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EDITORIAL NOTICE

Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

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The Track Association

The proposal to start some kind of an association for electric railway track engineers has resulted in the expression of various opinions as to the most desirable form of organization to adopt, although track engineers generally seem to be unanimous in the belief that something should be done to secure a trackmen's convention. One of the suggestions which has been made differs somewhat from any of those previously outlined in our editorials on the subject, but proposes a plan which appeals very strongly both to some track men and to certain prominent members of the American Street Railway Association. It is this. The idea of having a separate association for each important branch of railway work shall be given up, and, in its place, the American Street Railway Association will divide its work up into departments, with a vice-president for each department. This would centralize matters and might result in some economy financially. It is argued in favor of this proposal that there are many small companies which would not care to join all the various associations, but are, nevertheless, as much interested as anyone in all the branches of work which each represents.

To carry this plan out to its logical conclusion the accountants and master mechanics should also become departments of the American Street Railway Association. The master mechanics have at present a membership vested in individuals as well as in companies. To combine all these various associations would, of course, require some radical changes in the constitutions of all of them. One condition which experience has shown to be a very essential factor of ultimate success is that each convention should be conducted directly by those immediately interested in that particular convention. That is, under the plan proposed, the master mechanics should arrange for and conduct their own convention, the track men their own convention, and so on through the list. As to whether these conventions are to be organically separate or part of the parent association is for the various interested parties to decide, but the one absolute essential is that the men interested in a certain department have full charge of the convention relating to that department. This will secure interest and discussion which will make these various department conventions a success and will avoid the difficulties which these department associations were originally intended to overcome. Another suggestion in connection with the foregoing which has been made is that certain days be allotted to the convention of each department, so that those officials who are interested in only one department of street railway work need attend the convention during that period only.

The plan outlined above is one submitted to F. G. Simmons, of Milwaukee, in reply to the circular letter requesting suggestions as to an organization of track engineers sent out by him and published in our issue of Feb. 6. In its scope it is so radical and would require so many changes in existing organizations that its feasibility is doubtful. Nevertheless, it is at least interesting as affording a solution to the problem of the best way of organizing the track engineers and other departments of railway service, which have as yet no distinct organization of their own. If the several conventions proposed were held on successive days, the plan would also simplify the question, now serious, of sufficient hotel accommodations, as well as that of having a considerable number of the prominent officials of a railway company absent from duty at the same time.

Discipline and Railway Accidents

Slason Thompson, the press representative of the General Managers' Association, recently issued a pamphlet for that body on railway accidents in the United States and Europe, and the precautions taken for the prevention of such catastrophes. This organization is composed of the general managers of steam railroads centering in Chicago, and is one of the most representative bodies of railway men in the country. The document just issued appeals to the general public, which is, of course, deeply interested in the safe operation of all transportation properties, but some of the lessons that are taught by the experience thus recorded are of especial significance to electric railway managers and should be carefully studied, particularly by those engaged in interurban operation. One conclusion that is inevitable as a result of the investigation of accident statistics is that the great majority of collisions are due, not to inherent defects in apparatus or methods of operation, but to the mistakes and carelessness of employees. Another point brought out

is that the introduction of block signals does not by any means prevent collisions, though it may be a valuable safeguard.

Mr. Thompson says that conditions indicate "that the block signal system, though it seems to be correct in principle, has, for some reason, failed of anything like complete efficacy in practice." Why? Because it is not a system that can work itself. Its name has promised more than its principle is capable of fulfilling. The word "block," in the popular acceptation, infers the power to stop or prevent the passage of anything. When the word "automatic" is added to this it conveys an impression of absolute stoppage by a mechanical contrivance without human intervention. Just here is the weakness of the block signal system, for it depends wholly on the human observance of and obedience to its signals, and Mr. Thompson declares that "the lack of strict discipline and the presence of negligence account for nine-tenths of the collisions, not only where the block signal system is used, but where it is not."

Following this preliminary statement regarding what the block signal system can and cannot accomplish, the document affords the public an insight into the working of unionism that will go far toward indicating to those inexperienced in such matters why the responsible officers of large undertakings are averse to union rule aside from any question of wages. "What accounts for the laches of operating officials in enforcing regulations?" is a very natural question prompted by the statements quoted. "Is it not because they are in a constant dilemma between the public demands for fast schedules and a division of authority over their employees, from the engineers to the switchmen?" Mr. Thompson goes on to explain that every act of an operating official is not only subject to appeal to his own superior, but to the officials of the employees' unions or brotherhoods. It is conceeded to be a fact that no body of employees is represented by a more intelligent and well-informed class of officials than comprise the leaders of the several railway brotherhoods, but it must also be admitted that beneficial as these organizations may be in other directions, they exercise an influence over the entire field of railway employment that is detrimental to discipline. In England it is an invariable rule to dismiss a driver, as the engineer over there is called, if he passes a danger signal. Here, before disciplining him, the railway officials have to be prepared with proofs of habitual and dangerous insubordination, to face a demand for his reinstatement. The trouble is, that having neither authority nor responsibility, the organizations of railway employees do interfere with the authority of railway officials in innumerable ways. They seek to dictate appointments to the several branches of the service and to restrict employment to their own members. They also act as a check on the prompt suspension or dismissal for cause covered by the "good of the service." If the organizations guaranteed that all their members were competent and reliable men, and would be loyal employees, amenable to discipline in whatever branch of the service employed, their watchfulness lest injustice be done to such members would be justified. But no such guarantee is furnished; no such assurance is possible. "Discipline carried to the point where obedience to signals is involuntary must eventually become the reliance of the American railway system," is the conclusion of competent experts, whose deliberate judgment is voiced in this publication. This discipline, it is explained, can only be practically effective when the authorities responsible to the public are untrammeled in its enforcement by any secondary responsibility. This subject is of great importance, and we hope that it will not be allowed to rest.

Recent Street Railway Motors

We have previously called attention to several designs of street railway motors brought out recently. It has been thought many times during the past few years that the design of direct-current street railway motors had reached such a state of perfection that important changes were unlikely. While it is true that the electrical efficiency of street railway motors has not been greatly increased, there has been a steady improvement in mechanical design and perfection of numerous details. An example of this is shown by the new Westinghouse motor adopted in St. Louis and described in a recent issue. This motor is similar to and at the same time has points of dissimilarity as compared with the new General Electric motors designed for service in Milwaukee, and described in our issue for Sept. 5. The two features which are common to the design of both motors are, first, the introduction of bearings which provide for oil lubrication, such as has been common for some time on the heavier types of elevated and interurban motors, but not for smaller sizes, and, second, provision for opening the motor case from above only. In both of these motors the ordinary babbitted bearing shells are contained in larger shells or heads, and the motor case is bored out to receive these heads. The heads are large enough to permit of an ample oil well underneath the journal, from which oil is fed to the journal by waste. In the new General Electric motor the bearing head or shell is fastened to the motor casing by bolts running parallel with the armature shaft. In the new Westinghouse motor lugs are provided on the oil-bearing shells, by which they are bolted to the lower motor casing. In the General Electric motor the top part of the motor casing lifts off without the use of hinges, and dowel pins are used to align the casing. In the new Westinghouse motor the top casing is hinged. The General Electric motor was designed primarily for use as an interurban motor on an M. C. B. type of truck, where the truck would not permit the top part of the motor casing to swing back, as it does in the new Westinghouse motor. The latter was planned primarily to go on a truck of the Du Pont type, as an outside-hung motor. Consequently, there was little restriction, and the motor casing is divided in line with the armature journal and swings back on a hinge, an arrangement that would not be feasible on a truck, where the motor is less accessible.

Leaving aside, however, these questions of detail it is evident that there is now the beginning of a movement on the part of large street railway companies to do away with pit work and take the trucks out from under the cars whenever overhauling and repair are necessary. It is not to be supposed that pit work is to be abandoned generally for a number of years to come, even by those companies that are working away from it, as many companies have a large number of equipments on which the motors are designed to be opened from beneath. Many companies have pits equipped with motor and armature lifts that do not have facilities for quickly hoisting car bodies. The latter apparatus is almost a necessity with any company which is to adopt the principle of overhauling from above and doing away with pit work. There is no doubt that repair men can do more and better work when working from above with the motor open before them on a level floor than when working from below in a dark pit.

The other important principle embodied in these motors, namely, the use of oil for lubrication, is a principle which has been tested out thoroughly on heavier motors for several years, and the designs under discussion are simply adaptations of it for the smaller sizes. There is no doubt that a good oil lubrica-

tion will result in much longer life for motor bearings than the old-fashioned grease lubrication which depends upon the heating of a bearing to feed the lubricant to the bearings, and, hence, cannot be efficient in operation unless conditions of heating exist which should not be present.

Esprit De Corps in Corporation

Among the problems which confront those who are responsible for the success of modern industrial enterprises, the question of operating efficiency occupies an important place. Much attention has lately been paid to obtaining the maximum output consistent with a reliable product for a given expenditure of capital and labor in manufacturing establishments. In like manner operating companies have striven to reduce the cost of service rendered, to increase the volume of business done, and to stop the little leaks in operation wherever possible. To this end the machinery of plants is being critically examined and often replaced by apparatus of greater economy; methods of handling materials and carrying on office work are being improved, and the results are justifying the changes made. But while directing attention to the mechanical equipment the equally important fact should not be overlooked that in all organizations where the labor element is large, one of the chief factors of success is the cultivation of a proper esprit de corps among the employees.

A great deal has been accomplished in fostering this feeling of loyalty in some of our present-day corporations, and a great deal remains to be done in others. The policies of various companies differ in regard to the best method of securing the results sought, but experience has shown that it is unwise to run to either extreme of generosity or niggardliness, if the most satisfactory results are to be attained. Sympathy is at the bottom of the whole question, and appreciation grows out of it.

One of the most important questions in this consideration, although not the only one, is that of wages, and while it would be a hopelessly impossible task adequately to discuss this subject in all its phases in this article, there is one precept that should be laid down here. No company can secure the most loyal, lasting and skilled service which does not pay a reasonable and fair amount of money for services rendered. The reader, whether he is employer or employee, will probably agree to this, but may consider the precept a glittering generality. Two illustrations which recently came to our notice, however, will be cited to make it more specific. An electric railway company operating in a city of over 100,000 inhabitants, refused to pay even a motorman's wages to its electrical engineer, who was assistant to the superintendent of motive power and machinery. The electrical engineer was a graduate of one of the best engineering schools in the East, a man of four years' practical experience, and an able constructor and designer. Of course, no such man would stay with a road standing behind such a niggardly policy. Another large company appointed one of its best engineers chief engineer of its most modern power station, at a certain salary, and after he had become established in his new position the company cut his salary over 5½ per cent. To-day this engineer is general manager of a large electric lighting, power and railway company, at several times the salary which was his portion before he made the change. A little encouragement in the direction of salary will do much toward eliminating the petty personal jealousies which cause so much friction between different departments in various companies that might be mentioned—quite apart from the retention of desirable employees.

One electrical engineer, whose day as head of a large department in a large operating company has long since passed, used to give out work to his subordinates in piecemeal Each man would be assigned a certain small part of a particular job, and when the scattered bits were finished the departmental chief would put them together, and work out the conclusions himself, so that none of the under employees would become sufficiently competent to do the entire piece of work alone. This policy speaks for itself; although the illustration is not to be taken as an argument against the evident right of every department head responsible for his subordinates' work to present their work to his superiors over his own signature.

Daily lunch meetings and annual outings of officials, such as have been a feature for the past ten years of the New York City Railway Company, and, possibly of other companies, offer another means of increasing esprit de corps among the department heads. They constitute excellent examples of how loyalty to the corporation may be conserved through the medium of interchange of opinions, social intercourse and social events.

In like manner lectures to the rank and file of a great company's employees may be productive of much good. The president of more than one street railway system in this country makes a practice of speaking on occasion to his employees, and the good feeling that results is mutually helpful. Along with this may be mentioned the advantages of a well-stocked company library, equipped with the technical and popular journals as well as the latest works of fiction and standard technical books. It would not seem necessary to enlarge here upon the influence of well ventilated and lighted work rooms, properly heated in winter, and wholesome sanitary and washing arrangements upon the employees' attitude toward a company. If an employee once becomes imbued with the idea that his personal welfare is a matter of sublime indifference to the corporation which employs him, it is difficult to obtain his sympathetic loyalty in times of crisis, even though he may perform his daily work without mistakes or complaint.

Various kinds of co-operation are of interest in this connection. The privilege of buying stock, the formation of savings associations for employees' benefit, the offering of free legal advice by the law department, and the gift of money by the company to employees' benefit associations are all means of increasing the esprit de corps in the rank and file. Of course, in buying stock employees should be made to understand that they take precisely the same chances as regards dividends as though it was purchased in the open market, but the conditions of purchase may be made easy through the installment plan, or the employee favored in some way which gives him a real advantage over the outside. One savings association paid 6 per cent dividends on all employees' deposits, and it was a strong incentive to both thrifty habits and loyalty to employers. The Boston Elevated Railway Company sold coal at less than cost to its employees during the great coal strike of 1902. About 7250 tons of coal were supplied in this way at an estimated saving to employees of about $40,000. This was a transaction which had the best interests of perhaps 7000 employees at heart, and it is safe to say that it could not have but increased the good feeling of the men toward the company.

When all is said on this subject that can be said, it will be found that unselfishness on the part of both management and employees is the foundation of corporation loyalty. In just so far as each appreciates the conditions under which the other works, so will the opportunity arise for the attainment of a unified and homogeneous organization. The highest success is reached when the esprit de corps felt by every employee of a company is a maximum.

THE SAN FRANCISCO, OAKLAND & SAN JOSE RAILWAY—"THE KEY ROUTE"—II.

POWER HOUSE

The power station (Fig. 25) is situated about midway between the land end of the pier and the Berkeley terminal of the road. Salt water for condensing purposes is conveniently obtained from the bay, and excellent facilities are secured for receiving freight through a side track from the Southern Pacific road, and a branch from the new Oakland Terminal line of the Santa Fe. As the present demand for power is for short but heavy hauls, the station is equipped with only direct-current generators. Ample space has been left for the installation of alternating-current equipment to take care of future extensions or the proposed San Jose road.

The power house is of red brick, with outside ground dimensions of 153 ft. 6 ins. x 125 ft. 4 ins. The central portion of the building, containing the engines and generators, and the west wing, containing the boilers, form one room, the only division being a longitudinal row of built-up steel columns. This unusual arrangement is allowable, as oil is used for fuel, and the boiler room can be kept very clean. This division gives the engine room a width of 45 ft. 6 ins., and the boiler room a width of 40 ft. 5 ins. The east wing of the building is cross divided into a storage battery room, 91 ft. 3 ins. x 35 ft., and a shop room 57 ft. 8 ins. x 35 ft. The roof of the station is supported by steel trusses and covered by galvanized, corrugated iron roofing. A clear height of 32 ft. is given above the engine room floor, 22 ft. for the boiler room, and in the battery room a clear height of 14 ft. to the wooden ceiling is provided. Brick pilasters, 15 ft. apart on the longitudinal brick wall, support the engine room roof trusses. A plan of the station is given in Fig. 26, and an elevation of the engines and boilers is shown in Fig. 27.

The construction views of the station, shown in Fig. 28, illustrate the method of erection of the building. As the plant was built during the summer months, which, in California, are especially favorable for out-door work, most of the machinery was installed before the walls were up or work on the roof was begun. The latter was placed the last thing. The needs of the station did not demand a traveling crane, so the engines and boilers were placed as soon as the foundations were ready, avoiding the interference of walls. Fig. 29 shows the completed engine and boiler room.

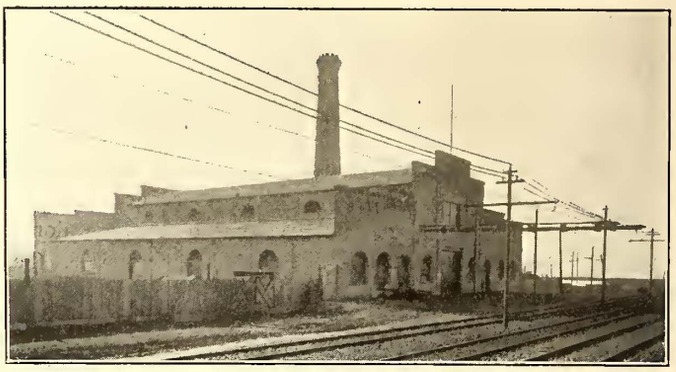


FIG. 25.—EXTERIOR OF MAIN POWER HOUSE

The boiler equipment of the station comprises eight 264-hp water-tube, Cahall boilers. They have 14 x 9 18-ft. tubes, 4 ins. in diameter; giving 264 sq. ft. of heating surface, 59½ sq. ft. grate surface, 36-in. drums, 23 ft. 3 ins. long; butt-strap triple-riveted joints and flowed-steel headers. The working pressure is 200 lbs. The boilers are set in four batteries of two each, and space is left for an additional bank. Asphaltum base crude oil, from the Bakersfield district (California) is used as fuel, and is fed to the furnaces through Pfieffer burners. Storage capacity for the fuel oil is provided by two 35-000-gal. iron tanks, 20 ft. in diameter, outside the building. The oil is pumped by two Snow duplex 6-in. x 4-in. x 6-in. pumps.

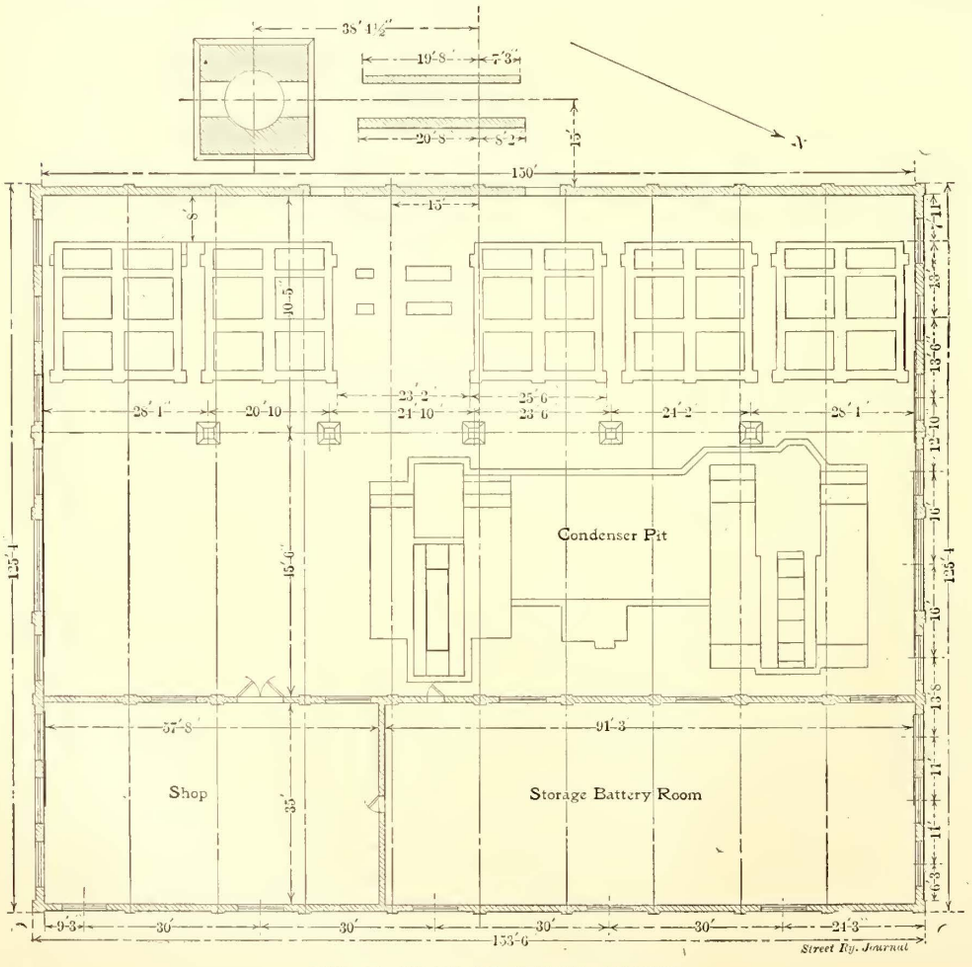


FIG. 26.—PLAN OF POWER HOUSE

The hot gases from the boilers pass through a brick breaching, 7 ft. 8 ins. wide, and varying in height from 4 ft. to 5 ft. 3 ins., to a Green fuel economizer, thence to the brick stack, set 15 ft. from the wall of the building. In the construction of the stack the foundation piles were driven to hard pan, and on top of them were laid six rows of old car rails, with lengths alternative. On these was placed a 9-ft. concrete foundation bed for the stack proper. The inside diameter of the firebrick flue is 8 ft. throughout, and the top of the stack is 121 ft. 2 ins. above the station floor. The outside diameter at the bottom is 18 ft. 10 ins., and the walls are carried up with a batter of one in twenty-four.

The generating equipment of the station is composed of two direct-current u its. The larger of these consists of a Pennsylvania Iron Works cross-compound condensing Corliss engine, 32 ins. and 52 ins. x 48 ins., directly driving, at 80 r. p. m., an 850-kw General Electric 525-575-volt multipolar generator. The smaller engine, built by the St. Louis Iron

& Machine Works, has cylinder dimensions of 18 ins. and 38 ins. x 42 ins., and is of the cross-compound Corliss condensing, heavy duty type. It is direct-connected to a 600-kw Westinghouse 550-volt, direct-current generator, which it drives at 100 r. p. m.

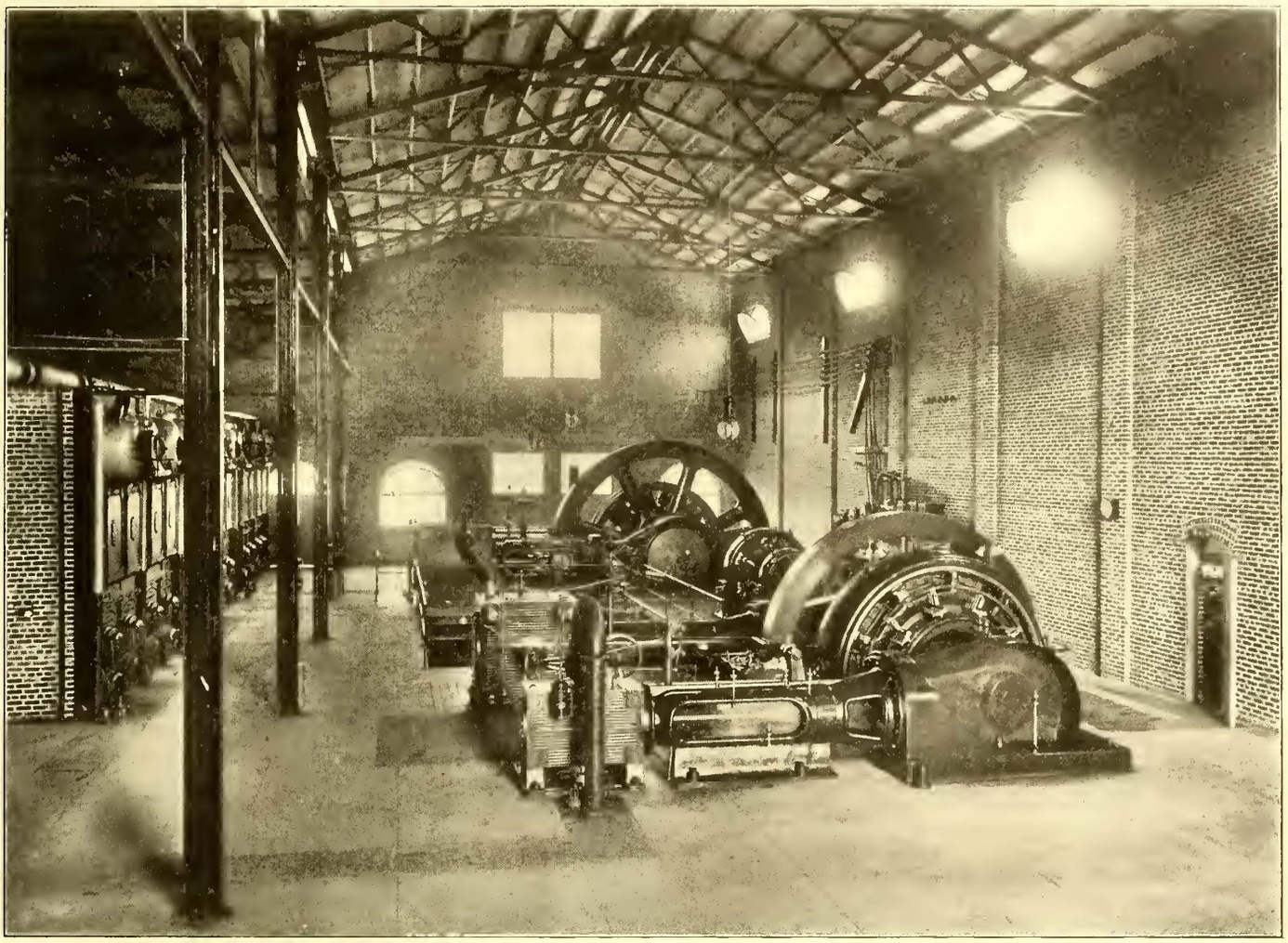


FIG. 29.—ENGINE AND BOILER ROOM IN MAIN POWER HOUSE

Cooling water for the condenser system is obtained from the bay, being impounded at high tide by means of a flood gate.

