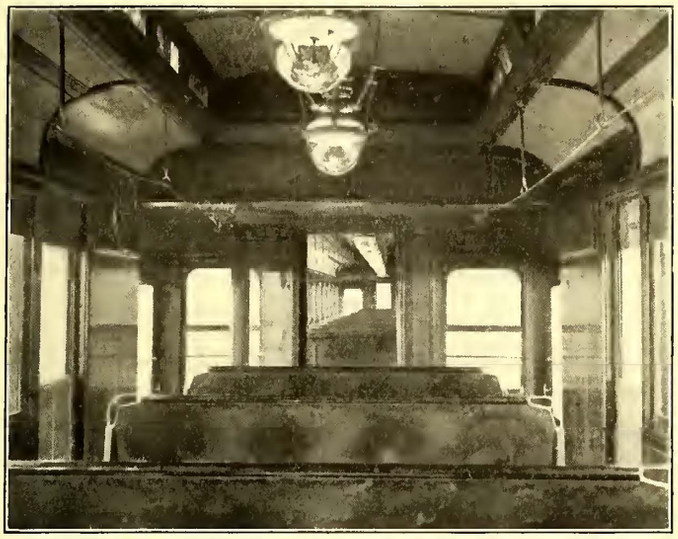


FIG. 3.—END OF ONE CAR AND VIEW OF FOLLOWING CAR, THROUGH VESTIBULE

from either end as the train stops, leaving the opening of such doors as are needed to the passengers who desire to use them. They are then closed and locked simultaneously by the trainmen before starting.

In Fig. 3 the sockets for the key (which the trainmen carries in his pocket) to control the air valve are seen on each side of the car in the panel just next to the vestibule door, while at the left is seen the hand wheel, and also between it and the wall the lever, which, by a quarter circle movement

FIG. 5.—VIEW OF INTERIOR, SHOWING LIGHTING ARRANGEMENT

toward the end of the car throws the hand operating mechanism into gear.

A study of the engraving will reveal many of the good points of the design. The glass in doors and windows is sufficiently high to afford a clear view of the outside to both seated and standing passengers without the necessity of stooping, and they are also protected from the direct rays of the sun.

The ceiling is of canvas-covered veneer painted a light shade of green, to harmonize with the entire mahogany finish. The ceiling of the lower deck is mounted in hinged sections 5 ft. long, held by thumb-screws, with a cotton flannel joint underneath. This allows instant access to the door-operating mechanism behind it. These cars are illuminated by Pintsch gas, the lamps being 18 ins. lower than usual. The heating is by steam from the locomotive under the Safety Car Heating & Lighting Company's system. The elevations show clearly

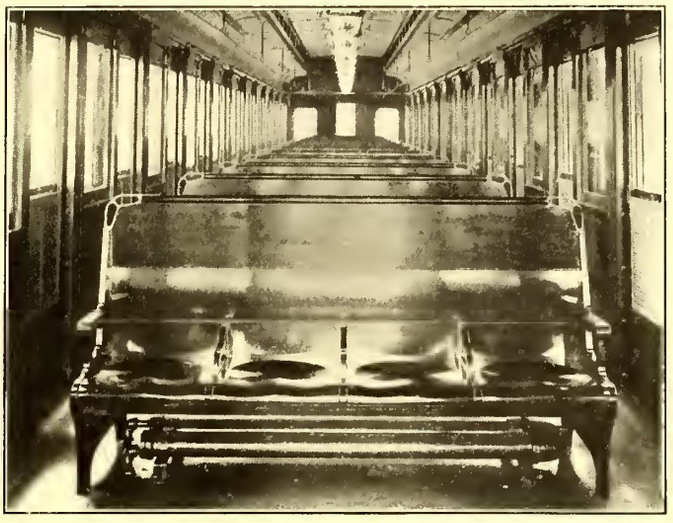


FIG. 4.—ARRANGEMENT OF SEATS AND HEATING COILS

the arrangement of piping. These cars are also equipped with the Westinghouse quick action automatic brake and four-wheeled trucks of standard passenger construction, with 33-in. rolled-steel wheels and 5 ins. x 9 ins. steel axles. Standard steel platforms and couplers and the Session friction draft gear are used. As the center sills are 3 ins. apart a ¾-in. steel plate is bolted through the main sills of the under frame and the sub-sills of the platform with ⅝-in. fitted bolts, and the draft gear attached to this.

Referring to the illustrations: Fig. 3 shows clearly the end of one car and a view of the next through the vestibule, the connecting doors of which are open. The hand-wheel and

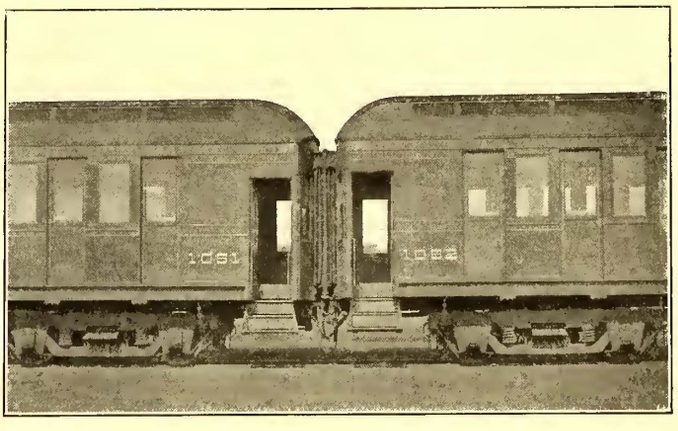


FIG. 6.—SHOWING MANNER OF COUPLING CARS AND CARRYING CABLES

air-key connections for the door mechanism, the hand bell cord signalling apparatus are seen, and also the cord to the conductor's valve of the air brake. This latter cord is dark red, and runs completely around the car up close to the monitor junction with the roof.

Fig. 4 shows the exquisite inlaid mahogany finish, the seats and doors, and the heating coils and utter absence of any pockets to impede air circulation.

Fig. 5 gives an idea of the excellent interior lighting and general arrangement of the car.

Fig. 6 brings out the great flexibility of the car in service in meeting any conditions. The electric cable connecting the door alarm circuit can be seen coming out on and along the roof of car No. 1052, near the end, whence it leads down beside the vestibule diaphragm and terminates in a coupling similar to the air hose.

Fig. 7 is a general view of the appearance of the car.

Fig. 8 is the same as Fig. 7, but with the side doors opened, showing the free access to the interior.

RESULTS OF OPERATION

Eight of these cars have been in regular service now for seven months, and one of them has just been installed at the St. Louis Exposition. They were built in two lots, of four each, in the company's works at Burnside, and have run during an exceptionally severe winter, undergoing, up to this time, over 100 degs. total variation in temperature.

Of the objections urged against this design at its inception, not one has arisen in service. There have been no failures and no important structural changes are necessary in the order for new equipment, which includes eight more cars.

In the original design, however, expansion joints were provided at both ends of the frame to allow for the theoretically necessary expansion of three-fourths of an inch, and to prevent its localization at any one point, the entire structure doors are now made, as shown in the sketch, of a small rectangular piece of plate glass, 1¼ ins. x 7 ins., set in a metal frame in the center of the thickness of the door. They are more easily discerned at night by the passengers outside, owing to the light shining through the glass from the inside of the car.

The doors and surroundings are most carefully designed to prevent any possible personal injury. As the doors weigh 60 lbs. each, and as it frequently is necessary to close all twelve doors on one side at each stop, it was feared that to move this weight of 720 lbs. would call for too much muscular effort. Therefore, in the first four cars an air-closing cylinder was installed. In actual operation it was found that a 4-oz. pressure on the wheel of the hand gear is sufficient to close one door; therefore, 48 ozs or 3 lbs. pressure would suffice for one side. The friction of the packing in the air cylinder is several times as great as the force necessary to close the doors. The hand wheels of the apparatus are thrown into gear by a lever behind the wheel against the wall. This is never used except in emergency, as the doors are customarily operated by the air. Possibly an additional air connection will be installed at the middle of each side for the convenience of the men when collecting tickets.

Rattan seats will be fitted to a few cars, as some pas-

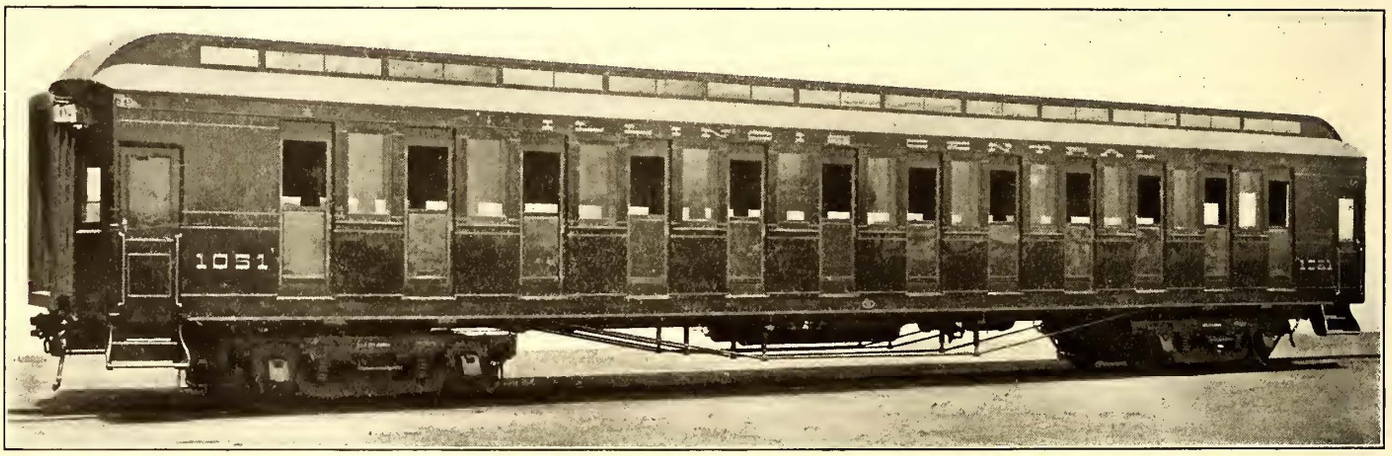


FIG. 7.—VIEW OF CAR WHEN SIDE DOORS ARE CLOSED

was tied tightly at the center. The bolt holes through the floor were also slotted. In the new cars all provision for expansion has been entirely omitted, as it is found not necessary, the cars being built tight from end to end.