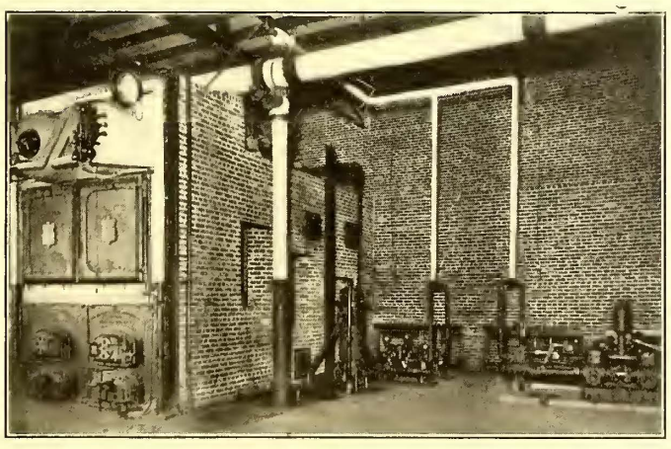


FIG. 31.—FUEL OIL PUMPS AND FEEDER PUMPS IN BOILER ROOM

It is carried through a 14-in. cast-iron suction pipe to a double-suction centrifugal circulating pump, which is direct-driven by an 18-hp 500-volt Bullock motor. The two condensers are of the Wheeler surface condensing type, and have a capacity of 200,000 lbs. of water an hour. Eight-inch inlet and outlet pipes are providing for the circulating water. The air pump, of the triplex Edwards type, is driven through gearing by an 18-hp 500-volt Bullock motor, both motors being controlled by Cutler-Hammer starting boxes. The discharge from the air pump is carried to the hot well through a 9-in. standard pipe. The two boiler-feed pumps are of the Snow center-packed plunger type,

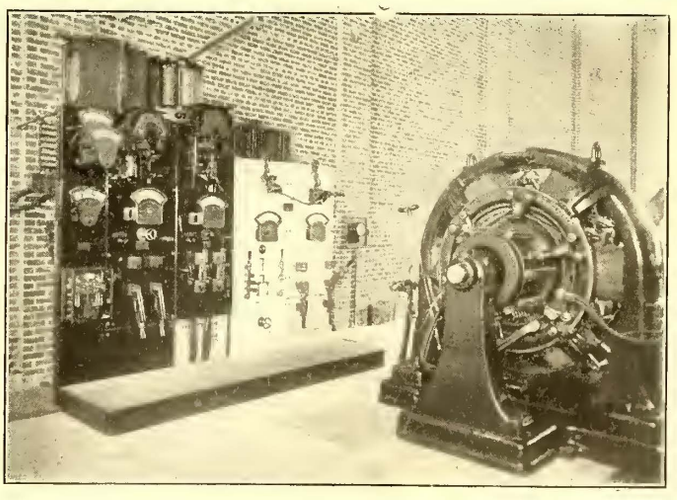


FIG. 33.—STORAGE BATTERY SWITCHBOARD AND BOOSTER IN MAIN POWER HOUSE

8 ins. x 5 ins. x 10 ins. in size, and have a 6-in. delivery to the economizer. The main boiler feed is a 4-in. pipe, and the main steam header is of 12-in. extra heavy pipe, with 6-in. and 12-in. feeders to the engines. An 18-in. free exhaust pipe is provided. The hot well was designed and constructed especially for the company. It is 8 ft. wide, 25 ft. long and 6 ft. 3 ins. high, and

is built of 3-in. x 12-in. redwood, no iron being used in its construction, except for the ½-in. wrought-iron tie-rods. The hot well has a 9-in. inlet and a 7-in. outlet.

All steam pipe fittings about the station are extra heavy, and

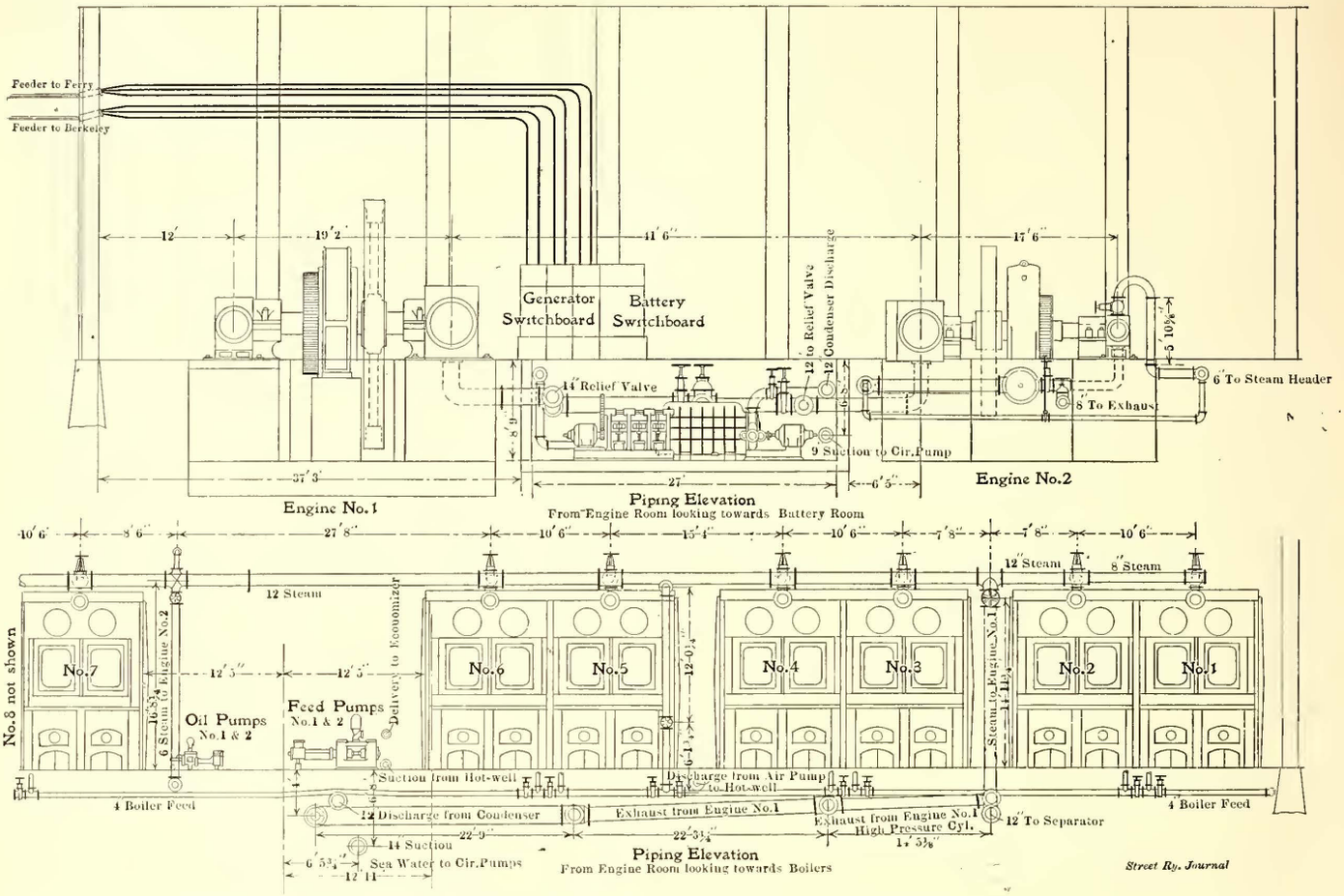


FIG. 27.—ELEVATIONS OF ENGINES AND BOILERS

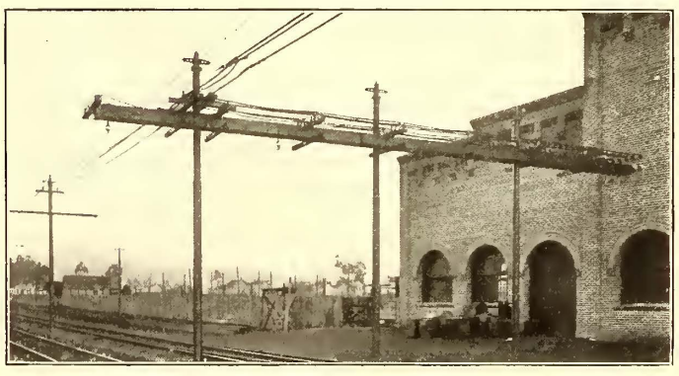


FIG. 35.—FEEDER WIRE BRIDGE EXTENDING OUT OF MAIN POWER HOUSE

of the Crane manufacture. The piping is encased in Johns-Manville covering, having 85 per cent magnesia. Fig. 30 is a plan of the feed and fuel pumps illustrated in Fig. 31, and Fig. 32 is a piping plan of the station.

ELECTRICAL DETAILS OF STATION

The generators and the station output are controlled from a three-panel enamelled black-slate switchboard, shown at the left in Fig. 33. The first or storage battery panel contains a 750-scale voltmeter, an astatic voltmeter for the battery current, a 5000-scale astatic ammeter, and a 4000-amp. recording wattmeter, all Thomson instruments. Each of the two generator panels is equipped with a G. E. circuit breaker, a 3000-scale Weston ammeter, rheostat and two single-pole single-throw knife switches.

The storage battery, Fig. 34, floats on the system, and carries a fluctuating load with the aid of a differential booster. The battery was furnished by the Electric Storage Battery Company, and consists of 264 G-27 chloride cells in G-41 tanks. The present discharge capacity is 1000 amps. for 1 hour, and the ultimate capacity, with all forty-one plates installed, will be 1600 amps. for 1 hour. Momentary fluctuations, 50 per cent in excess of the normal capacity, can safely be carried. The booster set, Fig. 33, is of the Western Electric make, and consists of an L-5½-7 69-kw booster generator, direct-driven by an L-4 108-hp motor. The storage battery switchboard is of the

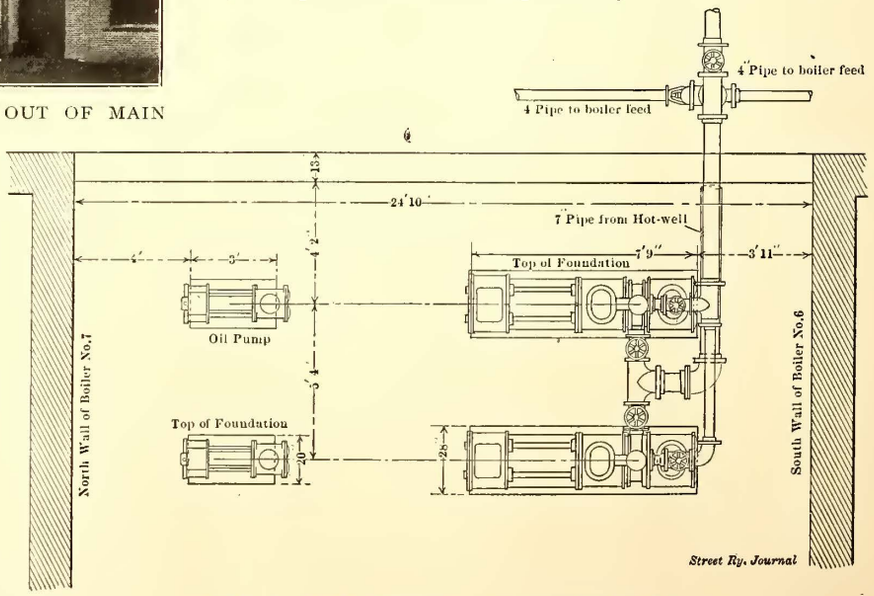


FIG. 30.—PLAN OF FEED AND FUEL PUMPS

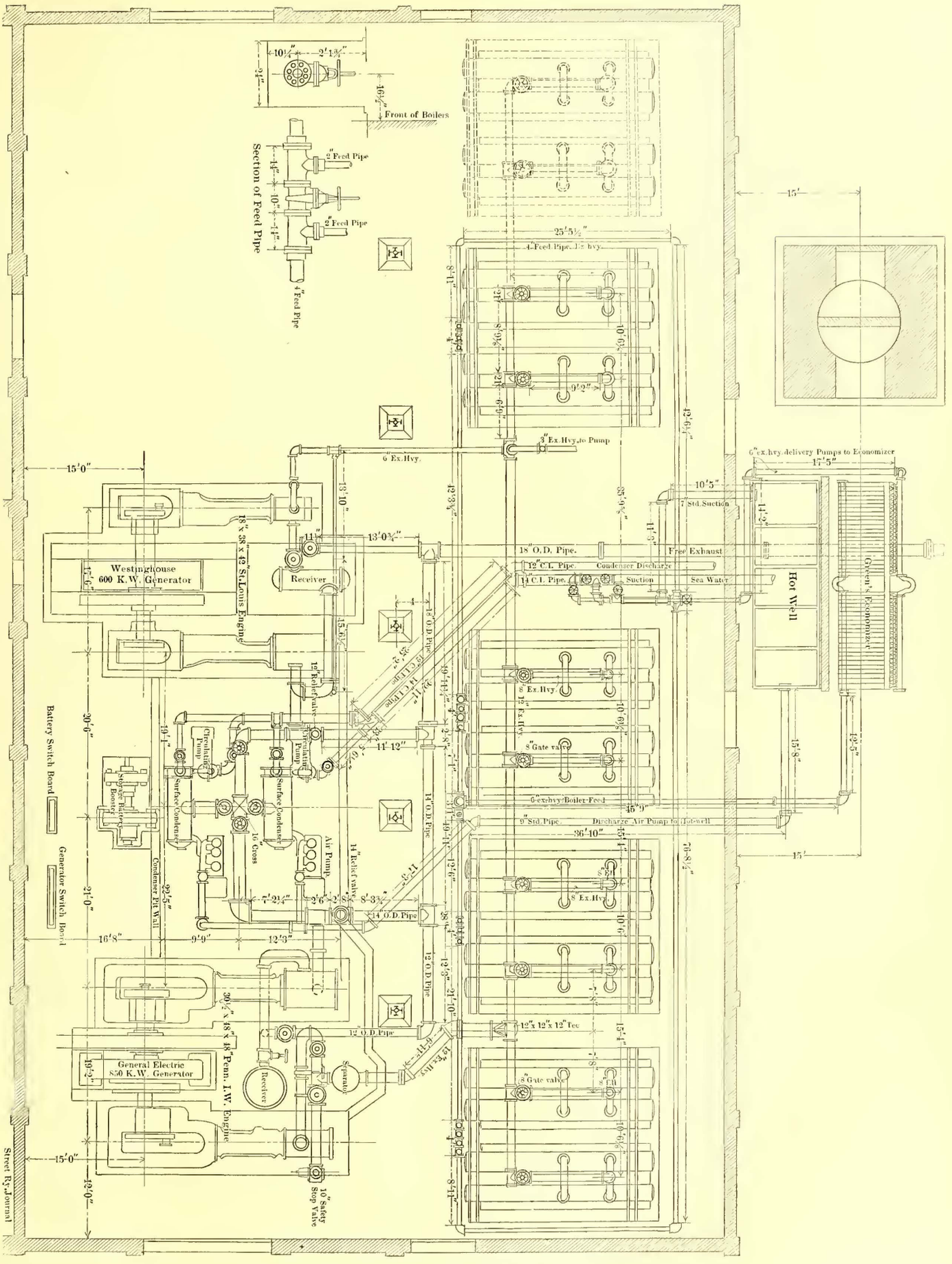


FIG. 32.—PIPING SYSTEM OF THE MAIN POWER PLANT

standard two-panel type, and adjoins the station switchboard.

The six 1,000,000-circ. mil feeder cables from the switchboard are carried up the east wall of the engine room and out through the north wall onto a bridge, which takes them to the regular pole line, three feeders going in each direction. This feeder-wire bridge is illustrated in Fig. 35. The cables are supported on five single eight-pin cross arms, 5 ft. 10 ins. long, which, in turn, are carried on two 2-in. x 12-in. pieces that are

fastened to the poles. At the end, over the track, are double cross-arms, from which the feeders are carried to the center poles.

ROLLING STOCK

The rolling stock at present in service on the Key Route comprises sixteen passenger cars, such as were shown in Figs. 10 and 15 (in the last issue), and Figs. 36 and 36a, which are presented herewith. They are of the light railway passenger type, arranged for carrying passengers only. The cars are operated in trains, under the General Electric type-M multiple-unit train control system. There are four motor cars and four control cars, the remaining eight being ordinary trail coaches. In body construction all the cars are of the same pattern and dimensions, this style having been adopted as the standard for this service. The general dimensions are as follows: Length over body, 44 ft. 11¼ ins.; length over vestibules, 54 ft. 7¼ ins.; width over side sills, 8 ft. 8½ ins.; width over body, 9 ft.; height from bottom of sill to top of deck, 9 ft. 6 ins.; height from top of rail to top of deck, 12 ft. 9⅝ ins. The side, or main sills, are of 5-in. x 8-in. long-leaf yellow pine, reinforced with 6-in. channel. Steel built-up bolsters are used with side bearings, suitable to operate around 100-ft. radius curves. The interior finishing is in mahogany, and the doors and windows are of plate glass, while glazed art glass is used for the deck sashes. The vestibules are 4 ft. 10 ins. long, and are fitted with drop sash in the ends with adjustable catches. In the vestibule ends are swinging doors, and at the right side in each

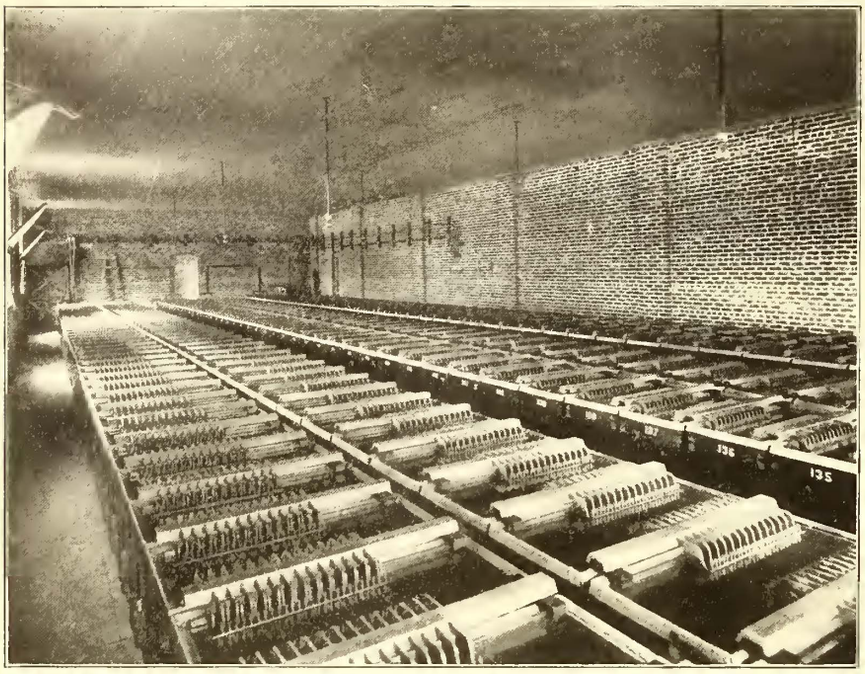
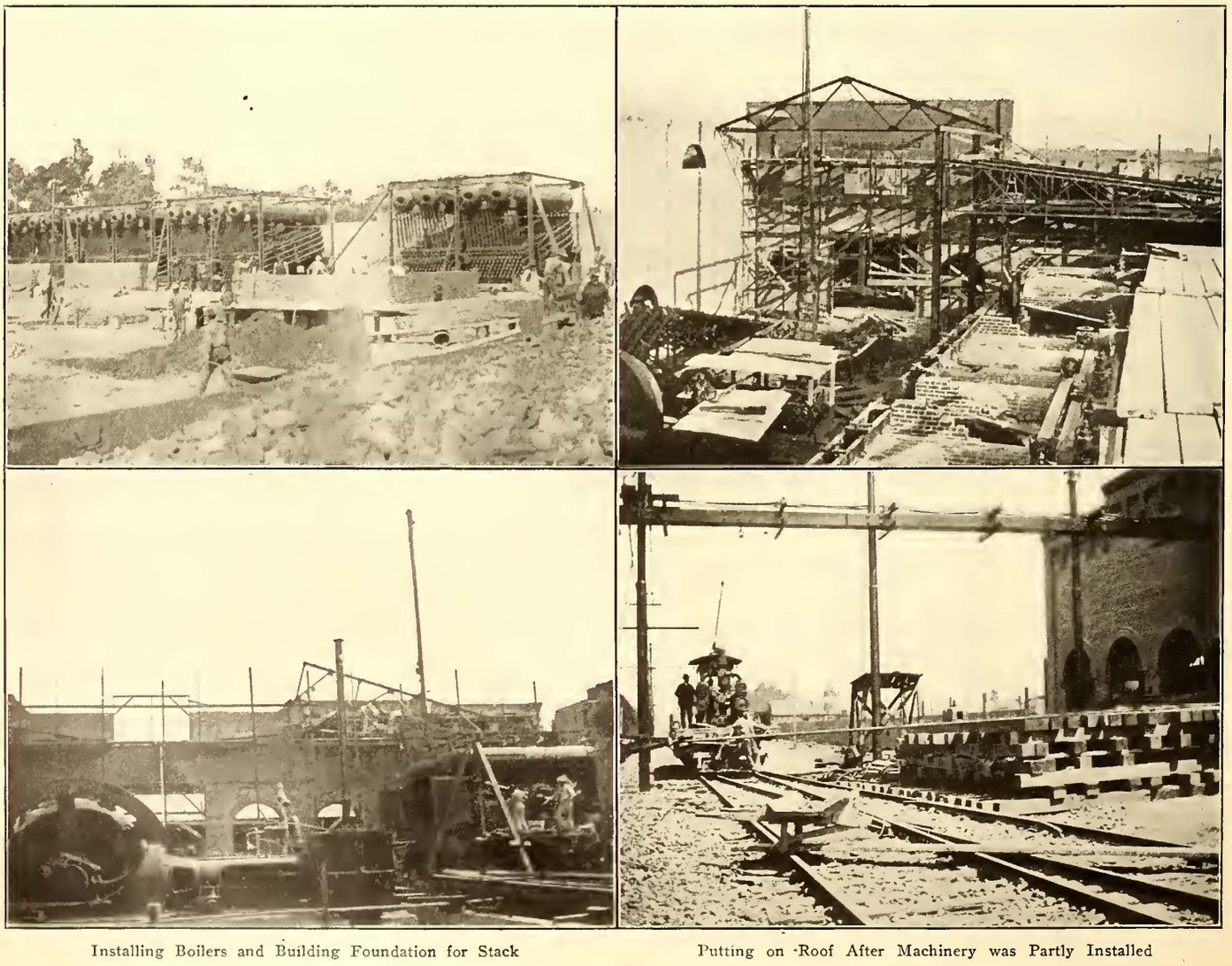


FIG. 34.—STORAGE BATTERY IN KEY ROUTE POWER HOUSE



Installing Boilers and Building Foundation for Stack

Engines and Boilers Installed Before Roof was Put On

Putting on Roof After Machinery was Partly Installed

Unloading Machinery from Trolley Car

VIEWS OF CONSTRUCTIONAL FEATURES

vestibule of the motor and controller cars are single-hinged doors, which, when opened, enclose the controller equipment. Gould trap-doors are also provided in these vestibules over the straight air-brake apparatus, with 12-in. brake cylinders. On the motor cars are mounted Westinghouse type D-3 motor-driven compressors. Air whistles are provided at the engineer's valve.

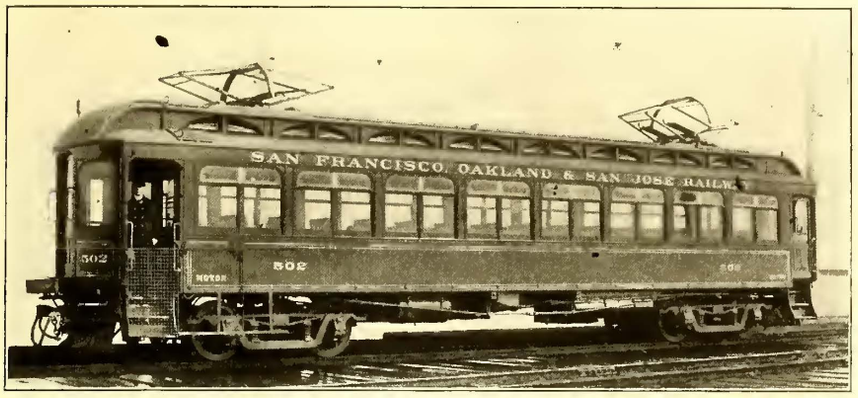


FIG. 36.—STANDARD MOTOR CAR WITH DIAMOND TROLLEY

The motor and controller cars were fitted up by the company's own shop force, under the supervision of the late George W. Spink, master mechanic. One motor car was equipped with the control and brake equipment in three days, which is considered record-breaking time for that class of work.

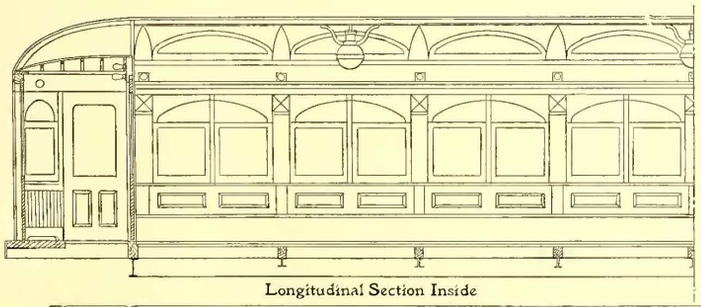
In order to give service on the lines to Piedmont and the center of Oakland, ten new cars have been ordered from the St. Louis Car Company. In most respects they will be identical with the cars now in use. The one important exception is in the platform design. The vestibules and platforms of the new cars will be 6 ft. 6 ins. long, and will have a 1½-in. brass railing in the center of the steps, which will have 54-in. x 8-in. treads. This will give the cars a length over vestibules of 57 ft. 11¼ ins., and a total length over bumpers of about 60 ft. This extra long platform, with double steps, was adopted so as to facilitate more rapid loading and unloading of passengers at stations.

side steps for the motorman to stand upon. The cabs overhead on the motor and controller cars are cased up with lockers, suitable for personal belongings of the motorman. Oak steps, with 28-in. x 8-in. treads and 10¾-in. rise are used, and all doors are protected by sliding gates of a special design.

The cars are provided with Gould continuous buffers, and with M. C. B. couplers of sufficient strength to operate safely in an eight-car train. The cars and trucks were built by the St. Louis Car Company, and are provided with that company's walk-over type rattan seats, thirty-two in number, with nickle corner grab handles. Other furnishings include bell-cord hangers, Smith-Anderson arc headlights and interior lights, incandescent step and platform lights, Nichols Lintern compressed air track sanders, Ohmer fare registers, Pantasote curtains, and cow-catchers of the steam road type. Fig. 37 is an interior view of one of the cars. The wiring diagram for the lighting circuits of a 55-ft. car is reproduced in Fig. 37a.

The bodies of the cars are painted an orange shade of chrome yellow, and the trucks and all iron work below the floor are coated a rich brown. The striping on the ends, sides and letter board is done with silver leaf, edged with tuscan red. The ceilings of the cars are painted in light green, with simple decorations of gold in empire style of finish.