These cars have proven the most economically heated and the best heated and ventilated of any cars of the company, the exhaust steam from the locomotive air pump being quite sufficient. Those cars having one-half partitioned off for a smoking compartment have simple swinging door therein, which is entirely successful in keeping tobacco odors and smoke from the other end of the car. It was feared this might not be accomplished. The reason for this success is thought to be the absence of any draperies or pockets which would obstruct the perfect circulation now obtained. The side doors have recorded against them no failures in closing or opening, as planned and desired in the severest of winter and summer weather.

In the new cars, slight changes found advantageous by experience in operation, will be adopted, and are as follows: Originally the edge of the door was made solid of wood. On new doors, this taper edge is cut away, leaving only a small moulding, and the edge is composed of rubber glued on, as shown in the horizontal section through the door. This is to avoid noise in closing. The edges of the rubber are tacked down by brads as a precaution against possible loosening of the glue by action of frost. The hand holes for opening the sengers have objected to the mahogany now used, although the new wood seats are much better in every way. The present cars are equipped with the hand signal bell cord, whereby the man in the last car in the train signals when he is ready to start to the man in the next car ahead of him, and this is transmitted car by car by hand to the locomotive cab. It is found that a greater delay is frequently occasioned by this method of signaling than by all the necessary work during a stop To avoid this a series circuit is being wired from the cab down one side of the train and up the other side, including every door in the train in series and back to the cab. This circuit is so arranged as to ring a bell in the cab when any door in the train is not locked, thus breaking the main circuit, hence the bell in the cab will ring during the five or six seconds of stop, and its cessation notifies the engine man that all is in condition for him to proceed. The hand-signal apparatus will still be maintained as a reserve system.

The capacity or these cars is 100 passengers seated, and 200 passengers standing. No extensive figures are available at present covering time required in continuous service for loading and unloading, but such tests will be made shortly. It is certain, however, that there is a great saving.

From the floor plan it is seen that the efficiency of this design, as regards loading and unloading, is equally high at full capacity and at minimum capacity, thus allowing great

uniformity of station stops, and improvement and regularity in schedule at all times of the day.

ADVANTAGES SUMMED UP

Mr. Sullivan, who is responsible for many of the features of the design of the car and for its adoption by his company, urges, among other things, the following points in its favor:

1. Steel construction throughout of the under frame and upper frame, giving greater protection to the passengers against accidents and from fire.

2. A floor plan combining with transverse seats an aisle on both sides of the car, affording access to every part of the car from either side.

3. Side doors which slide within the walls of the car, and end doors, with vestibules connecting all the cars, affording access from within to every part of the train.

4. Carrying capacity far in excess of any other car, with seats for the greatest number of passengers.

5. Perfect system of lighting, heating and ventilation.

6. Electric connection between the side doors of the entire train and the locomotive, giving signal automatically to the engine man of the opening and closing of door.

7. Absolute control by the train men of the opening and closing of the side doors.

8. Inability of passengers to expose themselves to danger.

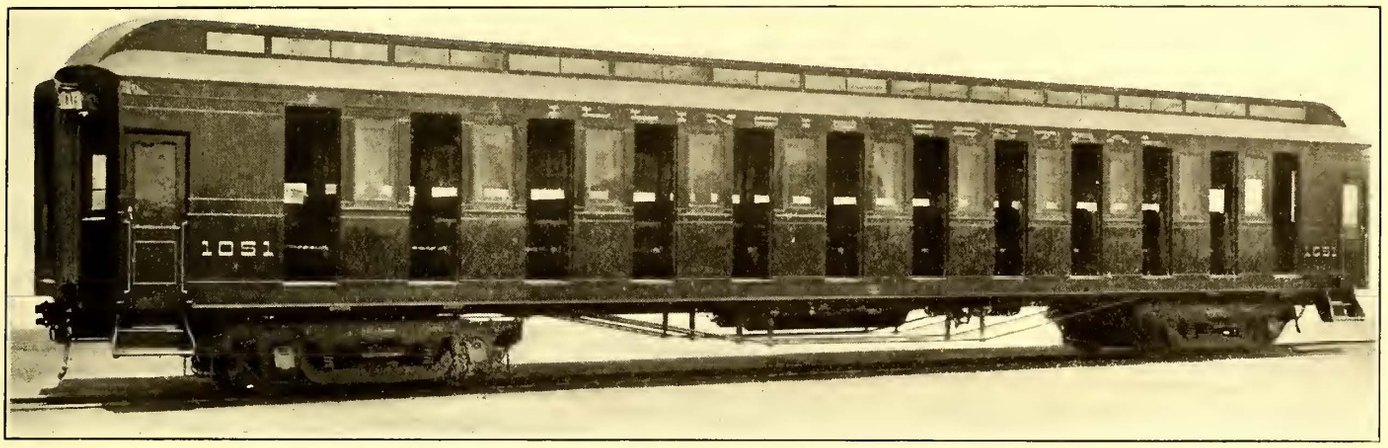


FIG. 8.—VIEW OF CAR WHEN SIDE DOORS ARE OPEN

9. Rapidity of loading and unloading passengers without disturbance of those who remain in the cars.

10. Distribution of passengers throughout the car or the entire train after it has resumed motion.

11. Distribution of passengers evenly on station platforms with assurance that the train can be entered at any point.

12. Short stops at stations, with consequent improved train schedules.

He further calls attention to the fact that while the seating capacity is 100 passengers, there is standing room for 200 more. During the rush hours the load is usually 210 to 225 per car. The cars first built weighed 84,600 lbs., but this will be reduced on those under construction. The net weight of car per passenger is less than can be obtained with any form of wooden construction. One new car takes the place of two old cars.

He reports that as many as forty-six passengers have been discharged from one car at an intermediate station in two seconds.

This speaks for itself as to the rapidity of unloading, which is the greatest single point in the car's favor. There is comcomparatively little difference in the time consumed by trains at stations as between a light and heavy business.

Aside from this one very important end being secured by the Illinois Central Railroad, is the increase in the passenger carrying capacity of its suburban service without any corresponding increase in its suburban terminal at Randolph Street.

THE WABASH & ROCHESTER ELECTRIC RAILWAY

The Wabash & Rochester Electric Railway, now under construction between Wabash and Rochester, Ind., will be constructed up to the standard of recent interurban practice, and will be a model for a road of its kind. The route between Wabash and Rochester extends through Roann, Gilead, Akron and Athens. The maximum grade will be 1 per cent, except in Wabash, where about 1 mile will have a maximum grade of 2 per cent. Larger ditches and small streams will be crossed either by concrete arches or small bridges, having Portland cement concrete abutments and steel stringers with standard bridge floor system of ties and guard rails. The bridge across Eel River at Roann will be of steel construction. The rails will be 70-lb. T type, except in towns where the girder or Shanghai rails will be used.

The power house will be of brick with stone or concrete foundation with steel roof trusses and tile floor, the building to be large enough to contain additional machinery equal to the present installation. The power house machinery will consist of two 750-hp heavy duty compound condensing engines, direct connected to two 500-kw three-phase 25 cycles revolving field type, alternating-current generators to operate approximately 125 r. p. m.

All wiring for high potential current will be suitable for 26,000 volt current. There will be three sub-stations of sufficient size to allow for a waiting room and ticket office.

The car house will be of brick with offices, stock room and repair shop, with capacity for ten cars.

The rolling stock will consist of six combination passenger cars, 50 ft. in length, with smoking compartment and toilet rooms. The motorman's compartment will be sufficiently large to provide for the carrying of baggage and express. The cars will be provided with hot water heaters and air brakes. There will also be two express cars of heavy construction.

ELECTRIC CAR AS AN AID TO LIFE SAVERS

An ingenious use of an electric car and its arc headlight was recently made at Redondo, Cal., a Pacific Coast town near Los Angeles. A lumber schooner which had anchored during the day off the beach broke her chains at night and was blown on to the shore. Efforts were immediately taken to rescue the men, and to assist the work, one of the interurban cars of the Los Angeles & Redondo Railway Company was run to a position back of the beach from where the bright illumination of its headlight could be thrown on the vessel. The bright rays gave some heart to the crew of the boat as well as materially aided the rescuers in getting a line to them. H. B. Ainsworth, secretary and manager of the railway company, directed the movements of the car.

REPAIR SHOP NOTES—PHILADELPHIA RAPID TRANSIT COMPANY

The Philadelphia Rapid Transit Company has made many improvements in the equipment of its Dauphin Street and Kensington repair shops, and now has unexcelled facilities for repair work in the maintenance of its rolling stock. The work of heavy repairs for the entire system is now concentrated in these shops to provide for all classes of work met in the service. Both shops are similarly equipped for heavy repairs with the exception that all wheel work is carried out at the Eighth and Dauphin Streets shops, while electrical construction and repair work is done at the Kensington shops only. Repair parts and stock materials are, however, interchanged between the two works as required by the varying classes of work on hand.

Many interesting shop kinks characterize the work of these shops. In the electrical department of the Kensington shops, where all commutators required for the system are built new, an interesting centering clamp or chuck is used for assembling the commutator segments; it consists of an adjustable or expandable ring, which acts as a chuck for clamping the commutator bars in position for fitting. This is a most convenient arrangement for building up, either in repairing or in assembling new commutators, as it may be used to hold the bars securely and accurately placed for boring and machining. In detail, it consists of a heavy, solid steel ring, with inwardly projecting set-screws which may be used to force inward the expandable ring or chuck, which consists of a series of steel segments interlocking each other with tongues and grooves; this is placed over the loosely assembled commutator segments when first set up and is clamped tightly around them by carefully moving the centering screws equally inward. This serves to bind the commutator so tightly together that it may be machined as a solid unit. The device has proven very effective and is the best arrangement of the kind that has yet been called to general attention.

The equipment at these shops for winding field and armature coils is very complete. All coils required for the motor repair work are form wound at the Kensington shops and insulated ready for use, large stocks of each type of coil being, of course, kept in stock for immediate use at any time. The winding forms are in most cases built of brass and are either of the well-known sectional or collapsible type for ease in removing coils after winding. They are mounted upon and operated by a very simple type of winding lathe, with a foot lever for starting and stopping. The entire winding systems have been reduced to methods of the greatest simplicity of operation, so that the work may be carried on by cheap labor and yet very carefully and thoroughly done.

Another labor saving method that has been introduced by Mr. Wampler, foreman of the Kensington shops, is for the cutting out of the insulating discs for protecting the armature windings at either end next to the shaft. The cutting out of these discs, both of cloth and in fibre, by hand formerly required the time of from three to five boys working constantly, but it is now done by a punching machine, which accomplishes the same work in a very small fraction of the time required by hand labor. This press is operated in a manner similar to the modern methods of cloth cutting, a hardwood plate upon the upper moving head being used to press upon a set of circular knives, with strippers, on the lower bed of the machine; in cutting out the discs several layers of the cloth or fibre are placed over the knives and the action of the press is that of driving the cloth down and past the knife edges, thus cutting out the discs to shape, while the spring stripper plates surrounding the knives push the cut discs out where they can be removed with ease. This machine is operated only a few hours, once or twice a week now, in order to replace the constant services of from three to five boys formerly required to cut by hand.

A notable feature of this shop is the use of jigs for the machining and drilling of duplicate parts, and also of punches and dies for the duplicate manufacture of sheet metal pieces in quantities. All castings that are required in quantities are machined by the use of carefully made jigs for ease of location in drilling holes and surfacing of parts. All contact fingers, connecting strips and other sheet metal pieces that are required in the repair or rebuilding of controllers and other electrical apparatus, are punched to size by special sets of punches and dies which are provided for each class of work; these dies are usually of the two-stage type, arranged to also locate the necessary holes in addition to stamping to size, so that the pieces are ready for use with no other machining. These jigs and dies, while expensive to build in the first place, are a source of great saving where the parts are required in quantities; the savings that have been effected at the Kensington shops by these processes are almost beyond the possibility of calculation.

The practice, which was some time ago instituted, of babbitting armature shells and of making the axle bearings of solid babbitt metal has proven very successful and is now being used exclusively. A further improvement has been added, however, in that now they have found it possible by the use of carefully sized mandrels to avoid the necessity of scraping the bearings to fit. They have found that the bearings and shells when poured with care, come out so closely to size that they may be placed in service with little or no scraping, as was formerly found necessary. The bearings soon wear down to a good surface after being placed in service, and no trouble whatever has been experienced from thus using them without scraping. This is an important saving in time and expense and has elsewhere also been found entirely feasible.

Another radical departure in detail of repair shop operation may be seen at these shops. In connection with the transfer tables, a traversing motor truck is used for shifting cars and car trucks to different parts of the shop. Some difficulty was found in devising a trolley for carrying current to the motor truck, but the problem has been solved in a novel and surprising manner. A system of depressed protected third rail was resorted to which provides protection from contact with machinery and from injury to the workmen. The conductor rail is embedded in the concrete flooring, with a slot opening above it extending to the surface; contact is made by a sliding shoe which reaches down through the narrow slot and bears on the rail. This slot is not more than 2 ins. wide and about 3 ins. deep, and is therefore so narrow that no difficulty is experienced whatever from personal contact and it has been found that pieces of machinery or apparatus can not easily get to it.

This arrangement of third rail has operated very successfully, no trouble having been experienced in its operation or from the dirt that will necessarily accumulate in the slot; the dirt is easily brushed out and a good contact is always to be had. One of the important features of this shop, however, which accommodates itself to this scheme is that of its remarkable cleanliness; it is one of the cleanest shops that can be found, which enhances the value of the depressed contact rail.

IOWA STREET & INTERURBAN RAILWAY ASSOCIATION

The Iowa Street & Interurban Railway Association was formed at Des Moines last week, April 21, at a meeting of the representatives of seventeen such companies operating in Iowa, held at the Kirkwood Hotel. The formation of this association is due to the efforts of George B. Hippee, general manager of the Des Moines City Railway. Very few companies were not represented. It was at first thought that the street railway men

might join in with the Iowa Electrical Association, which is an organization of Iowa electric light men, which held a convention in Des Moines last week at the same time that the street railway men met. After a conference between representatives of both, however, it was decided that it would be better to keep the two organizations separate, with the understanding that for the present the conventions of the Iowa Street & Interurban Railway Association and the Iowa Electrical Association shall be held at the same place the same week, and made to overlap one day so that topics of interest to both lighting and railway men can be taken up that day. This will suit the convenience of several members who operate both railway and lighting properties and who belong to both associations.

The first meeting of the Iowa electric railway men was held at 2 p. m. April 20, and a temporary organization effected. Permanent organization was completed Thursday morning, April 21.

The officers elected were: George B. Hippee, of Des Moines, president; J. F. Lardner, of Davenport, vice-president, and L. D. Mathes, of Dubuque, secretary and treasurer.

The constitution provides that the membership shall consist of companies or individuals operating street or interurban railways in the State of Iowa. The admission fee is $10 and the annual dues are $10.

The companies represented and officers present at the meeting were:

Des Moines City Railway Company—J. S. Polk, president; Geo. B. Hippee, general manager, and A. G. Maish, superintendent.

Tri-City Railway Company, Davenport & Rock Island—J. F. Lardner, secretary, treasurer and general manager.

Union Electric Company, Dubuque—L. D. Mathes, manager; J. R. Lindsay, secretary and treasurer.

Independence & Rush Park Street Railway Company—S. B. Hovey, manager.

Keokuk Electric Railway & Power Company—A. D. Ayres, president.

Marshalltown Light, Power & Railway Company—M. W. Hovey, general manager.

Mason City & Clear Lake Railway Company—F. J. Hanlon, vice-president and secretary.

Oskaloosa Traction & Light Company—J. F. Springfield, secretary.

Ottumwa Traction & Light Company—J. F. Springfield, general manager.

Sioux City Traction Company—E. L. Kirk, manager.

Tama & Toledo Electric Railway & Light Company—W. C. Walters, president and manager.

Waterloo & Cedar Falls Rapid Transit Company—Frank McDonald, purchasing agent.

Peoples' Gas & Electric Company, Burlington—W. L. Bowers.

Omaha & Council Bluffs Street Railway Company—R. A. Leusler, secretary.

Citizens' Electric Light & Gas Company, Centerville—Frank S. Payne, president.

Council Bluffs, Tabor & Southern Railway Company—Mr. West.

Interurban Railway Company, Des Moines—H. H. Polk, president.

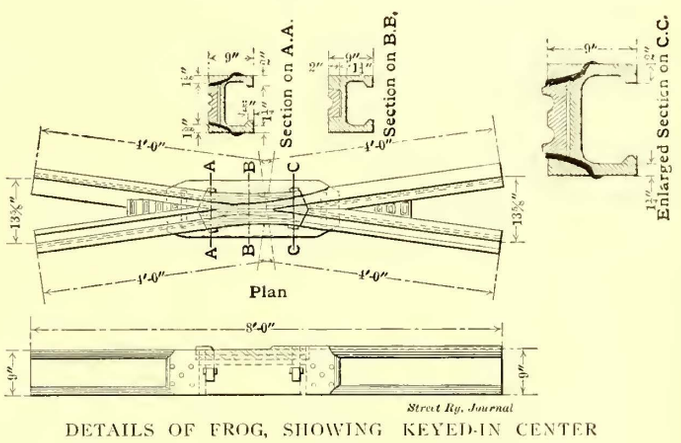
The next meeting will be in Dubuque in April, 1905.

SPECIAL WORK WITH INSERTED HARDENED CENTERS

The problem of obtaining special work with centers that will withstand the wear met in severe conditions of street railway operation has been a very difficult one for the track maintenance departments. The New York Switch & Crossing Company, of Hoboken, N. J., has developed a method of constructing street railway frogs, crossings and switches, with inserted hardened steel centers, which meets the requirements in a new and most satisfactory manner. Instead of casting or forming its special work with the wearing centers permanently in position, this company has adopted the method of inserting the centers into the special work, holding the same in place by a combined method of keying and babbitting, which has proven in practice to be a most secure method.

The accompanying illustration indicates clearly the method in which this is accomplished upon a frog. The rail ends are held in their relative proper position by the cast-iron body cast around them, as shown in the lower part of the sectional view; the wearing centers are located in the cored openings in the upper face and securely fastened there. In casting the supporting or binding body, small, flat holes are cored on either side of the face opening, left vacant for the wearing center, through which special malleable iron keys are driven in such a manner as to wedge the center tightly and hard down onto its bed. As shown in the drawing, the center is tapered inward at points opposite the cored holes in order to take advantage of the wedging effect of the keys. After driving the wedge keys in, they are secured in position by merely clinching the ends which project out at the sides below—these keys are shown in solid black in the drawing.

An important feature of this construction of special work is that, in inserting the hardened steel wearing centers, babbitt is poured in between the casting and the center before keying



DETAILS OF FROG, SHOWING KEYED-IN CENTER

the latter up tight. This causes all vacancies or openings between parts of the center and the frog casting to be filled up tightly so that the battering tendency of the jar and wear is minimized. After the babbitt is cooled the keys are driven tightly into place and clinched. An additional advantage of this keyed construction is that if at any time the wearing center should become loose, it may be readily tightened by merely driving the wedge keys further in; this can be done easily from the surface without disturbing the pavement or either side of the joint. In case it is desired to renew a wearing center it may be easily lifted out and a new one refitted, by merely disturbing the pavement on either side of the joint sufficiently to permit the wedges being driven out from below. After the new center is in place new wedges are driven in as before.

For all wearing centers this company uses the very best grade of hammered 40-point steel, which is carefully hardened after being machined to shape. This in conjunction with the novel keying and babbitting method of fastening in the wearing center, makes the work very durable.

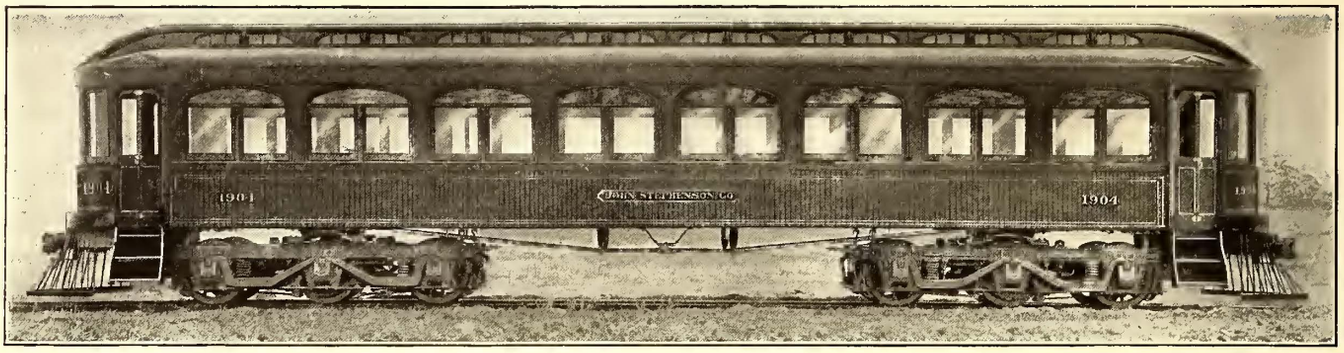
The method of casting-in of the steel centers has proven to be an absolute failure, principally on account of the unequal shrinkage between the steel and the iron portion, which inevitably causes eventual loosening of the center. The new method here described was invented to prevent this disagreeable and destructive loosening, and it has been entirely successful.