The car bodies are mounted on St. Louis Car Company's No. 23-B trucks, M. C. B. type, each truck on the motor cars being equipped with two G. E.-66 motors. An eight-car train with two motors has been found to require 1800 amps. in starting. Steel-tired, spoke-center 36-in. wheels are used, with 6-ft. 6-in. wheel base. All cars are fitted with Westinghouse



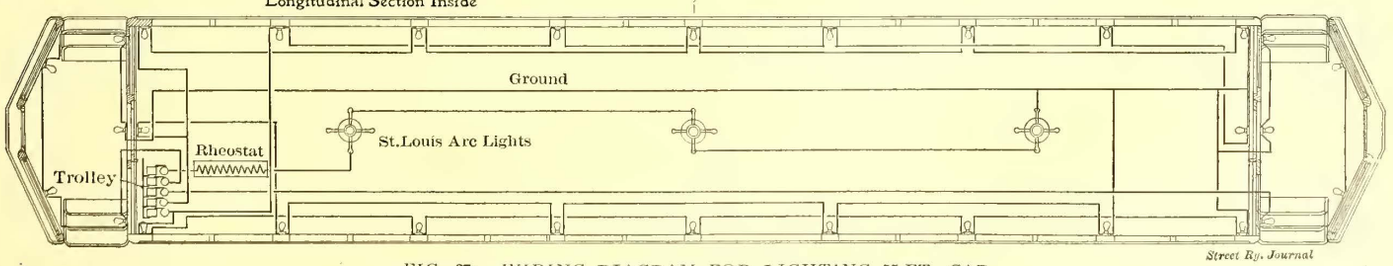


FIG. 37a.—WIRING DIAGRAM FOR LIGHTING 55-FT. CAR

FIG. 37.—INTERIOR OF STANDARD CAR FOR KEY ROUTE

In the rear of the power house the company has erected a temporary car house, 40 ft. x 150 ft., covered with galvanized iron. Plans are now being drawn for permanent buildings, to be located near the power house, which will contain the company's repair shops and car houses.

DIAMOND-SHAPED TROLLEY

One of the most difficult problems the officials of the Key Route had to contend with was the design of a current-collecting device for the cars. The third-rail system could easily have

been adopted for operation on the pier, but the fact that the land lines traversed public streets prevented the use of a third rail on that portion of the road. Rather than have the two methods of collecting the current it was deemed advisable to depend entirely upon an overhead construction. The factors met with in the design of a suitable trolley were as follows: It must be capable of taking a heavy current and of operating at high speeds on curves as well as straight track; it must be heavy enough in its construction to stand the wear; on account of the low head room under the Southern Pacific tracks in the subway it was necessary for the trolley to operate from 18 ins. to about 5 ft. above the car roof; it must also be capable of passing under crossings with regular trolley wires. To meet these conditions several designs were prepared, and the one finally adopted is illustrated in the pictures of the cars and in detail in Figs. 38 and 39. J. I. Brown, assistant general manager and engineer of the company, designed the trolley, while the details of construction were worked out by the late George W. Spink, master mechanic, and George St. Pierre, shop foreman.

The trolley consists of a double diamond frame of angle-iron, hinged at all four corners so that the contact-shoe, or roller, which is supported between the two frames across the top, can be raised or lowered to meet the varying heights of the trolley wire. The top part of the frame is built of 1½-in. x ¼-in. angle-iron, 50 ins. in length, and the lower part of 1¾-in. x ⅜-in. angles, 50 ins. long. The upper two legs on each side end

FIG. 38.—DIAMOND TROLLEY WHEN IN LOWERED POSITION

in brass gears or lugs, which play into each other at the ends of the roller, and are bolted to special castings, to which are fastened the solid shaft of the roller. From the middle joint of the frame to the center of the top gear the distance is 54 ins.

The bottom arms of the frame end in similar brass gears, that are fastened to two 1⅜-in. shafts, 3 ft. 2 ins. long, spaced on 6-in. centers and supported at the ends in brass-bearing blocks. The center joints of the frame are formed by two ¾-in. cold-rolled rods, the fittings at the joints being of brass. Four cross pieces of 1-in. x 3-16-in. angle-iron serve as stiffeners for the four sides of the frame. The frame is 32 ins. wide.

Considerable trouble was anticipated in designing a contact-shoe or roller which would have good wearing qualities, would not heat at bearings and would be noiseless, but it is believed the problem has been satisfactorily solved, as the roller in use seems to meet all these requirements. The roller consists of a 5-in. brass tube, 24 7-16 ins. long and 5-32 ins. thick, screwed at each end to ordinary brass trolley wheels, which have been turned down to fit the tubing. These wheels turn on a ⅝-in. steel shaft that runs through the tube, and is held stationary at the ends by means of dowel pins in the special castings mentioned above. One of these end castings is illustrated at the right in Fig. 38. The wheels have 1-in. bushings, 2 ins. long, and the bearings are oiled from grooves connected to oil pockets in the wheels. It was found that these rollers made considerable noise in operating on account of the hollow tubing, so a method was adopted to deaden them. Between the bearing wheels at the ends was fitted a fibre roll about 1½ ins. in diameter, and the space between the outside of this roll and the inside of the brass tubing was packed tight with waste. This arrangement very effectually deadens the noise. The object of the fibre roll is to keep the waste away from the stationary shaft when the roller is revolving. The roller complete weighs 27 lbs.

Curved contact-shoes, made of ⅛-in. sheet steel, 6 ins. wide, have been fastened at the ends of the roller, so that the contact may not be lost at curves, as, of course, the trolley has no lateral motion. These shoes give a 4-in. horizontal contact, which, added to the 24 ins. of the roller, gives a total contacting surface of 28 ins.

The trolley ordinarily operates with the roller about 5 ft. above the platform, but it will rise to a height of 7 ft., and can be depressed so that the roller is but 18 ins. above the platform. To hold the contact roller to the wire twenty-four tension trolley springs, 12 ins. long and 1½ ins. round, are used, they being arranged twelve on a side, as shown. The springs are fastened by a ½-in. eye-bolt to the bottom end of one side piece, and to a bracket near the middle joint of the frame on the opposite side. The tension of the springs is taken up by a ⅝-in. eye-bolt.

The entire frame serves as a conductor for the electric cur-

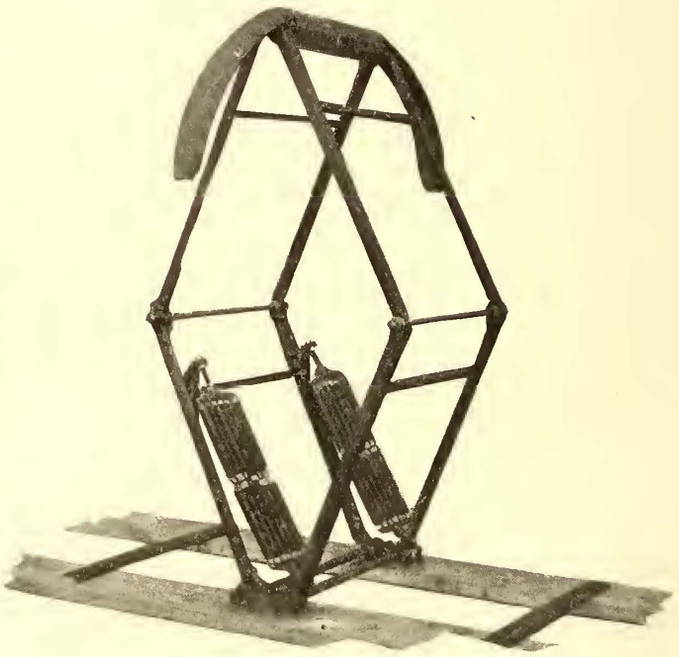


FIG. 39.—DIAMOND TROLLEY RAISED

rent from the roller to copper contact plate, mounted on top of the bottom bushings and connected to the car leads.

No trouble has been experienced from heated bearings of the roller, and from present indications it would seem that the roller would wear longer than an ordinary trolley wheel. When repairs are necessary the roller can be taken out inside of 5 minutes and replaced by another. Two of the trolleys are mounted on each of the motor cars and one on the controller cars. The trolleys are being temporarily built in the Piedmont shops of the Oakland Transit Consolidated, pending the erection of the new Key Route shops.

FIRE CAR

In order to afford protection against fire, either in the ferry depot or any portion of the pier, a fire pump car has been constructed, and is in constant readiness in the train shed at the end of the pier. This car was built in the shops of the Oakland Transit Consolidated Company, and is illustrated by exterior and interior views in Figs. 40 and 41. Plan and elevation drawings are shown in Fig. 42. The car body has a total length of 25 ft., and a width of 9 ft.. The main portion of the car, containing the pump, is 16 ft. long, and at each end are

4-ft. square vestibules for the motorman. Platforms, 2 ft. 6 ins. wide and 4 ft. long, are provided at the corners of the car, 18 ins. below the car floor, and from them the hose can be manipulated. There are no doors across the ends of the pump room, it being considered best to leave them open, so that the pump men may not be hampered in handling the apparatus. The fire pump is an 8½-in. x 12-in. machine, with 8-in. suction and 6-in. discharge, and was built by the George E. Dow Pumping Engine Company, of San Francisco. It is driven through gearing by a General Electric-1000 35-hp motor. The car is mounted on a Taylor truck, the motor equipment consisting of two W. P.-50 motors. A heavy suction pipe, long enough to draw water from the bay, is carried along one side of the car. The drawing, Fig. 42, shows the pump set straight with the car, but it was found advisable on installing it

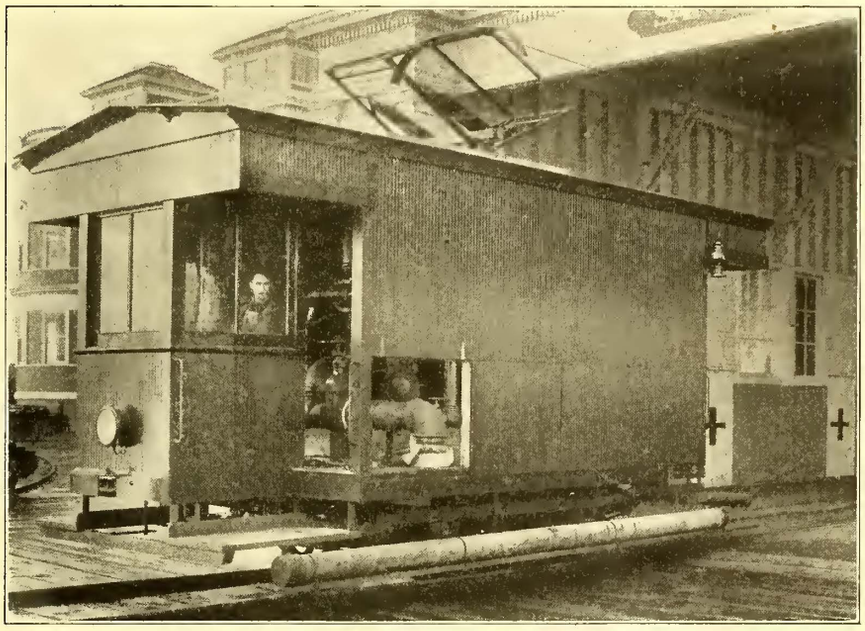


FIG. 40.—FIRE CAR

to place it at an angle, as shown in Fig. 41. The pump car is also equipped with one of the new diamond trolleys, so that it can operate over the entire system.

TRAIN OPERATION

The first regular train service over the Key Route was inaugurated on Oct. 26, when an hourly schedule was put into effect, and one boat was used for the pier connection. A few days after that a half-hourly service was put on with two boats, and on Nov. 28 the schedule was increased to a 20-minute service. The present time card calls for ninety-seven trains during the day, running at 20-minute intervals from 6:20 a. m. to 7:00 p. m., when hourly trains are operated till 1.00 a. m. To follow out the present schedule four trains are required. Six-car trains have been operated, and the equipment has been built to handle safely eight cars in a train. The distance between Berkeley and the pier depot, 6.84 miles, is made regularly, including the four stops, within the schedule time of 18 minutes for the down trip and 19 minutes for the up trip. The motors are geared for 45 m. p. h. Two minutes are allowed for transferring passengers from the train to the boat at the pier depot, and with 15 minutes for the 2.75-mile boat passage the whole trip from Berkeley to San Francisco, a distance of 9.59 miles, is made in 35 minutes. For the return trip 36 minutes is allowed on account of the up grade in Berkeley.

As compared with the new and fast service of the Key Route the Southern Pacific Company operates its Berkeley trains on a 30-minute headway, and about the best time its regular trains and boats can make is 50 minutes between Berkeley and San Francisco, and on its time cards 57 minutes is allowed for the run. The boat lines of the two systems are about equal in length, and the steam line of the Southern Pacific is only a little longer than the electric line of the Key Route, but the steam trains have to make ten stops as against the five stops of the electric line. With new cars, new boats and a faster service the Key Route has naturally drawn heavily upon the patronage of the older system, and now is carrying from 10,000 to 20,000 passengers daily. The number of passengers carried depends largely upon the weather, and on Sundays it quite frequently reaches the higher mark.

To meet the competition of the electric line the Southern Pacific Company is said to be considering changes and improvements in its equipment and service which will enable it effectually to hold its own in the local passenger business. Already two flyers have been put on the Berkeley branch for morning and evening service, these trains leaving Berkeley 10 minutes after the regular trains, stopping at but five or six stations and making close boat connections at the Oakland pier. These flyers, however, cannot make the entire trip in much less than 40 minutes, so the Key Route still continues to enjoy an advantage.

Berkeley is the seat of the University of California, a large and growing educational institution, and the transportation lines running thither depend largely upon the student body. The Key Route terminates within one block of the entrance of the University campus, and the management is painstaking in catering to the needs of the students in running special trains for athletic contests, etc. Fig. 43 is a view of the Berkeley terminal, and shows a regular four-car Key Route train with a Telegraph Avenue car of the Oakland Transit Consolidated in the foreground. At the left is shown a portion of the Southern Pacific depot, and beyond, in the distance, is seen one of the steam freight trains. Excepting the temporary station at San Pablo Avenue, the Key Route has erected no stations or waiting rooms along its line as yet, but a union depot at Berkeley is being advocated.

FARES AND TICKETS

No cuts in fares have been made by the Key Route manage-

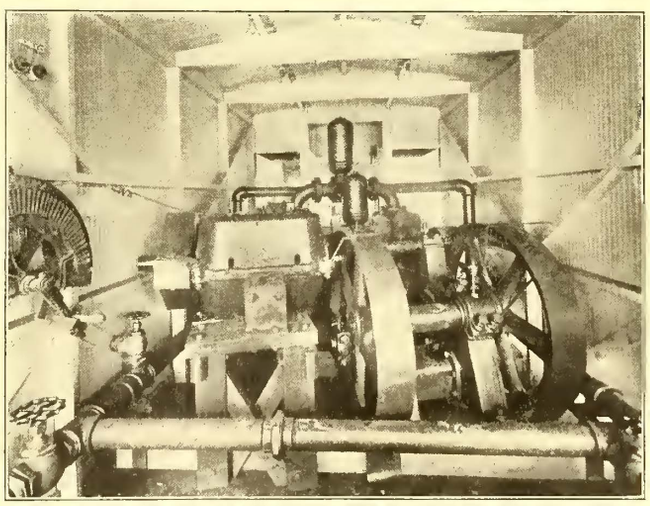
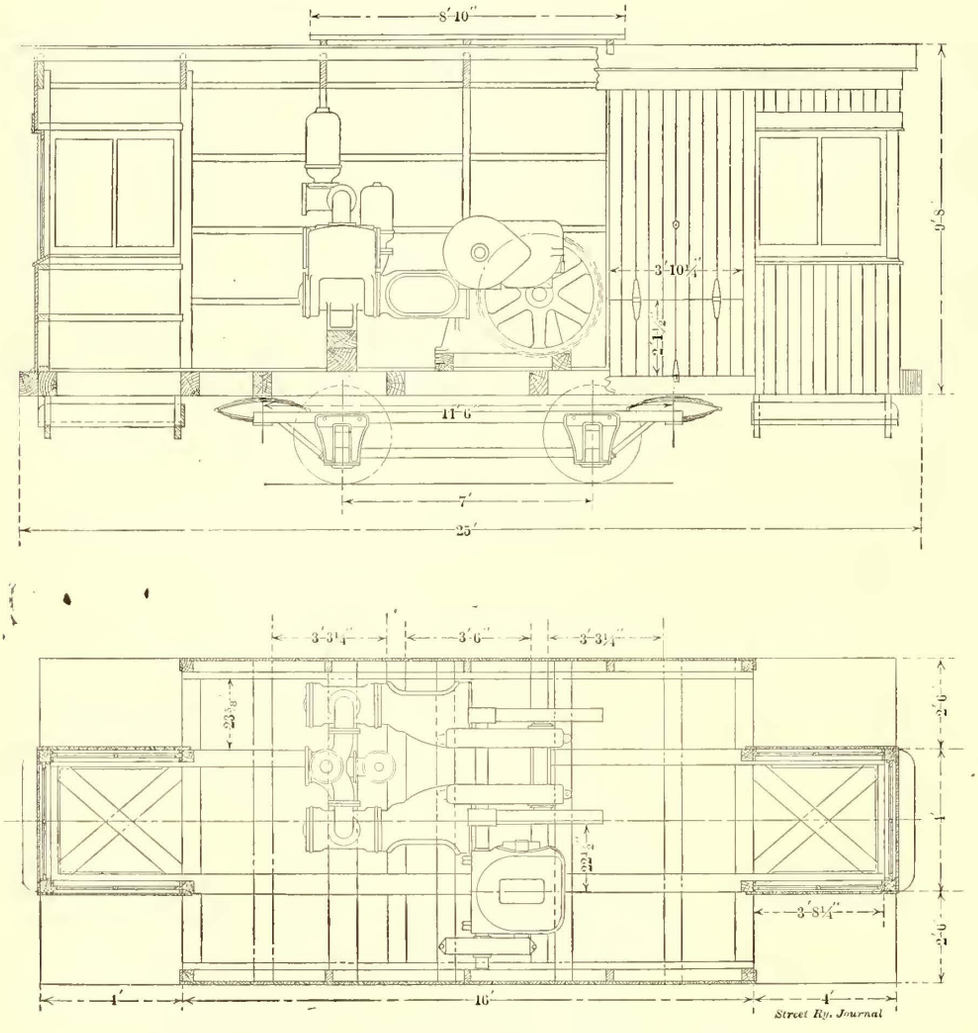


FIG. 41.—MOTOR-DRIVEN PUMP IN FIRE CAR

ment, the same rates being charged as on the Southern Pacific. Between any of the stations and San Francisco the rate is 10 cents for a single trip. Between stations in Berkeley and Oakland a fare of 5 cents is charged. Beside the motorman and conductor on each train, each car has a collector, who takes all

fares in his car. On boarding a train at Berkeley the passenger pays his cash fare and is given a fare check, which is taken up after San Pablo station is passed. No tickets are required on the boats, as the pier is used exclusively by the company for passengers, and no one is able to reach the station except by boat or train. For the trip from San Francisco the passenger buys a ticket like an ordinary "L" ticket, drops it into a collector's box and passes onto the boat, no ticket being required on the train. These tickets are sold in any number at 10 cents each, and are good for passage in either direction.

On Dec. 1 a limited number of commutation tickets were put into use. These tickets are issued in book form with two coupons for each day of the month, and the tickets must be used on the dates specified or they become invalid. These books



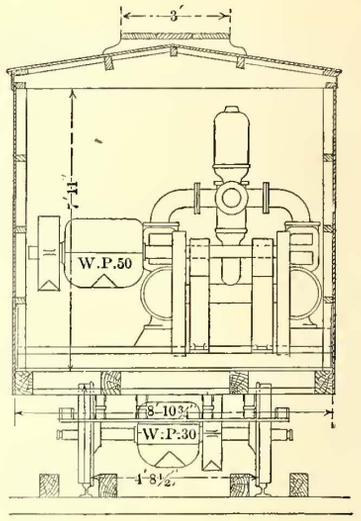


FIG. 42.—PLAN, ELEVATION AND SECTION OF FIRE CAR

are sold for $3, the same rate as is charged for commutation tickets on the Southern Pacific lines. They are not transferable, so several rides during the month are generally forfeited.

At present transfers are not given between the Key Route trains and the connecting car lines of the Oakland Transit Company, but possibly this concession to the public is being held in reserve until such time as the Southern Pacific meets the present competition.

SPECIAL FEATURES

It is interesting to note some of the special features of the Key Route system as distinguished from similar features of its rival. The most striking of these characteristics, outside of the electric train operation, is the color scheme of yellow that has been adopted throughout for the Key Route. The boats of all the other ferry lines are painted white, and the ferry depots are painted white or drab. In order to give a distinctive appearance to its boats and pier depot the Key Route adopted a pleasing shade of yellow, and all the cars are painted a shade of this color, as already mentioned. The color scheme is carried still farther, in that the tickets, both single fare and commutation, the time cards, signs and notices are all printed on yellow paper.

One of these notices, displayed in all the cars, informs the passengers that no baggage will be carried other than ordinary hand baggage, that no advertising or soliciting of any kind will be allowed on the trains or boats, or in the ferry building, or elsewhere on the company's premises. The effect of the prohibition of baggage is to give the public prompt and quick service, as the carrying of trunks, express and freight boxes, general merchandise, and oftentimes chickens and vegetables on the other line, had a tendency to delay the prompt starting and unloading of the boats, to say nothing of the inconvenience to the passengers. The advertising, which is so prominent and profitable on the steam trains, is conspicuous by its absence on the electric trains, and the plain, clean cars evidently please the passengers. The public had been so long accustomed to the sights and scenes of the old steam line that all the features of the Key Route were examined with interest by the passengers carried on the first few trains, and the impression made was a pleasing one, judging from comments overheard during the first day or two.

OFFICERS AND ORGANIZATION

The San Francisco, Oakland & San Jose Railway Company has an authorized capitalization of $5,000,000, and about $2,300,000 has been issued. A bond issue of $3,000,000 has been authorized, but no bonds have been sold as yet. It is stated that the cost of the railway system, as it is now in operation, including the pier, rolling stock and boats, was about $1,500,000, and the gross earnings show a good percentage on the investment.

The following-named are officers of the company: President, E. A. Heron; vice-president, W. H. Martin; treasurer, F. C. Havens; secretary, S. J. Taylor; general manager, W. F. Kelly; assistant general manager and engineer, J. Q. Brown; superintendent, J. P. Potter; civil engineer, Edward M. Boggs, American Society Civil Engineers. Directors, E. A. Heron, F. C. Havens, W. H. Martin, W. F. Kelly and S. J. Taylor. The position of the late George W. Spink as master mechanic of the company has been filled by the appointment of George St. Pierre, formerly shop foreman, and the position of assistant

superintendent of transportation, held by the late Clark Yerrick, has been filled by Mr. Piper, of the Telegraph Avenue division of the Oakland Transit Consolidated. F. W. Nelson is chief engineer of the power station. Mr. Kelly has had general supervision over the construction and operation of the road, and has been ably assisted by Mr. Brown, who has also had direct charge of the engineering features of the system. Howard C. Holmes, of San Francisco, was the consulting hydraulic engineer on the construction of the pier depot and the pier and subway, and Walter J. Matthews, of Oakland, was architect for the depot.