It is found that these centers are very durable, as they will wear almost indefinitely and rarely, if ever, give trouble. This method of inserting the centers is also found to be very successful, as they universally remain absolutely tight; special work of this type has been in use for several years in all classes of service and has been used under the most severe conditions that can be found in street railway operation, and has yet to meet with failure.

CAR FOR HIGH-SPEED TRACTION

Among car builders, the John Stephenson Company was one of the first to recognize the possibilities of high-speed traction, and as a result of this belief it has given considerable attention toward designing cars whose construction would permit them to run with entire safety at speeds even as high as 120 m. p. h. The company has now completed a car of this type, and has arranged to exhibit it at the Louisiana Purchase Exposition, where visitors will have ample facilities to examine its merits.

The car body is framed very rigidly, being exceptionally well braced and trussed to withstand the heavy and severe strains experienced in high-speed service. The principal dimensions are: Total length, 61 ft. 6 ins.; length over the corner posts, 46 ft.; length over the bumpers, 51 ft.; width over sheathing, 8 ft. 9 ins.; height from bottom of sill to top of roof, 9 ft. 8 ins.



VIEW SHOWING SIX-WHEEL TRUCKS, DOUBLE VESTIBULES, ROOF CONSTRUCTION AND OTHER EXTERIOR DETAILS

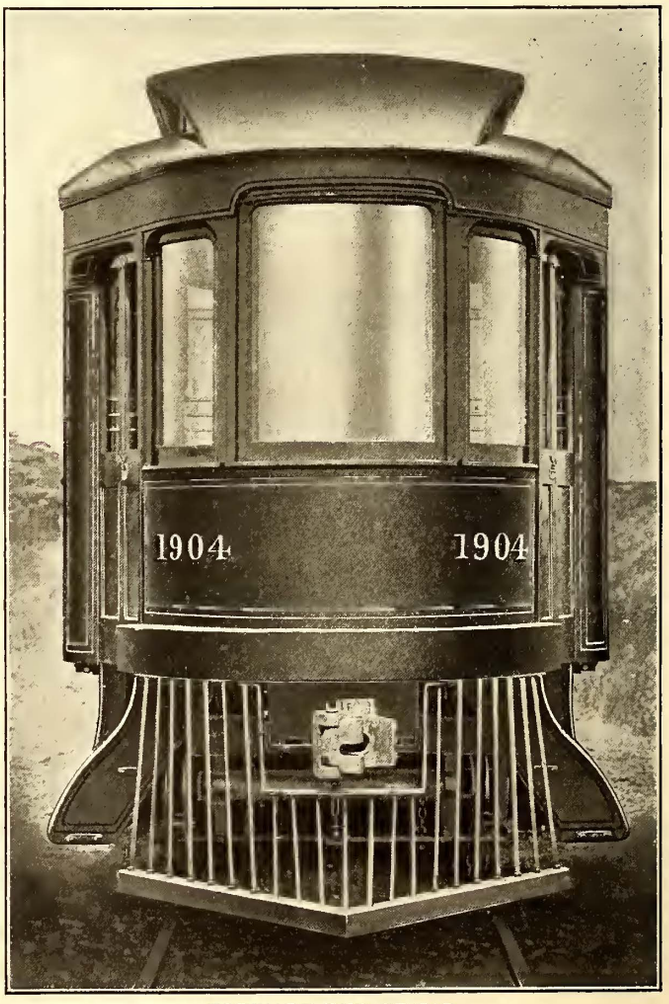
The floor framing consists of six sills, the four center sills being 6-in. I-beams, with wood fillers, extending the entire length of the car. The side sills are double, and are made of yellow pine, with steel plate sandwiched between them. The cross bars are of malleable iron, each carrying two tie rods. They are so arranged that electric or air brake apparatus may be easily suspended from them. On top of these bars is laid ¼-in. Transite board. The floor is placed above this and securely fastened to the fillers of the side and center sills. All of the wood fillers are also covered with Transite board, thus greatly reducing the possibility of fire in the entire underside of the car, and at the same time producing a frame that will not give out the disagreeable resonance common in cars constructed entirely of metal.

The bottom frame is equipped with built-in double bolsters, having steel centers, all parts being machine-fitted. Special care has been taken in the construction of these bolsters to make them as rigid as possible. The king pin is 3 ins. in diameter, and the center is exceptionally heavy. The total weight of the bottom frame is 20,000 lbs.

The car is divided into three compartments—passenger, smoking and private. The passenger compartment is finished in quartered oak, and has rattan upholstered walk-over seats. The smoking compartment is finished in cherry, and has leather upholstered vis-a-vis seats. The private compartment is finished in mahogany, and is furnished with six plush-covered revolving chairs. The total seating capacity of these compartments is fifty-two. The builder used a different finish for each compartment for the purpose of giving the railway men inspecting this car an opportunity to note the various results obtained by the use of different woods.

The car platforms, or vestibules, are constructed to accommodate one or two operators, according to conditions, and are not made to carry passengers. Although the vestibule is somewhat small there is enough room in the center to permit the motorman to operate, and at the same time allow free passage to and from the car for other persons. The vestibules taper toward the car ends so as to present the least possible air resistance.

As the car is intended to run smoothly even at the highest speeds, the company built for it special six-wheel trucks. These trucks will tend to make roadbed defects far less apparent to travelers than if four-wheel trucks were employed. On account of the motors these trucks will carry, they are built heavier than the ordinary six-wheel truck. The side frames are made of I-beams with solid steel fillers, all of these fillers being milled and machine fitted. The truck bolster is of special construction, and built exceptionally rigid. The oil boxes are of malleable iron. All other castings are either of malleable iron or steel, gray iron being used only for the brake-shoes. The wheels are 36 ins. in diameter, steel tired, with M. C. B. standard treads and flanges. The flange has been omitted on the center wheels to enable the trucks to take 60-ft. curves. The wheel base of the driving axles is 10 ft. 4 ins. The axles are 6½ ins. in diameter, with 5-in. x 9-in. journals. The weight of each truck is 19,000 lbs.; weight of complete car, 76,000 lbs.



FORWARD END OF CAR

FINANCIAL INTELLIGENCE

Wall Street, April 27, 1904.

The Money Market

The two features of the week's money market have been the heavy exports of gold on the one hand, and the further large receipts of currency from domestic sources on the other hand. The leading question now is how nearly these two movements are likely to balance during the coming weeks. Hitherto income has very greatly exceeded outgo. The Japanese gold consignments, coming together with the extraordinary return of cash from the interior has, notwithstanding the withdrawals of gold to Europe, raised the reserve holdings of the local banks to an unparalleled total. Last Saturday's statement showed a further gain of $11,000,000 in specie and legal tenders, and a surplus reserve the largest sum for the period in recent years. This superabundant money supply, taken in conjunction with the falling demands for mercantile and speculative purposes, explains, of course, the almost nominal figures at which loans are now offered. Call money on the Stock Exchange continues to rule at from 1 to 1¼ per cent, sixty-day money at 2½ per cent, while loans for six months and longer are being negotiated commonly at 3¾ per cent. But opinion in banking circles is getting stronger that a decided change is likely to occur befor very long. Within the last few days a great impetus has been given to gold exportations. On Saturday and Monday alone engagements of $6,700,000 were made, and yesterday's steamer carried out to France the full capacity allowed for a single consignment for the precious metal. Following this large out-flow sterling exchange has reacted somewhat, and were the conditions as they were a fortnight ago, a pause in the shipping movement might be expected. As it is, however, the sterling rate has declined again at Paris to the lowest of the season, thus affording an offset to the lowering of our own rate, while the nearer prospect of another great Russian loan to be floated on the Paris market has revealed a strong additional incentive to the accumulation of gold by the French banks. The chances seem to be that the outgo of gold will continue rapidly, and that New York banking reserves during the next few weeks will be curtailed, in which event some hardening of local money rates is probable.

The Stock Market

The stock market has now fairly settled back into the rut which it occupied before the Northern Securities decision six weeks ago. Trading has dwindled to small dimensions and a series of petty fluctuations in prices with the tendency slowly downward makes up the record of the past week. Absence of real investment demand has become more painfully apparent than ever. Investment capital is heavy enough to go into the high-grade issues which stand outside the speculative arena, but it positively refuses to have anything to do with the ordinary favorites of the Stock Exchange. As for the speculative public, they have scarcely been a factor in this season's market, and the recent dealings have merely shown their absence more forcibly than at any other time. Professional traders make up the daily business and the larger interests seem content to let them have a free rein. Under these circumstances liquidation has naturally cropped out in various quarters, not in sufficient quantity to cause any sharp decline, but enough to discourage operations for the rise and to expose the market to the attack of bearish speculators. The bear party has made considerable headway against the steel shares, which are down again to within a short distance of last autumn's low prices. A general feeling exists that the policy of the Steel Corporation management in maintaining the 7 per cent stock dividends was unwarranted, and this conviction has been strengthened by the recent trade reports, indicating that the recent trade revival was more or less in the nature of a flash in the pan. The uncertainty of the outcome of the interminable Northern Securities litigation has had a depressing effect upon all the stocks concerned, Union and Southern Pacific suffering the worst of any. Along with this, the extraordinary duration of the cold spell throughout the country, interfering, as it has, with railway traffic, has been additional reason for the weakness in the railway share list. It is altogether not a very pleasing prospect which confronts Wall Street at the moment. Even the most sanguine are forced to admit that there is not much of a chance for an important advance in prices until the outlook for the crops is clearer, and until it can be seen more distinctly what effect the presidential canvass is going to have on business and finance.

The local traction stocks have displayed a rather better resistance to the general tendency than any other group. There is no special reason for this, apart from the comparatively independent position which these shares always occupy in the market. Brooklyn Rapid Transit has been the active specialty and undoubtedly is one of the few objects on which bullish efforts are willing to concentrate. According to one reliable authority, a speculative party which has just completed a successful turn in Consolidated Gas has ventured its profits on the long side of Brooklyn Rapid Transit. This would account for the leadership which this stock has assumed during the brief periods when the general market has been inclined to move upward. No further signs of the recent liquidation are visible in Metropolitan. Both this stock and Manhattan have merely followed the general fluctuations in prices.

Philadelphia

Some rather heavy buying of bonds—an obvious reflection of reviving investment activity elsewhere—has been the main development in Philadelphia during the past week. Consolidated Traction of New Jersey 5s, which have been selling around 105 for some time, were taken in large blocks up to 106. Fractional improvement occurred in the other traction bonds, like People's Passenger 4s and Electric People's Traction 4s. Consolidated of New Jersey stock was systematically affected by the strength in the bonds, 200 shares changing hands from 64½ up to 65. Union Traction and Philadelphia Traction held their recent rise, the former selling at 49⅝ and 49¾, while the latter sold between 96 and 95¾. Philadelphia Company common was notably strong, advancing from 38¼ to 39½, but later receding to 38¾. On the other hand, Philadelphia Electric showed the ill effect of further liquidation, induced by the rumor of an assessment coming on the shares. Rochester Passenger was a feature, selling at 99, with 100 bid later. Fifty shares of Hestonville Passenger preferred went at 71½, Pittsburg preferred sold at 49¼, Reading Traction (125 shares) at 29¾, Philadelphia Rapid Transit at 13¼ to 13½, and two or three odd lots of American Railways at 44½.

Chicago

The recent decision of the Appellate Court sustaining the contention of the shareholders of the underlying properties, has placed Union Traction Company affairs in a tangle that even the lawyers themselves do not see their way out of. It is now the opinion that this ruling will cause the modified leases to be overthrown on the ground that the Union Traction Company has forfeited all rights since it has defaulted on payments of the guaranteed rentals, and that consequently the North and West Chicago lines will be turned back to their old owners. This new development has caused a fresh outburst of liquidation in the securities concerned, more particularly in West Chicago stock, which has made the new low record of 38 during the past week. Five hundred shares were sold on the decline from 40½. Only one transaction occurred in North Chicago, but this was made at a loss of 3 points from the last previous sale, the stock changing hands at 70. Union Traction issues have not been particularly affected by the decline in the subsidiary shares. The common sold as low as 5⅝, but later recovered to 5⅞ while the preferred, after touching 30¼, recovered to 31. Metropolitan issues have again been somewhat weak, especially the preferred, which lost a point from 47 to 46, on a few scattering sales. The common, after selling as low as 15, recovered to 15¾. Two hundred shares of Northwestern Elevated common sold between 16¼ and 16, and later a minor lot went at 15⅝. One sale of the preferred occurred at 44. One hundred shares of South Side sold at 92. Lake Street receipts sold as high as 3⅝, and as low as 3¼, ending at 3½. A few small blocks of City Railway were dealt in at 160.

Other Traction Securities,

The feature of the week's dealings in Boston has been the sharp rise in Elevated, which went up from 140⅛ to 142½ on transactions of over 1000 shares. The unusual activity in this stock is ascribed to a demand from investors desiring to put their funds in non-taxable securities before the State assessments are taken on May 1. For the same reason West End issues have been strong, though

much less active, the common holding at 92½, and the preferred gaining a point from 112 to 113. A recovery in Massachusetts Electric carried the common up from 19 to 20⅜; the preferred, however, after reaching 75, reacted to 74. In Baltimore there have been no transactions in United Railways stock during the week. The income bonds continued weak, dropping from 50⅞ to 50½, but the 4 per cent bonds were firmer, recovering from 89¾ to 90½. Other sales for the week included Macon Railway & Lighting 5s at 91½, Anacostia & Potomac 5s at 96, City & Suburban (Baltimore) 5s at 114, City & Suburban (Washington) 5s from 98⅝ to 100, Lexington Street Railway 5s from 99 to 99½, Atlanta Street Railway 5s at 105¼, Knoxville Traction 5s at 101, and Norfolk Street Railway 5s at 107.

Speculation in Miami & Erie Canal Transportation stock continues the feature of the Cincinnati market. Several lots sold early in the week at ⅞, and then large blocks changed hands at ½; total sales were 2200 shares. The impression is gaining ground that a stock assessment will be made and holders are anxious to unload at any old figure. Cincinnati Street Railway was active and reached a new high mark of 139¾; sales 620 shares. Cincinnati, Covington & Newport preferred sagged to 85, and the common to 30⅛, sales in both being small. The first consolidated bonds of this company sold to the extent of $11,000 worth for 109 to 109½. Detroit United sold at 64, Toledo Railways & Light at 21½, and Cincinnati, Dayton & Toledo at 21, all small sales. Columbus Street Railway 5s sold at 106 for $7,000 worth.

Columbus Railway & Light was active at Columbus, and there were several sales at 40; more was offered at this price. Columbus Railway common was in good demand at 92. Columbus, Delaware & Marion preferred has been very active at around 90, and the demand exceeds the supply at this figure. Columbus, Buckeye Lake & Newark Traction preferred is also in good demand at 90. Rochester Railway preferred was wanted at 95, Springfield (Ill.) Railway & Light at 34½, East St. Louis & Suburban at 68, and Grand Rapids Railway preferred at 84½, and the common at 50.

At Cleveland, Northern Texas Traction featured and advanced to 36, making a high point record. A small amount of Miami & Erie Canal was unloaded at ⅞. Cleveland holders are less anxious to sacrifice than those in Cincinnati. There was considerable bidding for Aurora, Elgin & Chicago 5s, bids being three points above last sale; holders are asking 80 for these bonds. Cleveland Electric sold at 74 for a small lot.

Security Quotations

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

	Closing Bid	
	April 19	April 26
American Railways	44	44
Aurora, Elgin & Chicago	a15	a14
Boston Elevated	140	142
Brooklyn Rapid Transit	44¾	46½
Chicago City	a162½	155
Chicago Union Traction (common)	5¾	5½
Chicago Union Traction (preferred)	30¼	30¼
Cleveland Electric	73½	72½
Consolidated Traction of New Jersey	64	64
Consolidated Traction of New Jersey 5s	105¾	106½
Detroit United	62	61⅜
Interborough Rapid Transit	107½	107⅝
Lake Shore Electric (preferred)	a40	—
Lake Street Elevated	3	3⅜
Manhattan Railway	141¾	142⅛
Massachusetts Electric Cos. (common)	19	20
Massachusetts Electric Cos. (preferred)	74¼	73
Metropolitan Elevated, Chicago (common)	15	15
Metropolitan Elevated, Chicago (preferred)	46½	46
Metropolitan Street	111¼	113
Metropolitan Securities	77¼	79½
New Orleans Railways (common)	9½	8
New Orleans Railways (prefered)	28½	28
New Orleans Railways 4½s	75	75
North American	81	82½
Northern Ohio Traction & Light	13	13
Philadelphia Company (common)	38⅜	39
Philadelphia Rapid Transit	13⅜	13½
Philadelphia Traction	95¾	96
St. Louis (common)	11¾	11¾
South Side Elevated (Chicago)	91	91
Third Avenue	120	120
Twin City, Minneapolis (common)	91	92¾

a Asked. * Ex-dividend.

	Closing Bid	
	April 19	April 26
Union Traction (Philadelphia)	49⅝	49⅝
United Railways, St. Louis (preferred)	53	53
West End (common)	92	92
West End (preferred)	111	112

Iron and Steel

The trade reports which have come to hand during the last ten days have suddenly weakened the more optimistic feeling which had begun to appear in the iron market. Doubt is now cast on the stability of the recent improvement, as something which went ahead too rapidly to last. In their haste to avoid a runaway market consumers of pig iron undoubtedly over-reached themselves in the active buying movement which set in six weeks ago. When the Steel Corporation canceled its large option order it gave the whole trade a rude awakening. Buyers saw they had been in too much of a hurry, and began abruptly curtailing their demands. Prices have not yet fallen, but it is a great question in view of the enormous addition to the recent output of iron whether a price reaction will not soon be due. The whole market continues to suffer severely from the shrinkage in the railway orders which are a part of the general policy of retrenchment that the railroad companies have inaugurated. This fact weighs much more than whatever slight improvement there might have been in the business supplied by the building industry. Quotations are as follows: Bessemer pig iron $13.85, Bessemer steel $23, and steel rails $28.

Metals.

Quotations for the leading metals are as follows: Copper 13¼ to 13⅜ cents, tin 28 to 28⅛ cents, lead 4 7-16 cents, and spelter 5¼ cents.

CHESAPEAKE TRANSIT MAKES PURCHASE—EXTENSIONS AND IMPROVEMENTS

The Chesapeake Transit Company, which operates an extensive electric railway system connecting Norfolk, Cape Henry and Virginia Beach, Va., has acquired control of the Norfolk & Southern Railroad, a steam line which has been a competitor of the Chesapeake Transit for the Norfolk-Virginia Beach traffic.

A. H. Flint, of Flint, Bacon & Company, of New York, formerly Flint, Jones & Company, is president of the Chesapeake Company, and J. C. Chaplin, president of the Colonial Trust Company, of Pittsburg, Pa., is vice-president. These gentlemen, together with Henry Sproul, of the New York and Pittsburg banking and brokerage house of Henry Sproul & Company, and J. T. Bacon, of Flint, Bacon & Company, compose the new directorate of the Norfolk & Southern, vice Chauncey M. Depew, Chas. T. Cox, E. V. W. Rossiter and George R. Turnbull, who have resigned. The new president of the railroad is A. H. Flint, he having succeeded John Carstensen, fourth vice-president of the New York Central Railroad, who, however, will remain on the Norfolk & Southern board. Henry Sproul has been appointed vice-president in place of Alfred Skitt. William S. Langford has been chosen as secretary and assistant treasurer. J. C. Chaplin is treasurer under the new regime.