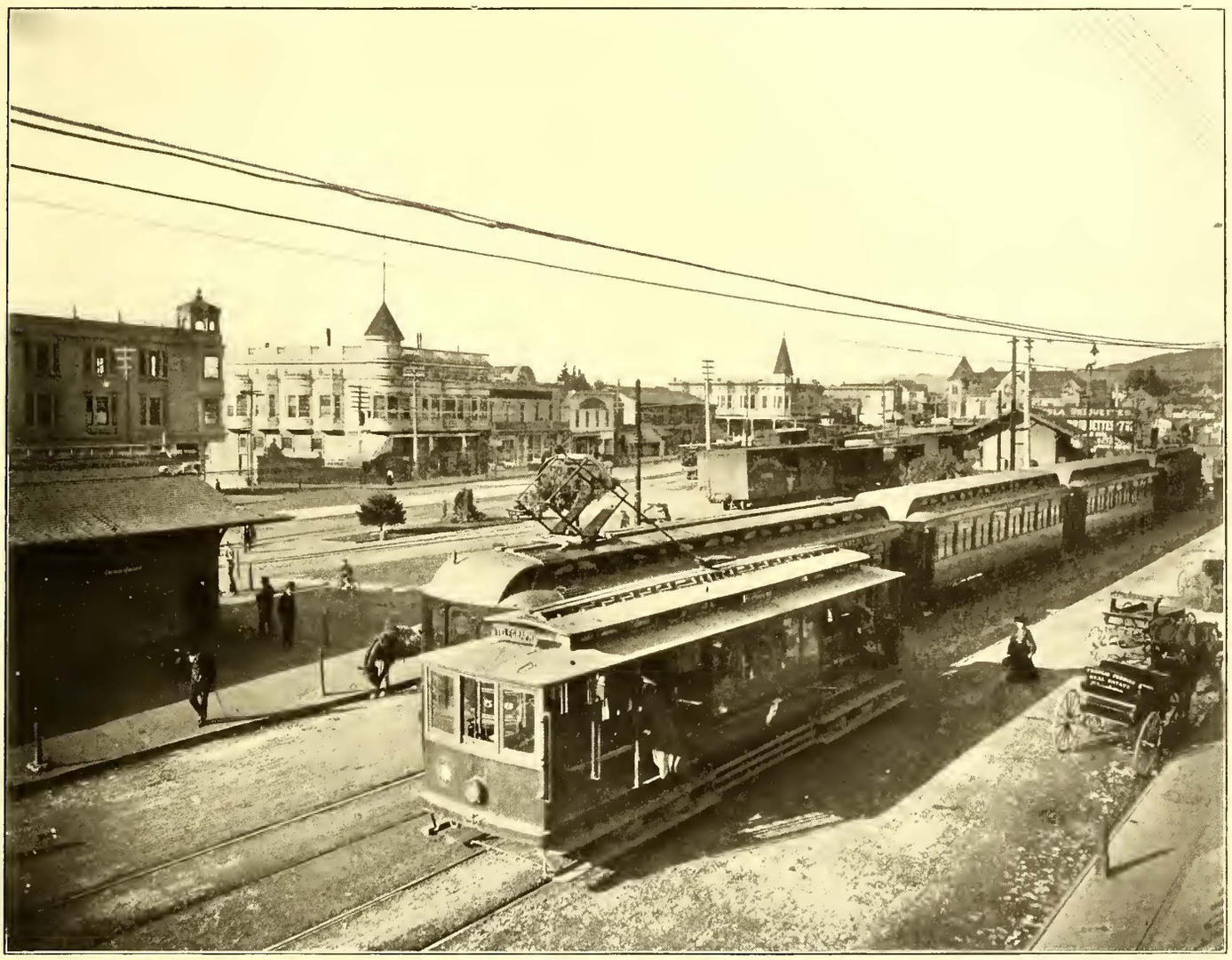


FIG. 43.—STEAM, LOCAL TROLLEY AND INTERURBAN CARS AT SOUTHERN PACIFIC STATION IN BERKELEY

ARRANGING ROUTES AND SCHEDULES FOR THE FAIR

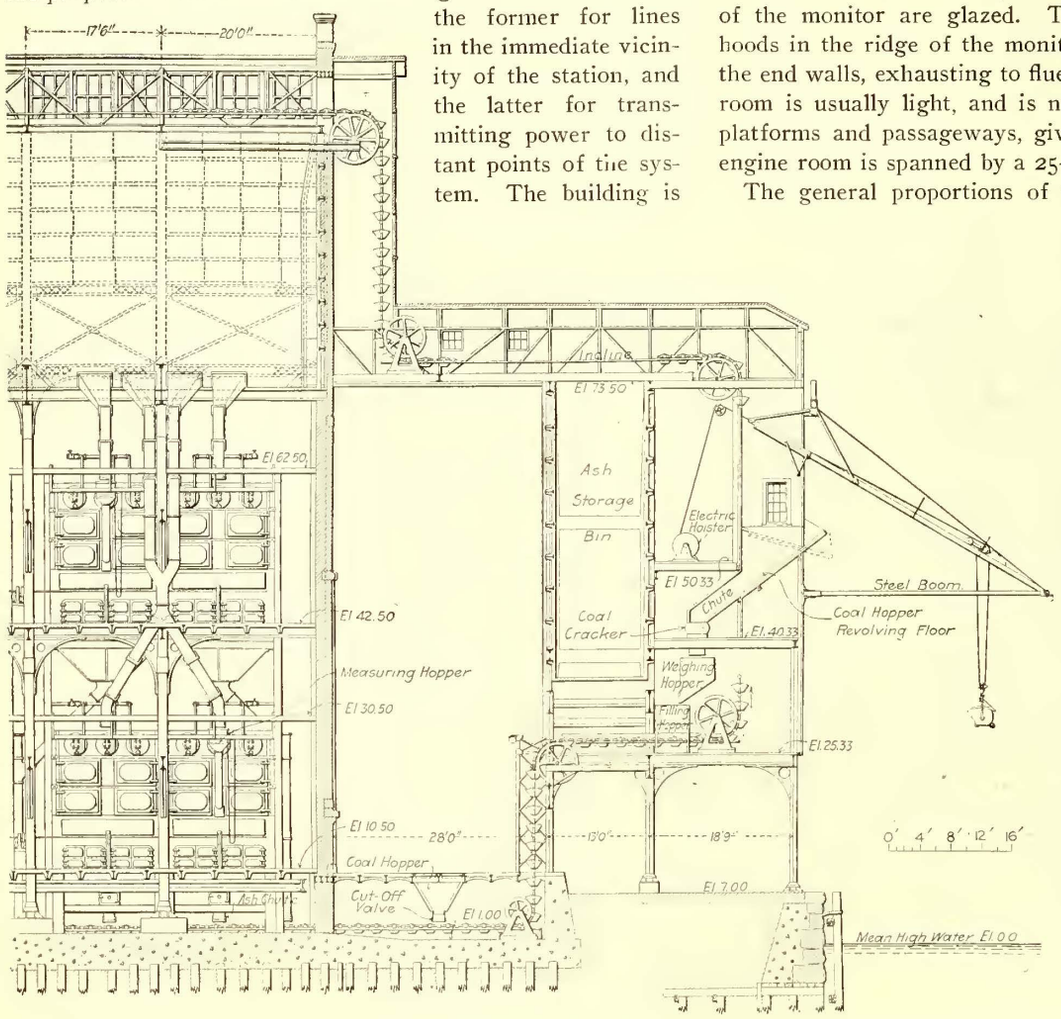
The transportation department of the St. Louis Transit Company, under the supervision of General Superintendent John Grant, is now arranging routes and schedules for World's Fair traffic, which will soon go into effect. All lines passing Union Station on the north will go direct to the World's Fair grounds. This includes the Laclede Avenue and the Market Street lines, which will go direct to the entrances on the south and west of the grounds, either at the State buildings or the west end entrance. The Chouteau Avenue line, which is now routed that way, will take the Market Street line tracks at Manchester and Chouteau Avenues, covering the section now traversed by the Market Street line. Transfers from the Chouteau line to Market Street will be made at that point. Other lines going direct to the Fair Grounds are the Olive Street lines, the Eastern Avenue line, Delmar and Page. The Taylor Avenue line will be routed directly to the World's Fair grounds, taking up passengers from all the lines north of Chouteau Avenue. These lines include the Bellefontaine, Lee Avenue, Cass Avenue, Easton Avenue, Spring Avenue, Page Avenue, Delmar Avenue and Olive Street. All South St. Louis lines will connect with the direct lines to the grounds at their down-town termini. By this arrangement six main lines and nine sub-lines will have direct entrance to the grounds from every part of the city, while connections can be made from both north and south for one fare at any intersecting point.

NEW STREET RAILWAY BILLS IN NEW YORK STATE

Five important bills affecting street railways have been introduced in the New York Legislature by the chairmen of the two railway committees of the Senate and House. The first bill is designed to make it possible for investors to ascertain whether corporate powers have been kept alive that would menace a new road and that such corporations have legal existence. The second bill is to confer upon the State Railroad Commission the right to abolish the giving of transfers at any crossing where there is congestion of traffic. The third does away with the 5 per cent interest payable on arrearages of percentage on gross earnings, and substitutes 10 per cent a year. The fourth allows a company to remove its unused rails, with the consent of the Mayor, without impairing its franchise, and to relocate its route with the consent of local authorities. The fifth gives to a city's financial board the power to make contracts with street railway companies for the payment of street improvement assessments.

RAILWAY POWER PLANT AT PROVIDENCE, R. I.

An excellent example of a modern power plant is furnished in the new station of the Rhode Island Suburban Railway Company at Providence, a company which, by ownership of stock, is associated with the United Traction & Electric Company, of Providence, R. I. The company's new power station, the subject of this article, will have a capacity of 10,500 kw, and will supply current to the Cumberland Street Railway and the Pawtuxet Valley Electric Street Railway, which it owns. The station is located at the foot of Manchester Street on the Providence River, and the site is admirably adapted for the purpose. Both direct and alternating current is furnished, the former for lines in the immediate vicinity of the station, and the latter for transmitting power to distant points of the system. The building is an imposing fire-proof structure, and is a model plant both in architectural and construction features. It is well lighted, and the arrangement of the machinery is admirable from the point of convenience and economy of operation.



PORTION OF LONGITUDINAL SECTION OF STATION, SHOWING COAL CONVEYOR

The plant is operated condensing, with an independent jet condenser for each unit, and the fresh feed water constantly required is warmed by auxiliary feed heaters and by economizers. The boiler plant is arranged on two decks, and is equipped with mechanical stokers, an extensive coal and ash-handling plant, and is served by natural draft. Among the details of especial interest are the condensing water system, including the in-take chamber, several patterns of pipe supports, an oiling system and the feed piping system.

The building has a steel frame structure with red brick enclosing walls, trimmed with heavy granite cap-stones, water table and window sills. The steel columns and walls are carried by concrete footings on the top of piles. These are driven all over the site, and concrete spread over them, forming the floor of engine and boiler room basements. The other floors, the sides and bottom of the coal pocket, and also the roofs, are all of expanded metal construction in Portland cement concrete; the windows are glazed with wired glass, the window casings are sheathed with copper, and all doors are likewise enclosed in sheet metal, in the interest of fire-proof construction, the outside doors in copper, and the inside in tinned sheet iron, painted. The metal concrete roofs are covered with tar and gravel roofing rolled into hot pitch on the concrete. The end walls are carried up in parapets. In the interior, the floors are finished in granolithic, blocked off in large squares, as usual, and the walls have been coated with a white enamel paint, except the lower 8 ft. or 9 ft., which are of a dark green. Besides the large amount of window area in the side walls the verticals of the clere story over the engine room and the top of the monitor are glazed. There are five large ventilator hoods in the ridge of the monitor and ventilating registers in the end walls, exhausting to flues within the walls. The boiler room is usually light, and is noteworthy for the longitudinal platforms and passageways, giving access to apparatus. The engine room is spanned by a 25-ton Niles crane.

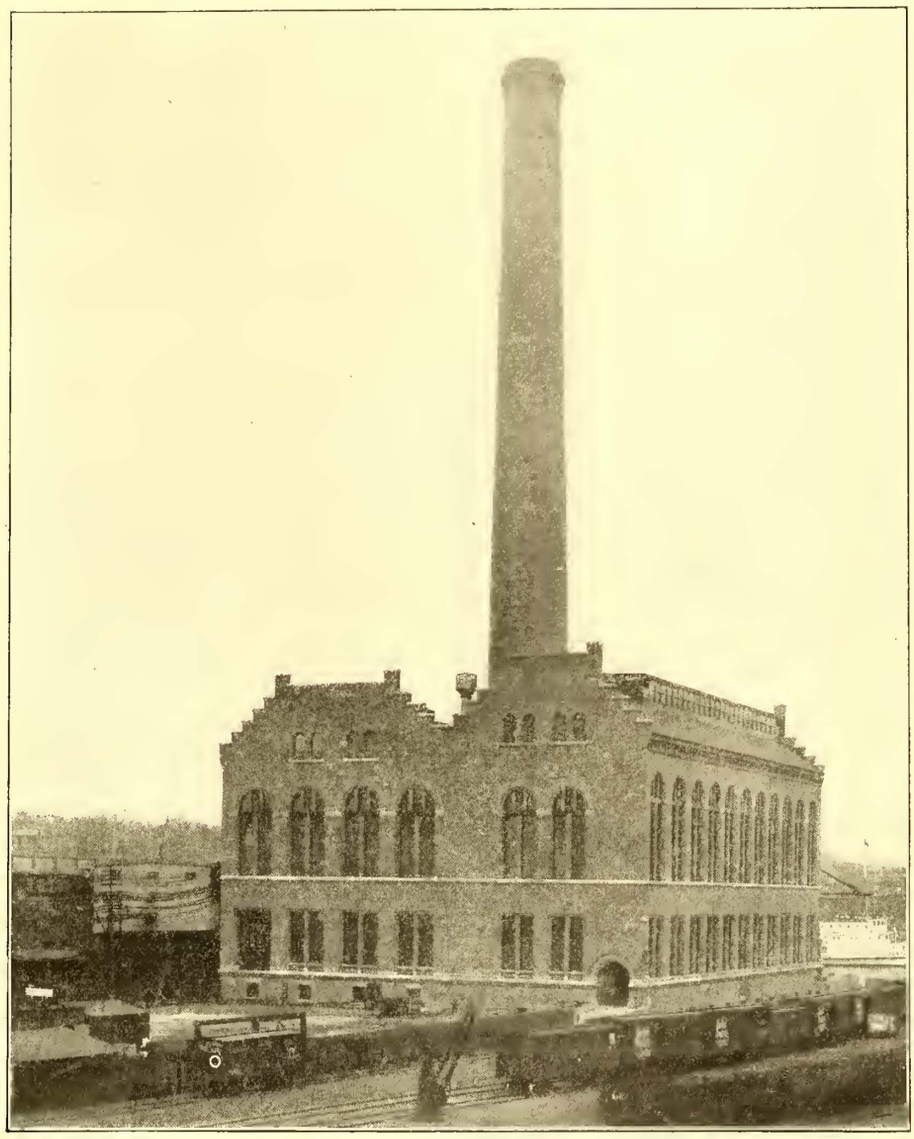
The general proportions of the building are given in the accompanying engravings. The engine and boiler rooms are separated by a partition wall built with air spaces, and at one end of the engine room is an extension containing an office, oil room, stock room and lavatories on the basement and main floor levels. The building stands 55 ft. back of the bulkhead line, and between it and the wharf is a combined coal tower and ash pocket. The ground space occupied by the main building is about 29,580 sq. ft., or 2.8 sq. ft. per kilowatt of the rated output of the main generating units. In the engine room there are 1.5 sq. ft. of ground area per boiler horse-power. On the basis of the cubic contents above the foundations there are, roughly, 260 cu. ft. per kilowatt.

COAL HANDLING

Coal is ordinarily brought to the station by water, and is transferred to the station coal bunker by means of a continuous Hunt bucket chain conveying system. A bucket of ½-ton capacity, hoisted by a 25-hp electric motor, lifts the coal from the barge into a timber pocket in the coal-hoist tower, and thence the coal passes through a coal cracker to a weighing hopper, and into a hopper delivering into the conveyor buckets. One man in the tower controls the hoist, which handles, under ordinary circumstances, ½ ton per minute. The conveyor is electrically driven from a 15-hp motor above the coal pocket, and is utilized also to carry ashes. In the usual way it travels longitudinally over the coal pocket, down the far end of the boiler room, underneath ash hoppers in the basement and back to the hoist tower. Its passage from tower to main building is through a covered truss bridge, and from building to tower through a short tunnel. Through a covered opening in the roof of the latter it can receive coal delivered by wagons. The conveyor chain has eight changes of direction, and is 630 ft. in total length, containing about 270 buckets. The tower is 16 ft. x 32 ft. in plan, and is supported 18 ft. above ground by steel columns and rises 66½ ft. above grade to the bottom of the

conveyor bridge. It also houses the ash bin, which is built of expanded metal and concrete, with vertical sides and delivery spout to wagons hauled underneath it.

The coal storage bin is a single bunker, 156 ft. long, with vertical sides 30 ft. apart, and a V-shaped bottom with the slopes at an angle of 45 degs. It has a capacity of 3000 tons. Extending longitudinally through the boiler room are two rows of columns, which, with the wall columns, constitute the main members of the boiler room structure, and by means of these interior columns and plate girders carried by them the coal bin structure is supported. The bin itself is formed of concrete, reinforced with expanded metal, and the surfaces are plastered smooth. From the bottom of the bin a chute, 256 sq. ins. in inside area, is taken for each boiler, and the run of these is shown in the drawing. The chutes are cast-iron, in sections bolted together, and at various points are provided with sight soles by which a slicing rod can be inserted in case the coal should, for any reason, get wedged or blocked. Each chute ends in a gate valve, from which coal can be delivered at will into a measuring chute. This is a traveling spout, hung by small wheels on double tracking extending across the boiler fronts. One is furnished for every battery or pair of boilers, so that coal for both boilers can be supplied from either chute, and the spout commands the entire width of the feed hopper of the mechanical stoker. The weight of the coal that the chute will hold affords a measure of the coal consumption of each boiler, and the traveling carriage allows it to be hauled out of the way when tubes have to be drawn from the setting. Arrangements are under consideration, however, looking to its replacement by a traveling weighing hopper, in case it seems desirable to secure a more positive record of coal consumption. The stokers are of the Roney type, and dump into ash hoppers, which are fitted with gates for discharging on the coal conveyor at night or at such times as coal is not being handled. The ash hoppers are lined with concrete, and those for the upper deck of boilers are of boiler plate.



POWER STATION OF THE RHODE ISLAND SUBURBAN RAILWAY COMPANY

BOILERS AND ECONOMIZERS

The boiler plant comprises sixteen 515-hp Babcock & Wilcox water-tube boilers, arranged in four batteries on each deck, two boilers per battery. At present three pairs of boilers have not yet been installed in the second story. Each boiler has 5159 sq. ft. heating surface, with 252 tubes, 4 ins. in diameter and 18 ft. long, arranged twenty-one sections wide and twelve tubes high. Each boiler has also three 36-in. steam and water drums, and in addition the boilers of the second deck are provided with superheating surface, which is to be given a trial before the boilers below are equipped. The boiler settings are faced with white glazed brick.

The products of combustion are carried off by natural draft, but economizers are employed, as already stated. These are of the Green pattern, and are arranged in an interesting manner, according to the so-called unit system, one for each battery of boilers. Each group comprises 280 tubes, and presents 3360 sq. ft. of heating surface. The economizer cleaners are driven by electric motors. As shown in the drawings, the gases from the boilers flow into a passage between the economizer setting and the corresponding battery, and the passage opens at one end so as to cause the gases to pass through the economizer or at the other to by-pass the economizer. The main flow passage is located underneath the economizer, increasing in depth toward the stack where the horizontal breeching is 8 ft. x 15 ft. in size, of 3-16-in. steel plate, reinforced with angle bars. The walls and bottom of the smoke passage underneath the economizer settings are of brick, while the top is of terra-cotta book tiles, 8 ins. thick, plastered top and bottom with Portland cement mortar. The chimney is of the Custodis radial perforated brick construction, 312 ft. 7½ ins. high above the foundation, and 16 ft. in inside diameter at the top. There are, of course, dampers in the passages to and around the economizers, and there is a main damper in the breeching near the stack in both decks, these under the control of Locke damper regulators.

STEAM PIPING

The high-pressure steam piping from the two decks of boilers is all brought to one steam header, which is noteworthy from the fact that though nearly 160 ft. long it is provided with but two valves, as will be explained. The steam pipe from each boiler is 10 ins. in diameter, and the two pipes from the boilers vertically in line are united in a special connection before joining into the header. The usual long radius bends are employed in the pipes to and from the header, as shown, and the gate valves, which are of the Chapman pattern with bronze valves,

seats and stems, are placed in them in the boiler room. The valves in the boiler leads are accessible from an iron slat walk located over the smoke duct, in the case of both tiers of boilers, and the valves in the supply pipes to the engines are close to the header.

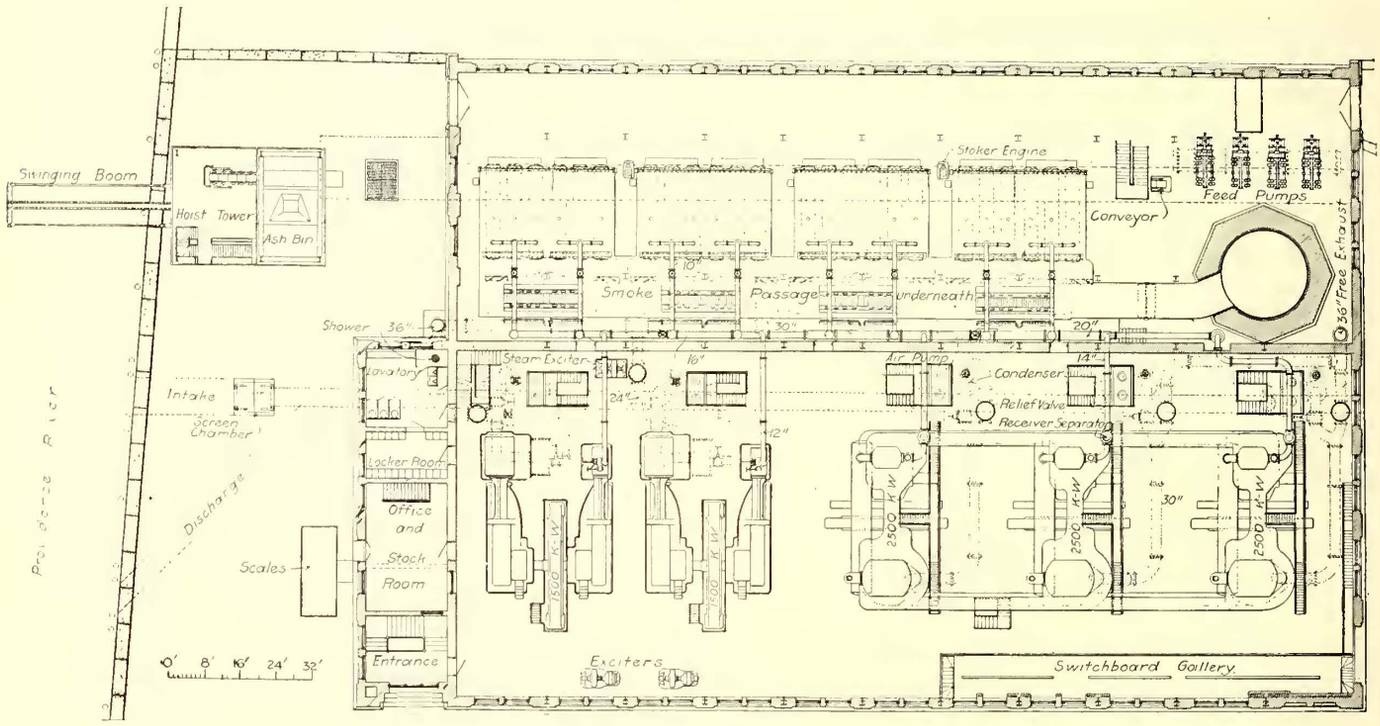
Wherever possible, providing there is no chance of receiving oil, the condensation in the high-pressure lines is returned to the boilers by means of the Holly gravity return system. In that connection an alarm whistle set against the partition wall in the engine room is connected to blow should the system fail to act, allowing water to accumulate. On each side of the whistle is a brass hand wheel; if the alarm is given, one is turned to cut out the regular connections, and the other turned on to blow off the water, and thus prevent its reaching the engine cylinders in any way. The live steam piping is lap-welded Bessemer steel pipe, ⅜ in. thick, with flanges welded on, and having rebated joints with corrugated copper gaskets. The fittings are open-hearth steel castings.

Expansion in the steam header is allowed for by the long, curved lateral pipes, as usual, and the header is anchored at a center point, so that the amount of movement at the ends is reduced to a minimum. Besides the anchor the pipe rests on three roller-bearing saddles to accommodate the movement, and the bases of supports and anchor are bolted to short cross I-beams. In the case of the expansion bearings the tee sets in a saddle, and this in turn on three 1½-in. steel rollers between the saddle and the roll-plate, which roll-plate is brought into position for the proper alignment of the pipe by means of four screws in the base attached to the I-beams. In the case of the anchor the saddle bears directly on the base, with finished mating surfaces, and the saddle has a lateral tongue with finished sliding surfaces fitted into a groove in the base to allow for lateral but not for longitudinal movements of the pipe. To lock the tee to the anchor a wedge piece at each end is fitted between the saddle and a block held against the flange of the tee, and, as shown, each wedge contains a screw by which it is tightened. The tees, it may be noted, are provided with drain taps, which are brought sidewise from the bottom through an opening which had to be left in the saddles for that purpose.

The steam pipes to the main units enter the room through the partition wall, as shown, and immediately within the engine room, each is tapped for the supply of the corresponding condenser air pump, and in the case of the horizontal units also for a live steam pipe, by which high-pressure steam can be delivered to the receiver when necessary, and in one instance also for the steam-driven exciter. With regard to the subdivision of the high-pressure steam header, it will be seen that by the location of the two valves provided in it, the center section of the header can supply one direct-current and one alternating-current machine, if either end has to be cut out, and similarly in the event of an accident to the center section or to the boilers connected thereto, an alternating unit can be run from one end of the header, and the direct-current supply can be maintained from the other, pending repairs. The header is located close to the partition wall, and to facilitate handling connections, whenever the necessity may arise, there is an opening 2 ft. x 4 ft. or so in the wall opposite the tee joints. These are closed with easily removable sheet metal covers, to minimize the number of openings in the wall.

ENGINE ROOM

The engine room plan shows five direct-connected units, two with horizontal and three with vertical engines and all cross compound. The vertical unit at the end of the room is not yet installed, and the third is at present occupied by a horizontal set which it is shortly to replace. The horizontal units are Filer & Stowell engines, 32 ins. and 64 ins. x 54 ins. in cylinder size, with General Electric generators, two giving an alternating-current output of 1500 kw at rated load, and the other a direct-current output of 1600 kw. The vertical unit consists of a Westinghouse engine, of 42-in. and 86-in. cylinders, with 60-in. stroke, and a General Electric railway unit of 2500-kw capacity. The alternators are operated at about 94 r. p. m., and give current in three phases at 25 cycles and 11,000 volts, and the engines, which, it may be noted, are operated with automatic cut-off for both cylinders, are equipped with a ⅛-hp Browning motor, by which the generators can be brought into synchronism by controlling the engine governors from the switchboard. The present horizontal railway unit runs at 90 revolutions and the vertical unit at 75 revolutions. The steam pressure is 150 lbs., and the vacuum, normally, 26 ins. For the alternators there are two motor-driven and one steam-exciter unit, the last for use when no alternating current is available, as the motor-generators employ induction motors. The steam



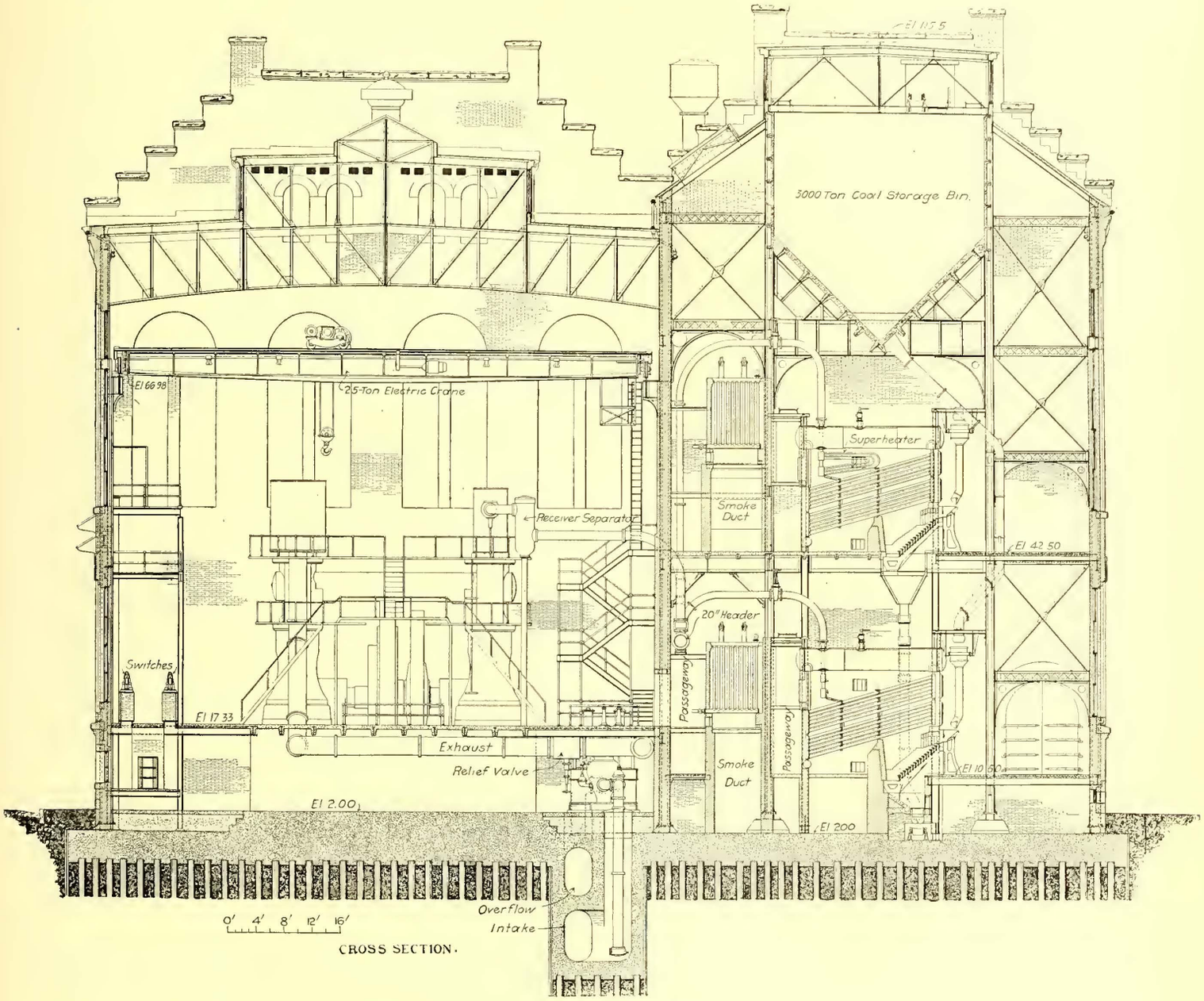
PLAN OF POWER STATION

unit is a General Electric marine set with an 11-in. x 8-in. engine, and a 30-kw, 125-volt dynamo, while the others consist of 440-volt, 75-hp motors and 125-volt, 55-kw dynamos, each set capable of exciting both alternators.