The Chesapeake Transit Company now has 32 miles of electric railway in operation and proposes to equip electrically the steam line of the Norfolk & Southern lying between Norfolk, Virginia Beach and Cape Henry, a total distance of 27 miles. The company also intends to electrify the 22-mile line which runs from the Kempsville junction of the Norfolk & Southern to Munden's Point on Currituck Sound. This will give a total of 81 miles of electric lines. The central power station at Lynnhaven has a capacity of 2000 hp. It is equipped with General Electric apparatus, and the General Electric Company is now drawing up plans for the necessary machinery, etc, to take care of the proposed new mileage. Sub-stations will be built at both Kempsville and Virginia Beach. The additional cars to be used will be of Stephenson build.

Mr. Flint denies that the Gould interests are concerned in the Chesapeake, Norfolk & Southern deal.

COMPANY'S OFFER VOTED DOWN AT SAN FRANCISCO

The latest information concerning the negotiations being carried on between the United Railroads, of San Francisco, and its employees for a new working agreement to date from May 1, is that the men have just voted not to accept the terms of the company as given in detail in the Street Railway Journal of April 23.

FAVORABLE REPORT OF NEW YORK CITY RAILWAY COMPANY'S SUBWAY PLAN

The plan and scope committee of the Rapid Transit Commission, of New York, on Thursday, April 21, practically decided to report to the commission in favor of the subway route proposed by the New York City Railway interests a few weeks ago. This runs down Lexington Avenue to Irving Place and Fourteenth Street, thence to Broadway, to Chambers, to William, through the financial district, and around the Battery, through West and Hudson Streets, up Eighth Avenue to Thirty-Fourth Street, and thence east to Lexington Avenue. It would afford a large loop system for the lower part of the city, and connect with the Grand Central Station and the new Pennsylvania station at Thirty-Third Street and Seventh Avenue. It is understood that the plan and scope committee are in favor of modifying this route so as to make it feasible for the Belmont interests to bid for the contract when it is let. Details of the proposal of the New York City Company, together with a map, were published in the STREET RAILWAY JOURNAL of March 5, 1904. The estimated cost of this subway on the lines favored by Chief Engineer Parsons is in the neighborhood of $30,000,000.

Another thing favorably considered by the committee was the proposed route of an extension of the Brooklyn extension from Flatbush and Fourth Avenues down Fourth Avenue to Fort Hamilton. With this scheme is a tentative proposition for a new subway to run from the Williamsburg end of the new bridge to East New York. A subway over this route would be about 5 miles in length, and on account of the difficulty of constructing where an elevated road already occupies the street, its cost is put at $10,000,000. The extension down Fourth Avenue would cost not to exceed $6,000,000.

Importance is added to the decision arrived at by the plan and scope committee by the signing by the Mayor, of the two rapid transit bills which enable the commission to contract for new subways without being hampered by a $50,000,000 limit.

The Twenty-Eighth Ward Board of Trade, of Brooklyn, has sent plans to the committee for a tunnel from Union Square to Jamaica. The plans have been indorsed by every Board of Trade in the Eastern District, Brooklyn. They provide for a tunnel starting from Union Square, through East Fourteenth Street, New York, under the East River to North Seventh Street, Brooklyn, thence to Union Avenue, to Broadway and to Jamaica.

THE TERMS OF THE CONSOLIDATION OF THE APPLEYARD PROPERTIES

A. E. Appleyard & Company, of Boston, who control several important interurban properties in Ohio, have announced their plan for consolidating the various properties into the Ohio Union Traction Company, which was incorporated a short time ago. Holders of stocks and bonds of the Dayton, Springfield & Urbana Railway Company; Columbus, London & Springfield Railroad Company; Columbus, Grove City & Southwestern Railroad Company; Central Market Street Railway Company; Urbana, Bellefontaine & Northern Railway Company, Kenton & Southern Railway Company and Springfield & Western Railway Company are given until May 1 to exchange their 5 per cent bonds for the Ohio Union Traction Company's first and consolidated mortgage fives, based on their respective market values as follows:

For each $1,000 5 per cent bond of the Dayton, Springfield & Urbana Railway Company 110 and accrued interest in Ohio Union Traction Company first and consolidated mortgage 5 per cent gold bonds.

For each $1,000 5 per cent bond of the Columbus, Grove City & Southwestern Railway Company 105 and accrued interest in the Ohio Union Traction Company first and consolidated mortgage fives.

For each $1,000 5 per cent bond of the Central Market Street Railway Company 107 and accrued interest in the Ohio Union Traction Company first and consolidated mortgage fives.

For each $1,000 5 per cent bond of the Urbana, Bellefontaine & Northern Railway Company 105 and accrued interest in the Ohio Union Traction Company first and consolidated mortgage fives.

For each $1,000 5 per cent bond of the Kenton & Southern Railway Company 100 and accrued interest in the Ohio Union Traction Company first and consolidated mortgage fives.

For each $1,000 5 per cent bond of the Springfield & Western Railway Company 105 and accrued interest in the Ohio Union Traction Company first and consolidated mortgage fives.

For each share of Central Market Street Railway Company preferred stock 100 and accrued dividend in the Ohio Union Traction Company first and consolidated mortgage fives.

For each share of Central Market Street Railway Company common stock 30 in the Ohio Union Traction Company first and consolidated mortgage fives.

For each share in the Dayton, Springfield & Urbana Electric Railway Company preferred stock 95 and accrued dividend in the Ohio Union Traction Company first and consolidated mortgage fives.

For each share of the Columbus, London & Springfield Railway Company common stock 50 in the Ohio Union Traction Company first and consolidated mortgage fives.

For each share of the Columbus, London & Springfield Railway Company preferred stock 70 and accrued dividend in the Ohio Union Traction Company first and consolidated mortgage fives.

In all of the above exchanges of stock there will be 100 per cent bonus of common stock of the Ohio Union Traction Company. One hundred dollar receipts will be issued for parts of the amount, and fractions of $100 will be paid in cash.

Exchange mediums designated are A. E. Appleyard & Company, Philadelphia and Boston; Central Trust & Safe Deposit Company, Cincinnati, Ohio; Third National Bank, Dayton, Ohio; City Deposit Bank, Columbus, Ohio, and the Springfield National Bank, Springfield, Ohio.

An official statement is made by the company that the total bond issue, including the underlying issues, will not exceed $30,000 per mile of single track and $10,000 additional per mile of double track of main line, exclusive of turn-outs and sidings, outside of cities, and over $60,000 per mile of single track and $40,000 additional per mile of double track of main line, exclusive of turn-outs and sidings within cities, except that where lines are situated upon unpaved city streets the limitation shall be reduced by $5000 per mile.

The authorized capital stock of the companies to be consolidated is about $4,500,000, and the system includes about 165 miles of track, nearly all in operation.

PROFIT SHARING NOTES OF THE LONDON UNDERGROUND RAILWAY

Speyer & Company and Blair & Company, of New York, offer $10,000,000 5 per cent profit-sharing secured notes, due June 1, 1908, of the Underground Electric Railways Company, of London, England. The notes are offered at 96½ and interest. This is part of an issue of £7,000,000 sterling, of which $16,650,000 are payable in United States gold. The proceeds of this issue of notes are being used for the construction and equipment of the railways of the tube companies, and for electrically equipping the existing lines of the Metropolitan District Railway Company.

The Underground Railways Company of London, Ltd., has a capital of £5,000,000 fully subscribed (£2,500,000 paid up), and will control, through the ownership of securities and leases, the following railways:

Metropolitan District Railway, Baker Street & Waterloo Railway, Great Northern, Piccadilly & Brompton Railway, Charing Cross, Euston & Hampstead Railway, London United Tramways.

The Metropolitan District Railway is at present being operated by steam locomotives, but it is confidently anticipated that the electrical equipment will be finished and the road in operation under the new system by the end of 1904. The Baker Street & Waterloo Railway, Great Northern, Piccadilly & Brompton Railway, and the Charing Cross, Euston & Hampstead Railway are tube roads under construction. The greater part of the running tunnel of the Baker Street & Waterloo Railway, including the portion under the Thames, has been completed, and it is anticipated that this railway will be completed and in operation by the end of 1904, or shortly thereafter. The other two roads, it is expected, will be completed and in operation some time during 1904. The underground roads, when completed, will be about 45 miles in length. The London United Tramways system consists of about 30 miles of surface lines operated electrically.

The trust deed covering the notes provides that in case of the sale, while any of the notes remain outstanding, above 95 per cent. of any of the deposited ordinary shares of the tube companies one-half of the net profit shall be set aside by the company or trustee, whichever may receive same, for equal pro rata benefit of the notes outstanding.

The articles of association provide that Speyer & Company, of New York, the Old Colony Trust Company, of Boston, and Speyer Brothers, of London, shall during a period of ten years have the right to nominate a majority of the directors for the time being of the company, thus insuring a continuity of management.

Tickets for the through trip from Indianapolis, Ind., to Dayton, Ohio, have been placed on sale by the Dayton & Western Railway, the Richmond Street & Interurban Railway, and the Indianapolis & Eastern Traction Company. It is reported there is a good demand for them.

THE WORK OF THE LEGISLATIVE COMMITTEE OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

The legislative committee of the Ohio Interurban Railway Association will make an interesting report at the meeting of the association to be held in Cleveland this week. The committee, composed of Warren Bicknell, president of the Lake Shore Electric Railway; H. C. Lang, of the Western Ohio Railway, and Judge Dennis Dwyer, of the Dayton, Covington & Piqua Railway, was appointed at the time of the Dayton meeting a month ago and had only a very short time to work in the Legislature, which adjourned last Saturday. During that time, however, the committee accomplished results that will be invaluable to the interurban lines of the State.

The most important step was the defeat of the Judy bill and the passage of the Bruce bill as a substitute. The Judy bill provided that electric roads should be taxed the same as express companies, telephone and telegraph companies, the basis being on the total of stocks and bonds issued. The result of such a bill would have been most disastrous. This bill had been favorably reported to the House and would undoubtedly have passed except for the efforts of the committee.

The Bruce bill, substituted for the above, provides that interurban roads shall be taxed the same as steam roads. The auditors of the various counties through which a line passes form an appraising board, and the taxes are distributed throughout the various counties upon a basis of the miles of road in a certain county. One of the most advantageous features of the bill is that power houses are considered as a part of the rolling stock of the road and not real estate, hence the tax on power stations is scattered throughout the various counties through which a road extends, instead of being taxed in the town in which it happens to be located. This has been the rule in the past, and where a power station had been located in a large city, the taxes have been excessively heavy. Heretofore the taxation of interurban roads has been indefinite, no law governing this point. While the Auditor of State has always instructed county auditors to tax such roads on the basis of steam roads, there has been no hard and fast rule on the subject, and where the village and township assessors have been familiar with the situation they have frequently caused the roads considerable inconvenience. In a great many cases after the county auditors have made their appraisments, the local boards of revision in villages and towns ships have stepped in and increased the tax on certain pieces of property. The interurban managers have been obliged to appeal to the State Board of Revision, as the State Auditor declined to take action on the matter, claiming there was no special legislation on the subject. It is apparent, therefore, that the passage of the Bruce bill will relieve interurbans of a large amount of trouble and excessive taxation. The legislative committee was assisted in the passage of this bill by a number of prominent electric railway men from various portions of the State.

The committee secured the passage of the Chapman bill, which makes possible the consolidation of interurban roads that are physically connected or that may be operated from one power station.

The Overturf bill, relating to grade crossings of interurban roads with steam roads, was passed. Heretofore the new road has been obliged to pay for the grade crossing. The bill saddles part of the expense of a grade crossing upon the old road.

The Hoiles bill, granting police powers to motormen and conductors, was passed, but it was amended through the efforts of the committee. The amendment provides that there shall be but one special policeman to 5 miles of track. This will enable the companies to select the men they desire vested with police authority.

The Heinlein bill, giving interurban roads the right of eminent domain in municipalities, was an important victory. This will enable interurban roads to condemn private right of way into a city or towns the same as a steam road.

Several obnoxious measures were killed through the efforts of the committee, among them the following:

The Schumen bill, which placed a special excise tax on interurban roads doing express business.

The Judy bill, which required the use of radiators or heaters in vestibules.

The Reynolds bill, which required electric roads to furnish the defendants with the names of witnesses in cases of accidents.

The Thomas bill, which required interurbans to erect waiting rooms at all stopping points, but not closer than one to the mile.

The Eggleson bill, which required roads to maintain overhead lights at all stopping points.

The Lerch bill, which required interurban roads to pay for sprinkling tracks in municipalities through which they pass.

MUNICIPAL OWNERSHIP SCHEME IN CHICAGO

The Municipal Ownership Central Committee has given out the following statement as the first steps urged toward municipal ownership under the Mueller law, which was adopted at the recent election:

For the purpose of testing the feasibility and legality of issuing street railway certificates under the Mueller law in order to raise money to pay for the street railroads of Chicago, the committee has decided to urge the acquisition of the lines of the Chicago Passenger Railway, either in toto or simply those which expire April 21 next. The reason the committee selected the Chicago Passenger Railway is because neither it nor its franchises are in any way affected by the ninety-nine-year act; because a large part of its franchises expire April 21 next, and the last April 8, 1906, and because the company is bound to remove its tracks and restore the street pavement at the end of its grant.

For the purpose of testing the power of the city to condemn the property and franchises of the street railway companies and for the purpose of obtaining a ruling as to the value of a franchise, the committee will urge that a suit be instituted to condemn the Clark Street and Wentworth Avenue line of the Chicago City Railway, which line raises most, if not all, of the questions to be raised concerning condemnation.

It is rumored that the receivers of the Chicago Union Traction Company and the shareholders of its underlying companies are unable to agree upon certain expenditures for improvements as opposed to apply the money toward dividends.

BILL FOR EMINENT DOMAIN IN MASSACHUSETTS

The committee on street railways of the Legislature has voted unanimously to report a general bill authorizing street railway companies of Massachusetts to take land by right of eminent domain.

The bill which the committee will report is as follows:

Section 1. No street railway company shall begin to construct any part of a proposed extension located subsequent to the first day of January, nineteen hundred and four, unless the same lies entirely within the limits of a single city or town, or incur any liabilities or issue any securities on account of such extension, and no company established subsequent to said date shall begin the construction of any part of its railway, or incur any liabilities or issue any securities, until the directors shall have complied with section thirty-nine of chapter one hundred eleven of the Revised Laws, all the provisions of which are hereby extended to street railway companies, nor unless the board of railroad commissioners shall grant a certificate that in their opinion the proposed railway or extension can be completed within the estimate of cost required by said section, and that the same when equipped for operation will be able to meet its proper fixed charges and the expenses of its suitable maintenance and operation, and that public necessity and convenience require the construction of the proposed railway or extension for the public accommodation in addition to that which is already furnished by existing railroads and street railways, or which, in the opinion of said board, the owners thereof are willing and able to furnish at less cost to the public for construction and equipment. In any proceedings relative to the granting of said certificate, existing railroad and street railway corporations shall be deemed to be interested parties, within the provisions of sections ninety-eight and one hundred of chapter one hundred twelve of the Revised Laws, and entitled to the benefits thereof.

Sec. 2. Any street railway company organized or in process of organization under the laws of this Commonwealth may, in the manner and under the conditions provided in sections nine, ten, and twenty-nine of chapter one hundred twelve of the Revised Laws, for the purpose of securing a more direct route, causing less interference with other uses of the highway, or operating its cars at a higher rate of speed in addition to the purposes specified in said section nine of said chapter, locate or relocate and construct, maintain and operate portions of its proposed or existing railway or any extension thereof upon private land outside the limits of public streets, roads and bridges; and any such company, duly organized according to law, may in the manner and under the conditions provided in chapter four hundred and seventy-six of the acts of nineteen hundred and three, take by right of eminent domain land or rights in land for any of the purposes above described in addition to the purposes specified in said chapter four hundred and seventy-six of the acts of nineteen hundred and three.

Governor Bates raised objection to the bills to allow the Old Colony Street Railway Company and the Bostorn & Northern Street Railway Company to refund their indebtedness on account of clauses allowing the two companies to take land by eminent domain to connect their power stations with their systems, and these clauses were stricken from the bills by the Legislature.

Members of the committee on street railways believe, however, that the Governor will approve a general bill affecting all street railways, though he is opposed to special measures which give certain roads the advantage.

The plans for the power station for the city terminus of the New York Central electric extension were filed with the city authorities on April 26. The station will be located on the south side of 149th Street, in the Borough of the Bronx, and 95 ft. from Long Island Sound. It will be a three-story structure 236.6 ft. x 156.4 ft.

WORK ON THE JOLIET, PLAINFIELD & AURORA RAILROAD

The Fisher Construction Company has vigorously taken up the completion of the Joliet, Plainfield & Aurora Railroad from Plainfield to Aurora, Ill. Since the work began April 1, the track has been laid from the center of the village of Plainfield west to the DuPage River, which will be crossed by a 155-ft. span steel bridge. The fills for both approaches of the bridge have been finished, and the concrete abutments are now being constructed. The bridge is expected to be in place by May 5. It is being erected by the American Bridge Company. About 2 miles of grading have been completed west of the DuPage River. Track is now being laid on this stretch, and it is expected to have the line finished to Normantown by May 15, and to Aurora by July 1. The railroad company has purchased ten acres of beautiful grove, located on either side of the DuPage River, immdiately south of the point where th road crosses the river. This property is being fitted up for picnic purposes. The DuPage River is being dammed at this point. This will give a 2-mile boating course and excellent bathing facilities. A livery of steel row boats and electric launches will be provided, all to be in readiness for the opening of the season.

BELGIAN CARS FOR MANILA

The cars to be used on the extensive electric traction system now under construction in Manilla, Philippine Islands, will be of Belgian manufacture. They will be built of teak, so as to withstand the ravages of the white ants so prevalent in the Philippines. The frames will be made of steel. Fifty-five ten-bench open cars to seat fifty passengers each have been ordered. La Metallurgique, of Brussels, secured the contract. The motors are to be of Westinghouse build. It will be recalled that the Manila system is being built by an American syndicate in which J. G. White, ex-President Buhl, of the Sharon, Pa., Steel Company; C. M. Swift, of Detroit, Mich., and the Westinghouse interests are chiefly concerned. J. G. White & Company are hastening the construction work to completion, and it is expected that the 30 odd miles of line will be in active operation by the close of the current year.

SOME RECENT FOREIGN RAILWAY REPORTS

At the sixth annual meeting of the Buenos Ayres & Belgrano Tramways Company, Ltd., held in London last month, the increase in receipts was reported as 7 per cent. New extensions are being built.

The Mersey Railway, which has recently equipped its line along the Mersey River with electricity, reports an increase in receipts of practically £8,000 for the half-year. The number of passengers during this time increased from 2,844,000 to 4,153,000. The train miles run during the last half-year were 400,000, as compared with 155,000 miles run during the half-year ended Dec. 31, 1902. The operating expenses per train mile under steam was 41.2d., as compared with 18.2d. under electricity.

The Anglo-Argentine Tramways, Ltd., report an increase in receipts during the year from £254,582 to £328,994. The operating expenses were reduced by £16,700, so that the net income of the company was £91,000 greater than in 1902. A dividend of 6 per cent on the ordinary shares was declared, £15,000 was devoted to the reserve and renewal fund, and £6,000 carried forward. A dividend of 5 per cent on the preference shares was also declared.

The Perth Electric Tramways shows receipts for the year amounting to £62,523, with a net of £29,971. The corresponding figures for the preceding year were: gross receipts, £56,157; net receipts, £20,591.

The Calcutta Tramways Company shows gross receipts of £113,756, operating expenses of £55,670, and a balance after crediting sundry receipts of £58,812. The directors recommend a dividend at the rate of 7 per cent per annum for the half-year, making 6 per cent for the year, after placing £12,418 for depreciation fund, and leaving £2,351 to be carried forward. The period under review has been the first complete year of operation by electric traction.

The Elevated & Underground Electric Railway, of Berlin, reports passengers carried on the main line in 1903 as 29,628,463, as compared with 18,813,994 in 1902. The gross receipts amounted to £190,903, and the operating expenses to £100,126. A dividend at the rate of 3½ per cent for the year on the capital of £1,500,000 was declared.

At the meeting of Willans & Robinson the reasons for the suspension of the dividends on the preference shares were pointed out. The chairman, Mr. Robinson, stated that the company was making gas engines of vertical high-speed type up to 250 hp, and larger engines of the horizontal type would be built. He also stated that the steam turbine work of the company was progressing, but that no turbines had yet been put in operation.