CONDENSERS

The condensing plant consists of four jet condensers, one for each unit, with vertical twin pumps drawing from one and discharging into a second of two concrete conduits, extending lengthwise of the building under the basement floor. The pumps, which are of the Blake pattern, are 16 ins. x 40 ins. x 24 ins. in size for the horizontal engines, and 16 ins. x 48 ins. x 24 ins. for the vertical unit. Relief valves are furnished near each condenser unit, and the exhaust piping is of cast-iron, except beyond the relief valves, where it is of spiral riveted pipe. There are two 36-in. free exhaust risers, one at each end of the building, the run of pipes being shown in the plan. The two straight horizontal lines leading to the risers are each provided with a Wainwright corrugated copper expansion joint. The risers, which are capped with exhaust heads, are some 100 ft. high, and the braces used allow for expansion. The rods have a fork at each end, making a hinge joint, one at a bracket fixed to the building wall and the other to a plate bolted to the flange of the exhaust riser. There are three sets of these braces for each pipe.

Salt water from the Providence River is used for condensing. It is admitted into a flume, 7½ ft. wide and 8 ft. high, lined with 6-in. sheet piling and having a floor of 4 ft. of concrete. The bottom of the suction flume is 16½ ft. below mean high water, and leads to a screen chamber, beyond which the flume takes the form of a flattened ellipsoidal concrete conduit with axes 7½ ft. and 4 ft. The discharge conduit within the building is similar to the suction passage, except that it is 7 ft. high. Outside the building it is also of the timber wall and concrete floor construction, with its bottom 7 ft. below mean high water, or about 2 ft. below low water, and it is 4 ft. x 7.5 ft. in cross-section. The concrete discharge conduit is vertically over the suction passage, but a short distance outside the building line it diverges from the line of direction of the suction flume, emptying at the wharf line 46 ft. from the in-take. Under each condenser the suction conduit can be reached by a well, in which is placed the pump suction pipe with strainer foot valve. The screen chamber at the end of the suction flume contains two 5-ft. x 8-ft. screens, of brass wire, one of 1½-in. mesh and the other of 1-in. mesh, through which the water



CROSS SECTION OF POWER STATION

passes in succession. This chamber is at the foot of a timber-lined shaft through which the screens may be removed. Hinged covers of heavy planking at grade level give entrance to the shaft, and immediately above the screen chamber proper is a 6-in. splined plank roof, through which the screens may be lifted in wooden guide posts extending from the bottom of the shaft to the ground surface.

BOILER FEED SYSTEM

The boiler-feed system is one of the specially interesting features of the plant. Owing to the use of jet condensers operated with salt water, fresh water for the boilers is constantly required, taken from the city mains. Normally, the water is passed through feed-water heaters, to which is brought the exhaust steam from the feed and condenser pumps and the marine-type exciter set, and is then taken by the feed pumps, at a temperature of about 170 degs. F., so that the pumps thus handle hot water, and is delivered through the economizers into the boilers at a temperature of 220 degs. to 230 degs. The heaters, pumps and economizers are all provided with by-passes, and there are also duplicate feed mains to the boilers.

The scheme of piping and connection is indicated in the accompanying diagram. Water is admitted from the public service through either one or both of two 6-in. pipes, and is passed through a meter, provided with the usual by-pass. The city pressure is sufficient to force the water through the feed

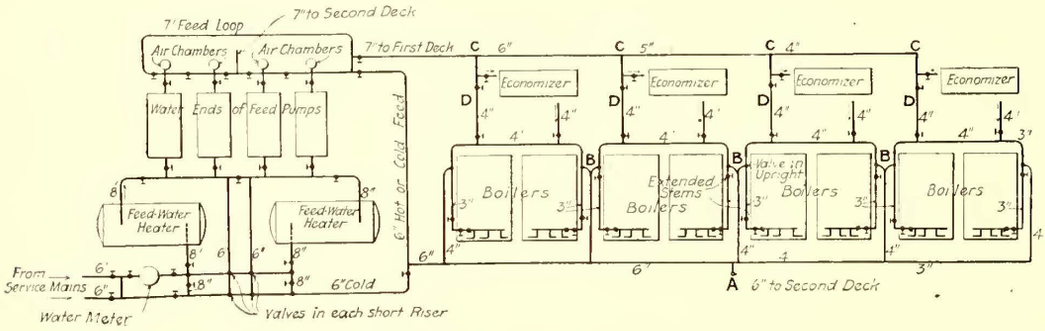


DIAGRAM OF FEED PIPING

heaters and to the pumps, which are located on the lower boiler floor, while the heaters are in the basement directly underneath. The delivery pipes from the heaters feed into opposite ends of of a suction header, into which also two 6-in. heater by-passes connect as shown. Each heater is the Gleaner type, made by Messrs. I. B. Davis & Sons, of Hartford, consisting of groups of U-tubes, through which the exhaust steam is led successively from steam inlet to drain outlet. Each heater has some 375 sq. ft. of heating surface, and is 4¾ ft. in diameter and 12½ ft. long. An interesting point is that all oil-laden drips are discharged into the lower row of tubes, and, it is stated, that the condensed steam is discharged at a temperature of only 4 degs. higher than the inflowing cold water.

There are four feed pumps, of the Worthington 14-in. x 8½-in. x 15-in. duplex, double-acting plunger pattern, all delivering to the same discharge header, but ordinarily connected two to the feed system of the lower deck of boilers and two to that of the upper deck. There are two steam mains run across the pumps, with a branch from each to each pump, and the steam valve to the pumps for the upper deck have extended stems rising through the second boiler floor so that they can be controlled from that point.

Opposite each pump discharge into the pressure header is a large air chamber, and in addition each pump carries a relief valve discharging into the suction. The header is formed into a loop in a vertical plane with the lower run in the cellar. From it are carried two 7-in. connections, these being the regularly employed feed mains for the two decks of boilers, and also a 6-in. connection, this leading to an auxiliary feed main, to which is also brought a 6-in. pipe direct from the city meter connections. The last pipe provides for filling the boilers with cold water, the other 6-in. main for forcing water in the boilers either hot or cold. A study of the diagram will show that any of the pumps can draw from either heater or direct from the cold supply, and that any pump can be used to supply either deck of boilers, by means of the delivery loop and the arrangement of valves.

The diagram also shows the distribution of the feed piping for one deck of boilers, the arrangement for the other being similar. The main, starting 7 ins. in diameter, is carried overhead behind the boilers, suspended from I-beams, and the branches of each battery, for the length C to D, are taken vertically upward from it, with a connection for the economizer, as well as direct to the boilers. The auxiliary main, starting 6 ins. in size, is run in the cellar, and at the point A supplies a vertical to a similar horizontal main in the upper part of the lower story of boilers for the second deck installation. The branches from this main, at the points B in each deck, bifurcate into two vertical pipes for the two adjacent boilers, with a valve in each vertical. At the top the verticals connect into the branches from the main feed system. The valve in the supply pipe to each boiler has an extended stem dropping toward the floor within reach of the firemen.

ELECTRICAL EQUIPMENT

The handling of current at 11,000 volts has resulted in an interesting equipment of electrical apparatus grouped around a two-gallery switchboard, 31 ft. above the engine room floor. The various electrical conductors from the generators are carried overhead on the underside of the ceiling in a spacious, well-lighted gangway in the basement. Here the high-tension bus-bars are located, each enclosed in separate brick housings supported on a slate platform, and connections to and from them are made in oil-break, brick-housed switches on the engine room floor. These are of the pattern operated by relay switches on the switchboard, the switches actuating the main switches through worm and wheel gearing driven by small direct-current motors, one mounted on the brick enclosure of each switch. There are five alternating-current feeders, and the conductors pass out of the building opposite the second story of the switchboard, where there are cut-out copper bar switches mounted on marble panels, with branches to the lightning arresters, grouped underneath the first gallery.

A feature of the switchboard construction is the provision of 3½-in. pipe conduits, built in pilasters against the outside building wall, for the passage of the conductors. At the bottoms the pipes are set into special cast-iron sockets, giving smooth, rounded surfaces into the conduit, and at the top they are fitted into the marble cap of the pilaster. The high-tension feeders are carried horizontally through the building wall in the center of an 8-in. x 8-in. opening in it, and outside, under the cover of heavy slate hoods, are located the tension insulators and the beginning of the transmission line.

The alternating-current feeder panels have each a recording wattmeter and three ammeters, the latter showing the state of balance of the load on each phase. The generator panels have only one alternating-current ammeter, but have both an indicating and recording wattmeter, together with an ammeter for field current. For the motors of the electric-driven exciters there are two banks of three delto-connected transformers on the slate platform in the basement. These step down to 460 volts, and the motor panel of the switchboard contains the relay

switches for cutting in and out the high-tension current of the transformers, the switches being the motor-operated oil-break type.

The direct-current board at present provides for thirty feeders in fifteen panels. Each panel carries two ammeters for the two feeders, but only one circuit breaker. The generator panels have one switch on the switchboards in the negative side, and one circuit breaker in the negative side, while on a pedestal at each machine there is a positive switch and the equalizing switch. The total direct-current output is measured in a large recording wattmeter on a panel between generator and feeder panels, and this panel also carries a totalizing indicating ammeter. The positive feeders are 500,000 circ. mils, and the negative returns 1,000,000 circ. mils. The switchboards are, generally speaking, equipped with standard General Electric instruments; they are of Vermont marble, 2 ins. thick, mounted on 3-in. longitudinal timber stringers. The switchboard structure is of steel framing with slate floors.

OPERATING DETAILS

The plant is equipped with an interesting oiling system, and is piped for compressed air throughout engine and boiler rooms. A large clock on the partition wall is set to strike a gong every 20 minutes, when the oilers are required to make a circuit of the engine room to ascertain the condition of all bearings, and once a day the machinery is cleaned by compressed air. For the latter there is a Westinghouse locomotive-type compressor, automatically controlled to maintain 70 lbs. pressure, and the system distributes from an air reservoir about 18 ins. in diameter and 7 ft. long. For signaling between operating engineer and switchboard attendant the system in vogue on shipboard is in use, consisting of two dials, one in the switchboard gallery and the other on the engine room floor, these connected together with chains and actuating pointers to stop opposite various legends on the dials, to which attention is drawn by the ringing of a gong. The system is patented by Charles Cory & Sons, of New York.

The oiling system referred to comprises a duplicate set of storage, separating and filtering tanks, all located in an oil room in the basement of the extension or L; a fifteen-barrel reservoir, 35 ft. or 40 ft. above the engine room floor on the partition wall, two small Mason pumps for lifting the oil from the storage tanks to the reservoir, and a system of brass distributing piping. The separating tanks to which the oil is brought by gravity from the engines are 36 ins. in diameter and 7½ ft. high above the base. They are partly full of water and the oil is introduced at the bottom through a central pipe, and passes upward through the water and through a circular plate perforated with ⅛-in. holes for catching foreign matter. Near the top is the overflow for the separated oil, which flows to the filters. In these the oil falls on a flat conical plate or shedder, perforated with ¼-in. holes, from which the oil passes by gravity through alternate layers of woolen waste and charcoal. These layers of filtering material are held between brass wire screens, five layers of waste, each about 4 ins. thick, and four layers of charcoal, each about 3 ins. thick. This filtering material is enclosed in a 30-in. shell, in the bottom of which are ½-in. holes, by which the filtered oil reaches the outer chamber of the filter, and thence through an outflow pipe to the storage tanks, to be used again. This is for the engine oil. For cylinder oil, a good-sized vertical tank is located in the engine room, from which distribution to the cylinder oil pumps is to be effected by compressed air.

The station was designed by the engineering department of the Rhode Island Suburban Railway Company. The building was erected by Messrs. Horton & Hemenway, and the piping work by the General Fire Extinguisher Company, both of Providence. Plans for the station had been completed for horizontal units and a single floor of boilers, when, in August, 1902, it was decided to double the capacity of the plant without an increase in ground area. The pile and concrete foundation work had, fortunately, been planned heavy, and it was necessary only to redesign the superstructure. The steel was rolled and erected, the chimney was built, the brickwork completed and the four engines and the boiler plant installed in a year and four months.

TRAFFIC CONDITIONS ON THE BROOKLYN RAPID TRANSIT SYSTEM*

BY C. R. BARNES

The average number of passengers carried daily on all lines of this company's system, including the elevated, in both directions, is 942,107. Of this number, 301,408 are carried on the elevated system, and 640,699 on the surface lines. A majority of these passengers are carried during the morning and evening rush hours, the greater number being carried during the evening rush hours. The conditions of traffic during these hours are such that passengers cannot ride with any degree of comfort or convenience. The consideration of traffic conditions in this report is confined to the period of maximum traffic during the evening rush hours, namely, from 5 to 6:30.

From 5 p. m. to 6:30 p. m. there is an average of 121,295 passengers carried on the system, from the New York terminus of the Brooklyn Bridge, the ferries and local points in Brooklyn, to the suburban section and the towns and villages adjacent to the city of Brooklyn. Of these, 46,808 passengers are carried on the elevated system and 74,487 on the surface lines. Of the number carried on the elevated lines "out" during that period, 27,544 are carried from the Brooklyn end of the Brooklyn Bridge, 2065 from the ferries, and 12,228 from local points in Brooklyn. In addition, there is an average of 4911 passengers carried over the bridge during this hour and a half from New York to Brooklyn, which can be considered as local bridge travel, not continuing a through trip on either the surface or the elevated lines. Of the number carried on the surface lines "out" during that period, 17,495 are carried from the New York end of the bridge, 8750 from the ferries, and 48,242 from local points in Brooklyn.

There are fourteen lines of surface cars operated from the New York end of the Brooklyn Bridge to different points in Brooklyn and the surrounding territory. The cars on two of these lines run through Fulton Street, between the City Hall and Flatbush Avenue.

There are nine lines of surface cars operated from Fulton Ferry. Eight of these lines are operated through Fulton Street, between Sands Street and the City Hall, and six of them run through Fulton Street between the City Hall and Flatbush Avenue.

There is one line of cars operated from Wall Street Ferry; these cars do not pass through Fulton Street.

There are five lines of cars operated from South Ferry. One of these lines is operated through Fulton Street from City Hall to Flatbush Avenue.

There are three lines of cars operated from Hamilton Ferry, none of which runs through Fulton Street.

There are four lines of cars operated from Thirty-Ninth Street Ferry, none of which passes through Fulton Street.

There are twelve lines of cars operated from Broadway ferries, none of which runs through Fulton Street.

There are three lines of cars operated from Grand Street Ferry, none of which passes through Fulton Street.

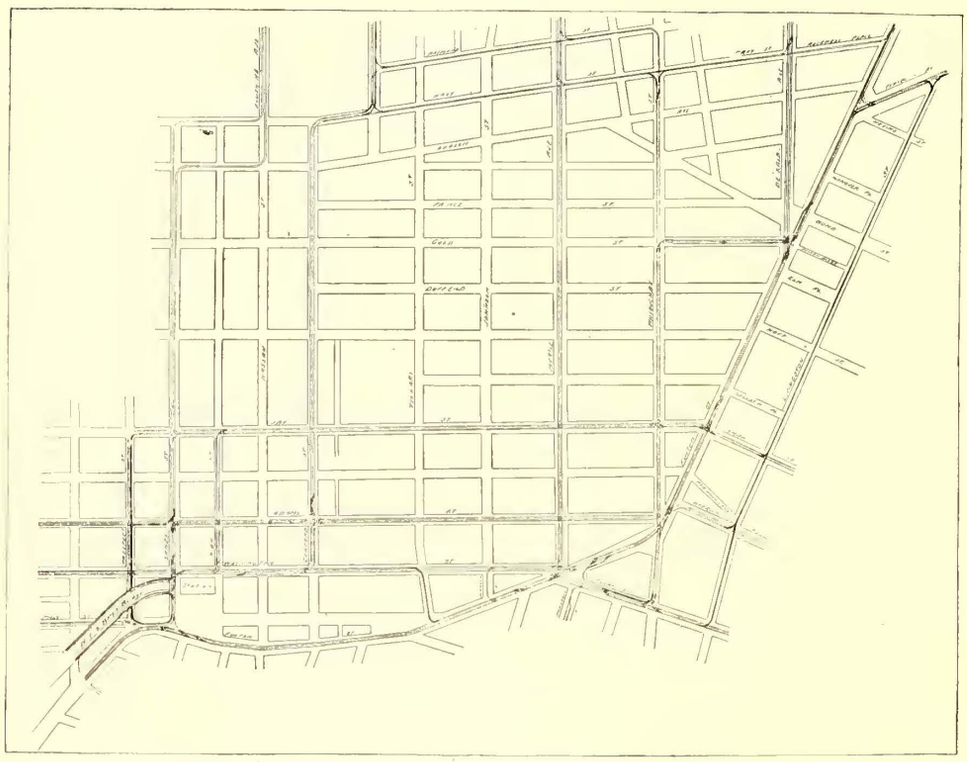
There are four lines of cars operated from Greenpoint Ferry, none of which passes through Fulton Street.

*Abstract of report of the electrical expert of the Railroad Commissioners of the State of New York, at Albany, Feb. 3, 1904.

Several of the lines mentioned run over the bridge and to some of the ferries.

The number of trips operated from the New York terminus over the bridge during 1 hour—from 5 p. m. to 6 p. m.—varies from 220 to 280, including cars operated by the Coney Island & Brooklyn Railroad Company.

The larger portion of the volume of traffic originating in Brooklyn and moving from the center of the borough to the outlying districts during the evening rush hours, originates in a section within a radius of half a mile of the City Hall. The greater part of this travel starts from the vicinity of the City Hall and on Fulton Street, between the City Hall and Flatbush Avenue. Cars operated from New York during the evening rush hours furnish practically no facilities for this traffic, as these cars are loaded when leaving the New York terminus of the bridge. This travel depends on local cars, which are operated from points in the territory and the ferry cars which pass through it; as the latter are not at all times during the evening rush hours fully loaded when leaving the ferry, they furnish some facilities for the local travel.



MAP SHOWING PROPOSED CAR ROUTES NEAR BROOKLYN END OF BRIDGE

From actual count made at the ferries of passengers carried and number of cars run, it is determined that the ferry cars passing through the district of local travel mentioned, in addition to carrying the ferry passengers would leave room for a number of local passengers equal to 271 trips on the different lines between 5 and 6:30 o'clock each evening.

The total number of surface car trips operated "out" on the system between 5 p. m. and 6:30 p. m., is 1291, of which 271 are available for local traffic in the territory mentioned. The number of passengers carried locally on the surface lines "out" during the hour and a half mentioned in the evening, from the territory within a radius of a half-mile of City Hall is 24,000, which is 32 per cent of the total passengers carried "out" on the surface lines. There is operated available for this traffic 21 per cent of the total trips run on the surface system.

CONGESTED POINTS ON THE SURFACE SYSTEM

There are several points on the surface lines at which the movement of cars is delayed by congestion of traffic. The most serious delays from this cause occur at the following points: On the bridge; the Brooklyn terminus of the bridge; Fulton Street, between Court Street and Flatbush Avenue, and at the Broadway ferries.

The number of cars operated over the bridge during 1 hour of the evening rush, varies from 220 to 280. The distance traveled by cars running over the bridge is 1.1 miles; the average running time of cars over the bridge is about 9 minutes, which is at a speed of about 7.3 m. p. h. Serious delays to traffic occur on the bridge. These and the fluctuation in the number of cars operated per hour, result largely from interference with car traffic by vehicles moving over the bridge.

The delay to traffic at the Brooklyn end of the bridge is caused by running outbound cars from the bridge through Sands Street across the inbound traffic on Washington Street, going on to the bridge. During the rush hours this is a very congested point, and the delays to movement are very frequent and serious. There are ninety cars per hour which leave the bridge and run through Sands Street, crossing the movement of 190 cars on Washington Street going on to the bridge between 5 p. m. and 6 p. m. In addition, during this hour there are twenty-nine cars operated from Fulton Ferry up Washington Street which cross the movement of the ninety cars coming from the bridge through Sands Street; also crossing the movement of the ninety cars which run through Sands Street to the bridge. At the intersection of the tracks on Washington Street and the out-bound track on Sands Street there are 304 cars operated during the hour mentioned, making about five cars per minute. The congestion near this point is still further increased by the fact that 116 cars are run from Sands Street over a connecting curve to the out-bound track on Washington Street, joining the twenty-nine Fulton Ferry cars operated through that street. These cars, moving in the same direction, come together at a junction which is located within a car's length of the Sands Street track.

The number of cars operated over the bridge during the hour from 5 p. m. to 6 p. m., with the present physical conditions and present regulations of vehicular traffic over it, cannot be increased to any great extent. There is an average of 17,495 passengers carried on the surface lines over the bridge in one hour and a half in the evening. A broken or stalled truck, which would delay the movement of cars for half an hour during this period (which is not an unusual occurrence), would delay the movement of 6770 persons. With due consideration for the commercial interests whose business requires traffic by trucks between Manhattan and Brooklyn, justice to the large number of people inconvenienced by such traffic demands that stringent methods be adopted to prevent the delays to car traffic caused by it.

Several plans have been suggested to relieve the congestion and delay to traffic at the Brooklyn end of the bridge, caused by the operation of cars from the bridge through Sands Street, none of which, however, has been executed. If any appreciable increase is to be made in the number of cars operated over the bridge there must be some relief from the congestion at this point.

The congested condition of traffic on Fulton Street between

the City Hall and Flatbush Avenue is worse than at any other point in the State of New York. The number of cars operated is such that any additional cars would decrease the traffic facilities rather than add to them. There are more cars operated over the Boerum Place crossing than over any other in this State. Movement of cars on the system would be facilitated if this number were reduced. As a large majority of the traffic from Brooklyn to the suburban territory originates on and in the vicinity of Fulton Street, cars to properly serve this traffic should be operated through that street. With the present physical conditions no more cars can be run through Fulton Street, and any additions to the facilities for local travel must be made by removing through cars from New York from that street, or running additional cars through streets near to and parallel with it.

The delay to car traffic on the bridge can be prevented by the regulation of the vehicular traffic passing over it; the passage of heavy trucks or other vehicles which might interfere with the free movement of vehicles in a single line over the bridge between the hours of 5 p. m. and 6:30 p. m., should be prohibited. All vehicles passing over the bridge should be confined to a single line and not allowed to approach near enough to the tracks to prevent the movement of cars.

The congestion on Sands Street could be avoided by running all cars from the bridge that are now operated through Sands Street, through Fulton Street to Prospect Street, passing under the arch of the bridge and continuing on Prospect to Adams or Jay Streets. The track for this operation is at present constructed, but would require reconstruction. This route would add 590 ft. to the distance traveled by the cars at present which pass through Sands Street. This change would result in a free movement of cars at the intersection of Sands and Washington Streets, and prevent the frequent and serious delays at that point. If these changes were made and the vehicular traffic on the bridge regulated as suggested, the speed of cars across the bridge could be increased so that the number of cars operated over it could be increased from an average of 250 to about 300 per hour.

In reference to the congestion on Fulton Street—Livingston Street extends nearly parallel with Fulton Street and one short block from it. The rears of the retail stores facing on Fulton Street abut Livingston Street on one side of it, and there are dwelling houses on the other. There are no tracks constructed in this street; it is not wide enough to accommodate double tracks, and the street traffic at present passes through it. This street extends from Court Street to Flatbush Avenue, a distance of about one-half a mile. To relieve the congestion on Fulton Street and facilitate the movement of cars on a large portion of the system, double tracks should be constructed through Livingston Street between these points. This would necessitate the widening of the street. A single track could be constructed through this street, which could be done by placing it on one side of the street, in such a manner that the operation of cars over it would not seriously interfere with the street traffic. If this were done the congestion on Fulton Street could be materially relieved, as about one-half of the cars that are at present run "out" on Fulton Street could be operated through Livingston Street and return over other routes not running through Fulton Street.

In addition to the delays caused from the above reasons, the operation of cars during the present winter has been seriously delayed by vehicular movement in the business portions of the Borough of Brooklyn. While there was a decided improvement in the regulation of street traffic during the past summer season, the regulation of this traffic during the present winter has been very poor. One of the causes of the obstruction of car movements by vehicles during the present winter season has been the heavy fall of snow and the manner in which it has been removed from the streets. In most cases it has been allowed to remain on the streets for a considerable period, in such a position as to force the vehicles on to the car tracks.

The conditions of travel in the Borough of Brooklyn and to and from the Borough of Manhattan, are such that nothing should be left undone to improve them. If the above suggestions were carried out the present conditions would be greatly improved, but they would not furnish adequate facilities for the present travel or the probable increase of traffic in the near future. What this increase will be is indicated by the fact that during the year ending June 30, 1903, there were 15,000,000 more people carried on this company's system than the year previous. Some commercial or private interests might be unfavorably affected by the adoption of the above suggestions, but the benefit to the large number of people carried daily is of such vast importance that the impairment of any interest, private or otherwise, should not prevent it. The people living in the suburbs and doing business in Brooklyn, an average of 48,000 of which leave Brooklyn in one hour and a half for their homes, via the surface lines, are entitled to and should receive better transportation facilities than they have at present. The number of passengers carried from the vicinity of the City Hall constitute 32 per cent of the total number of passengers carried on the surface lines, and are only given 21 per cent of the traffic facilities; but, with the present physical conditions, no additional cars can be furnished them. If a track were constructed through Livingston Street and some minor changes made in the present track connections at other points, including the construction of a short piece of track through Tillary Street, connecting tracks in Washington and Fulton Streets, the present facilities for local travel from the section at and near the City Hall—which at present consist of 271 trips between 5 p. m. and 6:30 p. m., could be nearly doubled.

If the suggestions in reference to change of routes at the Brooklyn terminus of the bridge and in regard to the regulation of traffic on the bridge were adopted, the facilities for through traffic from New York could be increased 20 per cent, as since the four additional loops on the New York end of the bridge have been in use there has been no delay to the movement of cars caused by loading and unloading of passengers at that point. The number of cars operated over the bridge during the rush hours is controlled by the number which can be passed the intersection of Sands and Washington Streets on the Brooklyn end. If these suggestions were adopted the number of passengers carried on the surface cars over the bridge during the maximum period of travel, between 5 and 6:30 in the evening, could be increased from 17,495 to about 21,000.

The consideration of the traffic conditions and the suggestions for improving them is confined to the surface lines and to the present physical conditions and possible changes which might be made by the addition of new tracks and reconstruction of existing ones. The possibilities of increased facilities in connection with the new bridges in course of construction, or of the new tunnels contemplated, have not been considered.

No suggestion is made in reference to the improvement of traffic conditions on the elevated system in the Borough of Brooklyn, and very little, if any, can be made with the present limited terminal facilities. It is possible that a few more trains and a few additional cars could be operated on some of the different lines, but no improvement of this service, such as the present and probable increase in traffic demands, can be made at present or in the near future, with the restrictions caused by the present physical conditions.

To sum up:

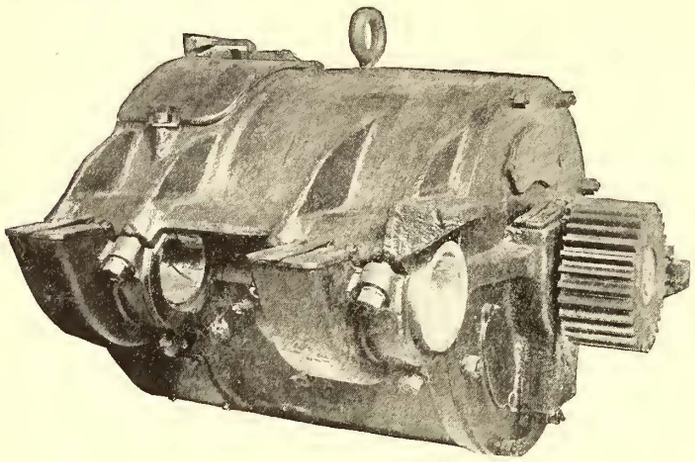
(1) I suggest that vehicular traffic over the bridge be regulated as suggested in this report.

(2) I recommend that the changes in the route of cars at the Brooklyn end of the bridge be made as stated in this report.

(3) I recommend that the company take the proper legal steps for the construction of the Livingston Street line.

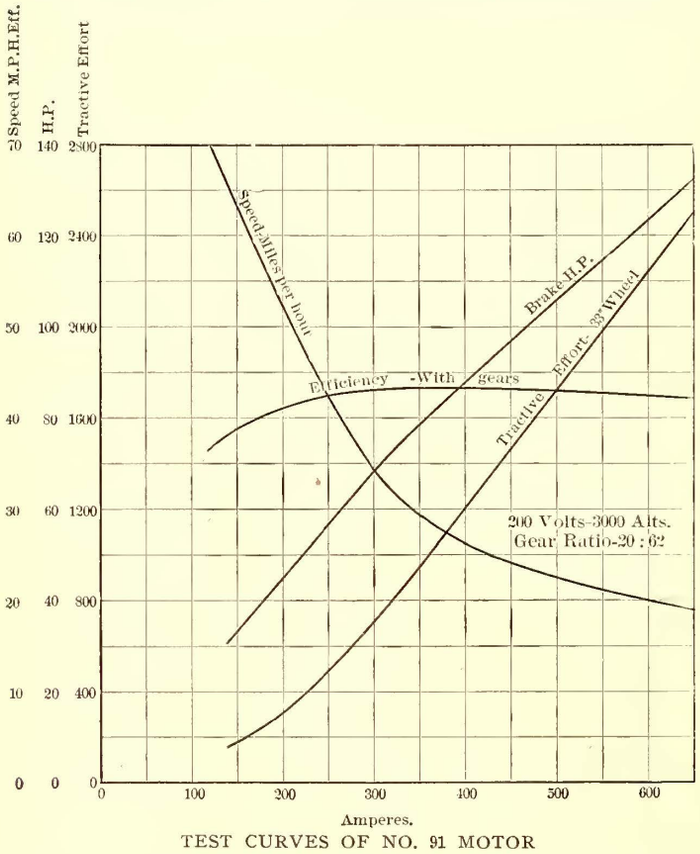
WESTINGHOUSE NO. 91 SINGLE-PHASE RAILWAY MOTOR

The alternating-current single-phase railway system recently placed upon the market by the Westinghouse Electric & Manufacturing Company is attracting so much attention and presents so many possibilities that a description of one of the motors which makes this system practicable cannot fail to be of interest.



MOTOR, FRONT VIEW

The No. 91 motor has a nominal rating of 125 hp, on the basis of a 1-hour run at full load with rise of temperature not exceeding 75 degs. C. Mechanically it follows the general lines now regarded as standard for direct-current railway motors. The principal features peculiar to the new type are found in the

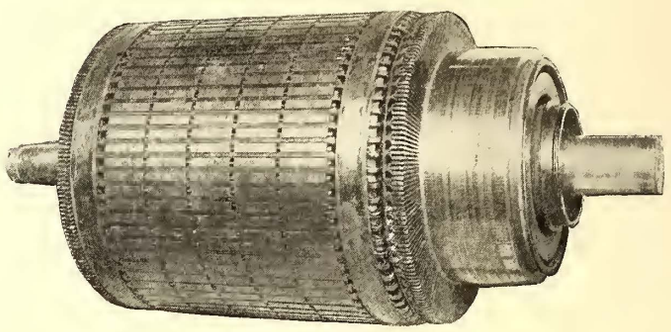


TEST CURVES OF NO. 91 MOTOR

construction of the magnetic field and in the winding of the armature and field coils. The motor is series wound and of the commutator type.

The field frame consists of a cylindrical shell of cast-steel, to which are bolted solid end brackets of the same material. These end brackets contain supports for the armature bearings. The upper caps of the axle bearings are cast solid with the frame. The lower caps are rigidly held in place by heavy bolts. The axle bearings consist of cast-iron shells lined with babbit and divided into two parts. Solid shells, also babbit lined, are used for the armature bearings, and ample wearing surface is provided. Oil lubrication is used throughout, and the bearing boxes are large and are packed with waste. The extensions which carry the axle bearings are especially strong and heavy. An eye-bolt in the top of the casting provides for easy handling. There is a large opening in the upper frame which permits access to commutator and brushes. Numerous hand holes are provided both in the end brackets and at the bottom of the motor. The lugs for "nose" suspension and for the support of the gear case are cast solid with the frame.

The field core is made up of circular punchings of soft lami-

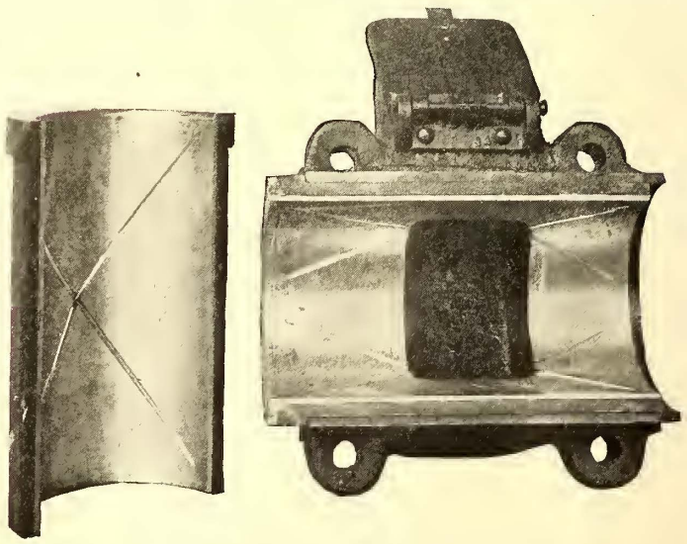


ARMATURE

nated steel, and the poles are rectangular in section and project inward. A magnetic circuit is thus formed which is wholly laminated and without break from pole face to pole face. As the armature core is correspondingly constructed there is no mechanical joint in the whole magnetic circuit. The construction, as will be seen, is in general the same as that used for alternating-current induction motors.

The field coils are wound with copper strap bent on edge, and are held firmly in place by adjustable hangers of improved design. They are connected in series. Brush holders of the sliding shunt type are used, and are supported inside the end bracket. The brushes are of carbon.

The armature is of the slotted drum type with machine-formed coils, and the core, as stated, is composed of laminated



AXLE BEARINGS, BABBIT LINED

punchings of soft steel built up upon a spider. As in d. c. motors numerous ventilating spaces are provided, permitting air to circulate through the core and between core and coils. The slots in the core for the coils are of the open type. The coils, themselves, are made of copper strap without joint, and are held in place by retaining wedges of hard fibre. The winding is of the multiple type, and there are no band wires over the core. The commutator is built up of cold rolled copper segments with long necks.

The No. 91 motor is wound for 225 volts and a frequency of 25 cycles or lower. Its general performance is shown by the curves in the diagram on page 294. These curves indicate the similarity in performance to the direct-current, series-wound railway motors now standard.

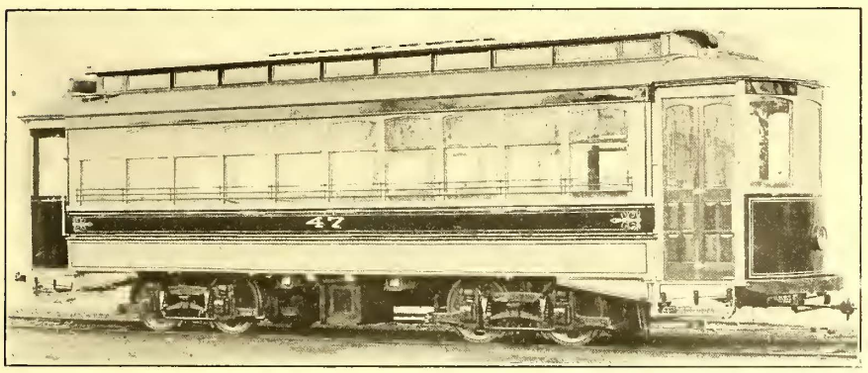
The No. 91 motor though designed primarily for operation on alternating-current, single-phase, circuits may also be operated by direct current. For this purpose a modification of the controlling apparatus is required.

A complete line of motors of this type has been designed by the Westinghouse Company and may now be obtained for railway service of any class.

HANDSOME SEMI-CONVERTIBLE CARS FOR SYRACUSE

Within the last week or so the Syracuse Rapid Transit Company, of Syracuse, N. Y., has added to its equipment five new semi-convertible cars, built by the J. G. Brill Company. The new cars are to run from Syracuse to East Syracuse, a suburb about 6 miles from the city, connected by one of the branches of the 70-mile system owned by the company. The passenger traffic in this section has grown rapidly since the lines were constructed, and most of the business which formerly went to the steam road has been diverted by the trolley extension. These new cars, with the fast service that they are capable of giving, will materially aid in further developing the locality.

The car dimensions are: Length, 28 ft.; length over end panels, 37 ft. 5 ins.; over vestibules, 4 ft. 8½ ins.; width over sills, 7 ft. 10½ ins.; over posts at belt, 8 ft. 2 ins.; centers of posts, 2 ft. 8 ins.; sweep, 1¾ ins. The side sills are 4 ins. x 7¾ ins., and end sills, 5¼ ins. x 6⅞ ins.; sill plates, 12 ins. x ⅜ ins. Thickness of corner posts, 3¾ ins.; side posts, 3¼ ins.



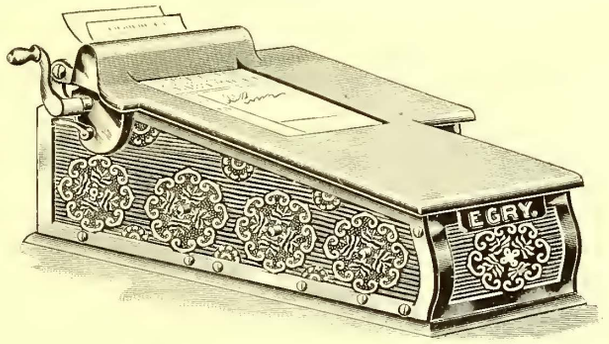
SEMI-CONVERTIBLE CAR FOR SYRACUSE

The windows of the car shown in the accompanying illustration are all in their lowered position, but, as is well known, this type of car has roof pockets into which the sashes may be raised. The seating arrangement comprises six 36-in. transverse seats on each side, and 64-in. longitudinal seats at the corners—a total seating capacity of forty. The aisle is 22 ins. wide.

The interiors of four of the cars are finished in cherry, with decorated birch ceilings, and one car in sycamore, including doors and vestibule wainscoting, etc. The platform timbers are reinforced with angle-iron, and angle-iron bumpers protect the ends. All the cars are furnished with specialties of the builder's make, such as draw-bars, brake handles, sand-boxes, alarm and conductor gongs. The cars are mounted on Brill 27-G trucks with 4-ft. wheel base, 33-in. wheels, 4½-in. axles, and equipped with four 38-hp motors per car.

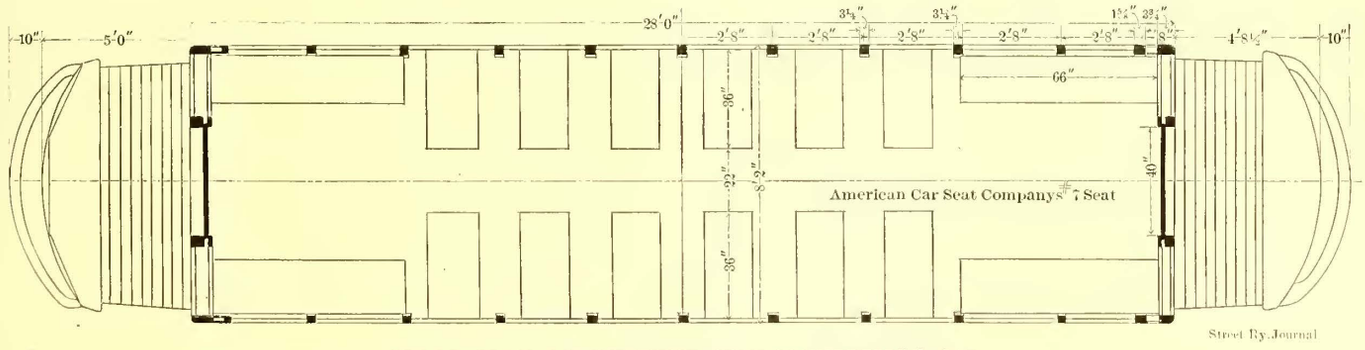
AUTOGRAPHIC REGISTRATION OF TRAIN ORDERS

Although autographic registers are used extensively in stores, offices and factories for issuing triplicate bills, orders, requisitions, shipping receipts and the like, it may not be known generally how well a specially constructed device of this kind



AUTOGRAPHIC REGISTER FOR TRAIN ORDERS

fits into the telephone despatching system of an interurban railway. The Egry Autographic Register Company, of Dayton, Ohio, has constructed for this work a register which it terms the "Despatcher." By using this register the conductor or motorman is provided with a train order blank ready for instant use. The device, which is shown in the accompanying illustration, is constructed of finely finished metal and is of excellent workmanship. It is arranged to carry the orders in triplicate, so that one may be given to the conductor, another to the motorman, and the third retained under lock and key. This last copy is not accessible to anyone save the authorized official of the railway who takes the record for auditing purposes from the receptacle. After the order has been written the conductor obtains a duplicate and triplicate by simply turning a crank. Thus the company is made acquainted with every train order as written by one of the train crew, who, in turn, is always provided with triplicate train orders ready for instant use, without bothering with the several sheets required ordinarily in taking down the duplicate or triplicate train orders. This method also assures the management that care in receiving orders will be taken by the train men.



FLOOR PLAN OF SYRACUSE SEMI-CONVERTIBLE CAR

The method of placing these registers is determined by the operating conditions. Where companies are equipped with portable telephone outfits in the cars, the despatcher's office and each car is provided with a register. On lines where pole boxes are used a register is placed in each box, that the train crew may receive orders and report along the route. Where orders are given only at way stations, located at short intervals, registers are placed in all such stations. In all instances, however, a register is placed in the despatcher's office, over which he writes the orders given, producing triplicate copies at one writing, placing one copy on file for his own reference, sending another to the general office with the despatch sheet, and leaving the third in the receptacle, from which it is taken whenever all orders are to be compared and checked.

It will be seen that this system is planned to produce despatch, yet command accuracy and protection for all car movements requiring written orders, except, of course, where cars move according to the schedule. Its use overcomes shifting of blame, confusion of orders, unnecessary messages and the like. Order forms of various sizes can be issued, depending upon the size of the register. Any form of train order blank, however, can be outlined according to the requirements.

MOTORMAN'S SANDAL

A spring sandal, to be worn by motormen for relieving them from the constant vibration of the car, has recently been invented by B. R. Bonney, of Pasadena, Cal. Mr. Bonney is an old motorman, having been employed by the Pacific Electric Railway Company, of Los Angeles, and his invention is the result of personal investigations, which had as their aim the relief to motormen of the jar and vibration which the men receive from the car. Physicians are said to testify to the bad effects that frequently result from this continual vibration, such as varicose veins and kidney trouble, and motormen often have to

SANDAL ATTACHED TO SHOE

leave the service on this account. Where the men are provided with stools, which they use during a part or all of the trip, the results are not so bad.

The Bonney sandal is constructed to fit over the shoe, as shown. As may be noticed from the accompanying illustrions the sandal consists of a thin sole, formed to fit the bottom of a shoe, and raised from the floor by a hard-rubber piece under the toe and by coil springs at the heel. The rubber piece is ½ in. x 1½ ins. x 4 ins., and is riveted to the metal sole. The springs are made out of a single piece of the best spring steel, and the design is such that the tension of the spring increases with the weight, so a heavy man gets the same protection as one of average or light weight. The sole is insulated with rubber, and is held to the foot by two leather straps, which are secured by glove fasteners. A pair of the sandals weigh about 15 ounces, and it is said that the wearing of them causes no inconvenience, as the motorman can walk with them easily. It is stated that officials of the Pacific Electric Railway Company, as well as several physicians, have given their endorsement to the sandal.

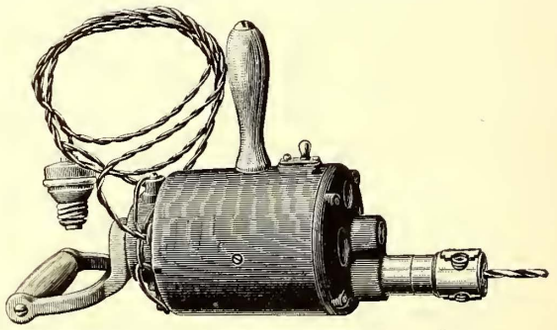
For use in winter in the Eastern States it is proposed to manufacture an overshoe on the same principle which will

ATTACHMENT FOR MOTORMAN'S SHOE

have an insulated spring sole, and a warm top to cover the entire shoe. If desired, such a shoe could be worn over an ordinary light rubber or overshoe. The Bonney Manufacturing Company, of 621 South Los Angeles Street, Los Angeles, Cal., has been incorporated to manufacture the sandals, and it is expected that they will soon be placed on the market.

ELECTRIC HAND DRILL

The accompanying cut illustrates the "Hisey" electrically-driven hand drill, sold by the W. R. Garton Company, of Chicago, Ill. It is made to operate at 110 volts and 220 volts direct current, but can also be operated in series with lamps



ELECTRICALLY DRIVEN HAND DRILL

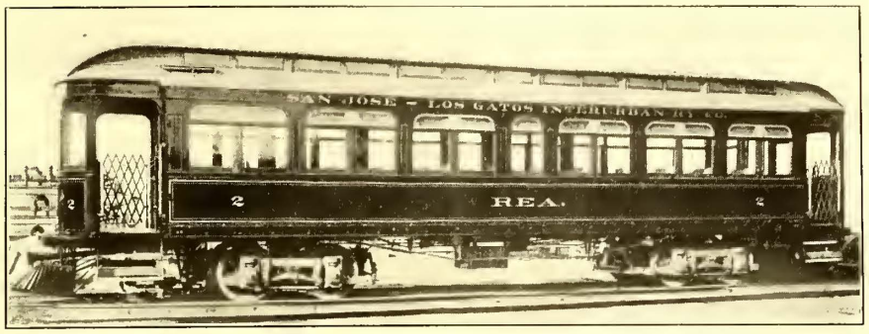
on 500 volts. The required operating current is obtained by plugging the drill terminal into the socket of an ordinary incandescent lamp in series with the regular circuit. This drill is extensively used in wood and metal-working shops, as it saves much time and labor. It should find extensive application wherever direct current may be obtained conveniently.

A revised schedule of rates of fare has been adopted by the Indiana Union Traction Company on its interurban lines between Indianapolis and Muncie, Anderson and Marion and Alexandria and Elwood. Single trip fares are on the basis of 1½ cents per mile, while the minimum cash fare is 10 cents. Round-trip fares are on the basis of 10 per cent reduction from single-trip fares. Two hundred and fifty-mile mileage books, good on all lines of the company, are sold for $3.25. One thousand-mile mileage books, good on all lines of the company, are sold for $12.50. Mileage books are sold only by company cashiers at passenger waiting rooms. An additional seat fare is charged on limited cars.

NEW CARS FOR SAN JOSE-LOS GATOS RAILWAY

A short distance from the lower end of San Francisco Bay, and about 40 miles south of San Francisco, is the city of San Jose, having a population of about 25,000, and situated in the heart of a large and populous fruit-growing district. Between San Jose and Los Gatos are the high-speed lines of the San Jose-Los Gatos Interurban Railway Company.

This company has lately added to its equipment twelve fine cars, like the one shown herewith, which were built by the American Car Company, of St. Louis. The cars present an attractive and imposing appearance with their steam car roofs, twin windows, vestibules and pilots, and have very pleasing interiors finished in handsomely carved cherry. They are seated for fifty-two passengers, the seats being of the walk-over type, 33 ins. in length, and the aisles 22 ins. wide. Over the crown-pieces the cars measure 45 ft. in length, and over the end panels 36 ft. The width over sills is 8 ft. 3 ins.; from center to center of posts, 2 ft. 5½ ins.; thickness of corner posts, 3¾ ins., and side posts, 2¼ ins. The side sills are 5 ins. x 7¾ ins., with 8-in. x ⅝-in. plates on the outside. The end sills are 5¾ ins. x 7⅞ ins. From the end panels over the vestibules is 4 ft. 6 ins. The step heights from the rail are respectively 16¼ ins., 12½ ins. and 12½ ins. The entrances have folding gates hinged to the corner posts. The cars are equipped with sand-boxes of the American Car Company's make, and Brill angle-iron bumpers, Dedenda gongs and folding gates. The trucks are 27-G with 4-ft. wheel base and 33-in. wheels. The motors used have a capacity of 45 hp.



CAR FOR SAN JOSE-LOS GATOS INTERURBAN RAILWAY

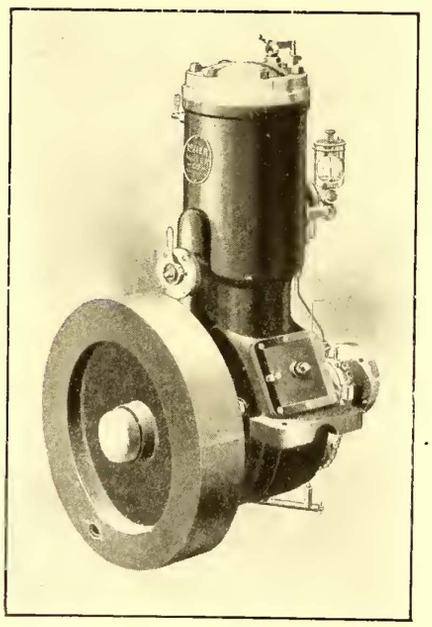
GASOLINE MOTOR BOATS FOR RAILWAY PARKS

A gasoline motor boat is rapidly becoming looked upon as an almost invaluable adjunct of pleasure resorts where boating is one of the possibilities. Traction companies are alive to the fact that a boat of this kind not only proves in itself a good paying investment, but adds much to the popularity of the resort reached by suburban lines as well as serving to increase traffic in the direction of these resorts. An excursion boat of this type propelled by a gasoline engine has one decided advantage over an electric launch, as it can be used continually for a considerable time, as the gasoline tank has a sufficient fuel-carrying capacity for a run of 200 miles to 400 miles, and can be refilled quickly, whereas, an electric launch, after 5 hours of running, requires practically an equal length of time for recharging, during which time the boat is out of commission.

GASOLINE MOTOR BOAT, USED BY THE COLUMBUS, BUCKEYE LAKE & NEWARK TRACTION COMPANY

The first cost of a boat with a gasoline motor is considerably less than the first cost of an electric boat, and there is no expense for storage batteries and recharging. The only current required in a gasoline boat is furnished by an ordinary set of primary dry cells, which can be purchased at a cost of $4 to $5. These gasoline motor boats require no licensed engineer, pilot or Government inspection. A man of ordinary intelligence cannot only operate and care for one of these gasoline motors, but, if found desirable, can steer the boat also. No fire or flame is necessary to operate the engine. The gasoline tank is carried in a water-tight compartment under the forward deck, separated from the balance of the boat, and the gasoline conveyed to the engine in pipes outside of the hull and under the water. Hence, there is no danger of fire or explosion.