MINORITY HOLDERS WIN IN CHICAGO

Minority stockholders in the North and West Chicago Street Car Companies have gained a victory in the Union Traction case. By the decision of the United States Court of Appeals the decision of Judge Grosscup, concentrating all the traction litigation in the Federal Circuit Court, has been overruled, and the order restraining the prosecution of suits by the minority shareholders in the underlying companies of the Union Traction Company has been declared void.

By the decision of the Appellate Court the minority stockholders have won the right to attack the leases and contracts of the Union Traction Company in the State courts, and if the decision is sustained by the Federal Supreme Court the way is opened for a flood of litigation to test the validity of the modifications of the leases of the West & North Chicago Street Railway Companies. It renders the traction situation even more complicated than before.

REPORT OF CHICAGO UNION TRACTION FROM APRIL 23, 1903, TO FEB. 17, 1904

The receivers of the Chicago Union Traction Company have filed a report of the operation of the company from April 23, 1903, to Feb. 17, 1904, which shows as follows:

	301 days to Feb. 17, 1904	Year to June 30, 1902	Year to June 30, 1901
Passenger	$7,112,404	$7,801,076	$7,269.816
Advertising	27,940	33,525	33,525
Mail	25,783	19,779	15,101
Chartered cars	4,778	4,265	4,222
Rents	65,723	59,703	43,564
Total	$7,236,628	$7,918,348	$7,366,228
Receipts per day, passenger.	23,629	21,373	19,916
Total per day	24,041	21,694	20,181

The report shows that the following amounts have been received from the sale of receivers' certificates:

August, 1903	$1,030,000
September, 1903	583,000
October, 1903	90,000
November 1903	10,000
January, 1904	50,000
February, 1904	400,000

The total amount of receivers' certificates outstanding is not stated.

OHIO & MICHIGAN COMPANY TAKEN OVER BY THE TOLEDO & NORTHWESTERN TRACTION COMPANY

The interests of the Ohio & Michigan Traction Company have been taken over by the Toledo & Northwestern Traction Company, of Toledo, Ohio, and the name of the latter will be retained. A syndicate headed by Lawrence Barnum & Company, of New York, has entered into an agreement to underwrite the bonds, and the company has closed a contract with the Patrick Hirsch Construction Company for the construction of the line from Toledo to Ann Arbor, Mich., the coming summer, work to start at once. At a meeting of the two interests held in Toledo a few days ago, J. H Southard, L. L. H. Austin, Col. J. C. Bonner, of Toledo; J. H Campbell, of Monroe, and John O. Zabel, of Petersburg, chief promoters of the Ohio & Michigan Traction Company, surrendered a certain amount of their stock in the company. The new Toledo & Northwestern Traction Company put up $200,000 as a guarantee of good faith with the Hirsch Construction Company. It is announced that the securities of the new company have been pooled for two years. The Hirsch Construction Company will open an office in Toledo, and material and equipment for the new road will be purchased in the near future. A considerable portion of the road was graded by the Ohio & Michigan Traction Company last summer. The line will extend from Toledo to Ann Arbor, Mich., by way of Milan, Dundee and Petersburg.

STREET RAILWAY PATENTS

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

UNITED STATES PATENTS ISSUED APRIL 19, 1904

757,468. Brake Handle; Claude J. Kaplinger, Canton, Ohio. App. filed Dec. 7, 1903. The personal contact surface of the brake handle is insulated.

757,537. Method of Signaling for Electric Railways; Samuel M. Young, New York, N. Y. App. filed Nov. 6, 1903. Consists in creating a difference of potential between the traffic rails of the system, which separately form return paths for the power circuit and over which a current differing in character is flowing, actuating signal devices by the current due to such differences of potential, and shunting said current around certain of the signaling devices by the aid of apparatus actuated by the power current.

757,564. Electric Headlight; William H. Northall, Elwood, Ind. App. filed March 20, 1903. Means whereby the length of the arc may be adjusted, thereby permitting the lamp to be readily "turned down."

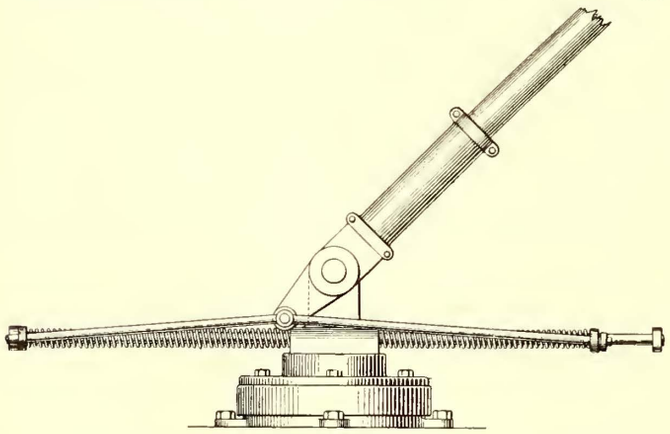
757,630. Safety Device for Trolley Poles; Phelam McCullough, Thomas Planey and Robert Baron, Liverpool, England. Details of a trolley-cord controlling spring drum.

757,746. Car Fender; Harry Howe, Toledo, Ohio. App. filed Dec. 10, 1903. A main and auxiliary fender and means whereby in case the main fender rises over an obstruction the auxiliary fender will come to operative position, both fenders being mounted on a common axis.

757,650. Means for Cleaning the Third Rails of Electrical Railways; Wilfrid Chausse, New York, N. Y. App. filed Sept. 30, 1903. A scraper consisting of a spring-depressed horizontal bar on which are mounted a plurality of diagonally arranged plates, the opposite ends of the plates being beveled at their opposite corners.

757,786. Trolley; Cyrus E. Smith, Fall River, Mass. App. filed Sept. 25, 1903. Details.

757,824. Trolley Base; Frederick S. Martin, Pittsburg, Pa. App. filed Sept. 4, 1903. The trolley base is ring-shaped and has a ball bearing upon a ring-shaped platform.



PATENT NO. 757,824

757,845. Car Fender; Earl Sherwood, Honesdale, Pa. App. filed Aug. 22, 1903. Comprises counterbalancing hanging devices, a separate pendent hanger and vertically-swinging counterbalancing members, the hanger members being provided with sockets or openings, and a folding fender frame having members separately and non-rotatably engaged in the sockets or openings of the hanger members.

757,906. Electric Railway; Geo. H. Frett, Springfield, Mass. App. filed July 14, 1903. By operating certain electric switches the motorman can move at will a switch point in the trolley wire.

757,910. Brake for Cars; William Gossett, Falls City, Neb. App. filed Sept. 10, 1903. The brake-shoes are so constructed and mounted as to be applied to the wheels and track rail at the same time.

757,925. Electric Switch; Charles F. Hopewell, Cambridge, Mass. App. filed Oct. 7, 1903. Details of a tappet switch for trolley wires.

PERSONAL MENTION

MR. W. H. HEULINGS, of the J. G. Brill Company, presented a lecture on "Types of Cars, their History, Design and Construction," at a meeting of the New England Street Railway Club, at Boston, on April 28.

MR. JOHN B. ALLAN, general manager of sales of the Allis-Chalmers Company, has resigned his position and expresses his intention of taking a vacation for a couple of months, in order to recuperate. Mr. Arthur West, assistant chief engineer of the Allis-Chalmers Company, has also resigned and will go to the Mediterranean for a holiday trip.

MR. GEORGE W. CUMBLER, of Highspire, Pa., president of the Steelton, Highspire & Middletown Street Railway Company, leased by the Central Pennsylvania Traction Company, of Harrisburg, Pa., is dead.

MR. JAMES SMITH, for fifteen years an official of the Consolidated Traction Company, of Jersey City, N. J., and recently division superintendent of the Newark division of the Public Service Company of New Jersey, died at his home in Newark a few days ago.

MR. S. S. BRADLEY has recently been appointed to the position of superintendent of the Scioto Valley Traction Company, with headquarters at Columbus, Ohio. Until March 1 Mr. Bradley was connected with the Seattle-Tacoma Interurban Railway as superintendent, in the employ of Stone & Webster.

MR. THOMAS C. PENINGTON, the popular secretary of the American Street Railway Association, was married at Chatham, Ontario, April 25, to Miss Ida Eileen Tompkins. Mr. Penington came East on his wedding trip and spent some time in New York, where he received the congratulations of all of his friends in this city who knew of his visit. After June 1, Mr. Penington will make his home at 4012 Drexel Boulevard, Chicago.

MR. JAMES M. JONES, assistant general manager of the Indianapolis Traction & Terminal Company, of Indianapolis, Ind., has resigned from the company to devote all his time to his personal interests. Mr. Jones has been connected with the company four years, during which time he made many friends. He formerly was Mayor of Kansas City, and has long been a firm friend of President Hugh J. McGowan, of the company.

MR. FRANK CHAPIN, the retiring assistant superintendent of the California Street Cable Railway Company, of San Francisco, Cal., was the recipient of a handsome diamond ring a few days ago from the employees of the company, on the occasion of his leaving the company to enter the employ of the new electric road in San Jose as superintendent. Mr. Chapin, who was very popular with the men, has been with the California Street Company for twenty-five years.

MR. ERVIN DRYER has resigned his position with the Westinghouse Electric & Manufacturing Company, and has accepted an appointment with the Allis-Chalmers Company. Mr. Dryer's connection with the Westinghouse Company extended over a period of sixteen years. He is one of the most competent salesmen in the electrical and mechanical field, and his wide acquaintance throughout the Western parts of the United States will be of great service to the Allis-Chalmers Company in the extensive new developments which it has undertaken. Mr. Dryer has already entered upon his new duties with the Allis-Chalmers Company, and his headquarters will be at its offices in the New York Life Building, Chicago. He will give his attention to the company's engine work as well as to the sale of Bullock electrical apparatus, which the Allis-Chalmers Company now controls.

MR. W. O. MUNDY has tendered his resignation as master mechanic of the St. Louis Transit Company, to take effect May 1.

W. O. MUNDY

During Mr. Mundy's term of office many important improvements have been made, including the building of the new repair shops, which contained so very many excellent features that much space has been given to a description of them in these columns the past year. Previous to going to St. Louis Mr. Mundy designed and worked out the engineering details of the General Electric Company's type-M train control system. He is known as one of the leaders in his profession, and has contributed many ideas of value to electric railway shop practice and railway controller and motor construction. Labor-saving methods have been carried to a high state of perfection by him in the St. Louis shops. Recently he has invented an air-brake appliance, the details of which are not yet public, but which promises a marked economy in air consumption without undue complications.