The boat shown in the accompanying cut was built by the Lozier Motor Company, of New York, for the Columbus, Buckeye Lake & Newark Traction Company, of Newark, Ohio. It is 41 ft. long, equipped with a 7½-hp Lozier engine, occupying a space of but 2 ft. x 4 ft. It seats forty-six passengers, but will carry a crowd of seventy people if necessary. The expense of operating the engine, aside from the wages of the motorman, is said to be only 13 cents per hour, including the cost of fuel, oil and all incidentals. The moment the engine is stopped the expense ceases.



GASOLINE MOTOR

The life of a gasoline engine of the type built by the Lozier Motor Company is estimated at from twenty years to twenty-five years, and a well-built hull will, with proper care, give good service for from fifteen years to twenty years.

The Cincinnati Traction Company has resumed registering transfers. They are recorded on separate registers and turned in at the end of each trip.

FINANCIAL INTELLIGENCE

The Money Market

No important change has occurred in the money market during the past week. Rates, both on call and time loans, remain as they were a week ago. Borrowers are still able to obtain all the six months funds they want at 4½ per cent, but there is not much demand even at this moderate figure. For the shorter time accomodations—sixty to ninety days—3½ per cent is still the ruling rate. While a fair business is being done in call money, the quotation has kept between 1½ and 2 per cent, with most of the renewals made at 1¾. The immediate outlook is somewhat more reassuring than it was a fortnight ago, because of the evidence that the enormous corporation borrowing which so inflated the loan account in December and January, has ceased. The bank statement of Feb. 6 showed an addition of only $4,000,000, and that of last Saturday an addition of only $719,000 to the outstanding credits at the local Clearing-House. On the other hand, while cash holdings have declined $4,200,000 from their high level two weeks ago, the regular spring movement of currency away from this city has not yet set in. Had it not been for transfers of money to Baltimore occasioned by the fire losses and the abnormal demand for currency at the cotton-distributing points in the South, the item of specie and legal tenders would not have fallen at all during the past fortnight. In other words, the routine operations of interior and Sub-Treasury exchanges are neither adding nor subtracting from the local cash supply just at the moment. Surplus reserve has fallen from $26,000,000—its high-water mark of Jan. 23—to $20,400,000, but it compares favorably with the surplus of $15,500,000 a year ago this date, and the surplus of $13,500,000 in 1902. The comparative weakness of the foreign exchanges has for the present effectually allayed apprehension lest the government payments on the Panama Canal will call for export of gold to Europe. While, for the next few weeks, it is hard to foresee any serious change in this satisfactory situation, the danger of an unconvertible bank loan account still remains, and it keeps alive the uncertainty of what will happen when the outflow of currency to the interior, usually witnessed in March and April, sets in.

The Stock Market

The feverish market of a week ago, when the Baltimore fire catastrophe and the outbreak of the Russo-Japanese war severely taxed the speculative structure, has given place this week to a dull trading market, in which the general tendency has been toward recovery. It was quickly discovered that not only were the first estimates of the Baltimore losses greatly exaggerated, but that they were so widely distributed that few insurance companies would be forced to suspend, and that there was little, if any, danger of investment security holdings being pressed to sale. The beginning of hostilities in the Far East had been so long expected and so amply prepared for, that the markets, both at home and abroad, were not seriously disturbed by the news. On the contrary, the usual tendency of every "war market" to recover when the long-waited blow has finally fallen, has been exhibited universally during the week. Unless it develops that the contest is likely to be prolonged over a much greater period than now expected, or unless some unforeseen complications draw other powers into the struggle, the war has probably exhausted its influence upon the financial markets. The two main obstacles in the path of the local stock market are the uncertainty of the money position, and the admitted fact that investment capital is inactive and unwilling to contribute toward improvement in prices. Stocks have advanced during the last few days chiefly because the short interest had become over-extended, and there was no pressure from real holders of securities t sell. Nevertheless, the immediate future seems to hold little in store beyond the usual narrow fluctuations and dull trading of a professional speculator's market.

Brooklyn Rapid Transit has been one of the leaders in the week's recovery on the Stock Exchange. No attempt has been made to explain its advance by any outside reasons; attention has been devoted entirely to conjectures upon the speculative position of the stock. The prevailing idea is that the so-called political pool which managed the rise in December, realized on their holdings above 50, and have been accumulating the stock at the recent low figures. Rapid Transit is a general favorite among semi-professional operators, and is one of the few stocks in which there is now any outside following. Neither Manhattan or Metropolitan have shown any particular activity, and attempts to advance them in sympathy with the movement in the Brooklyn specialty have been more or less perfunctory. Nevertheless, the old contention that the traction stocks are less concerned than any other group, with the popular causes of uncertainty in the financial situation, is again being urged, and apparently with some success in creating bullish sentiment.

Philadelphia

Prices have moved with considerable irregularity during the week in Philadelphia, and have left few net changes of importance. American Railways has been stronger and more active, selling up to 44¾. Philadelphia Rapid Transit, on sales of a few hundred shares, gained a half-point from 14 to 14½. On the other hand, Union Traction, on a few scattered transactions, hung around 47. Philadelphia Electric lost an eighth from 6 to 5⅞, Philadelphia Company common, after advancing to 40¼, fell back to 39½, and the preferred dropped from 46 to 44⅛. There was no news or gossip in connection with any of these movements. One hundred shares of Indianapolis Street Railway sold at 84—the first transaction in some time. A hundred shares of Union Traction of Indiana went at 34¾.

Chicago

The recent strength of South Side Elevated appears to be due to market support intended to keep the quotation above the subscription price of the new stock issue. The new stock is offered to the public at 93, and the old stock was advanced during the week to 93½. No further developments have occurred in the interminable franchise controversy, but a general feeling of disgust and uneasiness is spreading, and is reflected in the market. Union Traction common has sold down this week to 4⅞, which is the lowest reached in a long while. The preferred stock declined a half-point to 29. North and West Chicago securities have apparently ceased for the time being to be pressed for sale, and no dealings in them are reported on the week. City Railway, on sales of odd lots, lost a point from 166 to 165. Lake Street Elevated receipts are barely steady around 2, and weakness continues in Metropolitan preferred, 60 shares of which sold this week at 48½.

Other Traction Securities

There are few changes to be noted in the traction specialties in Boston. Some liquidation appeared in Massachusetts Electric common, carrying the quotation down from 21⅛ to 20¼. But the stock rallied quickly to 21⅝. Massachusetts Electric preferred, after a further decline to 75¾, rallied sharply to 78. West End common sold between 91 and 90½, and the preferred between 108 and 109. The Baltimore Exchange has been closed since the fire, and no business has been transacted during the past week. Recoveries were made by North American and Twin City Rapid Transit on the New York Stock Exchange, but dealings in both stocks have been too light to attract attention. On the New York curb Interborough Rapid Transit rallied from 101½ to 103½, then eased to 103¼. Washington Traction preferred lost a half-point on the sale of 100 shares, from 47 to 46½, Nassau Electric 4s sold at 79½, Washington Traction 4s at 76, and Brooklyn Rapid Transit 4s at 75, the weakness on the last-named being due to the announcement that the company is about to issue new bonds. The Cleveland market was very quiet, only fifty-five street railway shares being sold during the week.

Iron and Steel

The only important news connected with the iron trade during the past week is the report of a large order for steel rails for some of the Western roads. No prices were given on the transaction, but it was assumed that the quotation of $28 a ton was paid and the incident was accounted an important victory for the producing interests. On the other hand, several of the leading Eastern roads have taken pains to publicly declare that rather than come to the exorbitant terms demanded by the manufacturers, they will defer all works of improvement and maintenance which would require laying new rails this season. The situation as regards the rail industry, is therefore extremely confused, and, in fact, there has scarcely been a time during the last six months when the state of the iron trade has been a matter of such great uncertainty. Unquestionably, some improvement has occurred; the figures of pig

iron production and stocks on hand at the end of January establish this fact conclusively. But on the great question whether demand for the finished products will keep up without further concessions in prices there is still ground for wide difference of opinion. Quotations are as follows: Bessemer pig iron $13.50 to $13.75, Bessemer steel $23, steel rails $28.

Metals

Quotations for the leading metals are as follows: Copper 12⅜ cents, tin 28⅛ cents, lead 4 7-16 cents, and spelter 4⅞ cents.

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	
	Feb. 9	Feb. 16
American Railways	44	44
Aurora, Elgin & Chicago (preferred)	a55	a55
Boston Elevated	*136	137½
Brooklyn Rapid Transit	41	43⅜
Chicago City	166	162
Chicago Union Traction (common)	5	4½
Chicago Union Traction (preferred)	29	28
Cleveland Electric	70½	71
Consolidated Traction of New Jersey	63	63
Consolidated Traction of New Jersey 5s	105	105½
Detroit United	59¾	62½
Elgin, Aurora & Southern	a30	—
Interborough Rapid Transit	104½	103
Lake Shore Electric (preferred)	—	a45
Lake Street Elevated	2¼	2
Manhattan Railway	141½	142⅞
Massachusetts Electric Cos. (common)	20½	20½
Massachusetts Electric Cos. (preferred)	77	77
Metropolitan Elevated, Chicago (common)	17	17
Metropolitan Elevated, Chicago (preferred)	49	48
Metropolitan Street	117⅜	118
Metropolitan Securities	84½	88½
New Orleans Railways (common)	9	8
New Orleans Railways (preferred)	30	30
New Orleans Railways 4½s	80	79
North American	83	85¼
Northern Ohio Traction & Light	14	14¾
Philadelphia Company (common)	39¼	39½
Philadelphia Rapid Transit	13½	14¼
Philadelphia Traction	97½	97⅜
St. Louis Transit (common)	5¾	8
South Side Elevated (Chicago)	92½	92
Third Avenue	115	120
Twin City, Minneapolis (common)	89	90
Union Traction (Philadelphia)	46¼	47
United Railways, St. Louis (preferred)	50	52
West End (common)	90½	90
West End (preferred)	108½	108

a Asked. † Includes new $5 assessment.

IMPROVEMENTS IN KANSAS CITY, KAN.

The improvements planned by the Metropolitan Street Railway Company in Kansas City, Kan., are to be pushed to early completion as soon as the weather moderates sufficiently to permit of uninterrupted outdoor work. Work on the new Tenth Street line will soon be resumed. The contract for the Tenth Street viaduct has been let and the preliminary work on it is progressing satisfactorily. Work on the extension of the James Street line to the stock yards will also begin soon. The company is negotiating with railroad companies for the right to build elevated tracks over steam railway tracks, and expects to close the arrangements soon.

The construction of the Seventh Street viaduct and Central Avenue elevated structure and bridge is now progressing at a gratifying rate. Owing to the failure of the firms having the contract to supply the steel to be used on the Seventh Street structure in accordance with the terms of the contract, a great many vexatious delays have resulted. Steel is now arriving almost daily and the company expects to complete the structure within thirty days. The Central Avenue "L" road structure may be ready for traffic by March 1. The plan is to have the structure completed before the ice in the Kaw breaks and menaces the safety of the temporary bridges now used in giving service between the two cities. The elevated road can then be put in commission in a short time.

The new Tenth Street line and the James Street extension will give direct communication with the stock yards and other districts and the "L" road and Fifth Street lines will again restore the communication facilities of the two cities to what they were before the flood.

CHANGE IN CONTROL OF KNOXVILLE COMPANY

The property of the Knoxville Traction Company and the Knoxville Electric Light & Power Company, of Knoxville, Tenn., has lately been sold to Ford, Bacon & Davis, of New York. This was one of the most valuable and profitable properties owned by the Railways & Light Company, of America, which is controlled by John L. Williams & Sons, bankers, of Richmond, and J. William Middendorf & Company, of Baltimore, and from whom the purchase was made. The sale of the Knoxville properties, it is understood, is the outcome of the recent Williams-Middendorf financial troubles.

The new owners have taken active charge of the properties, and, it is stated, will make extensive improvements in the power plant and also in extensions of the street railway lines; also that they will connect the system with the new passenger entrance into Knoxville of the Louisville & Nashville Railroad Company at its new terminal, now in course of construction. The new management has elected the following officials and directors for the Traction Company: C. H. Harvey, president; W. S. Shields, vice-president; Leon Fender, secretary; H. T. Bunn, treasurer and auditor; C. H. Harvey, W. S. Shields, E. F. McMillan, J. K. Newman, A. H. Ford, C. F. Uebelacker, G. H. Davis, directors.

For the Electric Light & Power Company the following officials and directors have been elected: C. H. Harvey, president; G. H. Davis, vice-president; Leon Fender, secretary; H. T. Bunn, treasurer and auditor; C. H. Harvey, F. L. Fisher, J. K. Newman, G. H. Davis, W. B. Brockway, directors.

It is understood that no changes other than those indicated in the above selections will be made in the officials. C. H. Harvey, as president, will have full charge of the local properties and all matters connected therewith. It is understood that Superintendent W. G. Woolfolk, whose operation under Mr. Harvey has been so very satisfactory, will continue in office.

REPORT OF THE INTERBOROUGH COMPANY'S EARNINGS

The Interborough Rapid Transit Company, of New York, reports earnings as follows:

Quarter ending Dec. 31—	1903
Gross receipts	$3,657,709
Operating expenses	1,396,395
Net earnings	$2,261,314
Receipts from other sources	85,599
Total income	$2,346,913
Fixed charges	1,596,579
Surplus	$750,334
Cash on hand	6,245,225
Profit and loss (surplus)	$1,512,601
Nine months ended Dec. 31, 1903—	
Gross receipts	$9,868,249
Operating expenses	4,006,105
Net earnings	$5,862,144
Receipts from other sources	256,074
Total income	$6,118,218
Fixed charges	2,949,617
Surplus	$3,168,601

The general balance sheet of the company as of Dec. 31, 1903, shows as follows:

Assets—Cost of lease and equipment of subway, $10,608,620; stocks and bonds of other companies, $15,537,451; other permanent investments, real estate, $1,394,257; supplies on hand, $690,056; due by agents of this company, $76; due by others than agents, $11,492; due by companies and individuals (open accounts), $504,465; cash on hand, $6,245,225; prepaid taxes, $82,585; Manhattan guarantee fund, $4,018,812; sundries, $16,880; total, $39,109,920.

Liabilities—Capital stock, $35,000,000; interest and premiums on capital stock, $546,002; interest on funded debt of New York Metropolitan and Manhattan Railway Companies, due and accrued, $300,000; sundries, $53,991; Manhattan Railway Company lease account, $401,790; taxes in litigation, $578,129; due for wages, $57,253; due for supplies and taxes, $633,850; due companies and individuals (open account), $26,250; profit and loss (surplus), $1,512,601; total, $39,109,920.

THE STREET RAILWAYS OF CONNECTICUT IN 1903

Heretofore the annual reports of the street railways of Connecticut, as made to the Railroad Commissioners, have comprised only the operation of lines located wholly within the State, but the report of the present year includes the operations of the Worcester & Connecticut Eastern Railway Company, which consists of 30.540 miles in Connecticut and 20.574 miles in Massachusetts; also the Providence & Danielson Railway Company, comprising 1.980 miles in Connecticut and 24.110 miles in Rhode Island. In addition to the two companies named above, the Cheshire Street Railway and the Somers & Enfield Electric Railway have been placed in operation, the line from Ansonia to Seymour has been completed and opened for business by the Connecticut Railway & Lighting Company, the Bristol & Plainville Tramway has been extended from Bristol to Terryville Station, the Willimantic Traction Company's line has been completed and opened from Willimantic southerly to a connection with the Norwich Street Railway at Baltic. In addition a direct connection has been made between the Greenwich Tramway and the Stamford Street Railroad by an extension of each of those lines to a junction point at the boundary line between Stamford and Greenwich, and the line between New Haven and Derby has been completed and opened by an extension of the lines of the Fair Haven & Westville Railroad and the Connecticut Railway & Lighting Company to a junction point about midway between New Haven and Derby. Other unimportant extensions of existing lines have also been made in various parts of the State.

The mileage of the street railways in operation on June 30, 1903, was 611.261 of main tracks, exclusive of sidings and turnouts, and 642.383 miles of single track, including same, showing a total increase of main track for the year of 93.807 miles. However, the lines of the Worcester & Connecticut Eastern Railway Company, reported to be 51.114 miles in length, comprise 20.574 miles of road located in the State of Massachusetts not heretofore reported in Connecticut, and 30.540 miles in the latter State; also the Providence & Danielson Railway Company reports 26.090 miles of road, of which only 1.980 miles are in Connecticut. Excluding, therefore, the mileage located outside of the State, it will be seen that the mileage of main line wholly within the State is 566.577, showing an increase for the year of 49.123 miles.

The Connecticut Railway & Lighting Company, owning the systems in Bridgeport and Waterbury, operates 169.894 miles; the Fair Haven & Westville Railway Company, owning the lines in New Haven, operates 104.139 miles, and the Hartford Street Railway Company, owning the lines in Hartford, operates 85.678 miles. These are the principal urban systems of the State.

The capital stock of all of the companies authorized by their charters is $33,482,000, and the amount actually issued $26,653,548, showing an issue of $45,122.96 per mile of main line.

The total bonded debt of the companies is $20,633,500, being $34,931.36 per mile of road owned. The floating indebtedness is $2,714,030.82, which is $4,440.05 per mile of road. The total stock, bonds and floating indebtedness per mile of road owned, including sidings, is $71,728.50.

The cost of the construction and equipment of the roads is reported as $47,711,830.14, being $80,773.45 per mile of road.

The gross earnings for the past year were $4,503,571.29, being $6,798.45 per mile of road operated and $0.214 per mile run. The largest earnings per mile of road operated were $9,917.99, by the New London Street Railway; the second, $9,816.32, by the Winchester Avenue Railroad; and the third, $9,732.59, by the Fair Haven & Westville Railroad. The largest earnings per mile run were $0.402, by the Montville Street Railway; the second, $0.298, by the New London Street Railway, and the third, $0.278, by the Norwich Street Railway and the Hartford, Manchester & Rockville Tramway, both of which companies earned the same amount per mile run. The three companies having the largest earnings were the Fair Haven & Westville Railroad Company (including the Winchester Avenue line, which it operates), with gross earnings of $1,290,667.21, the Connecticut Railway & Lighting Company (including the Meriden, Southington & Compounce and the Cheshire lines, owned by it), earning $1,110,599.55, and the Hartford Street Railway Company, earning $807,856.53.

The operating expenses of the companies for the year were $3,164,599.07, which are $4,777.18 per mile of road operated and $0.151 per mile run.

The net earnings for the year have been $1,338,972.22, being $2,021.27 per mile of road operated and $0.063 per mile run.

Dividends amounting to $369,816.24 have been paid by ten companies upon $6,702,300 of capital stock, while no dividends are reported paid on $19,951,248 of capital stock.

The sum of $860,903.94 has been paid for interest by twenty-two companies upon a total bonded and floating debt of $23,347,530, and the total amount of taxes paid to the State by the various companies is reported as $267,708.

Number of miles run	21,029,889
Gross earnings per mile run	$0.214
Operating expenses per mile run	0.151
Net earnings per mile run	0.063

The number of miles run is 1,654,159 more than last year. The gross earnings per mile run about 1 cent per mile more, and the net earnings about 1 cent per mile run less than for the preceding year.

The total number of passengers carried was 96,857,782, as compared with 91,554,028 for the previous year. The number of paying passengers per mile operated has been 146,213, the number of paying passengers per mile run 4.606.

INTERURBANS AN ADDITIONAL BURDEN, SAYS WISCONSIN SUPREME COURT

The Supreme Court of Wisconsin has decided in the case of a number of property owners of Lincoln Avenue, in Waukesha, against the Milwaukee Light, Heat & Traction Company that the running of interurban trains and cars over streets within the city limits is an "additional burden" upon property abutting on such streets, and the owners of such abutting property can recover compensation.

Chief Justice Cassoday, who wrote the opinion, says that, while authorities agree that a street railway strictly for the purpose of transporting persons from place to place on the streets of a city is not an additional burden upon such streets, they also agree that a railway for the carriage of persons between cities, which is constructed and operated upon a country highway, is an "additional burden" upon such highway. The court holds that the entire line of railway from the city of Milwaukee to Waukesha Beach is an interurban railway, and that owners of property abutting on the streets over which it passes are entitled to compensation.

PROPOSED AMENDMENTS TO NEW YORK RAPID TRANSIT ACT

A. B. Boardman, of counsel to the Rapid Transit Commission, of New York, at last week's meeting of that body, made known the proposed amendments to the rapid transit act which the Legislature is to be asked to enact at the present session. At least two of these amendments directly concern Brooklyn. One gives the Rapid Transit Commission power to include the bridges over the East River in its rapid transit routes, and the other empowers the Board of Estimate, without the approval of the Legislature, to spend as much in excess of $55,000,000 for rapid transit construction as the needs of the city require.

There was more or less discussion of the first mentioned amendment at the meeting. There seemed to be a notion that the proposed amendment would give the Rapid Transit Commission entire control in the matter of letting franchises on the East River bridges, but this idea was dispelled by Comptroller Grout, who said that the power which would be conferred on the commission if the amendment is enacted would be merely co-ordinate and not exclusive. The Comptroller said that it would not deprive the Board of Aldermen or the Commissioner of Bridges of any power they now possess in the matter of awarding transit privileges on the bridges over the East River.

Mayor McClellan wanted to know whether the amendment in question would prevent the laying of a route across the Williamsburg Bridge, including an elevated line in Delancey and Elm Streets, Manhattan, and the counsel to the Rapid Transit Commission replied that he did not believe it would.

The second amendment referred to, if it becomes effective, will remove the restriction which prohibits the spending by the city in rapid transit construction of more than $55,000,000 without the approval of the Legislature. That is the sum which, under the rapid transit act, the city was allowed to lay out in the building of rapid transit subways, and until this restraint is removed it will be impossible for the city to go on with the various extensions of the subway system which have been proposed in the last year.

On the enactment of this amendment will depend whether or not there are to be any further rapid transit extensions in Brooklyn Borough other than the tunnel connecting Brooklyn and Manhattan. The Rapid Transit Commission at the present time has before it a comprehensive plan for extending the Brooklyn tunnel out to Eastern Parkway prepared by Chief Engineer William Barclay Parsons.

HITCH IN THE CLEVELAND LOW FARE PROCEEDINGS

Open rebellion in the ranks of the partisans of Mayor Tom L. Johnson, of Cleveland, has defeated for the time being any prospects a trial of the zone plan of fares for the Cleveland Electric Railway Company. An ordinance embodying the plan, outlined in a recent issue of the STREET RAILWAY JOURNAL, had been drawn up after a long contest between the Mayor and the Cleveland Electric Railway Company, and was to have been introduced at a recent meeting of the City Council. Seventeen Democratic Councilmen called at Mayor Johnson's home just previous to the meeting, and informed him that they proposed to stand by the platform on which they had been elected—a straight 3-cent fare. They stated that under no circumstances would they vote for an extension ordinance which prescribed a fare of 5 cents for certain people and practically 7 cents for others, no matter how small the percentage in the higher classes might be. Mayor Johnson pleaded that any ordinance passed at this time would be merely a tentative agreement, with the stipulation that it would not become binding on either the city or the company if found unsatisfactory. The Mayor was unable to convince the Councilmen on this point, and as a result the ordinance was not introduced.

The Mayor now admits that he does not know what the next step will be. Councilman Thompson, a Republican member, has determined to present to the Council an ordinance providing for franchise extensions on the basis of seven tickets for 25 cents, with limited transfers. His plan is to give but one transfer, except on crosstown lines, where transfers on transfers shall be given. Mr. Thompson believes the proposition would be considered by the company and that it would be acceptable to the public. He claims that a number of the Democratic Councilmen have expressed their willingness to support this measure, as they believe it more equitable than the zone plan. There is little doubt that this franchise extension matter will soon be settled. The public, the Council and the compan yare thoroughly tired of the controversy, and every effort is being made to bring the matter to a focus.

MORE DELAY FOR THE NINETY-NINE YEAR CASE IN CHICAGO

The hearing of the famous ninety-nine-year act case in Chicago has been postponed from time to time, and the latter part of February is now named as the date when the city of Chicago and the representatives of the Chicago Union Traction Company will be ready to present the case before Judge Grosscup. A controversy between the Chicago Union Traction Company and its underlying companies is being heard by Master-in-Chancery Bishop.

BALTIMORE POWER HOUSE SAVED

One of the remarkable features of the great Baltimore fire was the saving of the Pratt Street power house of the United Railways & Electric Company with all of its valuable electrical machinery, although the building was in the midst of the conflagration and was first reported as having been totally destroyed. The saving of the house and its contents was a piece of great good luck for the whole city as well as for the company, as it permitted the starting of the railway service within twenty-four hours after the fire was under control and a resumption of service which otherwise might have been delayed for weeks. This power house consisted of three sections, the first section being the old power house, in which was installed direct-current apparatus; the second section was the boiler room; the third section was the new plant, in which were instatlled four 2000-kw, 13,200-volt, three-phase, fly-wheel type, a. c. Westinghouse generators. The bus-bar structure is in the basement, and over this are installed the oil switches, three for each generator and three for each feeder. The control of these switches is in a gallery built at the end of the generator room.

The old part of the power house was destroyed, and in the new part, where the generators are located, the basement was flooded with water nearly up to the bottom high-tension bus-bar. The building in which this machinery was installed, however, is absolutely fireproof, the window casings and frames being of copper and the glass provided with wire netting. While the flames raged all around, the building did not suffer, and, in fact, a cat which was in this power house came through alive. The old power house burned early Monday morning; by Tuesday afternoon at 5 o'clock the water had been removed from the basement of the new section, test had been made of the apparatus, and the result was that the machines were placed in operation at this hour, started in to furnish current to the sub-stations, and have been running ever since without difficulty.

POWER BRAKES IN CLEVELAND

The Cleveland Electric Railway Company has agreed with the city authorities on an ordinance requiring the company to equip all double-truck cars with some form of power brake within one year. The company has agreed to equip ten of its summer cars with power brakes at once, in order that it be given opportunity to try out several different types of brakes now on the market. President Andrews states that he is watching with considerable interest the results obtained from the storage air system adopted by the St. Louis Company for the World's Fair traffic. This system was thoroughly described in a recent issue of the STREET RAILWAY JOURNAL.

MEETING OF PHILADELPHIA BRANCH OF A. I. E. E.

A meeting of the Philadelphia Branch of the American Institute of Electrical Engineers was held at the Engineers' Club, of Philadelphia, on the evening of February 8. C. E. Bonine gave a talk on "The Principles of Alternating Current Motors," which was followed by an abstract by E. P. Coles, of Walter I. Slichter's paper on "Speed-Torque Characteristics of the Single-Phase Repulsion Motor," and Charles P. Steinmetz's paper on "The AlternatingCurrent Railway Motor," which were presented at the New York meeting.

C. E. Renshaw, of the Westinghouse Company, Pittsburg, read a paper on "Alternating Current Railway Motors." Mr. Renshaw dwelt upon the manay advantages the alternating-current motor has over the direct for railway purposes, and went into details as to the principles governing the single-phase alternating-current motor. The discussion was participated in by Messrs. Cutler, Thomas Spencer, and Breed.

ACCIDENT FAKIRS RUN DOWN IN NEW JERSEY AND PHILADELPHIA

Mainly through the efforts of John P. Feeney, claim adjuster for the Public Service Corporation, of New Jersey, a gang of accident fakirs has recently been run down. The specific charge on which the members of the gang are held for appearance in court is an attempt to defraud the company by a claim for injuries said to have been received by one of their number on an Erie Street car from Pavonia Ferry. The bell of the car was rung at Jersey Avenue and First Street while the conductor was inside, and a member of the gang had a fall. Two male passengers ran out and raised him and informed the alarmed conductor that the company was at fault, as the car had started while the passenger was leaving. The conductor took the names of these two passengers, who later proved to be accomplices of the man who said he had been injured.

The "accident" was reported at headquarters by the conductor. Adjuster Feeney says he anticipated it, as he had heard that such a fall was expected. The next heard of it was a letter from Paterson by a lawyer that his client was confined to bed in his (the lawyer's) flat; that he had a claim for heavy damages, as the client is a busy broker and his confinement had subjected him to a severe financial loss. He was willing, however, to settle without suing. The physician of the company was sent over to see the "injured" man. He found him abed with a red mark, suspected to have been made by caustic, on the shoulder, but no other evidence of injury. Negotiations were carried on and when the "injured" man and his lawyer called at the company's office expecting the settlement would be made they were arrested.

Sworn confessions in the hands of Philadelphia Rapid Transit Company officials mark the collapse of one of the most sensational of the many attempts to swindle that company by means of false claims for damages. One of the principals is a New York stock broker and athlete, and the other is a young actress.

On Jan. 19 the company received a letter from Francis Irwin John Harte, a young stock broker, living in New York City, and having offices in the same city. Harte alleged that his wife had been on a trolley car which ran into a train here, on Jan. 16, and that her ankle had been broken and she had sustained internal injuries. Harte claimed $5,000 damages.

Investigation proved, however, that, while the woman had been injured, the injuries were due to a fall on an icy pavement in New York on Jan. 8. It was also found that Harte had read an account of the accident in a newspaper, and that he had plotted with the woman to sue for damages, and that he had come to Philadelphia and carried out his plot. After a futile attempt to escape he confessed. A confession had also been secured from the woman.

ANNUAL DINNER OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The annual dinner of the American Institute of Electrical Engineers was held at the Waldorf-Astoria in New York on the evening of Feb. 11. Thomas A. Edison was the guest of honor, and the speakers included gentlemen who had been associated with Mr. Edison in his early work, and who since have risen to high positions of honor and authority in the electrical business. The introductory address was made by the president of the Institute, B. J. Arnold, and T. C. Martin acted as toastmaster. About 600 guests were present, including about 100 ladies.

LAKE SHORE RESUMES SERVICE BETWEEN NORWALK AND TOLEDO

The Lake Shore Electric Railway Company has resumed its service between Norwalk and Toledo after suffering a tie-up of ten days, due to a flood in the Sandusky River, which submerged half the town of Fremont. The fires were put out under the boilers and the paint and repair shops were submerged. The company was obliged to cut through 4 ins. of solid ice for a distance of ½ a mile in order to open the line through the main street of Fremont. This is the second time this winter that the road has been tied up through floods, and the earnings have, of course, been affected.

The Toledo, Bowling Green & Southern Railway has just resumed its service between Toledo and Findlay, part of the line having been tied up since the January thaw. The Toledo, Waterville & Southern Railway had not operated a car since Jan. 28 up to a few days ago. In addition to being submerged for several miles, the overhead wires were down for a considerable distance, caused by floating ice dislodging poles. The Detroit, Monroe & Toledo Short line has resumed service to Monroe after a tie-up of several days.

MAYOR VETOES THE WESTCHESTER BILL

Mayor McClellan of New York, on Wednesday, Feb. 17, after hearing arguments against his signing the grant of franchise rights to the New York, Westchester & Boston Railway Company, vetoed the bill passed by the Aldermen of New York which gave the company the right to cross a number of streets in the Bronx. This action by the Mayor was a step in the struggle for franchises between the New York, Westchester & Boston Company and the New York & Portchester Railway Company which has lasted for several months. Both companies plan to build four-track, third-rail electric railways from New York to Portchester, and the New York & Portchester Company had already secured the consent of the Railroad Commissioners to the construction of its line and had proved its financial ability to the satisfaction of the Supreme Court of the State, when the New York, Westchester & Boston Company appeared on the scene and applied for the very grants which the New York & Portchester Company had been struggling to obtain for some months.

The question of the New York, Westchester & Boston Railroad being a legitimate enterprise was often raised, but was dispelled at times by the fact that the names of prominent New York financiers were connected with it. On the other hand, the checkered carcer of the company had much to do with the raising of doubts in the minds of the people of the territory to be served by its lines as to the sincerity of its latest move. It seems that the company was incorporated in 1872 under the railroad law of 1850, and that it was placed in the hands of a receiver in 1875, where it remained until Jan. 4, 1904. The company made application to the Board of Aldermen on Jan. 12, 1904, for the franchise that has just been vetoed by the Mayor.

On the other hand, the New York & Portchester Company was incorporated in 1901 under the railroad law of 1900, and, as previously stated, received a certificate from the State Railroad Commission in 1902 and proved its financial ability to the satisfaction of the Supreme Court. It has already received permits from Mt. Vernon for crossing some thirty streets in that place, and has also received permits for building through New Rochelle. In addition it has received permits from the Supreme Court at White Plains to cross some forty streets in Westchester County. Its application for franchise rights in the Bronx was made to the Board of Aldermen on May 5, 1903, and the first hearing on the application was called on Oct. 12, 1903, after an overwhelming public demand. The second hearing was called Dec. 14, 1903. The Fusion administration was then soon to go out of office and no action was taken on the application. Practically the entire population of the Bronx and Westchester supported the application of the company and demanded the Aldermen to pass the resolution favoring this company. Now that the Mayor has vetoed the grant of the New York, Westchester & Boston Company, and as it is not likely that an attempt will be made to pass the bill over his veto, it is announced that the New York & Portchester Company will again make application for a franchise from the aldermanic railroad committee, and that this application will be presented at once.

ANNUAL REPORT OF FRANKFORT-ON-MAIN MUNICIPAL POWER PLANT AND RAILWAY

The report for 1902, recently issued by the municipality of Frankfort-on-Main, Germany, contains some interesting figures relative to the city power plant and railway system. The power plant consists of two power houses and one sub-station.

POWER HOUSE NO. 1

In August, 1902, the city installed in power house No. 1 a 5000-hp steam turbine built by Brown, Boveri & Company. This turbine is operated seventeen hours a day regularly, and, although guaranteed for 2600-kw single-phase current, it frequently gives 3200-kw.

The boilers in this power house consist of six Cornwall boilers, each of 929 sq. ft. (86 sq. m.) heating surface, twelve water-tube boilers, each of 3364 sq. ft. (311.5 sq. m.) heating surface, and three water-tube boilers, each of 4320 sq. ft. (400 sq. m.) heating surface, making in all about 58,900 sq. ft. Nine of the water-tube boilers are furnished with superheaters. Two feed-water heaters having a total heating surface of 7193 sq. ft. (666 sq. m.) are also employed.

The generating apparatus includes four 552-kw turbines, four 1033-kw turbines, and the aforementioned 3200-kw turbine, making the total capacity of the station 9540 kw.

Compared with the preceding year, the coal required per kw-hour decreased from 3.79 lbs. (1.72 kg.) to 3.59 lbs. (1.63 kg.), or over 5 per cent. The total number of kw-hours was 15,773,781, as against 15,039,620, or an increase of 4.9 per cent. The number of kw-hours used was 14,004,421, compared with 13,104,779, an increase of 6.8 per cent. The waste in power was also reduced from 12.9 per cent to 11.2 per cent.

The cost of coal per kw-hour was reduced from .878 cents (3.66 pfgs.) to .722 cents (3.01 pfgs.) The other operating expenses were also lowered, making the net cost per kw-hour 1.49 cents (6.21 pfgs.), instead of 1.57 cents (6.54 pfgs.).

POWER HOUSE NO. 2

The second power house contains four Simonis & Lanz water-tube boilers having a total capacity of 8640 sq. ft. (800 sq. m.), and two Babcock & Wilcox water-tube boilers, each having a heating ing surface of 7171 sq. ft. (332 sq. m.), making a total heating surface of 15,811 sq. ft. The B. & W. boilers are fitted with chain-grate stokers and superheaters. The normal capacity of this station is 402-kw direct-current and 1000-kw polyphase current. The kw-hours generated increased 1 per cent over the preceding year, while the coal per kw-hour decreased from 4.52 lbs. (2.05 kg.) to 3.75 lbs. (1.70 kg.), fully 17 per cent. This difference is ascribed partly to the economizer, which heats the feed-water to about 100 degs. C., but mainly to the chain-grate stokers with which the B. & W. boilers are equipped. The favorable results at this station have led the authorities to equip power station No. 1 with chain-grate stokers also.

SUB-STATION

The sub-station contains a 112.5-kw rotary converter and a storage battery having a capacity of 486 amp.-hours.

RAILWAY SYSTEM

The traffic on the railway system suffered quite severely during 1902, owing to unusually inclement weather. It is notable, however, that while the increase in traffic on single-fare tickets was but 1.7 per cent, it was fully 12 per cent on commutation tickets, the latter costing considerably less. The number of trips made on single-fare tickets was 39,094,403, and on commutation tickets 12,120,480. The authorities are of the opinion that the commutation rates are too low, and have recommended that they be increased. The net earnings decreased from $121,610 (506,709 marks) to $117,303 (488,763 marks). The system employed 1279 men, and paid out $33,265 (138,607 marks) for employees' pensions and sick and death benefit funds. During the year the management sold to the employees 20,000 tons of coal at exceptionally low prices.

The following monthly dues are paid by the employees for the account of the death benefit fund: For $72 (300 marks), 12 cents (50 pfgs.) up to thirty years; 15.6 cents (65 pfgs.), from thirty to forty years; .192 cents (80 pfgs.), from forty to forty-five years, the last year being the maximum age; for $36 (150 marks) the dues are about one-half of the foregoing. The funds are in charge of a municipal board elected by the society members, and all clerical work is performed gratis by the railway officials.

THE OHIO & MIAMI CANAL BILLS

Two bills have been introduced in the Ohio Legislature to give the Miami & Erie Canal Transportation Company, which is now hauling canal-boats by electricity between Cincinnati and Dayton, the right to operate a steam railroad on the canal bank it now occupies. Ever since the "electric mule" system was first proposed, it has been generally predicted that this would be the outcome of the proposition. The first bill gives the canal company the right to operate steam freight and passenger trains, and the second bill provides for the leasing of the canal banks to the canal company for railroad purposes for a period of ninety-nine years. It provides for an annual rental to the State, the rental to be decided by a special commission. The railroad is to be constructed and operated so as not to interfere with the operation of ordinary canal-boats, and the bills are drawn so as to prevent competition. Mention is not made of the part of the canal not now occuped by the "electric mule" company, but it is understood that bills bearing on this portion will be introduced later.

The bondholders of the company met in Cleveland a few days ago for the purpose of discussing with the Cuyahoga Legislative delegation, the bills mentioned. The bondholders gave the Legislators to understand that they did not wish to be considered as standing, in a sense, back of a "steal." They claimed that they had invested their money in good faith, and that the original proposition might have proved successful had the State maintained a depth of 4 feet, as required by law. They stated that if the State would increase the depth of the canal, the electric mules would work admirably. The bondholders will take a party of legislators over the canal in order to convince them as to the facts. Although the canal company people have strong backing, it is the general opinion that the bills will not pass.

THE NEW YORK CITY RAILWAY COMPANY

On February 10, the Interurban Street Railway Company, of New York, changed its corporate name to the New York City Railway Company, by which it will hereafter be known. The preliminary steps taken to make this change have already been mentioned in these columns. The new name is much more appropriate than the old one, and the company acted wisely in adopting it.

AN IMPORTANT DECISION IN CHICAGO

Judge Tuley rendered an important decision in Chicago, Feb. 8, in which he has decided that the Northwestern Elevated Railroad Company has no right to extend its platforms without a franchise. The court further advanced the opinion that the city is without power, even by the joint action of the Mayor and Aldermen, to sell or barter away any franchise in the public streets for a compensation to be paid into the city treasury. This is thought, and indeed is stated by Judge Tuley himself, to have an important bearing on the proposed compensation clause in the ordinance of the Chicago City Railway Company, now pending. It is a well-established principle in the State of Illinois that a city holds the title to its streets as a trustee, not for its own citizens alone, but for all the citizens of the State, no matter where they reside. On this point the Judge says:

> While the city has the fee, it does not own the street as an individual owns his own property. It holds the fee and the control of the streets as a trustee for the public, and in its control of the streets its ownership is subordinate to its duties as a trustee. It is not a trustee for the inhabitants of the city, but it is a trustee for the public use. By the public use is meant the people of the whole State.
>
> The city as a public trustee is subject to the rule applied to all trustees, whether individuals or corporations, and that is, that a trustee cannot control trust property for his or its own benefit. The city has power to exact a reasonable license fee for compensation for the extra cost it may be put to, and the supervision and use of its police made necessary by such use of the street, but it cannot speculate or make money for its treasury or its taxpayers out of its exercise of the power to control the public streets as a trustee of the public.

According to this decision, the city cannot grant a franchise for a cash compensation to the Chicago City Railway Company, and if there is any remuneration to be paid for the franchise it must be in the shape of reduced fares, rather than in a percentage of the gross receipts. In summing up his decision, the court says:

> The only question decided is that the elevated railroads in question have no right, under the respective ordinances granted them, to extend the platforms upon their respective lines without some further grant by the City Council.

PAMPHLET ON THE STANDARD SYSTEM OF ACCOUNTING

Following up the publication in pamphlet form of the standard form of report mentioned in a recent issue of this paper, Secretary Brockway, of the Street Railway Accountants' Association of America, has issued another pamphlet, which will be of great convenience to members of the association. It contains a reprint of the report of the committee of a standard system of electric railway accounting adopted by the association in 1889, the report of a similar committee of the National Commission of Railroad Commissioners, and the standard classification of accounts as adopted conjointly by the two associations in 1889 and in 1902. The pamphlet, which contains seventy pages and two blank pages for memoranda, is printed uniform in size with the annual proceedings of the association, and is intended to give members in handy form for reference the standard classification of the association.

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 FEB. 9, 1904

751,456. Surface-Cleaning Device for Third-Rails of Electric Railways; Milton C. Canfield, Cleveland, Ohio. App. filed Jan. 14, 1903. A device for removing ice from third-rails, consisting of a roller having a corrugated face, and connected to a piston working in a cylinder which communicates with the air pressure for the brakes.

751,477. Brake Shoe; Frank T. Dickinson, Chicago, Ill. App. filed May 27, 1903. Comprises a cast metal body and a frame or band open at its top and bottom and surrounding both the sides and ends of the cast metal body of the shoe and united thereto in the casting operation.

751,547. Motor Controller; Francis V. Nicholls, Pittsfield, Mass. App. filed June 13, 1903. The object of this invention is to provide a simple and compact form of controller.

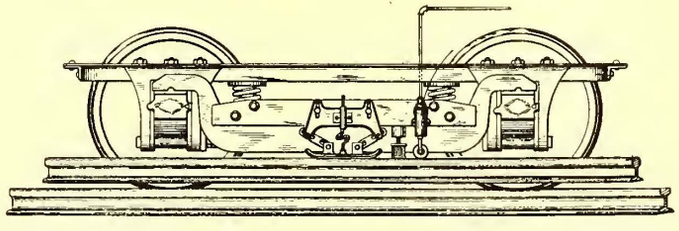
751,749. Trolley Wheel; John E. Palmer, Somerville, Mass. App. filed Nov. 14, 1903. A device for retaining the wheel on the wire.

751,760. Electric Signalling Apparatus; John E. Stannard, Springfield, Mass. App. filed Feb. 2, 1903. Details of a block signaling system.

751,780. Electric Signal; Harold E. Bradley, Warwick, R. I. App. filed Oct. 3, 1903. Improvements in a block signaling device directed toward the specific device whereby a signal set by one car as it enters a block, is not returned until the last of any number of cars which may also have entered, has passed out.

751,868. Automatic Railway Switch; William R. Murphy, St. Louis, Mo. App. filed June 23, 1903. Details.

751,900. Trolley Road Crossing; James M. Collins, Byesville, Ohio. App. filed Feb. 2, 1901. The trolley wire is sufficiently elevated at the crossings to prevent interference with crossing traffic, and a traveling trolley carriage is suspended from the elevated section adapted to engage with the trolley wheel while the car moves over the crossing.



PATENT NO. 751,456

751,932. Automatic Switch for Tramways; George A. Meighan, Providence, R. I. App. filed July 29, 1903. Details of construction of a switch adapted to be thrown from a moving car.

751,949. Road Crossing Device; Frank L. Sessions, Columbus, Ohio. App. filed Aug. 8, 1902. A modification of 751,900.

751,974. Rail Contact-Shoe and Support Therefor; George W. Brady and Lawrence R. Jones, Wheaton, Ill. App. filed April 13, 1903. A straddling shoe, the lips of which bear against the opposite sides of a third rail, and are hinged and spring-supported, to yield when passing around curves.

752,015. Switch; George Zimmermann, Pittsburg, Pa., and Otto Langos, Alliance, Ohio. App. filed Oct. 5, 1903. A rack-bar is depressed by the car wheel and rotates a gear wheel which throws the switch tongue through a system of ropes and pulleys.

PERSONAL MENTION

ALDERMAN WILLIAM MAVOR, of Chicago, a prominent member of the local transportation committee of the Chicago City Council, died Feb. 12.

MR. F. E. WILKINS, for the past two years auditor of the Dayton, Springfield & Urbana Railway at Springfield, Ohio, has resigned to become traveling auditor for the Pere Marquette Railroad (steam).

MR. GEORGE H. FOWLER, a master mechanic, who has had thirty years' experience in car construction, has entered the employ of the Southern Car Company, of High Point, N. C., as general superintendent.

MR. JOHN J. BYERS, general paymaster of the Brooklyn Rapid Transit Company, who went into the employ of the Brooklyn City Railroad Company forty years ago, died from pneumonia at his home in Brooklyn, on Tuesday, Feb. 9.

MR. P. LETHEULE, of the French Thomson-Houston Company, has been appointed, by the French Government, engineer of the French department of electricity at the St. Louis Exposition. Mr. Letheule will visit this country at an early date in connection with his mission.

MR. JOHN L. BUSHNELL has been elected president of the Springfield, Troy & Piqua Railway, of Springfield, Ohio, succeeding his father, the late General Asa S. Bushnell, whose death was announced in a recent issue of this paper. Mr. Bushnell announces that work on the road will be resumed as soon as weather permits.

MR. A. B. CLEAVELAND has been appointed general manager of the Cleveland, Painesville & Ashtabula Railway Company, of Painesville, Ohio. Mr. F. G. Daniell and Mr. H. C. Reagan, superintendent and chief engineer, respectively, have resigned. Mr. Cleaveland is a director of the company, and was one of the promotors.

MR. G. W. TALBOT has been elected general manager of the Peoria & Pekin Terminal Railway Company, with headquarters at Peoria, Ill., vice Mr. L. E. Myers. He will continue in direct charge of all traffic matters. Mr. E. A. Burrill has been appointed superintendent of the company, with headquarters at Peoria, Ill. The office of assistant superintendent has been abolished.

MR. M. MACDONALD, formerly with the Ohmer Fare Register Company, of Dayton, Ohio, has formed the Macdonald Ticket & Ticket Box Company, of Cleveland, which will shortly commence the manufacture of a new form of ticket and automatic cash fare register for interurban use. The device has been tested on several interurban roads and has been commended by the interurban managers to whom it has been shown.

MR. PUTNAM A. BATES, assistant secretary and sales manager of the Crocker-Wheeler Company, announces that he has resigned his position, and will retire from that company on March 1, next. Mr. Bates has formed a partnership with Mr. John Neilson, who was until recently assistant secretary and assistant treasurer of the New York & Stamford Electric Railway, and under the firm name of Bates & Neilson, will conduct a general practice of consulting electrical engineering, with offices in New York city.

MR. W. H. SMITH has resigned as superintendent at Pasadena, Cal., of the Pacific Electric Railway Company, and Mr. J. B. Rowray has been appointed to the vacancy. Mr. Rowray has been in charge of the Pacific Electric's Los Angeles lines since the system absorbed the Temple Street Cable Company. He has not been relieved from his former duties, the Pasadena lines inside that city, as well as the Pacific Electric main lines to and from there, and the Mount Lowe and Altadena feeders, being added to his jurisdiction. Mr. Smith says he will retire permanently from railway duties and will go into private business.

MR. J. B. McCLARY, formerly manager of the railway department of the Birmingham Railway, Light & Power Company, has formed the firm of J. B. McClary & Company, which will establish a supply business in the South. The firm will handle railroad, mining and furnace supplies, and in the former will be included electric railway supplies. There are very few companies in the South which have engaged in this business, and the standing of Mr. McClary, as well as the central position of Birmingham, which he will make his headquarters, should place the firm in an excellent position to handle electric railway business. The high price of cotton during the last three years has brought prosperous times to the South, and the outlook for considerable electric railway construction in the early future is excellent.

MR. E. T. WAGENHALS, superintendent of the Trenton & New Brunswick Railroad, extending from Trenton to Milltown, N. J., has resigned his position, and will go to Cincinnati, Ohio, where he will act as general manager of the Wagenhals Construction Company, of which he is vice-president. Mr. Wagenhals came to the Trenton & New Brunswick Railroad from Cincinnati, in the fall of 1902, and has been in charge of the operation of the road ever since it was opened. The Wagenhals Construction Company is headed by W. G. Wagenhals, inventor of the Wagenhals arc electric headlight, and has a contract for the construction of 70 miles of railway between Dayton, Ohio, and Greenville, Ind. Mr. Wagenhals' successor with the Trenton & New Brunswick Company has not yet been named.

SENATOR MARCUS ALONZO HANNA died Monday evening, Feb. 15, at his apartments in the Arlington Hotel, Washington, after an illness extending over nearly two months, filled with apparent recoverics, followed by relapses, and finally drifting into typhoid fever, which, in his weakened condition, he was unable to withstand. Mr. Hanna was prominently identified with street railway development in Cleveland, and also was active in interurban railway developments throughout the State. At one time he was president of the Cleveland City Railway Company, now part of the Cleveland Electric Railway Company, and at the time of his death was a director of the latter company. He was born in New Lisbon, in Columbian County, Ohio, Sept. 24, 1837. From a clerkship in a grocery store, he rose through successive stages of personal achievement to the command of great wealth, to the leadership of his party, and to be a Senator of the United States.

MR. G. J. SMITH has resigned his position as assistant superintendent of the St. Louis Car Company to take that of master mechanic of the Metropolitan Street Railway Company, of Kansas City, Mo. Mr. Smith has for some time occupied a prominent place among the electric railway master mechanics of the country. For a number of years he was master mechanic of the Cincinnati, Covington & Newport Street Railway, at Covington, Ky. He left Covington to take charge of the shops and power house of the St. Louis & Suburban Railway Company at St. Louis. While there his ability became so well recognized by the management of the St. Louis Car Company that he was offered the position of assistant superintendent for that company, where for the past two and a half years he has done important work in connection with truck design and methods of truck manufacture. He was one of the first to advocate an association of electric railway master mechanics, although his position with a manufacturing company recently has prevented his taking active part in the new master mechanics' association.

MR. WILLIAM BARCLAY PARSONS, chief engineer of the Rapid Transit Commission, of New York, is to sever his connection temporarily with the practical work of the Commission on or about April 1, to accept an appointment to the Royal Commission on London Traffic. It is expected that his labors in London will cover about three months, after which he expects to return to New York. It is understood that Assistant Chief Engineer George S. Rice will assume Mr. Parsons' duties for the time. Mr. Parsons' colleagues on the Royal Commission are Sir John Wolfe-Barry and Sir Benjamin Baker. The functions of the Commission are to make a detailed report on the surface and underground London traffic, and the possibilities of its improvement and development, with the idea of unifying the systems as far as possible, and getting better results for the traveling public. The Royal Commission was in New York in September of last year, and made a three weeks' study of the rapid transit subway. Mr. Parsons took much pains to show the visitors around and furnished them with valuable data.

MR. F. E. FISHER, for the past six years general manager of the Chicago & Joliet Electric Railway Company, has resigned his position with the company and will devote his time to the completion and the business interests of the new Joliet, Plainfield & Aurora Electric Company. Mr. J. R. Blackhall, who came to Joliet from Philadelphia to take the superintendency of overhead construction for the Chicago & Joliet Company, is being trained in the duties of Mr. Fisher's position, and will assume full charge April 1, when Mr. Fisher retires. Mr. Fisher is president of the Joliet, Plainfield & Aurora Company, and is also general manager of the Fisher Construction Company. Mr. H. A. Fisher, a brother, is the manager of the Joliet, Plainfield & Aurora Electric Company, and president of the Fisher Construction Company, and Mr. L. D. Fisher, a nephew of the president, is chief engineer. Mr. Fisher came to Joliet from the East six years ago next April, and succeeded the late Mr. Rush as general manager of the local company. During his administration he has rebuilt the entire Chicago & Joliet Electric Railway Company's system, and also added many new lines in the city.